#Request for Tender

**Document Number:** 2019-165T  
**Document Title:** MAJOR RENOVATION PROJECT AT TWO PEEL REGIONAL POLICE COMMERCIAL SITES  
**Date Issued:** Wednesday, October 30, 2019  

Mandatory site visit date: Monday, November 4, 2019 at 10:00 a.m.  
Site visit will begin at the Sir Robert Peel Centre (SRPC), 7750 Hurontario St., Brampton, ON L6V 3W6 and will proceed immediately following, to the Emil V. Kolb Centre (EVKC), 180 Derry Rd. E., Mississauga, ON L5T 2Y5  

**ELECTRONIC BID SUBMISSIONS ONLY** shall be received by the Agency through the Bidding System no later than:  

**12:00 noon local time**  
**Wednesday, November 13, 2019**  

The following General Contractors have been prequalified for this project in accordance with prequalification document 2019-234PQ:  
- Aquicon Construction Co. Ltd.  
- Defavri Group Contracting Inc.  
- Harbridge & Cross Limited  
- Jasper Construction Corp.  
- M.J. Dixon Construction Limited  
- Matheson Constructors Limited  
- Percon Construction Inc.  

It is the Bidder’s sole responsibility to ensure that:  
- a Bidder’s representative attends the mandatory site visit where applicable  
- the submission is received electronically by the Agency through the Bidding System by the date and time specified above  
- the submission is accompanied by all required documentation including but not limited to a digital bid bond in the amount of $300,000  

**Procurement Representative:** James Bell, Procurement Analyst  
**Telephone Number:** (905) 791-7800, ext. 4046
For MAJOR RENOVATION PROJECT AT TWO PEEL REGIONAL POLICE COMMERCIAL SITES, as required, and as specified within this Document.

1. Cover Sheet
2. Index
3. Instructions to Bidders
4. Supplementary General Conditions to CCDC2 - 2008
5. Appendices:
   5.1 Agreement to Bond
   5.2 Specifications

   Division 00 Introductory Information
   o 00 01 13 List of Standard Details
   o 00 31 00 Available Project Information

   Division 01 General Requirements
   o 01 10 00 Summary
   o 01 14 00 Work Restrictions
   o 01 21 00 Allowances
   o 01 25 00 Substitution Procedures
   o 01 32 00 Construction Progress Documentation
   o 01 32 33 Photographic Documentation
   o 01 33 00 Submittal Procedures
   o 01 40 00 Quality Requirements
   o 01 42 13 Abbreviations and Acronyms
   o 01 50 00 Temporary Facilities and Controls
   o 01 56 19 Temporary Noise Barriers
   o 01 57 19 Temporary Environmental Controls
   o 01 61 00 Common Product Requirements
   o 01 71 33 Protection of Adjacent Construction
   o 01 73 00 Execution requirements
   o 01 74 00 Cleaning and Waste management
   o 01 77 00 Closeout Procedures
   o 01 78 39 Project Record Documents
   o 01 91 00 Commissioning

   Division 02 Existing Conditions
   o 02 41 19 Selective Demolition

   Division 04 Masonry
   o 04 20 00 Unit Masonry

   Division 05 Metals
   o 05 40 00 Cold-Formed Metal Framing
   o 05 50 00 Metal Fabrications
Division 06  Wood, Plastics and Composite
- 06 10 00  Rough Carpentry
- 06 20 00  Finish Carpentry
- 06 40 00  Architectural Woodwork

Division 07  Thermal and Moisture Protection
- 07 81 00  Applied Fireproofing
- 07 84 00  Firestopping
- 07 92 00  Joint Sealants

Division 08  Openings
- 08 11 00  Metal Doors and Frames
- 08 14 00  Wood Doors
- 08 70 00  Hardware
- 08 80 00  Glazing

Division 09  Finishes
- 09 21 16  Gypsum Board Assemblies
- 09 30 00  Tiling
- 09 51 00  Acoustical Ceilings
- 09 65 00  Resilient Flooring
- 09 68 13  Tile Carpeting
- 09 69 00  Access Flooring
- 09 80 00  Acoustical Treatment
- 09 90 00  Painting and Coating

Division 10  Specialties
- 10 10 00  Information Specialties
- 10 20 00  Interior Specialties
- 10 21 13  Toilet Compartments
- 10 22 19  Demountable Partitions
- 10 28 13  Toilet Accessories
- 10 44 00  Fire Protection Specialties
- 10 50 00  Storage Specialties

Division 12  Furnishings
- 12 24 13  Roller Window Shades

Addendum 1: Added Section 08 36 13 - Sectional Metal Doors

Division 21  Fire Suppression
- 21 05 00  Common Work Results for Fire Suppression
- 21 12 00  Fire Suppression Standpipes

Addendum 4: Added Section 21 13 00 - Fire Suppression Sprinkler Systems

Division 22  Plumbing
- 22 05 00  Common Work Results for Plumbing
- 22 07 00  Plumbing Insulation
- 22 10 00  Plumbing Piping and Pumps
- 22 40 00  Plumbing Fixtures

Division 23  Heating, Ventilation and Air Conditioning
- 23 05 00  Common Work Results for HVAC
- 23 07 00  HVAC Insulation
- 23 10 00  Facility Fuel Systems
- 23 20 00  HVAC Piping and Pumps
Regional Municipality of Peel  Document 2019-165T
Procurement Division  MAJOR RENOVATION PROJECT
AT TWO PEEL REGIONAL POLICE
COMMERCIAL SITES

5.3 Contract Drawings:

Municipal Drawings:
- C1-1 Existing Condition and Removals Plan
- C2-1 Proposed Condition Plan

Architectural Drawings:
- A0-00 Cover Sheet
- A0-01 Abbreviations, Annotations, Materials
- A0-03 Ontario Building Code Analysis Plan – Basement
- A0-04 Ontario Building Code Analysis Plan – Ground Floor
- A0-05 Ontario Building Code Analysis Plan – Second and Third Floor
- A0-06 Ontario Building Code Analysis Plan – Basement

Addendum 1: Added Section 23
51 00 - Breecings, Chimneys, and Stacks
Regional Municipality of Peel  Document 2019-165T
Procurement Division  MAJOR RENOVATION PROJECT
AT TWO PEEL REGIONAL POLICE COMMERCIAL SITES

and First Floor
- A0-10 Construction Phasing and Hoarding Plan - Basement
- A0-11 Construction Phasing and Hoarding Plan – Ground Floor
- A0-12 Construction Phasing and Hoarding Plan – Second Floor
- A0-13 Construction Phasing and Hoarding Plan – Third Floor
- A0-14 180 Derry Road – Hoarding and Phasing Plan – Communications
- A0D-01 Ground Floor Demolition Plan – Records and MCB
- A0D-02 Ground Floor Demolition Plan – Enforcement
- A0D-03 Partial Basement, Ground and Second Floor Demolition Plans – Div. 22
- A0D-04 Third Floor Demolition Plan – CEI
- AD-05 Demolition Plan
- A1-01 Ground Floor Plan – Records and MCB
- A1-02 Ground Floor Plan – Enforcement
- A1-03 Partial Basement, Ground and Second Floor Plans – Div. 22
- A1-04 Third Floor Plan – CEI
- A1-05 Floor Plans – Communications
- A1-06 Ground Floor Finishes and Millwork Plan – Records and MCB
- A1-07 Ground Floor Finishes and Millwork Plan - Enforcement
- A1-08 Partial Basement, Ground and Second Floor Finishes And Millwork Plans – Div. 22
- A1-09 Third Floor Finishes and Millwork Plan - CEI
- A1-10 Finishes – Communications
- A1-11 Ground Floor Reflected Ceiling Plan – Records and MCB
- A1-12 Ground Floor Reflected Ceiling Plan – Enforcement
- A1-14 Third Floor Reflected Ceiling Plan – CEI
- A1-15 RCP – Communications
- A7-01 Millwork and Interior Elevations, Screen Elevations
- A7-02 Communications – Interior Elevations
- A9-01 Door and Screen Schedule
- A9-02 Door and Screen Schedule

Structural Drawings:
- S0-01 General Notes
- S0-02 Typical Details
- S1-01 Foundation Plan and Structural Roof Framing Plan
- S1-11 Ground Floor Structural Plan
- S2-01 Sections and Details
- S2-02 Sections

Mechanical Drawings:
- M0-1 Mechanical Legend, General Drawing Notes
- S1-12 Framing Plans East and Details
- Drawing List and Locational Key Plans
Regional Municipality of Peel  Document 2019-165T
Procurement Division  MAJOR RENOVATION PROJECT
AT TWO PEEL REGIONAL POLICE
COMMERCIAL SITES

- M1-1  Records and Major Collision Bureau - Mechanical Demolition
- M1-2  Road Safety Enforcement Mechanical Services - Mechanical Demolition
- M1-3  Division 22 - Mechanical Demolition
- M1-4  Community Engagement & Inclusion – Mechanical Demolition
- M1-5  Communications – Mechanical Demolition
- M2-1  New Plumbing Layout
- M2-2  Communications – New Plumbing Layout
- M3-1  Records and Major Collision Bureau – New Hydronic Piping Layout
- M3-2  Road Safety Enforcement Services – New Hydronic Piping Layout
- M3-3  Division 22 – New Hydronic Piping Layout
- M3-4  Community Engagement & Inclusion – New Hydronic Piping Layout
- M4-1  Records and Major Collision Bureau – New HVAC Layout
- M4-2  Road Safety Enforcement Services – New HVAC Layout
- M4-3  Division 22 – New HVAC Layout
- M4-4  Community Engagement & Inclusion – New HVAC Layout
- M4-5  Communications– New HVAC Layout
- M4-6  Communications– New Natural Gas Piping Layout
- M7-1  Mechanical Details 1 of 4
- M7-2  Mechanical Details 2 of 4
- M7-3  Mechanical Details 3 of 4
- M7-4  Mechanical Details 4 of 4
- M8-1  Mechanical Schedules
- M8-2  Mechanical Schedules
- F1-1  New Fire Protection Layout
- SP-01 of 01 Fire Sprinkler Add and Relocated / Pre-Action System

Electrical Drawings:
- E0-00  Electrical Legends, Notes and Drawing List
- ED-01  Records & Major Collisions Bureau – Lighting Demolition Layout
- ED-02  Road Safety Services Enforcement – Lighting Demolition Layout
- ED-03  Division 22 – Lighting Demolition Layout
- ED-04  CEI – Lighting Demolition Layout
- ED-05  Communications – Lighting Demolition Layout
- ED-11  Records & Major Collisions Bureau – Power and Systems Demolition Layout
- ED-12  Road Safety Services Enforcement – Power and Systems Demolition Layout
- ED-13  Division 22 – Power and Systems Demolition Layout
- ED-14  CEI – Power and Systems Demolition Layout
- ED-15  Communications – Power and Systems Demolition Layout
- E1-01  Overall Plans (SRPC)
Regional Municipality of Peel Document 2019-165T
Procurement Division
MAJOR RENOVATION PROJECT
AT TWO PEEL REGIONAL POLICE COMMERCIAL SITES

- E1-11 Overall Plan – Basement (EVKC)
- E1-12 Overall Plan – Ground Floor (EVKC)
- E1-13 Overall Plan – Roof (EVKC)
- E2-01 Records & Major Collisions Bureau – New Lighting Layout
- E2-02 Road Safety Services Enforcement – New Lighting Layout
- E2-03 Division 22 – New Lighting Layout
- E2-04 CEI – New Lighting Layout
- E2-05 Communications – New Lighting Layout
- E3-01 Records & Major Collisions Bureau – New Power and Systems Layout
- E3-02 Road Safety Services Enforcement – New Power and Systems Layout
- E3-03 Division 22 – New Power and Systems Layout
- E3-04 CEI – New Power and Systems Layout
- E3-05 Communications – New Power and Systems Layout
- E8-01 Partial Single Line Diagram and Fire Alarm Schematic for Emil V. Kolb Centre
- E8-02 Electrical Details (1 of 2)
- E8-03 Electrical Details (2 of 2)
- E9-01 Electrical Schedules
- E9-02 Panel Schedules (1 of 4)
- E9-03 Panel Schedules (2 of 4)
- E9-04 Panel Schedules (3 of 4)
- E9-05 Panel Schedules (4 of 4)

5.4 CCDC2 Stipulated Price Contract 2008 - This is not attached but forms part of the Contract
5.5 Digital Bid Bond
5.6 Performance Bond substantially in the form required under the Construction Act - This is not attached but forms part of the Contract
5.7 Labour and Material Payment Bond substantially in the form required under the Construction Act - This is not attached but forms part of the Contract
5.8 Owner’s Staff/Other Contractors Project Construction Coordination Form
5.9 Owner’s Staff/Other Contractors Anticipated to Attend Site for Contractor Coordination
5.10 Online Bidding System forms
5.11 Standard Details
5.12 Schedule of Finish Hardware – 180 Derry Road East, Mississauga, ON
5.13 Schedule of Finish Hardware – 7750 Hurontario Street, Brampton, ON
5.14 FreeAxez Preliminary Installation Plan
5.15 Peel Regional Police Network Cabling Specifications
5.16 Locker Spec
5.17 Designated Substances and Hazardous Materials Survey – 180 Derry Road East, Mississauga, ON
5.18 Designated Substances and Hazardous Materials Survey – 7750 Hurontario Street, Brampton, ON
5.19 Geotechnical Investigation, Proposed Concrete Slab for New Air Handling Units, 180 Derry Road, Mississauga, Ontario
1. **DEFINITIONS**

(a) “Agency” means The Regional Municipality of Peel, Peel Regional Police, Peel Housing Corporation and any other government or agency or board on behalf of which The Regional Municipality of Peel is acting and for the purposes of the performance of the Contract shall mean the municipality or entity awarding the Contract. For purposes of the Contract, “Agency” shall include “Owner”.

(b) “Bidder” means any proponent, respondent or other person or entity who has obtained official procurement documents for the purpose of submitting, or who has submitted a Bidder Submission in response to the Document. Furthermore, the definition of “Bidder” shall include any entity affiliated or related to the Bidder (including any entity with the same directing mind as the Bidder) as determined in the discretion of the Director of Procurement, in consultation with the Regional Solicitor.

(c) “Bidder Submission” means the document as completed by the Bidder for the purpose of offering to sell to the Agency the goods and/or services specified in the Document, and includes but is not limited to quotations, tenders and proposals.

(d) “Bidding System” means the electronic system used by the Agency for its public tenders, bids and request for proposals at the following website: peelregion.bidsandtenders.ca, which is required to be used for all dissemination of information by or on behalf of the Agency and all submissions from Bidders for this Document.

(e) “Document” means the document describing the goods and/or services to be purchased and the terms upon which the goods and/or services are to be purchased and includes, without limitation, those documents referenced on the index of the Document and such addenda as may be issued by the Agency from time to time.

(f) “Operator” means the Owner’s operations and maintenance employees, and/or contract operator of the site where the Work is being performed.

(g) “Procurement Representative” means the person named as the Procurement Representative or designate on the Document.

(h) “Region of Peel” has the same meaning as the Agency.

(i) “Vendor” means the successful Bidder and includes the term “Contractor” who enters into the Contract with the Agency for the provision of the goods and/or services set out in this Document.

2. **INFORMATION AND COMMUNICATIONS**

2.1 Any questions or information required regarding this Document must be submitted through the Bidding System via peelregion.bidsandtenders.ca by clicking the ‘Submit a Question’ button for the selected bid opportunity at least two working days prior to closing. Do not submit your questions via e-mail. No oral communications will be considered binding.

2.2 Any Bidder who requests and/or receives any information, with regards to this Document, by any person(s) other than the Procurement Representative or designate, may be disqualified from further consideration.
2.3 It is recommended that vendors add noreply@bidsandtenders.ca to their “safe senders” lists in their e-mail systems and monitor their spam/ clutter/ junk filters to ensure they do not miss automatically generated messages sent by bidsandtenders.ca that relate to this bid opportunity.

3. MANDATORY SITE VISIT
A mandatory site visit is in order to ascertain the Work requirements. Failure to sign in prior to the site visit and be present when the Procurement Representative determines that the sign-in process has closed will result in the disqualification of your Bidder Submission. Additional site visits will not be permitted. It is the responsibility of the Bidder to notify and ensure that any and all subcontractors, if required, are present.

The mandatory site visit will be held as indicated in electronic bid posting.

4. DATE AND PLACE FOR RECEIVING BIDDER SUBMISSIONS AND ACCEPTANCE PERIOD
4.1 ELECTRONIC BID SUBMISSIONS ONLY shall be received by the Agency through the Bidding System and must be received on or before the closing date and time shall be determined by the Agency's Bidding System.

4.2 Bidder Submissions submitted and/or received by any other method will be disqualified by the Agency unless instructed otherwise by published addenda in respect of the Document.

4.3 Only documents found on the Region of Peel's website at peelregion.bidsandtenders.ca are to be considered "official" documents. The Region of Peel accepts no responsibility for the accuracy or completeness of information found on other websites. The onus is on the Bidder to check the Region of Peel's website to verify they have received all relevant information. The Bidder risks submitting a non-compliant bid if addenda or other required information is missing, and disqualification could result.

4.4 It is the Bidder's sole responsibility to ensure their Bidder Submission is received by the time and date specified within the Document. The receipt of Bidder Submissions can be delayed due to a number of factors including, but not limited to, "internet traffic", file transfer size, and transmission speed. The Bidder should allow sufficient time to upload its Bidder Submission, including any attachments. Late Bidder Submissions will not be accepted by the Agency's Bidding System.

4.5 A Bidder Submission will only be considered to be submitted once it has been RECEIVED by the Agency in its Bidding System, regardless of when the Bidder Submission was submitted by the Bidder.
4.6 Bidders will be sent a confirmation e-mail by the Agency's Bidding System to the e-mail address provided by the Bidder when it registered as a Plan Taker in the Bidding System for the Document advising that its Bidder Submission was submitted successfully. Bidders should not consider its Bidder Submission to have been submitted until it has received the confirmation e-mail.

4.7 The Bidder is solely responsible for the delivery of its Bidder Submission in the manner and by the date and time prescribed in the Document. Each Bidder is responsible for the actual delivery of its Bidder Submission prior to the closing time and closing date.

4.8 The Agency is not responsible for any incomplete or misdirected Bidder Submissions due to electronic technical problems arising out of the Bidder's use of the Agency's Bidding System.

4.9 Bidder Submissions received by the Agency in accordance with the terms and conditions of the Document shall be irrevocable and open for acceptance for a period of 120 days following the date of the Bidder Submission closing.

5. ADDENDA
Addenda, if required, issued by the Procurement Representative and related to this Contract shall hereby form part of the Contract.

Any addenda related to this Contract will be posted through the Bidding System at peelregion.bidsandtenders.ca. Although the Bidding System will attempt to notify registered Bidders of when addenda are posted on the Bidding System, the Agency does not guarantee any receipt of notifications by Bidders and waives any responsibility. It is the sole responsibility of Bidders to check the Bidding System often to inform themselves of any posted addenda.

Bidders shall acknowledge receipt of any addenda when submitting their Bidder Submission through the Bidding System. Bidders shall check a box for each addendum and any applicable attachments that have been issued before a Bidder can submit their Bidder Submission online all in accordance with the terms and conditions of the Document and the Bidding System.

The Agency encourages Bidders not to submit their Bid Submission prior to forty-eight hours before the Document closing time and date, in the event that an addendum is issued. If a Bidder submits their Bidder Submission prior to this or at any time prior to the Document closing and an addendum is issued by the Agency, the Bidding System shall WITHDRAW their Bidder Submission and change their Bidder Submission to an INCOMPLETE STATUS (NOT accepted by the Agency) and the withdrawn Bidder Submission can be viewed by the Bidder in the “MY BIDS” section of the Bidding System. The Bidder is solely responsible to:
i) make any required adjustments to their Bidder Submission;
ii) acknowledge the addendum/addenda; and
iii) ensure the re-submitted Bidder Submission is RECEIVED by the Agency through the Bidding System no later than 12:00 noon local time on the Document closing date.

NOTES TO BIDDERS: Additional company contacts are recommended for the reasons outlined below:

- Do not invite any additional contacts that you do not want to have access to view, edit, submit and/or withdraw or who may be in direct competition, for example a company may have two divisions that could compete for the same bid opportunity.
- You are strongly urged, when creating or updating a Bidding System Bidder account, to add additional company contacts to create their own login to the Bidding System. This will permit your invited contacts that have created their own login to manage (register, submit, edit and withdraw) Bids which your company is a Registered Plan Taker for. In the event you are on vacation, or due to illness, etc., these additional contacts may act on your company’s behalf and have the authority to receive addendum notifications from the Bidding System and where permitted by the terms and conditions of the Document, to submit Bidder Submissions electronically through the Bidding System and/or withdraw and/or edit and/or acknowledge addendum/addenda, on your behalf.
- If you are an invited company contact, it is imperative that you create your login from the link contained in the e-mail invitation. Do NOT go directly to peelregion.bidsandtenders.ca website and create a separate Bidder account.

6. **CONTRACT AWARD**
Without limiting, and in addition to all other rights to which the Agency is entitled pursuant to this Document, the Agency shall be entitled to fully evaluate the Bidder Submission, which evaluation may include, without limitation, a review of references provided by the Bidder and of those that may be obtained by the Agency independently, past performance history of contracts between the Bidder and the Agency and/or between the Bidder and third parties, past completion history (including completion of full contract term, late or extended completion of contract and late delivery of goods or services), litigation and claims history of the Bidder (including previous, existing or potential litigation with the Agency or others and construction liens filed by the Bidder or subcontractors), delivery of incorrect services, customer service and responsiveness, or history of bidding unrealistic pricing, any of which may result in higher ultimate costs or other difficulties for the Agency, and to reject a Bidder Submission if the same is, in the Agency’s sole opinion, unsatisfactory, or would not provide the best value to the Agency.

7. **QUANTITIES**
Quantities in the Document are approximate only and are based on information available to the Agency at the time of tendering. Final quantities for payment of
tender items supplied on a unit price basis shall be based on actual field measurements as determined by the Agency.

8. **EMPLOYMENT AND LABOUR LEGISLATION**
The Province of Ontario has recently implemented legislation pursuant to the *Fair Workplaces, Better Jobs Act, 2017*, which amends Ontario’s *Employments Standards Act, 2000*, *Labour Relations Act, 1995* and *Occupational Health and Safety Act*. Legislative changes had increased the minimum wage effective as of January 1, 2018, along with other changes. The Province of Ontario has now (on November 21, 2018) passed Bill 47, the *Making Ontario Open for Business Act, 2018*, which repeals many of the amendments that were made to the *Employment Standards Act, 2000*, by the *Fair Workplaces, Better Jobs Act*. The Bill 47 amendments are effective on or before January 1, 2019. In submitting its Bidder Submission, Bidders hereby acknowledge that they have considered the changes and proposed changes to this legislation, and any impacts of the new legislation have been reflected in their bid prices. Bidders are advised that the Agency will not entertain requests to change submitted bid prices for this Document based on changes to the minimum wage or other legislative amendments made under any statute. It is the Bidder’s obligation to operate according to all applicable law at all times.

9. **TIME OF COMPLETION**
The Contractor shall diligently complete the Work in accordance with the time of completion set out in 9.1 below. **The date of substantial performance shall not extend beyond the time provided below after the written order for commencement of the Works by the Owner.**

If this time limit is not sufficient to permit completion of the Work by the Contractor within the Working Hours, the Contractor shall add and/or augment the Working Hours throughout the life of the Contract to the extent necessary to ensure that the Work will be completed within the time limit specified. Any additional costs occasioned by compliance with these provisions will be considered to be included in the prices bid for the various items of Work and no additional compensation will be allowed.

Any extension of working hours beyond those specified in this contract will require written authorization of the Owner.

9.1 The Contractor agrees to have the Works “Substantially Performed” in accordance with this document within 70 weeks after written order for commencement of the Work by the Owner.

The Contractor agrees that they will deliver the whole of the Works completed in accordance with this document within 4 weeks after the date of Substantial Performance.
10. **DIGITAL BID BOND**
   To be considered, the Bidder’s Submission must include a digitally created and electronically delivered bid bond in the form of bond included in Appendix 5.1 herein, naming the Agency as Obligee, in the amount of $300,000.

   The bond must be issued by a surety company licensed to issue surety bonds in the Province of Ontario.

   The bond must be delivered by means of a service or application recognized as meeting in whole or in part the Surety Association of Canada’s mandatory requirements for e-bonding solutions. Photocopies, images or scanned facsimiles will not be accepted.

   It is to be noted that the digital bid bonds of all Bidders will not necessarily be verified by the Agency. Prior to award of the Contract, the Agency will verify the digital bid bond of the Bidder who is proposed to be awarded the Contract by the Agency. Where the digital bid bond is not verifiable, the bid will be deemed non-compliant and disqualified. In such a case, the Agency will proceed to verify the digital bid bond of the next Bidder proposed to be awarded the Contract, and continue the process as necessary, until a digital bond is verified by a fully compliant Bidder whose bid is proposed to be awarded the Contract by the Agency.

   **If a digital bid bond and an Agreement to Bond are requested by the Agency and the surety company only provides the Bidder with a merged version, the Bidder is required to upload the merged document in both applicable fields of the online Bidding System forms.**

   The digital bid bond of the Bidder whose submission is accepted shall be called upon should the Bidder fail to execute a Contract and provide the necessary documents as required within this Document (such as a satisfactory bond, insurance certificate, Workplace Safety and Insurance Board letter of clearance) within seven days after receiving written notice from the Agency of the award of the Contract to the Bidder.

11. **AGREEMENT AND AGREEMENT TO BOND**
   Following award, the Vendor shall be required to execute an agreement with the Agency on the terms of the CCDC2 Stipulated Price Contract 2008, as amended by the Agency’s Supplementary Conditions as contained herein.

   In order to be considered for award, the Bidder shall submit through the Bidding System as part of their Bidder Submission, an Agreement to Bond in the form attached in Appendix 5.1, completed by a Bonding Company permitted to issue performance bonds and labour and material payment bonds in Ontario and with an A.M. Best rating of B+ or better. Any others will not be accepted. Each Bidder must submit the completed Agreement to Bond as part of their Bidder Submission in order to validate their Bidder Submission.
If a digital bid bond and an Agreement to Bond are requested by the Agency and the surety company only provides the Bidder with a merged version, the Bidder is required to upload the merged document in both applicable fields of the online Bidding System forms.

Upon receipt of written notice from the Agency that it has been awarded the Contract, the successful Bidder shall provide, within seven days of such notice, a Performance Bond and a Labour and Material Payment Bond, each for the amount of 50 per cent of the total lump sum price, substantially in the forms required under the Construction Act, to guarantee the performance of all obligations of the Contract.

12. INSURANCE
The insurance shall be maintained continuously from the commencement of the work until the end of warranty period established within these contract documents following the date of the completion Certificate.

The Agency’s Certificate of Insurance shall be completely filled in with the required information. No other form shall be accepted.

A deductible clause is only acceptable if the Contractor submits a signed and sealed letter stating the following:

“We (insert Contractor’s name) authorize the Region of Peel to appoint an independent adjuster to settle any claims arising from this Contract which are for amounts less than our insurance deductible figure. Furthermore, the Region can deduct any amounts of justifiable claims from monies owing to the Contractor.”

13. VENDOR PERFORMANCE EVALUATIONS
The Agency will utilize its Contractor Performance Evaluation Form as per the Vendor Performance Evaluations Procedure F35-27 (the “Procedure”) to provide a written evaluation and record of the Vendor’s/Contractor’s performance on this Contract. Evaluation on Contractor performance under this Contract will be used to provide feedback to the Vendor for performance improvements and/or to acknowledge satisfactory performance, to determine the Vendor’s eligibility or ineligibility to bid on future Agency Contracts and to justify award or non-award of future Contracts.

The complete Procedure, guidelines and Contractor Performance Evaluation Form can be found on the Agency’s website at peelregion.ca/procurement, “Vendor Performance Evaluations”. This Procedure and all related information may be amended from time to time and the most up-to-date version shall form part of this Contract. Bidders shall be aware that, if they are awarded this Contract, they shall be evaluated on the basis of the Procedure.

14. VENDOR AS CONSTRUCTOR
The Vendor acknowledges that, if the Agency does not enter into any other contracts for the project, the Vendor is the “constructor” and the “employer” within
the meaning of the Occupational Health and Safety Act (Ontario) and the Vendor undertakes to carry out the duties, obligations and responsibilities of the constructor and the employer with respect to the project. In this project, the Agency may have cause to enter into more than one contract for the project. Additionally, there may be instances where the Agency’s staff are required to attend the project site for specified intervals to perform work associated with the project. In such cases, the Vendor is required and agrees to fulfill all of the duties, obligations and responsibilities of the “constructor” and “employer” with respect to the project and on behalf of the owner, in accordance with the terms and conditions set out in SC 15 of the Supplementary General Conditions, and the Guidelines set out in GUIDELINES FOR THE CONTRACTOR WHERE OWNER'S STAFF AND OTHER CONTRACTORS ARE REQUIRED TO PERFORM WORK ON THE PROJECT SITE below.

15. GUIDELINES FOR THE CONTRACTOR WHERE OWNER'S STAFF AND OTHER CONTRACTORS ARE REQUIRED TO PERFORM WORK ON THE PROJECT SITE
Requirements for the contractor where other vendors/contractors or the Owner’s staff/other contractors are required to attend the project site to perform work associated with the project are as follows.

The contractor shall:
(a) Assume and fulfill the responsibility of constructor for all Owner’s staff/other contractors attending the project site to conduct required Work.
(b) Provide orientation to Owner’s staff/other contractors prior to Work commencement at the site.
(c) Identify a site supervisor contact or assistant for all Owner’s staff/other contractors.
(d) Maintain a sign in/out log of all visitors to the site, including owner’s staff/other contractors.
(e) Maintain a signed copy of the Owner’s Staff/Other Contractors Project Constructor Coordination Form (Appendix 5.8) for any Owner’s staff/other contractors on site, in which all such persons working on the site shall provide a signed acknowledgement that they will comply with the contractor’s safety program and safety instructions.
(f) In order to avoid delays, provide sufficient notice and coordinate Owner’s staff/other contractors’ work so it does not impact or conflict with any other work happening at the site.
(g) Schedule Owner’s staff/other contractors’ work as close as possible to substantial completion to avoid the majority of construction hazards and risk to Owner’s staff/other contractors.
(h) Maintain a log of all Form 1000 provided by each employer on site.

16. SUBCONTRACTORS
The Bidder shall provide in the Bidder Submission the name and address of each of its proposed subcontractors to be utilized in this project.
Attention is drawn to Section GC 3.7 of the General Conditions, Section SC19 of the Supplementary Conditions and to the instructions on the List of Suppliers and Subcontractors in the online Bidding System forms.

It is the responsibility of Bidders to ensure any subcontractors they retain are in good standing with the Agency under the Procedure and meet all requirements of this Document and are thus eligible to perform work on Agency contracts. Prior to bidding on this Document, Bidders shall contact the Agency at 905-791-7800 ext. 7538 to obtain a list of Contractors suspended from performing work on any Agency contracts as a subcontractor. Should a Bidder name any subcontractor in its Bidder Submission that is suspended as a subcontractor under the Procedure, the Bidder shall be required to name a replacement satisfactory to the Agency, acting reasonably, at no additional cost to the Agency, failing which the Bidder shall be deemed non-compliant and not given consideration for Contract award. By submitting a Bidder Submission, the Bidder accepts that the Agency has no liability to the Bidder or any subcontractor or third party related to the rejection of a subcontractor who is ineligible to be considered, or otherwise unsatisfactory to the Agency.

The Contractor shall arrange that each of the Contractor’s Owner-approved Subcontractors whose subcontracts have a value of $300,000 or greater, together with surety companies approved by the Owner, shall furnish to the Contractor a Performance Bond and a separate Labour and Material Payment Bond each in the amount of 50 per cent of the total value of the respective subcontract. The Performance Bond and the Labour and Material Payment Bond are to be substantially in the forms prescribed under the Construction Act, each adjusted only to reflect that it is to be obtained by the applicable Subcontractor instead of the Contractor. The Owner will not reimburse the Contractor separately for the cost of the bonds, therefore the Subcontractor should allow for the cost in the subcontractor’s lump sum price.

The Owner will not require completed Agreement to Bond forms for the subcontractors’ bonds mentioned above to be submitted by the Bidder at the time of tendering. The Bidder may decide, at the Bidder’s discretion, to obtain Agreements to Bond from the Bidder’s subcontractors at the time of tendering.

17. **BIDDER SUBMISSION**
   (a) The Bidder Submission must be submitted electronically using the Bidding System.
   (b) A person or persons with authority to bind the Bidder must electronically declare on the online Bidding System that their Bidder Submission has been made entirely in accordance with the Document.
   (c) All pricing in the Bidder Submission must be expressed in figures, and must be in Canadian Dollars.
   (d) Prices in the Bidder Submission must include all costs necessary to complete the Work in accordance with the Document including customs and duties.
(e) The Bidder represents, warrants and confirms that no oral or written alterations or variations in the Document and/or Contract have been made by the Bidder and none shall be valid or binding upon the Agency unless authorized by the Agency in writing.

(f) Bidder Submissions which are qualified or subject to any conditions, limitations or restrictions shall be rejected by the Agency.

(g) The Bidder acknowledges that it is solely responsible for obtaining and reviewing all Contract documents and all addenda issued by the Agency pertaining to the Document.

Only Bidders that are registered as a Plan Taker for this Document with Bids and Tenders at peelregion.bidsandtenders.ca and have obtained this Document from Bids and Tenders or the Agency, may submit a Bidder Submission.

Should the Agency receive a Bidder Submission that is subsequently found to be from a Bidder that is not a registered Plan Taker with Bids and Tenders at peelregion.bidsandtenders.ca, and the Bidder did not obtain the Document from Bids and Tenders or the Agency, the Agency reserves the right to reject the Bidder Submission as non-compliant and give it no further consideration for contract award.

18. AGENCY RIGHTS

The Agency reserves the right, in its sole and absolute discretion to:

(a) deem a Bidder Submission to be unbalanced and may reject any and all Bidder Submissions, which it so deems, and for this purpose, “unbalanced” shall include, without limitation, a Bidder Submission which does not reflect a realistic breakdown of the costs of each or any portion of the Work;

(b) adjust the totals in a Bidder Submission where there are errors in extensions, additions or computations. In such cases, the unit prices shown shall govern;

(c) reject any or all Bidder Submissions, accept a Bidder Submission which is not the lowest price, reject a Bidder Submission even if it is the only one received by the Agency; and cancel this request for Bidder Submissions at any time either before or after the receipt of Bidder Submissions, following which the Agency may proceed as it determines in its sole discretion, including without limitation, negotiating with any one or more of the Bidders or any other person or entity for the performance of the Work under such terms and conditions as the Agency may decide in its sole discretion, or issuing a new request for Bidder Submissions on the same or modified terms, all without liability to itself;

(d) award the Contract in its entirety or in part, to one or more Vendors, if in doing so the best interests of the Agency will be served;

(e) inspect and have a demonstration of the goods and/or services offered prior to award of a Contract and request evidence of experience, ability or financial standing;

(f) waive formalities, technical defects, irregularities and omissions in a Bidder Submission, and may accept a Bidder Submission which does not
comply with the formal requirements of the Document, if in doing so the best interests of the Agency will be served;

(g) remove from the Agency’s list of vendors the name of any vendor and/or Bidder for failure to accept a contract or for unsatisfactory performance or non-performance of a contract;

(h) fully evaluate the Bidder Submission, which evaluation may include, without limitation, a review of references provided by the Bidder and of those that may be obtained by the Agency independently, past performance history of contracts between the Bidder and the Agency and/or between the Bidder and third parties, past completion history (including completion of full contract term, late or extended completion of contract and late delivery of goods or services), litigation and claims history of the Bidder (including previous, existing or potential litigation with the Agency or others and construction liens filed by the Bidder or subcontractors), delivery of incorrect services, customer service and responsiveness, or history of bidding unrealistic pricing, any of which may result in higher ultimate costs or other difficulties for the Agency, and to reject a Bidder Submission if the same is, in the Agency’s sole opinion, unsatisfactory, or would not provide the best value to the Agency;

(i) reject and disqualify any or all Bidder Submissions based on a Bidder’s Vendor Performance Rating, status and standing as per the Agency’s Vendor Performance Evaluations procedures, as amended from time to time; and

(j) seek further information and/or clarification, including without limitation a detailed price breakdown, from any Bidder after the closing time, for the purposes of assisting the Agency in interpreting and evaluating any Bidder Submission and in interpreting any inconsistencies which may appear in any Bidder Submission, and the Agency shall have the right to consider and rely on such further information and clarifications in evaluating the Bidder Submissions and awarding the Contract.

19. **CONFIDENTIAL INFORMATION/OWNERSHIP AND DISCLOSURE OF BIDDER SUBMISSIONS**

(a) The Vendor agrees to protect and maintain the confidentiality of all personal or other information, including all personal health information, that the Vendor accesses or of which the Vendor acquires knowledge of as a result of the services in this Contract, and agrees to use, collect, disclose, retain, protect and dispose of the personal (health) information only in accordance with all privacy legislation applicable to the Agency where it is acting on behalf of the Agency. Disclosure of any information shall be done only with the Agency’s prior written consent. The provisions of the indemnity clause in this Contract apply to any breach of privacy or confidentiality in this clause. The Vendor shall ensure that its directors, officers, employees, agents, subcontractors and anyone else for whom it is responsible in law all adhere to the requirements of this section regarding privacy and confidentiality.

(b) The Agency, and the Agency’s responsibilities under this Contract, are subject to all applicable privacy legislation including the Municipal
Freedom of Information and Protection of Privacy Act, R.S.O. 1990 c.M.56, as amended (“MFIPPA”) and/or the Personal Health Information Protection Act, 2004 (“PHIPA”) with respect to the collection, use, disclosure, retention and protection of confidential, sensitive or personal (health) information under the Agency’s custody and control. Under an MFIPPA request, all documents provided to the Agency by the Vendor pursuant to the procurement process which led to this Contract, and the Contract itself and associated documents, may be required by law to be made available to a requesting member of the public, with the possible exception that the party submitting certain information requests that it be treated as confidential and that there is an appropriate exemption to disclosure in MFIPPA, or a non-disclosure requirement in either MFIPPA or PHIPA.

(c) The Bidder Submissions, along with all correspondence, documentation and information provided to the Agency by any Bidder in connection with or arising out of the Bidder Submission, once received by the Agency, shall become the property of the Agency and may be appended to any agreement and/or purchase order with the successful Bidder. Bidders must identify in their Bidder Submissions any scientific, technical, proprietary, commercial or other confidential information, the disclosure of which could cause them injury.

(d) In public bids, the name of each Bidder and the lump sum price contained in their Bidder Submission shall be published on the Bidding System.

(e) Where award is to be made by Regional Council, the Peel Police Services Board or the Board of Directors of Peel Housing Corporation, information regarding all Bidder Submissions, including names of each Bidder, lump sum prices and the annual or overall value of the Contract and/or Bidder Submissions shall be included in public reports to Regional Council or the relevant Boards such that the information is released publicly. The Bidder acknowledges that the Agency cannot guarantee it can honour requests to keep Bidder information confidential in light of applicable law requirements, and also in light of the need for transparency and public disclosure where release of Bidder information in public Council reports related to a specific project or procurement process is necessary.

20. **COLLUSION AND CONFLICT OF INTEREST**

(a) By submitting a Bidder Submission, each Bidder represents and warrants that no member, officer or employee of the Agency or Council has or will have an interest, directly or indirectly, in the performance of the Contract, or in the supplies, work or business in connection with the said Contract, or in any portion of the profits thereof, or in any monies to be derived therefrom; the Bidder Submission is not made in collusion with any other Bidder making a Bidder Submission for the same goods and services and is, in all respects, fair and without fraud; and that neither it nor any of its subcontractors nor any of their respective representatives has any actual, apparent or potential conflict of interest or existing business or other relationship with the Agency or any or any other party or person providing
advice or services to the Agency with respect to the Document or the Work or any of their respective representatives that gives rise or might give rise to an unfair advantage (a “Conflict of Interest”). Each Bidder acknowledges that it is within the Agency’s discretion to determine whether a Conflict of Interest exists.

(b) Should the Bidder give or offer any gratuity to or attempt to bribe any member of the Agency, or to commit collusion or fraud, the Agency shall be at liberty to reject the Bidder Submission or, if a Contract has been awarded, terminate the Contract forthwith, without liability to itself, and to rely upon the sureties as provided for.

(c) By submitting a Bidder Submission for this Document, each Bidder thereby releases and forever discharges the Agency from any and all liability related to any determination the Agency may make regarding Conflicts of Interest, including any disqualification, prohibition, rejection or contract termination which may result therefrom.

(d) In addition to all other rights in this Document or otherwise available at law or in equity, the Agency may, in its discretion, immediately disqualify a Bidder Submission or may terminate any contract entered into in connection with or resulting from the Document, without liability, penalty or cost, upon giving notice to the Bidder if the Bidder or any of their respective representatives fails to disclose or has failed to disclose any Conflict of Interest.

21. **HARMONIZED SALES TAX (HST) INFORMATION**

The Agency is subject to the payment of provincial and federal taxes imposed by the Provincial and Federal Governments and, if required, the collection of any withholding tax for non-resident Vendors. All prices within this document shall be quoted exclusive of HST.

22. **ACCESSIBILITY FORONTARIANS WITH DISABILITIES**

The Vendor shall comply with the Accessibility for Ontarians with Disabilities Act 2005, and its Regulations thereunder with regard to the provision of goods or services to persons with disabilities. The Vendor acknowledges that pursuant to the Accessibility for Ontarians with Disabilities Act 2005, the Region of Peel must, in deciding to purchase goods or services through its procurement process, consider accessibility for persons with disabilities to such goods or services. This legislation can be accessed through the following link to the Government of Ontario’s website: ontario.ca/laws/statute/05a11. You may also access this link at peelregion.ca/procurement, “Additional Information for Bidders” and view the accessibility standards.

23. **INVOICING AND PAYMENT INSTRUCTIONS**

23.1 All invoices must be sent to the individual ordering the goods/services or as directed at the time of the order placement. Failure to do so will result in a delay of payment.

23.2 The Agency’s method of payment is by Electronic Funds Transfer (EFT). The Vendor will be required to provide the Agency, with the Application
for Vendor Direct Deposit form containing original signatures in ink, by return mail, fax or hand delivered, the following banking information:

23.2.1 Names of two Company Officers, their titles, e-mail addresses, fax numbers, and phone numbers. Note: Both Company Officers must sign off on any subsequent changes to the Vendor's banking information.

23.2.2 Company mailing and remittance addresses.

23.2.3 Banking information including a void cheque.

23.2.4 The Vendor is required to notify the Agency of any changes to this information immediately.

24. **GOVERNING LAW**

The Agency and the Vendor acknowledge and agree that:

(a) this procurement process (within the meaning set out in Section 87.3 of the *Construction Act*) was commenced, and the Contract will be entered into, on or after July 1, 2018, but before October 1, 2019; and

(b) amendments to the *Construction Act* that are to be proclaimed and come into force on July 1, 2018 are applicable to this Contract, but amendments to the *Construction Act* that are to be proclaimed and come into force on October 1, 2019 are not applicable to this Contract; and

(c) the Vendor will incorporate into its contracts with Subcontractors and Suppliers, and ensure that all Subcontractors and Suppliers are made aware of, these acknowledgements and agreements.

25. **SECURITY CLEARANCE**

Peel Regional Police requires that all Vendor personnel attending any Police facility unescorted, as well as the organizations that they represent, be subject to a security clearance prior to the commencement of any Work. The successful Bidder will be required to have security clearance (background examination) forms completed and submitted for all employees and/or subcontracted employees who will be required to work on-site within 10 days of award. The security clearance process can take up to two months to complete. If the successful Bidder is unable to submit the completed forms within the stipulated time frame, or is unable to successfully satisfy the background examination(s) required, the Bidder will be disqualified and the award revoked at the Agency’s discretion. In this situation, the award will then be given to the next “best” responsive and responsible Bidder at the sole discretion of the Agency.

The Agency reserves the right to exercise this action as it deems necessary.

26. **EMPLOYEE IDENTIFICATION AND BUILDING ACCESS**

Vendor employees who have successfully met the criteria of the security clearance will be provided with an identification badge. This badge must be worn at all times while the employee is working in any Peel Regional Police facility. This identification badge will remain the property of the Peel Regional Police and must be returned upon request. The Vendor will be responsible for the prompt return of the identification badge upon written notice by the Agency.
SCHEDULE 1

Supplementary Conditions for Standard Construction Document CCDC2 2008
Stipulated Price Contract

SC.1 GENERAL
These Supplementary Conditions presuppose the use of the Standard Construction Document CCDC2 – 2008 Stipulated Price Contract. These “Supplementary Conditions” void, supersede or amend the “Agreement”, “Definitions” and “General Conditions” as hereinafter provided, as the case may be.

SC.2 AGREEMENT
1. Amend Article A–1 THE WORK as follows:
   (a) Add the following word to the beginning of paragraph 1.1, “diligently”,
   (b) Add the following as new paragraph 1.4:
   “1.4 provide all the labour, materials, equipment, machinery, Products and work including, without limitation, all commissioning services required by the Contract Documents in order to fully complete and construct the Work and in accordance with, and satisfaction of, all applicable federal, provincial, municipal and local laws, regulations, rules, by-laws, guidelines, standards, permits, statutes, ordinances, and codes including, without limitation, those relating to occupational health and safety and any and all obligations, responsibilities and duties required by or set out in any site plan agreement or approval, attributable to the Place of the Work and/or the proposed development therein, and furnish efficient business and construction administration and superintendence consistent with the interests of the Owner.”

2. Add the following documents to the existing list of Contract Documents set out in Article A-3 CONTRACT DOCUMENTS:
   - Addenda as issued
   - Instructions to Bidders
   - Supplementary General Conditions to CCDC2 – 2008
   - Agreement to Bond
   - Specifications

   Division 00 Introductory Information
   o 00 01 13 List of Standard Details
   o 00 31 00 Available Project Information

   Division 01 General Requirements
   o 01 10 00 Summary
   o 01 14 00 Work Restrictions
   o 01 21 00 Allowances
   o 01 25 00 Substitution Procedures
   o 01 32 00 Construction Progress Documentation
   o 01 32 33 Photographic Documentation

   Addendum 3: Added
   Sections 00 62 76 - Application for Payment Form and 01 29 00 - Payment Procedures
Regional Municipality of Peel Document 2019-165T Supplementary General Conditions
Procurement Division MAJOR RENOVATION PROJECT to Contract CCDC2 - 2008
AT TWO PEEL REGIONAL POLICE COMMERCIAL SITES

- 01 33 00 Submittal Procedures
- 01 40 00 Quality Requirements
- 01 42 13 Abbreviations and Acronyms
- 01 50 00 Temporary Facilities and Controls
- 01 56 19 Temporary Noise Barriers
- 01 57 19 Temporary Environmental Controls
- 01 61 00 Common Product Requirements
- 01 71 33 Protection of Adjacent Construction
- 01 73 00 Execution requirements
- 01 74 00 Cleaning and Waste management
- 01 77 00 Closeout Procedures
- 01 78 39 Project Record Documents
- 01 91 00 Commissioning

Division 02 Existing Conditions
- 02 41 19 Selective Demolition

Division 04 Masonry
- 04 20 00 Unit Masonry

Division 05 Metals
- 05 40 00 Cold-Formed Metal Framing
- 05 50 00 Metal Fabrications

Division 06 Wood, Plastics and Composite
- 06 10 00 Rough Carpentry
- 06 20 00 Finish Carpentry
- 06 40 00 Architectural Woodwork

Division 07 Thermal and Moisture Protection
- 07 81 00 Applied Fireproofing
- 07 84 00 Firestopping
- 07 92 00 Joint Sealants

Division 08 Openings
- 08 11 00 Metal Doors and Frames
- 08 14 00 Wood Doors
- 08 70 00 Hardware
- 08 80 00 Glazing

Division 09 Finishes
- 09 21 16 Gypsum Board Assemblies
- 09 30 00 Tiling
- 09 51 00 Acoustical Ceilings
- 09 65 00 Resilient Flooring
- 09 68 13 Tile Carpeting
- 09 69 00 Access Flooring
- 09 80 00 Acoustical Treatment
- 09 90 00 Painting and Coating

Division 10 Specialties
- 10 10 00 Information Specialties

Addendum 1: Added Section 08 36 13 - Sectional Metal Doors
Regional Municipality of Peel  Document 2019-165T  Supplementary General Conditions
Procurement Division  MAJOR RENOVATION PROJECT  to Contract CCDC2 - 2008
AT TWO PEEL REGIONAL POLICE
COMMERCIAL SITES

- 10 20 00  Interior Specialties
- 10 21 13  Toilet Compartments
- 10 22 19  Demountable Partitions
- 10 28 13  Toilet Accessories
- 10 44 00  Fire Protection Specialties
- 10 50 00  Storage Specialties

Division 12  Furnishings
- 12 24 13  Roller Window Shades

Division 21  Fire Suppression
- 21 05 00  Common Work Results for Fire Suppression
- 21 12 00  Fire Suppression Standpipes

Division 22  Plumbing
- 22 05 00  Common Work Results for Plumbing
- 22 07 00  Plumbing Insulation
- 22 10 00  Plumbing Piping and Pumps
- 22 40 00  Plumbing Fixtures

Division 23  Heating, Ventilation and Air Conditioning
- 23 05 00  Common Work Results for HVAC
- 23 07 00  HVAC Insulation
- 23 10 00  Facility Fuel Systems
- 23 20 00  HVAC Piping and Pumps
- 23 30 00  HVAC Air Distribution
- 23 70 00  Central HVAC Equipment
- 23 80 00  Decentralized HVAC Equipment

Division 25  Integrated Automation
- 25 05 00  Common Work Results for Integrated Automation
- 25 06 00  Schedules for Integrated Automation
- 25 10 00  Integrated Automation Network Equipment
- 25 30 00  Integrated Automation Instrumentation and Terminal Devices
- 25 90 00  Integrated Automation Control Sequences

Division 26  Electrical
- 26 05 00  Common Work Results for Electrical
- 26 05 19  Wire and Cable
- 26 05 33  Raceway Boxes for Electrical Systems
- 26 05 53  Identification for Electrical Systems
- 26 09 23  Lighting Control
- 26 09 43  Networked Lighting Controls
- 26 22 00  Low-Voltage Transformers
- 26 27 00  Low-Voltage Distribution Equipment
- 26 27 26  Wiring Devices
- 26 36 00  Transfer Switches
- 26 43 00  Surge Protection Devices
- 26 50 00  Lighting
- 26 52 13  Emergency and Exit Lighting

Addendum 4: Added Section 21 13 00 - Fire Suppression Sprinkler Systems

Addendum 1: Added Section 23 51 00 - Breechings, Chimneys, and Stacks
Division 27 Communications
- 27 05 28 Pathways for Communications Systems
- 27 10 00 Structured Cabling
- 27 53 13 Clock Systems

Division 28 Electronic Safety and Security
- 28 13 00 Access Control
- 28 31 00 Fire Detection Alarm

Division 32 Exterior Improvements
- 32 31 00 Fences and Gates

5.20 Contract Drawings:
Municipal Drawings:
- C1-1 Existing Condition and Removals Plan
- C2-1 Proposed Condition Plan

Architectural Drawings:
- A0-00 Cover Sheet
- A0-01 Abbreviations, Annotations, Materials
- A0-03 Ontario Building Code Analysis Plan – Basement
- A0-04 Ontario Building Code Analysis Plan – Ground Floor
- A0-05 Ontario Building Code Analysis Plan – Second and Third Floor
- A0-06 Ontario Building Code Analysis Plan – Basement and First Floor
- A0-10 Construction Phasing and Hoarding Plan - Basement
- A0-11 Construction Phasing and Hoarding Plan – Ground Floor
- A0-12 Construction Phasing and Hoarding Plan – Second Floor
- A0-13 Construction Phasing and Hoarding Plan – Third Floor
- A0-14 180 Derry Road – Hoarding and Phasing Plan – Communications
- A0D-01 Ground Floor Demolition Plan – Records and MCB
- A0D-02 Ground Floor Demolition Plan – Enforcement
- A0D-03 Partial Basement, Ground and Second Floor Demolition Plans – Div. 22
- A0D-04 Third Floor Demolition Plan – CEI
- AD-05 Demolition Plan
- A1-01 Ground Floor Plan – Records and MCB
- A1-02 Ground Floor Plan – Enforcement
- A1-03 Partial Basement, Ground and Second Floor Plans – Div. 22
- A1-04 Third Floor Plan – CEI
- A1-05 Floor Plans – Communications
- A1-06 Ground Floor Finishes and Millwork Plan – Records and MCB
- A1-07 Ground Floor Finishes and Millwork Plan - Enforcement
- A1-08 Partial Basement, Ground and Second Floor Finishes And Millwork Plans – Div. 22
Regional Municipality of Peel  Document 2019-165T  Supplementary General Conditions
Procurement Division  MAJOR RENOVATION PROJECT  to Contract CCDC2 - 2008
AT TWO PEEL REGIONAL POLICE
COMMERCIAL SITES

- A1-09 Third Floor Finishes and Millwork Plan - CEI
- A1-10 Finishes – Communications
- A1-11 Ground Floor Reflected Ceiling Plan – Records and MCB
- A1-12 Ground Floor Reflected Ceiling Plan – Enforcement
- A1-14 Third Floor Reflected Ceiling Plan – CEI
- A1-15 RCP – Communications
- A7-01 Millwork and Interior Elevations, Screen Elevations
- A7-02 Communications – Interior Elevations
- A9-01 Door and Screen Schedule
- A9-02 Door and Screen Schedule

Structural Drawings:
- S0-01 General Notes
- S0-02 Typical Details
- S1-01 Foundation Plan and Structural Roof Framing Plan
- S1-11 Ground Floor Structural Plan
- S2-01 Sections and Details
- S2-02 Sections

Mechanical Drawings:
- M0-1 Mechanical Legend, General Drawing Notes
- M1-1 Records and Major Collision Bureau - Mechanical Demolition
- M1-2 Road Safety Enforcement Mechanical Services - Mechanical Demolition
- M1-3 Division 22 - Mechanical Demolition
- M1-4 Community Engagement & Inclusion – Mechanical Demolition
- M1-5 Communications – Mechanical Demolition
- M2-1 New Plumbing Layout
- M2-2 Communications – New Plumbing Layout
- M3-1 Records and Major Collision Bureau – New Hydronic Piping Layout
- M3-2 Road Safety Enforcement Services – New Hydronic Piping Layout
- M3-3 Division 22 – New Hydronic Piping Layout
- M3-4 Community Engagement & Inclusion – New Hydronic Piping Layout
- M4-1 Records and Major Collision Bureau – New HVAC Layout
- M4-2 Road Safety Enforcement Services – New HVAC Layout
- M4-3 Division 22 – New HVAC Layout
- M4-4 Community Engagement & Inclusion – New HVAC Layout
- M4-5 Communications– New HVAC Layout
- M4-6 Communications– New Natural Gas Piping Layout
- M7-1 Mechanical Details 1 of 4
## Regional Municipality of Peel Document 2019-165T

**Supplementary General Conditions**
**Procurement Division**

**MAJOR RENOVATION PROJECT**

**to Contract CCDC2 - 2008**

**AT TWO PEEL REGIONAL POLICE COMMERCIAL SITES**

- M7-2  Mechanical Details 2 of 4
- M7-3  Mechanical Details 3 of 4
- M7-4  Mechanical Details 4 of 4
- M8-1  Mechanical Schedules
- M8-2  Mechanical Schedules
- F1-1  New Fire Protection Layout
- SP-01 of 01 Fire Sprinkler Add and Relocated / Pre-Action System

### Electrical Drawings:
- E0-00  Electrical Legends, Notes and Drawing List
- ED-01  Records & Major Collisions Bureau – Lighting Demolition Layout
- ED-02  Road Safety Services Enforcement – Lighting Demolition Layout
- ED-03  Division 22 – Lighting Demolition Layout
- ED-04  CEI – Lighting Demolition Layout
- ED-05  Communications – Lighting Demolition Layout
- ED-11  Records & Major Collisions Bureau – Power and Systems Demolition Layout
- ED-12  Road Safety Services Enforcement – Power and Systems Demolition Layout
- ED-13  Division 22 – Power and Systems Demolition Layout
- ED-14  CEI – Power and Systems Demolition Layout
- ED-15  Communications – Power and Systems Demolition Layout
- E1-01  Overall Plans (SRPC)
- E1-11  Overall Plan – Basement (EVKC)
- E1-12  Overall Plan – Ground Floor (EVKC)
- E1-13  Overall Plan – Roof (EVKC)
- E2-01  Records & Major Collisions Bureau – New Lighting Layout
- E2-02  Road Safety Services Enforcement – New Lighting Layout
- E2-03  Division 22 – New Lighting Layout
- E2-04  CEI – New Lighting Layout
- E2-05  Communications – New Lighting Layout
- E3-01  Records & Major Collisions Bureau – New Power and Systems Layout
- E3-02  Road Safety Services Enforcement – New Power and Systems Layout
- E3-03  Division 22 – New Power and Systems Layout
- E3-04  CEI – New Power and Systems Layout
- E3-05  Communications – New Power and Systems Layout
- E8-01  Partial Single Line Diagram and Fire Alarm Schematic for Emil V. Kolb Centre
- E8-02  Electrical Details (1 of 2)
- E8-03  Electrical Details (2 of 2)
- E9-01  Electrical Schedules
- E9-02  Panel Schedules (1 of 4)
- E9-03  Panel Schedules (2 of 4)
- E9-04  Panel Schedules (3 of 4)
Regional Municipality of Peel  Document 2019-165T  Supplementary General Conditions
Procurement Division  MAJOR RENOVATION PROJECT  to Contract CCDC2 - 2008
AT TWO PEEL REGIONAL POLICE
COMMERCIAL SITES

- E9-05  Panel Schedules (4 of 4)
- CCDC2 Stipulated Price Contract 2008 – This is not attached but forms part of the Contract
- Digital Bid Bond
- Performance Bond substantially in the form required under the Construction Act – This is not attached but forms part of the Contract
- Form of Labour and Material Payment Bond substantially in the form required under the Construction Act – This is not attached but forms part of the Contract
- Owner’s Staff/Other Contractors Project Construction Coordination Form
- Owner’s Staff/Other Contractors Anticipated to Attend Site for Contractor Coordination
- Online Bidding System Forms
- Standard Details
- Schedule of Finish Hardware – 180 Derry Road East, Mississauga, ON
- Schedule of Finish Hardware – 7750 Hurontario Street, Brampton, ON
- FreeAxez Preliminary Installation Plan
- Peel Regional Police Network Cabling Specifications
- Locker Drawing
- Designated Substances and Hazardous Materials Survey – 180 Derry Road East, Mississauga, ON
- Designated Substances and Hazardous Materials Survey – 7750 Hurontario Street, Brampton, ON
- Geotechnical Investigation, Proposed Concrete Slab for New Air Handling Units, 180 Derry Road, Mississauga, Ontario

3. Delete ARTICLE A-5 PAYMENT in its entirety and replace with the following:

(a) "ARTICLE A-5 PAYMENT"

5.1 Subject to, and in accordance with, the provisions of the Contract Documents and the Construction Act the Owner shall:

.1 make monthly progress payments to the Contractor on account of the Contract Price when due in the amount certified by the Consultant together with such Value Added Taxes as may be applicable to such amount certified by the Consultant;

.2 upon Substantial Performance of the Work, pay the Contractor the unpaid balance of the holdback amount when due together with such Value Added Taxes as may be applicable to such payment; and

.3 upon the issuance of the final certificate for payment, pay to the Contractor the unpaid balance of the Contract Price when due together with such Value Added Taxes as may be applicable to such payment.

5.2 As such payments become due, the Contractor shall, in accordance with the terms of its agreements with any

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Subcontractors, Suppliers and workmen, pay all of its
Subcontractors, Suppliers and workmen in full on account of work
properly performed or Products properly supplied, as applicable,
less any holdback monies retained in compliance with the
Construction Act.

5.3 In the event of loss or damage occurring where payment becomes
due under the property and boiler and machinery insurance
policies, payments shall be made to the Contractor in accordance
with the provisions of GC 11.1 – INSURANCE of the General
Conditions.

5.4 Interest

.1 Should either party fail to make payments as they become
due under the terms of the Contract or in an award by
arbitration or court, interest at one per cent per annum
above the bank rate on such unpaid amounts shall also
become due and payable until payment. Such interest
shall be compounded on a monthly basis. The bank rate
shall be the rate established by the Bank of Canada as the
minimum rate at which the Bank of Canada makes short
term advances to the chartered banks.

.2 Interest shall apply at the rate and in the manner
prescribed by Section 5.4.1 of this Agreement on the
amount of any claim advanced and for which the
Contractor is thereafter entitled to payment, either pursuant
to Part 8 – Dispute Resolution of the General Conditions,
or otherwise, from the date the amount would have been
due and payable under the Contract, had it not been in
dispute, until the date it is paid."

SC.3 RECEIPT OF AND ADDRESSES FOR NOTICES IN WRITING

1. Amend paragraph 6.1 by deleting the words “or other form of electronic
communication during the transmission of which no indication of failure of receipt
is communicated to the sender.”, and by deleting the words “or other form of
electronic communication”.

SC.4 LANGUAGE OF THE CONTRACT

1. Amend paragraph 7.1 to read:

“When the Contract Documents are prepared in both English and French
languages, it is agreed that in the event of any apparent discrepancy between
the English and French versions, the English language shall prevail.”

SC.5 SUBCONTRACTORS

1. Add new ARTICLE A-9 – ASSIGNMENT OF SUBCONTRACTS, as follows:

(a) “ARTICLE A-9 ASSIGNMENT OF SUBCONTRACTS
9.1 The Owner shall not be deemed by virtue of the Contract or for any other reason to have any contractual relationship with or obligation to any Subcontractor or Supplier but the Contractor hereby agrees that in the event that:

.1 the Contract is terminated; or
.2 the Contractor’s right to continue the Work is terminated;

and at the sole and absolute option of the Owner, any or all subcontracts for Work or Products as may be selected by the Owner, in its sole and absolute discretion, shall, upon notice to the Contractor and the affected Subcontractors and Suppliers from the Owner, be assigned to the Owner, without any further action being necessary from the Contractor or the affected Subcontractors and Suppliers and in order to ensure the Owner’s rights, the Contractor shall:

.3 contractually obligate each of its Subcontractors and Suppliers to agree that each such subcontract shall be assignable, at the Owner’s option, to the Owner, upon delivery of the notice described above, in the event that:

(A) the Contract is terminated; or
(B) the Contractor’s right to continue the Work is terminated.

9.2 The Contractor shall provide satisfactory evidence to the Owner that this obligation has been fulfilled.”

SC.6 DEFINITIONS

1. Amend definition “1. Change Directive” by deleting the words “within the general scope of the Contract Documents”.

2. Amend definition “4. Consultant” by adding the following sentence after the last sentence:

‘The words “Engineer”, “Architect” or “Consultant” wherever used in the Contract Documents shall be regarded as synonymous.’

3. Amend definition “8. Contract Time” as follows:

(a) delete “Substantial Performance of the Work” and replace with “the Substantial Performance Date”

4. Amend definition “9. Contractor” by adding the following sentence after the second sentence:

‘For the purpose of the Contract, the words “Contractor”, “Vendor” or “General Contractor” shall be regarded as synonymous.’

5. Amend definition "10. Drawings" as follows:

(a) add “and approved, in writing, by the Owner” after the word “issued,” in the second line.
6. Amend definition “13. Place of the Work” by adding the following sentence:
    ‘The term “Place of the Work” and “Site” wherever used in the Contract Documents shall be regarded as synonymous.’
7. Amend definition “16. Provide” by adding the following after “install”:
    “or supply, install and connect as applicable, complete and in place, including accessories, finishes, tests, and services required to render each item so specified complete and ready for use.”
8. Amend definition "17. Shop Drawings" as follows:
    (a) delete “which the Contractor provides” and replace it with “to be provided by the Contractor”.
9. Amend definition "18. Specifications" as follows:
    add “and approved, in writing, by the Owner” after “issued,” in the first line.
10. Amend definition “25. Work” by adding “Products, installation, commissioning, checkout, start–up, testing” after “total construction”.
11. Delete definition “26. Working Day” in its entirety and replace with the following:
    “26. Working Day
    Working Day means a day when the Regional Municipality of Peel is open, Monday to Friday, and does not include weekends or statutory holidays.”
12. Add the following new definitions:
    “27. Contract Completion
    Contract Completion means when the entire Work except those items arising from the provisions of GC 12.3 – Warranty has been performed to the requirements of the Contract Documents and is so certified by the Consultant.
    28. Authorities Having Jurisdiction
    The phrase Authorities Having Jurisdiction or the term Authorities means those authorities having jurisdiction under law over the Work or parts thereof.
    29. Contract Schedule
    Contract Schedule means the schedule indicating the timing of major activities of the Work submitted by the Contractor and approved in writing by the Owner including attaining Substantial Performance of the Work by the Substantial Performance Date.
    30. Supply or Furnish
    Supply or Furnish means fabrication or procurement of materials, equipment, or components, or performance of services to the extent specified and shown. Where used with respect to materials, equipment, or components, the term includes crating and delivery to the Place of the Work but is not intended to include installation of items, either temporary or final.
    31. Install
Install means the 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 the degree of installation specified.

32. Commission

Commission means, and Commissioning refers to, the procedure which includes checking, testing, adjusting and measuring Work performed by the Contractor to demonstrate and verify the installation, operation and performance of all components and the entire system.

33. Other Contractor

Other Contractor means an individual, firm, partnership or corporation having a separate contract with the Owner for work other than that required by the Contract Documents.

34. Substantial Performance Date

Substantial Performance Date means the date by which the Contractor shall attain Substantial Performance of the Work as specified in Article A-1 – THE WORK.

35. Reports

Reports means the Reports set out in Article A-3 – CONTRACT DOCUMENTS.

36. Rules of Mediation and Arbitration

Rules of Mediation and Arbitration mean the rules as provided in CCDC 40 in effect at the time of bid close."

SC.7 – GC 1.1 CONTRACT DOCUMENTS

1. Delete the first sentence in paragraph 1.1.1 and replace it with the following:

(a) “The intent of the Contract Documents is to include the construction, labour, Products, Construction Equipment and other services necessary, complementary or ancillary, for the performance and completion of the Work by the Contractor in accordance with the Contract Documents or properly inferable from them.”

2. Amend paragraph 1.1.6 by adding the following at the end of the provision:

"or in establishing the extent of the work to be performed by a trade."

3. Amend paragraph 1.1.7.1 by adding after “from highest to lowest, shall be:”

- Executed CCDC2 Contract
- Addenda as issued
- Instructions to Bidders
- Supplementary General Conditions to CCDC2 – 2008
- Agreement to Bond
- Specifications

Division 00  Introductory Information
- 00 01 13  List of Standard Details
Division 01 General Requirements
- 00 31 00 Available Project Information
- 01 10 00 Summary
- 01 14 00 Work Restrictions
- 01 21 00 Allowances
- 01 25 00 Substitution Procedures
- 01 32 00 Construction Progress Documentation
- 01 32 33 Photographic Documentation
- 01 33 00 Submittal Procedures
- 01 40 00 Quality Requirements
- 01 42 13 Abbreviations and Acronyms
- 01 50 00 Temporary Facilities and Controls
- 01 56 19 Temporary Noise Barriers
- 01 57 19 Temporary Environmental Controls
- 01 61 00 Common Product Requirements
- 01 71 33 Protection of Adjacent Construction
- 01 73 00 Execution requirements
- 01 74 00 Cleaning and Waste management
- 01 77 00 Closeout Procedures
- 01 78 39 Project Record Documents
- 01 91 00 Commissioning

Division 02 Existing Conditions
- 02 41 19 Selective Demolition

Division 04 Masonry
- 04 20 00 Unit Masonry

Division 05 Metals
- 05 40 00 Cold-Formed Metal Framing
- 05 50 00 Metal Fabrications

Division 06 Wood, Plastics and Composite
- 06 10 00 Rough Carpentry
- 06 20 00 Finish Carpentry
- 06 40 00 Architectural Woodwork

Division 07 Thermal and Moisture Protection
- 07 81 00 Applied Fireproofing
- 07 84 00 Firestopping
- 07 92 00 Joint Sealants

Division 08 Openings
- 08 11 00 Metal Doors and Frames
- 08 14 00 Wood Doors
- 08 70 00 Hardware
- 08 80 00 Glazing

Division 09 Finishes
- 09 21 16 Gypsum Board Assemblies
- 09 30 00 Tiling
- 09 51 00 Acoustical Ceilings

Addendum 3: Added Sections 00 62 76 - Application for Payment Form and 01 29 00 - Payment Procedures
Addendum 1: Added Section 08 36 13 - Sectional Metal Doors
Regional Municipality of Peel Document 2019-165T Supplementary General Conditions
Procurement Division MAJOR RENOVATION PROJECT to Contract CCDC2 - 2008
AT TWO PEEL REGIONAL POLICE COMMERCIAL SITES

- 09 65 00 Resilient Flooring
- 09 68 13 Tile Carpeting
- 09 69 00 Access Flooring
- 09 80 00 Acoustical Treatment
- 09 90 00 Painting and Coating

**Division 10 Specialties**
- 10 10 00 Information Specialties
- 10 20 00 Interior Specialties
- 10 21 13 Toilet Compartments
- 10 22 19 Demountable Partitions
- 10 28 13 Toilet Accessories
- 10 44 00 Fire Protection Specialties
- 10 50 00 Storage Specialties

**Division 12 Furnishings**
- 12 24 13 Roller Window Shades

**Division 21 Fire Suppression**
- 21 05 00 Common Work Results for Fire Suppression
- 21 12 00 Fire Suppression Standpipes

**Division 22 Plumbing**
- 22 05 00 Common Work Results for Plumbing
- 22 07 00 Plumbing Insulation
- 22 10 00 Plumbing Piping and Pumps
- 22 40 00 Plumbing Fixtures

**Division 23 Heating, Ventilation and Air Conditioning**
- 23 05 00 Common Work Results for HVAC
- 23 07 00 HVAC Insulation
- 23 10 00 Facility Fuel Systems
- 23 20 00 HVAC Piping and Pumps
- 23 30 00 HVAC Air Distribution
- 23 70 00 Central HVAC Equipment
- 23 80 00 Decentralized HVAC Equipment

**Division 25 Integrated Automation**
- 25 05 00 Common Work Results for Integrated Automation
- 25 06 00 Schedules for Integrated Automation
- 25 10 00 Integrated Automation Network Equipment
- 25 30 00 Integrated Automation Instrumentation and Terminal Devices
- 25 90 00 Integrated Automation Control Sequences

**Division 26 Electrical**
- 26 05 00 Common Work Results for Electrical
- 26 05 19 Wire and Cable
- 26 05 33 Raceway Boxes for Electrical Systems
- 26 05 53 Identification for Electrical Systems
- 26 09 23 Lighting Control
- 26 09 43 Networked Lighting Controls

Addendum 4: Added Section 21 13 00 - Fire Suppression Sprinkler Systems

Addendum 1: Added Section 23 51 00 - Breechings, Chimneys, and Stacks
26 22 00 Low-Voltage Transformers
26 27 00 Low-Voltage Distribution Equipment
26 27 26 Wiring Devices
26 36 00 Transfer Switches
26 43 00 Surge Protection Devices
26 50 00 Lighting
26 52 13 Emergency and Exit Lighting

Division 27 Communications
27 05 28 Pathways for Communications Systems
27 10 00 Structured Cabling
27 53 13 Clock Systems

Division 28 Electronic Safety and Security
28 13 00 Access Control
28 31 00 Fire Detection Alarm

Division 32 Exterior Improvements
32 31 00 Fences and Gates

• Contract Drawings:
  Municipal Drawings:
  C1-1 Existing Condition and Removals Plan
  C2-1 Proposed Condition Plan

Architectural Drawings:
A0-00 Cover Sheet
A0-01 Abbreviations, Annotations, Materials
A0-03 Ontario Building Code Analysis Plan – Basement
A0-04 Ontario Building Code Analysis Plan – Ground Floor
A0-05 Ontario Building Code Analysis Plan – Second and Third Floor
A0-06 Ontario Building Code Analysis Plan – Basement and First Floor
A0-10 Construction Phasing and Hoarding Plan - Basement
A0-11 Construction Phasing and Hoarding Plan – Ground Floor
A0-12 Construction Phasing and Hoarding Plan – Second Floor
A0-13 Construction Phasing and Hoarding Plan – Third Floor
A0-14 180 Derry Road – Hoarding and Phasing Plan – Communications
A0D-01 Ground Floor Demolition Plan – Records and MCB
A0D-02 Ground Floor Demolition Plan – Enforcement
A0D-03 Partial Basement, Ground and Second Floor Demolition Plans – Div. 22
A0D-04 Third Floor Demolition Plan – CEI
AD-05 Demolition Plan
A1-01 Ground Floor Plan – Records and MCB
A1-02 Ground Floor Plan – Enforcement
A1-03 Partial Basement, Ground and Second Floor
Plans – Div. 22
- A1-04 Third Floor Plan – CEI
- A1-05 Floor Plans – Communications
- A1-06 Ground Floor Finishes and Millwork Plan – Records and MCB
- A1-07 Ground Floor Finishes and Millwork Plan - Enforcement
- A1-08 Partial Basement, Ground and Second Floor Finishes and Millwork Plans – Div. 22
- A1-09 Third Floor Finishes and Millwork Plan - CEI
- A1-10 Finishes – Communications
- A1-11 Ground Floor Reflected Ceiling Plan – Records and MCB
- A1-12 Ground Floor Reflected Ceiling Plan – Enforcement
- A1-14 Third Floor Reflected Ceiling Plan – CEI
- A1-15 RCP – Communications
- A7-01 Millwork and Interior Elevations, Screen Elevations
- A7-02 Communications – Interior Elevations
- A9-01 Door and Screen Schedule
- A9-02 Door and Screen Schedule

Structural Drawings:
- S0-01 General Notes
- S0-02 Typical Details
- S1-01 Foundation Plan and Structural Roof Framing Plan
- S1-11 Ground Floor Structural Plan
- S2-01 Sections and Details
- S2-02 Sections

Mechanical Drawings:
- M0-1 Mechanical Legend, General Drawing Notes and Drawing List
- M1-1 Records and Major Collision Bureau - Mechanical Demolition
- M1-2 Road Safety Enforcement Mechanical Services - Mechanical Demolition
- M1-3 Division 22 - Mechanical Demolition
- M1-4 Community Engagement & Inclusion – Mechanical Demolition
- M2-1 New Plumbing Layout
- M2-2 Communications – New Plumbing Layout
- M3-1 Records and Major Collision Bureau – New Hydronic Piping Layout
- M3-2 Road Safety Enforcement Services – New Hydronic Piping Layout
- M3-3 Division 22 – New Hydronic Piping Layout
- M3-4 Community Engagement & Inclusion – New Hydronic Piping Layout
Regional Municipality of Peel  Document 2019-165T  Supplementary General Conditions
Procurement Division  MAJOR RENOVATION PROJECT to Contract CCDC2 - 2008
AT TWO PEEL REGIONAL POLICE
COMMERCIAL SITES

- M3-5 Communications – New Hydronic Piping Layout
- M4-1 Records and Major Collision Bureau – New HVAC Layout
- M4-2 Road Safety Enforcement Services – New HVAC Layout
- M4-3 Division 22 – New HVAC Layout
- M4-4 Community Engagement & Inclusion – New HVAC Layout
- M4-5 Communications – New HVAC Layout
- M4-6 Communications – New Natural Gas Piping Layout
- M7-1 Mechanical Details 1 of 3
- M7-2 Mechanical Details 2 of 3
- M7-3 Mechanical Details 3 of 3
- M8-1 Mechanical Schedules
- M8-2 Mechanical Schedules

Electrical Drawings:
- E0-00 Electrical Legends, Notes and Drawing List
- ED-01 Records & Major Collisions Bureau – Lighting Demolition Layout
- ED-02 Road Safety Services Enforcement – Lighting Demolition Layout
- ED-03 Division 22 – Lighting Demolition Layout
- ED-04 CEI – Lighting Demolition Layout
- ED-05 Communications – Lighting Demolition Layout
- ED-11 Records & Major Collisions Bureau – Power and Systems Demolition Layout
- ED-12 Road Safety Services Enforcement – Power and Systems Demolition Layout
- ED-13 Division 22 – Power and Systems Demolition Layout
- ED-14 CEI – Power and Systems Demolition Layout
- ED-15 Communications – Power and Systems Demolition Layout
- E1-01 Overall Plans (SRPC)
- E1-11 Overall Plan – Basement (EVKC)
- E1-12 Overall Plan – Ground Floor (EVKC)
- E1-13 Overall Plan – Roof (EVKC)
- E2-01 Records & Major Collisions Bureau – New Lighting Layout
- E2-02 Road Safety Services Enforcement – New Lighting Layout
- E2-03 Division 22 – New Lighting Layout
- E2-04 CEI – New Lighting Layout
- E2-05 Communications – New Lighting Layout
- E3-01 Records & Major Collisions Bureau – New Power and Systems Layout
- E3-02 Road Safety Services Enforcement – New Power and Systems Layout
- E3-03 Division 22 – New Power and Systems Layout
- E3-04 CEI – New Power and Systems Layout
- E3-05 Communications – New Power and Systems Layout
- E8-01 Partial Single Line Diagram for Emil V. Kolb Centre
- E8-02 Electrical Details (1 of 2)
- E8-03 Electrical Details (2 of 2)
Regional Municipality of Peel Document 2019-165T Supplementary General Conditions
Procurement Division MAJOR RENOVATION PROJECT to Contract CCDC2 - 2008
AT TWO PEEL REGIONAL POLICE COMMERCIAL SITES

- E9-01 Electrical Schedules
- E9-02 Panel Schedules (1 of 4)
- E9-03 Panel Schedules (2 of 4)
- E9-04 Panel Schedules (3 of 4)
- E9-05 Panel Schedules (4 of 4)

- CCDC2 Stipulated Price Contract 2008 – This is not attached but forms part of the Contract
- Digital Bid Bond
- Performance Bond substantially in the form required under the Construction Act – This is not attached but forms part of the Contract
- Form of Labour and Material Payment Bond substantially in the form required under the Construction Act – This is not attached but forms part of the Contract
- Owner’s Staff/Other Contractors Project Construction Coordination Form
- Owner’s Staff/Other Contractors Anticipated to Attend Site for Contractor Coordination
- Online Bidding System Forms

4. In the first sentence of paragraph 1.1.9 delete “and shall remain the Consultant’s property” and replace with “not the Contractor’s property”

5. Add new paragraph 1.1.11 and paragraph 1.1.12, as follows:

(a) “1.1.11 The Contractor shall review the Contract Documents and shall report promptly to the Owner and the Consultant any error, inconsistency, or omission the Contractor may discover. If the Contractor does discover any error, inconsistency, or omission in the Contract Documents, the Contractor shall not proceed with the Work affected until the error, inconsistency or omission has been addressed and in dealing with such error, inconsistency or omission the Contractor shall co–operate with the Owner in good faith to resolve such errors, inconsistency or omission so as to avoid any increase in the Contract Price or delay in the progress of the Work.

1.1.12 The Contractor declares and represents that in entering into the Contract with the Owner for the performance of the Work, it has reviewed any and all documentation including, without limitation, the Reports provided by the Owner and has either visually investigated for itself the character of the Work to be done and all local conditions including, without limitation, the position of all pole lines, conduits, watermains, sewers and other underground and overground utilities and structures, or that, not having so reviewed or visually investigated, the Contractor has assumed and does hereby assume all risk of conditions now existing or arising in the course of the Work which could have been reasonably identified by a visual inspection or which are identified or inferred in any information provided by the Owner including, without limitation, the Reports, which might or could make the Work, or any items thereof more expensive in character, or more onerous to fulfill, than was contemplated or known when the Contract was signed.”
SC.8 – GC 1.2 LAW OF THE CONTRACT

1. Add new paragraph 1.2.2 as follows:

“1.2.2 The Owner and the Contractor acknowledge and agree that:

(a) this Contract was signed and resulted from a procurement process (within the meaning set out in Section 87.3 of the Construction Act) was commenced, and the Contract will be entered into, on or after July 1, 2018, but before October 1, 2019; and

(b) amendments to the Construction Act that are to be proclaimed and come into force on July 1, 2018 are applicable to this Contract, but amendments to the Construction Act that are to be proclaimed and come into force on October 1, 2019 are not applicable to this Contract; and

(c) the Vendor will incorporate into its contracts with Subcontractors and Suppliers, and ensure that all Subcontractors and Suppliers are made aware of, these acknowledgements and agreements.

SC.9 – GC 1.4 ASSIGNMENT

1. Delete paragraph 1.4.1 in its entirety and replace it with the following:

(a) “The Contractor shall not assign the Contract, or any portion thereof, without the prior written consent of the Owner, which consent may not be unreasonably withheld. The Owner shall be entitled to assign the Contract to any person, corporation, or other entity (the “Assignee”). Upon the assumption by the Assignee of the Owner’s obligations under the Contract, the Owner shall be released from its obligations arising under the Contract.”

SC.10 TIME IS OF THE ESSENCE OF THE CONTRACT

1. Add new GC 1.5 TIME as follows:

“1.5.1 All time limits stated in the Contract Documents are of the essence of the Contract.”

SC.11 CONFIDENTIALITY AND CO–OPERATION, CONSULTATION AND CO–ORDINATION

1. Add new GC 1.6 CONFIDENTIAL INFORMATION/OWNERSHIP AND DISCLOSURE OF CONTRACTOR SUBMISSIONS as follows:

“1.6.1 The Contractor agrees to protect and maintain the confidentiality of all personal or other information, including all personal health information, that the Contractor accesses or of which the Contractor acquires knowledge of as a result of the services in this Contract, and agrees to use, collect, disclose, retain, protect and dispose of the personal (health) information only in accordance with all privacy legislation applicable to the Owner where it is acting on behalf of the Owner. Disclosure of any
information shall be done only with the Owner’s prior written consent. The provisions of the indemnity clause in this Contract apply to any breach of privacy or confidentiality in this clause. The Contractor shall ensure that its directors, officers, employees, agents, subcontractors and anyone else for whom it is responsible in law all adhere to the requirements of this section regarding privacy and confidentiality.

1.6.2 The Owner, and the Owner’s responsibilities under this Contract, are subject to all applicable privacy legislation including the Municipal Freedom of Information and Protection of Privacy Act, R.S.O. 1990 c.M.56, as amended (“MFIPPA”) and/or the Personal Health Information Protection Act, 2004 (“PHIPA”) with respect to the collection, use, disclosure, retention and protection of confidential, sensitive or personal (health) information under the Owner’s custody and control. Under an MFIPPA request, all documents provided to the Owner by the Contractor pursuant to the procurement process which led to this Contract, and the Contract itself and associated documents, may be required by law to be made available to a requesting member of the public, with the possible exception that the party submitting certain information requests that it be treated as confidential and that there is an appropriate exemption to disclosure in MFIPPA, or a non-disclosure requirement in either MFIPPA or PHIPA.

1.6.3 The Contractor’s Submission, along with all correspondence, documentation and information provided to the Owner by any Contractor in connection with or arising out of the Contractor’s Submission, once received by the Owner, shall become the property of the Owner and may be appended to any agreement and/or purchase order with the successful Contractor. Contractors must identify in their Submissions any scientific, technical, proprietary, commercial or other confidential information, the disclosure of which could cause them injury.

1.6.4 In purchases where a public opening of the Contractor’s Submission will be taking place, the name of each Contractor and the lump sum price contained in their Submission shall be read out by the Owner at the public opening.

1.6.5 Where award is to be made by Regional Council, the Peel Police Services Board or the Board of Directors of Peel Housing Corporation, information regarding all Contractor’s Submissions, including names of each Contractor, lump sum prices and the annual or overall value of the Contract and/or the Contractor’s Submissions shall be included in public reports to Regional Council or the relevant Boards such that the information is released publicly. The Contractor acknowledges that the Owner cannot guarantee it can honour requests to keep Contractor information confidential in light of applicable law requirements, and also in light of the need for transparency and public disclosure where release of the Contractor’s information in public Council reports related to a specific project or procurement process is necessary."
2. Add new GC 1.7 CO–OPERATION, CONSULTATION AND CO–ORDINATION as follows:

“1.7.1 The Contractor shall, at all times and as part of the Work, fully assist, co–operate, consult and co–ordinate with the Consultant and any other consultants or other entities retained or identified by the Owner which are related to the Project (collectively, the “Other Entities”). The objective of such assistance, co–operation, consultation and co–ordination is to make certain the Work is properly co–ordinated with and integrated with the work and services of the Other Entities.

1.7.2 Without limiting the generality of any other provision in the Contract, the Contractor shall attend all design, construction, general co–ordination and progress meetings relating to the Work between the Consultant, the Owner and Other Entities and any other meeting relating to the Project as requested by the Owner to discuss and resolve all matters and issues relating to the Project. The Contractor shall, on a timely basis, prepare and distribute detailed minutes to the Owner of the construction and progress meetings which it attends, if requested by the Owner.”

SC.12 – GC 2.1 AUTHORITY OF THE CONSULTANT

1. Amend the provisions of GC 2.1 – AUTHORITY THE CONSULTANT as follows:
   (a) In paragraph 2.1.3 delete “against whom the Contractor makes no reasonable objection and”.

SC.13 – GC 2.2 ROLE OF THE CONSULTANT

1. Amend the provisions of GC 2.2 ROLE OF THE CONSULTANT as follows:
   (a) Add the following sentence to paragraph 2.2.3: “The presence of such project representatives at the Place of the Work will not abrogate any of the Contractor’s responsibility to perform the Work as required by the Contract Documents.”
   (b) In paragraph 2.2.6 – insert the words “to the Contractor” after the words “the Consultant will not be responsible” in each of the first two sentences of such paragraph.
   (c) In paragraph 2.2.7 – delete the words “Except with respect to GC 5.1 – FINANCING INFORMATION REQUIRED OF THE OWNER, the” and replace with “The”.
   (d) In paragraph 2.2.17 – insert the words “to the Contractor” after the words “the Consultant does not guarantee”.

SC.14 – GC 2.3 REVIEW AND INSPECTION OF THE WORK

1. Amend the provisions of GC 2.3 REVIEW AND INSPECTION OF THE WORK as follows:
   (a) In paragraph 2.3.1 delete “the Consultant” and replace with “Consultant and Owner” in the second sentence only.
   (b) Amend paragraph 2.3.2 as follows:
(i) add “regulations, rules, by-laws, standards, guidelines, permits, statutes, codes,” before “laws or ordinances”.

(c) Amend paragraph 2.3.6 by replacing "designated in" with "required by", by replacing "designated by" with "required by" and by adding "or required by the Consultant" after “Contract Documents”.

(d) Amend paragraph 2.3.7 by replacing "designated in" with "required by".

SC.15 – GC 2.4 DEFECTIVE WORK

1. Amend paragraph 2.4.1 by deleting "Consultant" in the first instance and replacing it with "Consultant and/or Owner" and by adding", at the Contractor’s expense,” after “Contract Documents,”

SC.16 – GC 3.2 CONSTRUCTION BY OWNER OR OTHER CONTRACTORS

1. Delete paragraph 3.2.2.2 in its entirety and replace with “3.2.2.2 INTENTIONALLY DELETED”.

2. Add to paragraph 3.2.2.3:

“Without restricting the generality of paragraph 3.6.1, the Contractor acknowledges that, if the Owner does not enter into any other contracts for the Project, the Contractor is the “constructor” and the “employer” within the meaning of the Occupational Health and Safety Act (Ontario) and the Contractor undertakes to carry out the duties, obligations and responsibilities of the constructor and the employer with respect to the Project. In the event that the Owner enters into more than one contract for the Project, the Contractor agrees to fulfill all of the duties, obligations and responsibilities of the “constructor” and “employer” with respect to the Project and on behalf of the Owner. In the case where the Owner enters into more than one contract for the Project, the Owner shall contractually require the Other Contractors to comply with the Contractor's safety program and safety instructions and the Contractor, in fulfilling the role of constructor, will have the right to remove the Other Contractors from the Place of the Work should they not comply with the Contractor’s safety program and safety instructions. Without restricting the generality of any other term or condition in the Contract, the Contractor shall indemnify and hold harmless the Owner from any liability for claims, damages or penalties, including reasonable legal fees to defend any offences, arising from the Contractor’s failure to comply with the duties, responsibilities and obligations of the constructor and the employer under the Occupational Health and Safety Act (Ontario).”

3. In paragraph 3.2.2.4, add the words “as the Owner considers appropriate” after the words “GC 11.1 – INSURANCE” in the second line.

4. Amend paragraph 3.2.3.3 by adding: "Failure by the Contractor to so report shall invalidate any claims against the Owner by reason of deficiencies in the work of Other Contractors or Owner's own forces except those deficiencies not then reasonably discoverable.”

5. Add paragraph 3.2.3.4 as follows: “co-ordinate and perform the Work with care and diligence so as to ensure that the Owner and the Other Contractors will be in a position to proceed according to schedule with the delivery, installation and
testing of the equipment and other components to be incorporated into the Project and allow the Owner and the Other Contractors reasonable opportunity to receive and store materials and products on site and to perform their work.”

SC.17 – GC 3.4 DOCUMENT REVIEW:

1. Add new paragraph 3.4.2:

“Notwithstanding the foregoing, inconsistencies and omissions shall not include lack of reference on the Drawings or in the Specifications to labour and/or Products that are required or normally recognized within respective trade practices as being necessary for the complete execution of the Work.”

SC.18 – GC 3.5 CONSTRUCTION SCHEDULE

1. Delete paragraph 3.5.1 and substitute the following:

"3.5.1 The Contractor shall:

.1 prior to commencement of construction, prepare and submit to the Owner and the Consultant for their review and acceptance a construction schedule indicating the critical path for the Project, using "Primavera Project Planner" or equivalent, demonstrating that the Work will be performed in conformity with the Contract Time, and shall conform to the phasing and sequencing requirements for the Work as set out in the Contract Documents or as otherwise required by the Consultant or the Owner including, without limitation, a Products delivery schedule with respect to the Products whose delivery is critical to the schedule of the Work. The Contractor shall provide the schedule information required by this paragraph 3.5.1.1 in both electronic format and hard copy. Once approved by the Owner and the Consultant, the construction schedule submitted by the Contractor under this paragraph 3.5.1.1, as updated by the Contractor and approved by the Owner, shall become the “Construction Schedule”; .2 monitor the progress of the Work on a weekly basis relative to the Construction Schedule and update the Construction Schedule on a monthly basis; .3 perform the Work in accordance with the Construction Schedule; .4 advise the Consultant of any revisions required to the Construction Schedule as a result of extension of the Contract Time in accordance with PART 6 – CHANGES IN THE WORK; and .5 identify potential variances between scheduling and scheduled completion dates and implement necessary adjustments in the Construction Schedule in order to meet the Substantial Performance Date.

3.5.2 On request of the Consultant, the Contractor shall provide information regarding the progress of the Work or any part of it, or, copies, schedules and orders covering materials, components and services. The Contractor shall cooperate fully with the Consultant, and shall ensure that all Subcontractors and Suppliers and anyone for whom the Subcontractors and Suppliers may be responsible also cooperate and make available on request the same documents."
3.5.3 Without limiting the other obligations of the Contractor under GC3.5, the Contractor shall not amend the Construction Schedule (including, without limitation, any changes to the critical path) without the prior written approval of the Owner.”

SC.19 – GC 3.6 CONTRACTOR’S PERSONNEL COMMITMENT

1. Delete GC 3.6 – SUPERVISION in its entirety and replace it with the following:

(a) “GC 3.6 CONTRACTOR’S PERSONNEL COMMITMENT

3.6.1 The Contractor shall furnish a competent and adequate staff, who shall be in attendance at the Place of the Work at all times, as necessary, for the proper administration, co-ordination, supervision and superintendence of the Work; organize the procurement of all materials and equipment so that they will be available at the time they are needed for the Work; and keep an adequate force of skilled workmen on the job to complete the Work in accordance with all requirements of the Contract Documents.

3.6.2 Prior to commencement of the Work, the Contractor shall select a competent and experienced full time project manager (the “Project Manager”) who shall be in attendance at the Place of the Work or on the road and engaged in the Work at all times, and a competent and experienced full time site supervisor (the “Site Supervisor”) who shall be in attendance at the Place of the Work at all times. Both the Project Manager and Site Supervisor shall be Gold Seal Certified or equivalent. The Project Manager shall have full responsibility for the prosecution of the Work, with full authority to act in all matters as may be necessary for the proper co-ordination, supervision, direction and technical administration of the Work, who shall attend site meetings in order to render reports on the progress of the Work and who shall have authority to bind the Contractor in all matters related to this Contract. The Project Manager and the Site Supervisor shall be satisfactory to the Owner and shall not be changed except for good reason and with the prior written approval of the Owner.

3.6.3 The Project Manager and Site Supervisor shall represent the Contractor at the Place of the Work and notices and instructions given to the Project Manager and/or the Site Supervisor shall be held to have been received by the Contractor.

3.6.4 The Contractor may not change its Project Manager or its Site Supervisor without the Owner’s prior written approval which shall not be unreasonably withheld. Further, the Contractor shall not employ or continue to employ on the Work anyone to whom the Owner may reasonably object.

3.6.5. The Contractor shall provide the Owner and the Consultant with the names, addresses and telephone numbers of the Project Manager, the Site Supervisor and other responsible field persons who may be contacted for emergency and other reasons during non-working hours.”
SC.20 – GC 3.7 SUBCONTRACTORS AND SUPPLIERS
1. Amend paragraph 3.7.4 by adding “or anyone else performing the Work” after “Supplier”.
2. Add new paragraph 3.7.7 as follows:
   (a) “3.7.7 The Contractor shall not change any of the Subcontractors or Suppliers proposed by him in writing and accepted by the Owner at the signing of the Contract without the Owner’s prior written consent or execute any subcontracts for the performance of the Work without the Owner’s prior written consent.”

SC.21 – GC 3.8 LABOUR AND PRODUCTS
1. Amend paragraph 3.8.2 as follows:
   (a) add “and free from defects” after “new”; and
   (b) delete the second sentence of paragraph 3.8.2 and replace it with the following:

       “All Products and workmanship shall be in every respect of the best quality and the Work shall be performed in accordance with the best modern practice. Whenever the Contract Documents, or directions of the Consultant, admit of a reasonable doubt about what is permissible, and when they fail to state the quality of any Work, the interpretation that requires the quality be consistent with the quality of similar Products specified is to be followed.”

2. Delete paragraph 3.8.3 and replace it with:

   "3.8.3 The Contractor shall:
      .1 maintain good order and discipline among all personnel engaged on the Work;
      .2 not employ any persons on the Project whose labour affiliation (or lack thereof) is incompatible with other labour employed in connection with this Project or at the Place of the Work; and
      .3 act promptly on all problems of labour relations including grievances and jurisdictional disputes. The Contractor shall not employ on the Work anyone not skilled in the task assigned to him and the Owner has the right to require the Contractor to remove from the workforce for the Work any employee, representative or other personnel deemed by the Owner, acting reasonably, to be incompetent, careless or otherwise objectionable, or whose actions are contrary to public interest or inconsistent with the best interest of the Owner.”

3. Add new paragraph 3.8.4:

   “The cost for overtime required beyond the normal working day to complete individual construction operations of a continuous nature, such as pouring or finishing of concrete or similar work, or work that the Contractor elects to perform at overtime rates without the Owner or the Consultant requesting it shall not be
4. Add new paragraph 3.8.5:

“The Owner and the Contractor acknowledge and agree that the beneficial ownership of any portion of the Products required by the Contract Documents to be incorporated and form part of the Work shall pass to the Owner immediately upon payment therefore or upon incorporation thereof as part of the Work, whichever first occurs. For greater certainty, title to Products delivered, but not installed, shall pass to the Owner when paid for (subject to any applicable holdback). The Contractor agrees to promptly execute and deliver to the Owner, from time to time as the Owner may require, any further documentation required to identify, evidence, perfect or protect the Owner’s beneficial, or registered, interest in the Products, including, without limitation, any registrations pursuant to the Personal Property Security Act (Ontario). Notwithstanding the foregoing, the Contractor acknowledges and agrees that it shall continue to bear the risk of loss or damage with respect to the Work until the date of acceptance of the Work by the Owner in accordance with the Contract Documents."

SC.22 – GC 3.10 SHOP DRAWINGS
1. Amend paragraph 3.10.1 by adding the following at the end of the paragraph: "or as the Consultant may reasonably request".

SC.23. – GC 3.13 CLEAN UP
1. Add paragraph 3.13.4 as follows:

(a) “3.13.4 The Owner shall have the right to back charge cleaning to the Contractor if it is not done within 24 hours of written notice to clean and the Owner shall have the right to back charge cost of damage to the Place of the Work caused by Contractor’s, Subcontractor’s or Supplier’s transportation in and out of the Place of the Work if not repaired within 5 Working Days of written notice to repair or before final payment, whichever is earlier.”

SC.24 OPERATIONAL RISKS
1. Add new GC 3.14 – OPERATIONAL RISKS as follows:

(a) “3.14.1 The position of all pole lines, conduits, water mains, sewers and other underground and overground utilities and structures is not necessarily shown on the Contract Drawings, and, where shown, the accuracy of the position of such utilities and structures is not guaranteed. Before starting Work, the Contractor shall inform himself of the exact locations of such utilities and structures, and shall be liable for damages, as a result of any act or omission, to any utilities identified or reasonably to have been identified, whether or not the result of negligence, by those for whom he is responsible. Unless otherwise specified, the Contractor shall temporarily support or relocate such utilities and structures, or temporarily remove them, and restore them, to the satisfaction of the owners of the utilities and structures. The Contractor waives any claim and releases the Owner and the agents of the Owner from all liability for
damages suffered as a result of such Contract Drawings or any operation required under this paragraph.

3.14.2 Permanent relocation of underground or overhead utilities will be performed and paid for by the Owner, if necessitated by coincidence of lines or grades, or both unless such relocation has been specifically included within the Work by the drawings or specifications. The Contractor shall be responsible for scheduling permanent relocations of utilities with the Work.

3.14.3 The Consultant will provide the Contractor in writing with bench marks and points of reference to be used by him in setting out the Work. The Owner will be responsible only for the correctness of the information so supplied. From these bench marks and points of reference the Contractor will do his own setting out. The setting out by the Contractor shall include but shall not be limited to the preparation of grade sheets, the installation of centre lines stakes, grade stakes, offsets and site rails.”

SC.25 – GC 5.1 FINANCING INFORMATION REQUIRED OF THE OWNER
1. Delete paragraph 5.1.1 and paragraph 5.1.2 in their entirety and replace it with "Intentionally Deleted".

SC.26 – GC 5.2 APPLICATIONS FOR PROGRESS PAYMENT
1. Amend paragraph 5.2.2 by adding the following:

“The Contractor shall review with the Consultant and the Owner, at a scheduled time, the percentage of work completed for each item indicated in the schedule of values. This procedure shall be complied with for each application for payment prior to submitting the formal application for payment.”

2. Add new paragraph 5.2.8, new paragraph 5.2.9, new paragraph 5.2.10, new paragraph 5.2.11 and new paragraph 5.2.12 as follows:

(a) “5.2.8 The Contractor must provide with each application after the first, a sworn statement, in form satisfactory to the Owner, certifying that all accounts for the subcontracts, construction machinery and equipment, materials, Products, labour and other indebtedness which may have been incurred by the Contractor and for which the Owner might in any way be held responsible have been paid in full, except for amounts properly retained as holdback or as an identified amount in dispute.

5.2.9 After the first application for payment, with each subsequent application for payment the Contractor shall submit evidence of compliance with the applicable worker’s compensation legislation at the Place of the Work, including payments due thereunder.

5.2.10 The Contractor shall submit with each application for payment, payment receipts for products and materials purchased under conditional sales contracts. Authorization for payment of products and materials purchased under conditional sales contracts shall not be made by the Owner until evidence of payment is submitted."
5.2.11 Payment by the Owner pursuant to the Contract shall not preclude the Owner from thereafter disputes any of the items involved and shall not be construed as acceptance of any part of the Work.

5.2.12 The Contractor shall utilize and submit 2 copies of the “Contractor’s Application for Payment”, in a form satisfactory to the Owner, when submitting the formal application for payment. In addition, a breakdown of approved Change Orders and percentage completed of each shall be included, in a form satisfactory to the Owner. Deviation or incomplete submissions with respect to the approved breakdown will require resubmission of the application for payment.”

SC.27 – GC 5.3 PROGRESS PAYMENT
1. Amend paragraph 5.3.1.2 as follows:
   (a) delete “10 calendar days” and replace with “5 Working Days”

2. Amend paragraph 5.3.1.3 to read as follows:
   "the Owner shall make payment to the Contractor on account as provided in Article A–5 of the Agreement – PAYMENT on or before 20 Working Days after the date that the certificate for payment is issued by the Consultant.”

3. Add the following as new paragraph 5.3.2:
   (a) “5.3.2 If the Contractor fails to comply with paragraph 5.2 – APPLICATIONS FOR PROGRESS PAYMENT or paragraph 10.4 – WORKERS COMPENSATION, the Owner shall not be required to make payments to the Contractor until the obligation has been complied with.”

SC.28 – GC 5.4 SUBSTANTIAL PERFORMANCE OF THE WORK
1. Add the following as new paragraph 5.4.4:
   “5.4.4 At the time of issuance by the Consultant of the certificate of Substantial Performance of the Work, the Consultant shall:
   (i) notify the Contractor of the value of the Warranty Holdback required by Section 12.3 hereof.
   (ii) prepare a separate certificate (the “Substantial Performance Payment Certificate”) showing:
      (i) the value of work completed to date,
      (ii) the value of outstanding or uncompleted work,
      (iii) the value of the required Warranty Holdback,
      (iv) the amount of the holdback being held in accordance with the Construction Act (allowing for any previous release of holdback to the Contractor in respect of completed Subcontractors, Suppliers and deliveries of pre–selected equipment), and
      (v) the amount due the Contractor.
(iii) prepare a payment certificate releasing to the Contractor the holdback held in accordance with the Construction Act in respect of Work performed up to the date of Substantial Performance of the Work. Subject to the provisions of the Construction Act, including the Owner’s issuance of a notice of non-payment of holdback, and the submission by the Contractor of the following documents, such holdback shall become payable after 60 days from the date of publication of the certificate of Substantial Performance of the Work:

(i) a written undertaking by the Contractor to complete expeditiously any outstanding Work and to discharge all unfulfilled obligations under the Contract;

(ii) the Contractor’s final claim for all amounts incurred before and on the date of Substantial Performance of the Work;

(iii) a release by the Contractor in a form satisfactory to the Consultant releasing the Owner from all further claims relating to the Contract (except in respect of outstanding work) and other than claims relating to liens under the applicable lien legislation of the Place of the Work;

(iv) a Statutory Declaration in a form satisfactory to the Owner that all liabilities incurred by the Contractor and its Subcontractors, and Suppliers in carrying out the Contract have been discharged and that all liens in respect of the Contract and subcontracts thereunder have expired or have been satisfied, discharged or provided for by payment into court; and

(v) a satisfactory Clearance Certificate pursuant to the Workplace Safety and Insurance Act.

Notwithstanding the foregoing, if the Contractor has not provided the documents required by the General Conditions by the 30th day after Substantial Performance of the Work, the Owner, at its discretion, shall be entitled to withhold an amount equal to up to 100 per cent of the amount of statutory holdback as security for the Contractor’s delivery of the outstanding document(s). In the event of a withholding under this GC5.4.4, the Owner shall pay the withheld amount to the Contractor upon the earlier of (a) the Contractor’s delivery of such documents, (b) the end of the limitation period related to any claim that could arise from the Contractor’s non-delivery, and (c) a determination by the Consultant that such withheld amount should be released to the Contractor.”

SC.29 – GC 5.5 PAYMENT OF HOLDBACK UPON SUBSTANTIAL PERFORMANCE OF THE WORK

1. Amend paragraph 5.5.1.2 as follows:

(a) replace “CCDC 9A Statutory Declaration” with “a statutory declaration in a form satisfactory to the Owner”
Regional Municipality of Peel Document 2019-165T Supplementary General Conditions
Procurement Division MAJOR RENOVATION PROJECT to Contract CCDC2 - 2008
AT TWO PEEL REGIONAL POLICE
COMMERCIAL SITES

(b) add “materials,” before “labour”;
(c) add “or by any Subcontractor, or Supplier” after “Contractor”;
(d) delete “.” and replace with “, and”

2. Add paragraph 5.5.1.3 as follows:
   (a) “submit the documents required to demonstrate compliance under GC 10.4.”

3. Amend paragraph 5.5.2 as follows:
   (a) delete “statement as provided in” and replace with “other documents required to be provided pursuant to”

4. Delete paragraph 5.5.3 in its entirety and replace with “5.5.3 INTENTIONALLY DELETED”.

5. Amend paragraph 5.5.4 as follows:
   (a) replace “the holdback amount authorized by the certificate for payment of the holdback” with “the statutory holdback amount and any other holdback amount authorized by the certificate for payment of the holdback, subject to the delivery by the Owner of a notice of non-payment under the Construction Act”; and
   (b) delete “third party monetary claims against the Contractor which are enforceable against the Owner” and replace with “claims against the Contractor”.

SC.30 – GC 5.6 PROGRESSIVE RELEASE OF HOLDBACK
1. Delete GC 5.6 in its entirety and replace with “5.6 Intentionally Deleted”.

SC.31 – GC 5.7 FINAL PAYMENT
1. Amend paragraph 5.7.1 by adding “as defined in Section 2(3) of the Construction Act” after the words “Work is completed”.

2. Amend paragraph 5.7.4 as follows:
   (a) delete “5 calendar days after” and replace with “20 calendar days after”; and
   (b) delete “,” and replace with “provided that the Contractor shall provide the Owner and the Consultant, in a form acceptable to the Owner, a sworn statement that all accounts for the materials, labour, subcontracts, Products, Construction Equipment and other indebtedness which may have been incurred by the Contractor and for which the Owner might in any way be held responsible have been paid in full, except for amounts properly retained as a holdback or as an identified amount in dispute and submit the documents required to demonstrate compliance with paragraph 10.4 – WORKERS’ COMPENSATION.”

3. Add the following as new paragraph 5.7.5:
At the time of issuance by the Consultant of the final certificate of payment, the Consultant shall:

(1) Prepare a certificate (the “Completion Payment Certificate”) showing:
   
   (i) the final Contract Price,
   
   (ii) the amount of the further 10 per cent holdback (based on the value of further work completed over and above the value of work completed shown in the Substantial Performance Payment Certificate),
   
   (iii) the value of the required Warranty Holdback, and
   
   (iv) the amount due to the Contractor.

(2) Prepare a payment certificate releasing to the Contractor the further 10 per cent holdback. Subject to the provisions of the Construction Act, including the Owner’s issuance of a notice of non-payment of holdback, and the submission by the Contractor of the documents required by the General Conditions, such further 10 per cent holdback shall become payable after 60 days from the date of completion of the Work as established by the final certificate of payment.

If, at the end of the Warranty Period, any monies are still being retained by the Owner as Warranty Holdback or for other reasons, the Consultant will issue a certificate (the “Warranty Holdback Payment Certificate”) releasing the monies due the Contractor.

SC.32 – GC 5.8 WITHHOLDING OF PAYMENT

1. Amend paragraph 5.8.1 as follows:
   
   (a) delete “If” and replace with “Subject to applicable lien legislation, if”

SC.33 LIENS

1. Add new GC 5.10 LIENS as follows:

   “GC 5.10 LIENS

   5.10.1 Notwithstanding any other term or condition in the Contract Documents, the Owner shall not be obligated to make payment to the Contractor, if at any time such certificate or payment was otherwise due:

   .1 a claim for lien arising from the performance of the Work has been registered against the Place of Work, or
   
   .2 the Owner or mortgagee of the Place of Work has received a written notice of lien.

   5.10.2 In the event that a construction lien arising from the performance of the Work is registered against the Place of Work, or given to the Owner, the Contractor shall, within 10 calendar days, at its sole expense, vacate or discharge the lien from title to the premises. If the lien is merely vacated, the Contractor shall, if requested, undertake the Owner’s defence of any subsequent lawsuit commenced in respect of the lien at the Contractor’s sole expense.
5.10.3 In the event that the Contractor fails or refuses to vacate or discharge a construction lien within the time prescribed above, if the Owner receives a notice of lien, the Owner shall, at its option, be entitled to take all steps necessary to vacate and/or discharge the lien, and all costs and expenses incurred by the Owner in so doing (including, without limitation, legal fees on a full indemnity basis, disbursements, the cost of any security to vacate the lien and any payment which may ultimately be made out of or pursuant to security posted to vacate the lien) shall be for the account of the Contractor, and the Owner may deduct such amounts from amounts otherwise due or owing to the Contractor. If the Owner vacates the lien, it shall be entitled to retain all amounts it would be required to retain pursuant to the Construction Act if the lien had not been vacated.

5.10.4 Without limiting any of the foregoing, the Contractor shall indemnify the Owner for all costs (including, without limitation, legal fees on a full indemnity basis) it may occur in connection with the claim for lien or subsequent lawsuit brought in connection with the lien, or in connection with any other claim or lawsuit brought against the Owner by any person that provided services or materials to the Place of Work which constituted a part of the Work.

5.10.5 This GC 5.10 does not apply to construction liens claimed by the Contractor.”

SC.34 – GC 6.1 OWNER’S RIGHT TO MAKE CHANGES

1. Amend paragraph 6.1.1.2 by adding “or a Change Directive” after “Change Order”

2. Add paragraph 6.1.3, paragraph 6.1.4, paragraph 6.1.5, and paragraph 6.1.6, paragraph 6.1.7 and paragraph 6.1.8 as follows:

“6.1.3 The value of a change shall be determined in one or more of the following methods: (a) by estimate with detailed breakdown of the Change and all other backup information and documents and acceptance in a lump sum; (b) by unit prices set out in the Contract or subsequently agreed upon; (c) by cost and a fixed or percentage fee.

6.1.4 Where changes in the Work are paid for under method (b) of paragraph 6.1.3, the value of changes is based on the net difference in quantities with the appropriate unit rate applied.

6.1.5 Where changes in the Work are to be paid under method (c) of paragraph 6.1.3, the cost to the Owner shall be the actual cost of credits and where additional work is required, the cost to the Owner shall be the actual cost plus a percentage covering overhead and profit, after all credits included in the change have been deducted. Wherein changes in the Work are to be paid under method (c) of paragraph 6.1.3, an allowance covering overhead and profit shall be calculated as follows:

.1 on Work performed by the Contractor’s own forces, 10 per cent; and

.2 on Work performed by Subcontractors or Suppliers, five per cent.

6.1.6 If any change in the Work is made by which the amount of Work to be done is decreased, or if the whole or any portion of the Work is dispensed with,
the Owner shall, subject to paragraph 6.3.3, not be liable to the Contractor for any costs or damages whatsoever including, without limitation, any indirect, consequential or special damages, such as loss of profits, loss of opportunity or loss of productivity.

6.1.7 A Change Order shall be a final determination or adjustment in the Contract Time and Contract Price. There shall be no adjustments to the Contract Time or Contract Price or compensation or payment of any kind whatsoever (including, without limitation, claims for loss of productivity) based on the aggregate number, scope or value of changes in the Work whether resulting from Change Order or Change Directive.

6.1.8 It is the express intention of the parties that any claims by the Contractor for a change in the Contract Price and/or Contract Time shall be barred unless there has been strict compliance with the requirements of all of PART 6 – CHANGES IN THE WORK and the Contractor has notified the Owner and Consultant, within the earlier of: (i) ten (10) Working Days of any event or circumstance of which Contractor has knowledge which provides the Contractor with a change in the Contract Price and/or Contract Time pursuant to the terms and conditions of the Contract, or (ii) such other period of time expressly allowed for by the Contract. Such notice from the Contractor shall include without limitation, sufficient and adequate information and documentation to allow the Consultant and the Owner to properly consider the claim of the Contractor (including, without limitation, the cause of the change in the Contract Time, a description of the impact on the change in the Contract Time will have on the critical path of the Construction Schedule and a description of the portions of the Work affected thereby and a breakdown of the change in the Contract Price, together with all pertinent details and all other backup information and documents). The Contractor has an ongoing obligation to augment the information and documents described in this paragraph as it becomes available. No course of conduct or dealing between the parties, no express or implied acceptance of alterations or additions to the Work, and no claims that the Owner has been unjustly enriched by any alteration or addition to the Work, whether in fact there is any such unjust enrichment or not, shall be the basis of a claim for additional payment under this Contract or a claim for any extension of the Contract Time.”

SC.35 – GC 6.3 CHANGE DIRECTIVE

1. Delete GC 6.3.2 and replace it with "Intentionally Deleted"

2. Amend paragraph 6.3.7.1 by adding “while directly engaged in the work attributable to the change” after “in the direct employ of the Contractor”.

3. Amend paragraph 6.3.7.1(2) as follows:

   (a) add “required as a result of the change” after “materials or equipment”.

4. Amend paragraph 6.3.7.3 by adding “reasonable” before “travel”.

5. In paragraph 6.3.7.5, replace the words “and hand tools not owned by the workers” with the words “exclusive of hand tools”.

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6. In subparagraph 6.3.7.9 insert the words 'provided however that the costs included in such amounts shall be limited to the actual costs of the items described in this paragraph 6.3.7 changing “Contractor” to “Subcontractor” as necessary'.

7. And add the following words to the end of paragraph 6.3.7.17: “not caused by the Contractor or anyone for whom it is responsible”.

8. At the end of paragraph 6.3.7, add the following:

“All other costs attributable to the change in the Work including the costs of all administrative or supervisory personnel are included in overhead and profit calculated in accordance with the provisions of paragraph 6.1.5 of GC 6.1 – OWNER'S RIGHT TO MAKE CHANGES”.

SC.36 – GC 6.4 CONCEALED OR UNKNOWN CONDITIONS

1. In paragraph 6.4.1.1 and paragraph 6.4.1.2, add “or the Reports” after “Contract Documents”.

2. In paragraph 6.4.2, insert the words “Having regard to and subject to the liabilities and responsibilities assumed by the Contractor pursuant to GC 3.14 – OPERATIONAL RISK,” at the beginning of the first and second sentences.

3. Add new paragraph 6.4.5 as follows: “Without limiting the generality of any other provision in the Contract Documents, during the performance of the Work, the Contractor shall, as a part of the Contract Price and Work, perform any additional geotechnical and subsurface and other investigations, tests and studies beyond those being provided by the Owner, which a reasonable and prudent contractor would conduct to ascertain the nature and extent of subsurface or otherwise concealed physical conditions at the Place of the Work.”

SC.37 – GC 6.5 DELAYS

1. Amend paragraph 6.5.1 by deleting “them” in the second line and replacing it with “the Consultant” and by replacing the phrase "performance of the Work" in the first line with "performance of a critical path activity on the Construction Schedule”.

2. In paragraph 6.5.1, add the following to the end of the paragraph:

“, provided that the Owner shall not be liable for any other costs or damages whatsoever including, without limitation, any indirect, consequential, or special damages, such as loss of profits, loss of opportunity or loss of productivity resulting from such delay.”

3. Amend paragraph 6.5.2 as follows:

(a) replace the phrase "performance of the Work" in the first line with "performance of a critical path activity on the Construction Schedule”.

(b) add “or other entity” after “any person” in the third line.

(c) In paragraph 6.5.2, add the following to the end of the paragraph:

“, provided that the Owner shall not be liable for any other costs or damages whatsoever including, without limitation, any indirect,
consequential, or special damages, such as loss of profits, loss of
opportunity or loss of productivity resulting from such delay."

4. In paragraph 6.5.3, replace the phrase "performance of the Work" in the first line
with "performance of a critical path activity on the Construction Schedule".

5. In paragraph 6.5.3.1, delete the phrase “labour disputes, strikes, lock–outs
(including lock–outs decreed or recommended for its members by a recognized
contractor's association, of which the Contractor is a member or to which the
Contractor is otherwise bound)” and replace it with “any labour disputes, strikes
or lock–outs affecting the Work or the Project.”

6. Add the following to the end of paragraph 6.5.3:
“provided that the Owner shall, in such instance, only be liable for reasonable
costs incurred by the Contractor and shall not be liable for any other costs or
damages whatsoever including, without limitation, any indirect, consequential, or
special damages, such as loss of profits, loss of opportunity or loss of
productivity resulting from such delay. Notwithstanding the foregoing, the
Contractor shall use its best efforts to minimize the impact of such event upon
the performance of the Work and Contract Time.

7. In paragraph 6.5.4, add “and Owner” after “Consultant” and add the following to
the end: "Without limiting the generality of the foregoing, the following shall also
apply to the event of delay dealt with by paragraphs 6.5.1, 6.5.2 or 6.5.3:

.1 the notice provided by the Contractor as set out in this paragraph 6.5.4
shall include, without limitation, the information and documentation required by
paragraph 6.1.8.

.2 the Contractor shall take all reasonable steps to minimize the impact of
the delay event upon the performance of the Work, the Contract Time and the
Contract Price, resume performance of all its obligations under the Contract
affected by the delay as soon as practicable and use all reasonable endeavours
to remedy any failure to perform.

Failure to adhere strictly to these notice provisions shall constitute a waiver and
release of any obligation of the Owner to extend the Contract Time as a result of
such delay and of any claim by the Contractor for costs as a result of such delay.

8. Add paragraph 6.5.6 as follows:
“6.5.6 If the Work should be behind schedule for a reason other than as
described in paragraphs 6.5.1 to 6.5.3 (inclusive), or if any of the Subcontractors
or Suppliers or anyone for whom they are responsible delay the progress of any
portion of the Work necessary to complete the Work on schedule, the Contractor
shall not be relieved of its obligations under the Contract Documents and shall
use all possible and, if necessary, extraordinary measures to bring the Work
back on schedule. The Contractor shall exercise all reasonable means within its
discretion, such as directing any Subcontractors or Suppliers creating delays to
increase their labour forces and equipment, to improve the organization and
expediting of the Work, or to work overtime as may be necessary. The
Contractor shall provide any additional supervision, co–ordination and expediting,
including overtime by its own personnel as may be required to achieve this end.
The costs and expenses incurred by the use of such measures and overtime shall be borne by the Contractor, the Suppliers and/or the Subcontractors.”

**SC.38 – GC 7.1 OWNER’S RIGHT TO PERFORM THE WORK, TERMINATE THE CONTRACTOR’S RIGHT TO CONTINUE WITH THE WORK, OR TERMINATE THE CONTRACT**

1. Amend paragraph 7.1.1 by adding "or terminate the Contract" after "Work" in the third line.

2. In paragraph 7.1.2 add the words "fails or neglects to maintain the latest Construction Schedule provided pursuant to paragraph 3.5" immediately following the word "properly” in the first line and delete the words “to a substantial degree and if the Consultant has given a written statement to the Owner and the Contractor that sufficient cause exists to justify such action.”

3. Amend paragraph 7.1.5 by adding "or terminates the Contract" after "Work” in the first line and by adding "without prejudice to any other right or remedy which is available to the Owner" before "the Owner shall be".

4. Amend paragraph 7.1.5.2 by deleting “until a final certificate for payment is issued”.

5. Amend paragraph 7.1.5.3 as follows:

   (a) delete the words “; however, if such costs of finishing the Work is less than the unpaid balance of the Contract Price, the Owner shall pay the Contractor the difference”.

6. Renumber paragraph 7.1.6 as 7.1.11 and add the following as new paragraphs 7.1.6, 7.1.7, 7.1.8, 7.1.9 and 7.1.10:

   “7.1.6 Notwithstanding any other provision in the Contract Documents, the Contract may be terminated by the Owner without cause. Any such termination shall be effected by delivery to the Contractor of a notice of termination, specifying the date upon which such termination becomes effective. The Owner’s entitlement to so terminate the Contract shall be absolute and unconditional and exercisable by the Owner in its sole and absolute discretion.

   7.1.7 In the event of any termination by the Owner pursuant to paragraph 7.1.6, the Contractor shall only be entitled to payment of the following amounts:

   .1 that portion of the Contract Price relating to Work performed prior to the termination date, as certified by the Consultant; plus

   .2 Subcontractor and sub–subcontractor cancellation costs (which costs shall not include loss of profit claims) reasonably incurred by the Contractor as the result of such termination; provided the Contractor has substantiated such costs to the Owner’s reasonable satisfaction and after the Owner has reviewed the details thereof; plus

   .3 subject in all cases to the Owner being informed of all details relating thereto and the prior written approval of the Owner being obtained (which approval may not be unreasonably withheld), reasonable demobilization costs defined to include equipment and office dismantling, transportation
to Contractor’s storage facility, lease or rental cancellation costs, transportation of the Contractor’s employees to their home offices, provided each such demobilization cost shall be reasonable and substantiated (to the Owner’s reasonable satisfaction) by the Contractor.

7.1.8 Except as described in paragraph 7.1.7, the Contractor shall not be entitled to any additional reimbursement on account of any such termination including, without limitation, indirect, special, consequential or other damages, including, without limitation, loss of profits, loss of opportunity or loss of productivity, notwithstanding any other provision of the Contract Documents.

7.1.9 The terms of the Contract, which expressly or by their nature are intended to survive the termination or discharge of the Contract, shall survive such termination or discharge including, without limitation, GC 12.3 – WARRANTY.

7.1.10 Upon a termination, the Owner may publish a notice of termination in the form and manner prescribed in the Construction Act. For greater certainty, a termination in accordance with this GC 7.1 will be effective whether or not a notice of termination is published.”

SC.39 – GC 7.2 CONTRACTOR’S RIGHT TO STOP THE WORK OR TERMINATE THE CONTRACT

1. Amend paragraph 7.2.2 by deleting “20” and replacing it with “60”.
2. Delete paragraph 7.2.3.1 in its entirety and replace with “7.2.3.1 INTENTIONALLY DELETED”.
3. Amend paragraph 7.2.3.2 by adding “subject to the other terms and conditions of the Contract,” before “the Consultant”.
4. Amend paragraph 7.2.3.3 by adding “subject to the other terms and conditions of the Contract,” before “the Owner”.
5. Amend paragraph 7.2.3.4 by deleting the words “except for GC 5.1 FINANCING INFORMATION REQUIRED OF THE OWNER”.
6. Amend paragraph 7.2.3 by adding “and instruct the Owner to correct the default in the five (5) Working Days immediately following the receipt of such notice.” at the end of the paragraph.
7. Delete paragraph 7.2.4. in its entirety, renumber paragraph 7.2.5 as paragraph 7.2.6 and add the following new paragraph 7.2.4 and new paragraph 7.2.5:

“7.2.4 If the default cannot be corrected in the 5 Working Days specified, the Owner shall be in compliance with the Contractor’s instructions if the Owner:

.1 commences the correction of the default within the specified time; and
.2 provides the Contractor with an acceptable schedule for such correction, and
.3 corrects the default in accordance with such schedule.

7.2.5 If the Owner fails to correct the default in the time specified or subsequently agreed upon, without prejudice to any other right or remedy the
Contractor may have, the Contractor may suspend the Work for not more than 90 days or terminate the Contract.”

SC.40 – GC 8.1 AUTHORITY OF THE CONSULTANT

1. Amend paragraph 8.1.1 as follows:

(a) delete “.” at the end of the sentence and replace with “if the Owner and the Contractor both agree. If both parties do not agree to settle the dispute in accordance with GC 8.2 – NEGOTIATION, MEDIATION AND ARBITRATION, then either party may refer the dispute to the Courts.”

2. Delete paragraph 8.1.2 and paragraph 8.1.3 in their entirety and replace with:

“8.1.2 If a dispute is not resolved promptly, or the Owner and the Contractor cannot agree where agreement is required, the Consultant shall give such written instructions as in the Consultant’s opinion are necessary for the proper performance of the Work and to prevent delays pending settlement of the dispute. The parties shall act immediately according to such instructions, it being understood that by so doing neither party will jeopardize any claim the party may have. If it is subsequently determined that such instructions were in error or at variance with the Contract Documents, the Owner shall pay the Contractor the costs incurred by the Contractor in carrying out such instructions which the Contractor was required to do beyond what the Contract Documents correctly understood and interpreted would have required, including costs resulting from interruption of the Work.”

SC.41 – GC 8.2 NEGOTIATION, MEDIATION AND ARBITRATION

1. Amend paragraph 8.2.1 by replacing “Rules of Mediation of Construction Disputes as provided in CCDC 40 in effect at the time of bid closing” with “Rules of Mediation and Arbitration, as applicable”.

2. Amend paragraph 8.2.1.2 by replacing the words “either party by notice in writing requests” with “both parties agree”.

3. Amend paragraph 8.2.4 by replacing “Rules of Mediation of Construction Disputes as provided in CCDC 40 in effect at the time of bid closing” with “Rules of Mediation and Arbitration, as applicable”.

4. Amend paragraph 8.2.6 by replacing “Rules of Arbitration of Construction Disputes as provided in CCDC 40 in effect at the time of bid closing” with “Rules of Mediation and Arbitration, as applicable”.

SC.42 – GC 9.1 PROTECTION OF WORK AND PROPERTY

1. In paragraph 9.1.1 and paragraph 9.1.3, replace “property adjacent to the Place of the Work” with “property adjacent to, in the vicinity of or proximate to the Place of the Work”.

2. Delete paragraph 9.1.1.1 in its entirety and replace with “9.1.1.1 INTENTIONALLY DELETED”

SC.43 – GC 9.2 TOXIC AND HAZARDOUS SUBSTANCES

1. Add the following new paragraphs 9.2.10, 9.2.11 and 9.2.12:
“9.2.10 Neither the Contractor nor anyone for whom it is responsible shall bring on to the Place of the Work any toxic or hazardous substances and materials except as needed in order to perform the Work. If such toxic or hazardous substances or materials are required, storage in quantities sufficient to allow work to proceed for fourteen (14) calendar days only shall be permitted. All such toxic and hazardous materials and substances shall be handled and disposed of only in accordance with all Laws that are applicable at the Place of the Work. Without limiting the generality of any other provision in the Contract, the Contractor shall promptly provide the Owner with Material Safety Data Sheets for such toxic or hazardous substances or materials.

9.2.11 The Contractor shall indemnify and hold harmless the Owner and Consultant and their respective officers, directors, agents and employees, independent contractors from and against any and all liabilities, costs, expenses, and claims resulting from bodily injury, including death, and damage to property of any person, corporation or other entity, that arises from the use by the Contractor or anyone for whom the Contractor is responsible of any toxic or hazardous substances or materials at the Place of the Work.

9.2.12 The Contractor shall be familiar with, and comply with, the workplace hazardous materials information system. The Contractor shall ensure that all employees and Subcontractors and anyone for whom they are responsible who work with or in proximity to hazardous material fully understand all potential hazards and have been thoroughly trained to deal with any emergencies. Without limiting the generality of the foregoing, all employees and Subcontractors and anyone for whom they are responsible shall be able to:

a) Recognize and understand the labelling on hazardous materials; and
b) Understand material safety data sheets and are knowledgeable on how to safely use, store, handle and dispose of hazardous materials.

The Contractor shall ensure all material safety data sheets pertinent to the completion of the Work are at the Place of the Work.”

SC.44 – GC 10.1 TAXES AND DUTIES

1. Delete GC 10.1 TAXES AND DUTIES in its entirety and replace with the following:

“10.1.1 The Contract Price shall include all taxes, tariffs and customs duties in effect at the time of the bid closing except for Value Added Taxes payable by the Owner to the Contractor as stipulated in Article A-4 of the Agreement – CONTRACT PRICE.

10.1.2 Any increase or decrease in costs to the Contractor due to changes in such included taxes, tariffs and duties after the time of the bid closing shall increase or decrease the Contract Price accordingly.

10.1.3 The Contractor shall provide a detailed breakdown of additional taxes, tariffs and duties in a form satisfactory to the Owner. Profit and overhead shall not be included in the increase or decrease in costs incurred by the Contractor due to changes in the aforementioned taxes, tariffs and duties.
10.1.4 Where an exemption or recovery of government sales taxes, tariffs, customs duties or excise taxes is applicable to the Contract, the parties agree to co–operate with each other to obtain such exemptions. Refunds that are properly due to the Owner and have been recovered by the Contractor shall be promptly refunded to the Owner. In addition, any reduction or elimination of taxes, tariffs or customs duties that take effect after the date of bid closing resulting in savings to the Contractor shall be due to the Owner in the form of a credit to the Contract Price."

SC.45 – GC 10.2 LAWS, NOTICES, PERMITS, AND FEES

1. Delete paragraph 10.2.2 in its entirety and replace with “10.2.2. Without limiting the generality of any other provision in the Contract, the Contractor shall obtain and pay for, at its sole expense and cost, all permits, development approvals, licences, certificates, charges, refundable deposits, and approvals including, without limitation, building permit, site plan approval, water and sanitary sewer permits, water and sewer connection charges, site alteration permits, curb cut and road cut permits, sign permits, hydro approvals, and occupancy permit necessary for the performance of the Work and the use and occupation of the Work by the Owner in accordance with the Contract Documents, the cost of which shall all be included in the Contract Price.”

2. Delete paragraph 10.2.3 in its entirety and replace with the following:

“10.2.3 The Contractor shall comply, and shall require its employees, agents, Subcontractors, Suppliers and anyone for whom they are responsible to comply, with all laws, ordinances, guidelines, standards, permits, statutes, by-laws, rules, regulations, or codes and all of the Owner’s policies and procedures which are or become in force and are applicable to the performance of the Work including, without limitation, all those relating to the preservation of the public health, occupational health and safety and to construction safety.”

3. Amend paragraph 10.2.5 by replacing "The Contractor" with "Subject to paragraph 3.4.1, the Contractor".

4. Delete paragraph 10.2.6 in its entirety and replace with the following:

“10.2.6 If the Contractor fails to notify the Owner and the Consultant in writing, fails to obtain direction as required in paragraph 10.2.5, and/or performs work that it knows or ought to have known that contravenes any laws, ordinances, guidelines, standards, permits, statutes, by-laws, rules, regulations, or codes, the Contractor shall be responsible for and shall correct the violations thereof, and shall bear the costs, expenses, and damages attributable to the failure to comply with the provisions of such laws, ordinances, guidelines, standards, permits, statutes, by-laws, rules, regulations, or codes.”

5. Add new paragraph 10.2.8 as follows:

“10.2.8 Without limiting the generality of any other provision in the Contract Documents, the Contractor shall cause all certificates to be furnished that are required or given by the appropriate governmental or quasi–governmental Authorities as evidence that the Work as installed conforms with the laws and regulations of Authorities Having Jurisdiction, including, without limitation,
certificates of compliance for the Owner’s occupancy or partial occupancy. The certificates are to be final certificates giving complete clearance of the Work, in the event that such governmental or quasi–governmental Authorities furnish such certificates.”

**SC.46 – GC 10.3 PATENT FEES**

1. Amend paragraph 10.3.1 by adding “indemnify and” before “hold the” in the second line.

2. In paragraph 10.3.2, add “by the Owner” after “supplied to the Contractor.”

**SC.47 – GC 11.1 INSURANCE**

1. Replace GC 11.1 with the following:

   “**GC 11.1 INSURANCE**

   11.1.1 Without restricting the generality of GC 12.1 – INDEMNIFICATION, the Contractor shall provide, maintain and pay for the following insurance coverage’s:

   1. Commercial General Liability insurance shall be with limits of not less than $5,000,000 per occurrence with an annual aggregate limit of not less than $5,000,000 within any policy year. The policy shall be maintained for at least twenty-four (24) months from the date of Substantial Performance of the Work.

   The insurance shall be in the name of the Contractor, include the Owner as an additional insured, and include bodily injury including death, personal injury, property damage including loss of use thereof, contractual liability, non–owned automobile liability, owner’s and contractor’s protective, products and completed operations, employer’s liability, contingent employer’s liability with coverage including the operations and activities of the Contractor and those for whom the Contractor is in law responsible. The policy shall contain cross liability and severability of interest clauses.

   The insurance coverage shall not be less than the insurance provided by IBC Form 2100, or its equivalent replacement, provided that IBC form 2100 shall contain the latest edition of the relevant CCDC endorsement form and shall include an endorsement with respect to sudden and accidental pollution acceptable to the Owner (including an extension for a standard provincial or territorial form of non–owned automobile liability policy) and IBC Form 2320.

   The policy will include but is not limited to the liability of the insureds arising out of their general supervision, if any, or such operations with respect to safety or otherwise, or arising out of the ownership or control of the premises on which such operations are performed.

   All liability coverage shall be maintained for completed operations hazards from the date of Contract Completion on an ongoing basis for a period of six (6) years following the date of Contract Completion.”
To achieve the desired limit, umbrella or excess liability insurance may be used. Subject to satisfactory proof of financial capability by the Contractor, the Owner may agree to increase the deductible amounts.

All policies of insurance shall be primary and shall not act as co-insurance or as excess coverage to any policies obtained by the Owner for its sole protection.

Prior to commencement of the Work and upon the placement, renewal, amendment or extension of all or any part of the insurance, the Contractor shall promptly provide the Owner with a certified true copy of the policy(ies) by an authorized representative of the insurer together with copies of any amending endorsements or a Certificate of Insurance on the Owner’s form evidencing compliance with the policy requirements and endorsed to provide the Owner with not less than 30 days’ notice in writing in advance of any cancellation, change or amendment restricting coverage.

2. All Risk property insurance shall have limits of not less than the sum of 1.1 times the Contract Price and the full value, as stated in the Contract, of Products and design services that are specified to be provided by the Owner for incorporation into the Work, with a deductible not exceeding $25,000. The insurance coverage shall not be less than the insurance provided by IBC Forms 4042 and 4047 (including flood and earthquake endorsements) or their equivalent replacement and include coverage for boiler & machinery testing and commissioning; property in transit and off-site coverage with limits acceptable to the Owner. Subject to satisfactory proof of financial capability by the Contractor, the Owner may agree to increase the deductible amounts.

The policy shall waive subrogation against the Owner. The coverage shall be maintained continuously from the commencement of use or operation of the property insured and until the date of Contract Completion.

The insurance policy shall name the Owner, Contractor, Subcontractors, Consultant and Subconsultants as their respective interests may appear and be endorsed to provide the Owner with not less than 30 days’ notice in writing in advance of cancellation, change or amendment restricting coverage.

3. Boiler and Machinery insurance shall have limits of not less than the replacement value of the permanent or temporary boilers and pressure vessels, and other insurable objects forming part of the Work. The insurance coverage shall not be less than the insurance provided by a comprehensive Boiler and Machinery policy. The policy shall waive subrogation against the Owner and shall be endorsed to provide the Owner with not less than 30 days’ notice in writing in advance of cancellation, change or amendment restricting coverage.
The coverage shall be maintained continuously from the commencement of use or operation of the property insured and until the date of Contract Completion.

4. **Standard Exclusions**

4.1 In addition to the broad form property exclusions identified in IBC 4042 (1995) and 4047 (2000), the Contractor is not required to provide the following insurance coverages:

- Cyber Risk
- Terrorism

11.1.2 Prior to commencement of the Work and upon the placement, renewal, amendment, or extension of all or any part of the insurance, the Contractor shall promptly provide the Owner with confirmation of coverage and, if required, a certified true copy of the policies certified by an authorized representative of the insurer together with copies of any amending endorsements applicable to the Work or Certificate of Insurance on the Owner’s form evidencing compliance with the policy requirements and endorsed to provide the Owner with not less than 30 days’ notice in writing in advance of any cancellation, change or amendment restricting coverage.

11.1.3 The parties shall pay their share of the deductible amounts in direct proportion to their responsibility in regard to any loss for which the above policies are required to pay, except where such amounts may be excluded by the terms of the Contract.

11.1.4 If the Contractor fails to provide or maintain insurance as required by the Contract Documents, then the Owner shall have the right to provide and maintain such insurance and give evidence to the Contractor and the Consultant. The Contractor shall pay the cost thereof to the Owner on demand or the Owner may deduct the cost from the amount which is due or may become due to the Contractor.

11.1.5 All required insurance policies shall be with insurers licensed to underwrite insurance, in the Province of Ontario and shall be at the approval, not unreasonably withheld, of the Owner.

**SC.48 – GC 11.2 CONTRACT SECURITY**

1. Amend paragraph 11.2.2 by replacing "in accordance with the latest edition of CCDC approved bond forms" with "substantially in the forms required under the Construction Act and with a surety company deemed acceptable by the Owner."

2. Add the following as new paragraph 11.2.3:

   “11.2.3 The Contractor shall, as part of the Contract Price, provide a Performance Bond with a face value of **50 per cent** of the Contract Price and a Labour and Material Payment Bond with a face value of **50 per cent** of the Contract Price, substantially in the form required under the Construction Act. The Performance Bond and the Labour and Material Payment Bond must remain in effect for a period of not less than the full duration of the Warranty Period under the Contract.”
SC.49 – GC 12.1 INDEMNIFICATION

1. Delete paragraph 12.1.1 in its entirety and replace with the following:

   “12.1.1 The Contractor shall indemnify the Owner, the Consultant and their respective officers, council members, partners, agents, employees, servants, insurers, advisors, consultants, contractors, successors and assigns (collectively the “Indemnified Parties”), and save them harmless from and against any and all claims, demands, losses, costs, damages, actions, causes of action, suits or proceedings and all other liabilities, losses and expenses including bodily injury or death to any Person or loss or damage to property, court costs, interest, legal fees, adjusting fees and disbursements (collectively "claims") made against or suffered or incurred by the Indemnified Parties, directly or indirectly and which arise from or are connected with:

   .1 any failure or alleged failure by the Contractor (or any Subcontractor, Supplier or anyone for whom the Contractor and/or its Subcontractors and Suppliers may be responsible) to comply with the Contract Documents including any applicable Laws or Regulations, including provincial workers’ compensation laws or regulations;

   .2 any infringement or alleged infringement by the Contractor (or any Subcontractor, Supplier or anyone for whom the Contractor and/or its Subcontractors and Suppliers may be responsible) of any intellectual property right including without limitation any misuse, passing off or infringement or alleged infringement of trade–marks;

   .3 any defective or potentially hazardous goods used by the Contractor (or any Subcontractor, Supplier or anyone for whom the Contractor and/or its Subcontractors and Suppliers may be responsible);

   .4 any form of theft, fraud, or illegal activity by the Contractor (or any Subcontractor, Supplier or anyone for whom the Contractor and/or its Subcontractors and Suppliers may be responsible) or any of their respective agents, directors, officers, or employees;

   .5 any wilful act, omission or negligence of the Contractor (or any Subcontractor, Supplier or anyone for whom the Contractor and/or its Subcontractors, and Suppliers may be responsible), or any of their respective agents, directors, officers, servants, contractors or employees;

   .6 any negligence by the Contractor (or any Subcontractor, Supplier or anyone for whom the Contractor and/or its Subcontractors, and Suppliers may be responsible) directly or indirectly arising or contributing to or alleged to arise out of the Contractor’s performance of or the failure to perform the Work, or out of the conditions of the work, the job site, adjoining land, driveways, streets or alleys used in connection with the performance of the Work under this Contract;

   .7 any negligence, errors or omissions, or monies owing to the Owner for claims payable under this indemnity due to failure of any insurance required of Subcontractors or Suppliers thereof as retained by Contractor,
but shall not include any claims arising solely from the active negligence of the party asking to be defended, indemnified or saved harmless.”

2. Delete paragraphs 12.1.2 and 12.1.3 in their entirety and replace each with “INTENTIONALLY DELETED.”

SC.50 – GC 12.2 WAIVER OF CLAIMS

1. Delete paragraph 12.2 in its entirety and replace with the following:

"12.2 WAIVER OF CLAIMS

12.2.1 Subject to any rights or remedies provided by the Construction Act, as of the date of the final certificate for payment, the Contractor expressly waives and releases the Owner from all claims against the Owner including, without limitation, those that might arise from the negligence or breach of contract by the Owner except:

1. those made in writing in compliance with the Contract Documents prior to the Contractor's application for final payment and still unsettled; and

2. those arising from the provisions of GC 9.2 – TOXIC AND HAZARDOUS SUBSTANCES AND MATERIALS or GC 10.3 PATENT FEES

SC.51 – GC 12.3 WARRANTY

1. Delete paragraph 12.3.1 in its entirety and replace it with the following:

(a) “The Contractor agrees to remedy, at its costs, any defects in materials and workmanship which are identified by the Owner within a period of 24 months (except where otherwise noted for a longer period of time in the Contract Documents) from the date of Substantial Performance of the Work (the “Warranty Period”). This warranty shall cover labour and material, including, without limitation, the costs of removal and replacement of covering materials. This warranty shall not limit extended warranties on any items of equipment or material called for elsewhere in the specifications or otherwise provided by any manufacturer of such equipment or material.”

2. Amend paragraph 12.3.3 by replacing “one year” with “24 months”.

3. Amend paragraph 12.3.4 by replacing “one year” with “24 months”.

4. Add the following to paragraph 12.3.5:

“The carrying out of the replacement work and making good of defects shall be executed at such times as convenient with the Owner which may entail overtime work on the part of the Contractor. Additional charges for overtime work in this regard must be borne by the Contractor.”

5. Delete paragraph 12.3.6 and add the following new paragraph 12.3.6, paragraph 12.3.7, paragraph 12.3.8 and paragraph 12.3.9:

“12.3.6 Any material or equipment requiring excessive servicing during the Warranty Period (or free maintenance period, if applicable) shall be considered defective and the warranty (or free maintenance period) shall be deemed to take
effect from the time that the defect has been corrected so as to cause excessive servicing to terminate.

12.3.7 The final payment certificate shall not relieve the Contractor from its responsibility under this GC 12.3 – WARRANTY.

12.3.8 Following Substantial Performance of the Work, and without limiting the Contractor’s warranty under this GC 12.3, the Contractor shall assign to the Owner, to the extent assignable, the benefit of all warranties and guarantees relating to the Work. The assignment shall expressly reserve the right of the Contractor to make any claims under such warranties and guarantees and such assignment shall in no way prejudice any rights of or benefits accruing to the Contractor pursuant to such warranties and guarantees.

12.3.9 The provisions of the GC 12.3 – WARRANTY shall not deprive the Owner of any action, right or remedy otherwise available to the Owner for the Contractor’s failure to fulfill its obligations or responsibilities under the Contract and shall not be construed as a waiver of claims in favour of the Contractor or as a limitation on the time in which the Owner may pursue such other action, right or remedy. The warranties set out in the Contract are not supplemental to and do not limit or preclude the application of any other conditions and warranties, express or implied, by law or trade usage.”

6. Add the following as new paragraph 12.:

“12. WARRANTY SECURITY HOLDBACK

12.4.1 The Contractor agrees that the Owner may withhold an amount of the payments due by the Owner to the Contractor hereunder as security for the Contractor’s performance of its warranty obligations hereunder (the “Warranty Holdback”). The amount of the Warranty Holdback shall be determined based on the contract price in accordance with the following table:

<table>
<thead>
<tr>
<th>CONTRACT PRICE</th>
<th>VALUE OF WARRANTY HOLDBACK ($)</th>
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<tbody>
<tr>
<td>FROM ($)</td>
<td>TO ($)</td>
</tr>
<tr>
<td>Less than 0.1M</td>
<td>4 per cent of Final Contract Price</td>
</tr>
<tr>
<td>0.1 M</td>
<td>0.5 M</td>
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<tr>
<td>0.5 M</td>
<td>1.0 M</td>
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<td>4.0 M</td>
<td>6.0 M</td>
</tr>
<tr>
<td>6.0 M</td>
<td>10.0 M</td>
</tr>
<tr>
<td>Over 10.0 M</td>
<td>186,000 on first 10.0M + 1.0 per cent on balance</td>
</tr>
</tbody>
</table>

For the avoidance of doubt, the Warranty Holdback shall be adjusted from time to time to account for changes to the contract price as a result of approved Change Orders and Change Directives.

12.4.2 In order to fund the Warranty Holdback, the Owner may, at its sole discretion, retain the Warranty Holdback progressively as a percentage of some or all progress payment to the Contractor, or retain a lump sum upon the achievement of Substantial Performance of the Work or, if insufficient funds have
been retained at the time of Substantial Performance of the Work, retain a portion of any remaining payment owing to the Contractor, including any remaining progress payment, final or finishing work payment, or the holdback under the Construction Act, if any.

12.4.3 The Owner shall release the Warranty Holdback, less any amount due to the Owner by the Contractor hereunder, at the end of the Warranty Period. Notwithstanding the foregoing:

.1 after the first 12 months of the Warranty Period, the Contractor may apply for a release of 80 per cent of the Warranty Holdback, provided that balance of the Warranty Holdback shall not be below $5,000 as a result of the release and provided that there are no outstanding deficiencies at the time of the application; and

.2 The Contractor may apply in writing to the Owner at the time of Substantial Performance of the Work to substitute for the monies retained as the Warranty Holdback an alternative warranty security of equivalent or greater value comprising:

a) one or more irrevocable letters of credit, or

b) another readily negotiable security.

Acceptance of any such alternative shall be at the sole discretion of the Owner.

Following receipt and acceptance of any such alternative security by the Owner, the Consultant shall release to the Contractor the monies previously retained for warranty security purposes.

The Owner may, at its discretion, allow the total Warranty Holdback to be made up in part of monies retained under the Contract and in part of an alternative warranty security as indicated in (a) and (b) above provided that the total value of such parts, as determined by the Owner, shall be not less than the required value as derived from the table set out above.

Such alternative warranty security or the monies derived therefrom, less any deductions made as provided for in the Contract, shall be released to the Contractor following the issuance by the Consultant of a Warranty Holdback Payment Certificate.”

SC.52 MISCELLANEOUS

1. Add new PART 13 MISCELLANEOUS as follows:

“PART 13 MISCELLANEOUS

GC 13.1 REVIEW BY OWNER AND REVIEW BY CONSULTANT

13.1.1 Neither the Owner’s and/or Consultant’s receipt, review or approval of any documents or the Work nor the failure of the Owner and/or Consultant’s to provide comment shall limit, waive or diminish the Contractor’s obligations, responsibilities, duties or liabilities under the Contract. The review or approval by the Owner and/or Consultant is intended only to ascertain that the document or the performance of the
Contractor’s duties, liabilities, responsibilities or obligations under the Contract including, without limitation, the Work generally meets the intention of the Contract and is not an assurance or confirmation of the adequacy, quality, fitness, suitability or correctness of the Contractor’s obligations, responsibilities, duties and liabilities under the Contract including, without limitation, the Work, for which the Contractor is solely responsible in accordance with the Contract.

**GC 13.2 CARE AND SKILL**

13.2.1 The Contractor acknowledges, confirms, represents and warrants to the Owner that:

1. in performing the Work, it shall at all times exercise the degree of care and skill that ought to be exercised by contractors in performing work of the nature contemplated herein; and

2. it has the necessary experience, skill and expertise required to enable it to fulfill its obligations, duties, liabilities, and responsibilities herein.

**GC 13.3 USE AND/OR OCCUPATION OF COMPLETED PORTIONS OF THE WORK**

13.3.1 Upon the Owner’s request, the Owner shall, at any time or times, have the right of occupying and/or using any part or parts of the Work (including, without limitation, for the purposes of installing and testing fittings and equipment), whether partially performed or entirely complete, or whether completed on schedule or not, before the completion of the Work.

13.3.2 In the event the Owner desires to exercise the privilege of occupancy and/or use of the Work as provided above, the Contractor shall cooperate with the Owner throughout in making available for the Owner’s use such building services as heating, ventilation, cooling, water, lighting and telephone for the space or spaces to be occupied and/or used, and if the equipment required to furnish such services is not entirely completed at the time the Owner desires to occupy and/or use the aforesaid space or spaces, the Contractor shall make every reasonable effort to complete same as soon as possible to the extent that the necessary equipment can be put into operation and use and any extra cost beyond that originally required to complete the Work arising from such early occupancy and/or use shall be borne by the Owner.

13.3.3 In the event that the Owner exercises the privilege of occupancy and/or use of the Work as provided above, it agrees to do so, so as not to materially interfere with the respective work of the Contractor, Subcontractors or Suppliers and under the understanding that the Owner will be occupying premises within a construction site which will require compliance with all normal construction site requirements including, without limitation, health and safety requirements.
13.3.4 It shall be understood, however, that the Owner's occupancy and/or use 
of such space or spaces of the Work shall not constitute the Owner's 
acceptance of any Work, materials or equipment which are not in 
accordance with the requirements of the Contract Documents, nor affect 
the warranty period under the Contract, nor relieve the Contractor from 
his obligations, duties, responsibilities, and liabilities to complete the 
Work, nor for responsibility for loss or damage due to or arising out of 
defects in, or malfunctioning of, any Work, material or equipment, nor 
from any other unfulfilled duties, liabilities, obligations or responsibilities 
under the Contract nor from any other duty, liability, obligation or 
responsibility under the Contract including, without limitation, the 
Contractor's warranty obligations. If, however, damage results from any 
act by the Owner, the Owner shall assume its share of the responsibility 
for such damage.

GC 13.4 NON–INTERFERENCE

13.4.1 The Contractor acknowledges that the Place of the Work is and will 
continue to be occupied by the Owner and the Owner will continue to 
carry out its normal operations at the Place of the Work. The Contractor 
agrees to perform the Work in the least intrusive manner possible. 
Without limiting the generality of the foregoing, the Contractor 
acknowledges and agrees that it shall carry out its duties, responsibilities, 
and obligations under the Contract in such a manner so as not to disrupt 
or interfere with any of the Owner’s or any third party’s existing facilities 
and ongoing operations or activities or other operations located in the 
area adjacent to, in the vicinity of or proximate to the Place of the Work.

GC 13.6 DAMAGES AND MUTUAL RESPONSIBILITY

13.6.1 If either party to the Contract should suffer damage in any manner 
because of any wrongful act or neglect of the other party or of anyone for 
whom the other party is responsible in law, then that party shall be 
reimbursed by the other party for such damage. The reimbursing party 
shall be subrogated to the rights of the other party in respect of such 
wrongful act or neglect if it be that of a third party.

13.6.2 Claims for damage under paragraph 13.6.1 shall be made in writing to the 
party liable within reasonable time after the first observance of such 
damage and if undisputed shall be confirmed by Change Order. Disputed 
claims shall be resolved as set out in Part 8 for the General Conditions – 
DISPUTE RESOLUTION.

13.6.3 If the Contractor has caused damage to the work of another contractor on 
the Project, the Contractor agrees upon due notice to settle with the other 
contractor by negotiation or arbitration. If the other contractor makes a 
claim against the Owner on account of damage alleged to have been so 
sustained, the Owner shall notify the Contractor and may require the 
Contractor to defend the action at the Contractor’s expense. The 
Contractor shall satisfy a final order or judgement against the Owner and 
pay the costs incurred by the Owner arising from such action.
13.6.4 If the Contractor becomes liable to pay or satisfy a final order, judgment, or award against the Owner, then the Contractor, upon undertaking to indemnify the Owner against any and all liability for costs, shall have the right to appeal in the name of the Owner such final order or judgment to any and all courts of competent jurisdiction.

**GC 13.7 RIGHT OF SET-OFF**

13.7.1 The Owner has the right to set-off against the balance due or to become due to the Contractor under the Contract, any reasonable and substantiated amounts due or to become due from the Contractor to the Owner under the Contract.

**GC 13.8 SOFTWARE**

13.8.1 Without limiting the generality of any other provision in the Contract, the Contractor, as a part of the Work, shall supply and install all software required by the Contract Documents or included with any systems required by the Contract Documents ("Software"). The Contractor shall grant or obtain a perpetual, irrevocable non-exclusive royalty-free license to use the Software sufficient for the Owner’s purposes.”
AGREEMENT TO BOND

We, the undersigned, hereby agree to become bound as Surety for

In a Performance Bond totalling **50 per cent** of the Contract amount and a Labour and Material Payment Bond totalling **50 per cent** of the Contract amount, substantially in the forms required under the *Construction Act* and conforming to the Instruments of Contract attached hereto, for the full and due performance of the Works shown as described herein, if the Tender for

is accepted by the Owner.

It is a condition of the Contract that if the above-mentioned Tender is accepted by the Agency, application for a Performance Bond and a Labour and Material Payment Bond, each in the amount of **50 per cent** of the Contract amount, and each substantially in the forms prescribed by the *Construction Act*, must be completed with the undersigned within 10 days of acceptance of Tender related thereto, otherwise this Agreement shall be null and void.

Dated this __________ day of _________________________, ________.

_____________________________________
Name of Bonding Company

_____________________________________
Signature of Authorized Person Signing for Bonding Company (Company Seal)

_____________________________________
Position
1. **GENERAL**

1.1 The following Drawing details are an integral part of the Contract Documents.

1.2 These details are considered typical in nature, and may be augmented or supplemented by specific details indicated on the Drawings. Refer to Appendix 5.11 for all details.

1.3 **Detail List**

5000 Series: Metals

5003-10 Wall Mounted Handrail Detail
5005-1 Section Through Barrier Free Ramp Handrail Detail

6000 Series: Wood and Plastics

6001-2 Detail Section: Typical Cupboard Upper Cabinet – Open Shelving, Lower Cabinet - Cupboard with Door
6001-3 Detail Section: Typical Cupboard Upper Cabinet – Cupboard, Lower Cabinet – Bank of Drawers
6001-4 Detail Section: Typical Cupboard Upper Cabinet – Cupboard, Lower Cabinet – Single Drawer and Cupboard
6001-5 Detail Section: Typical Microwave Oven Shelf Single Microwave
6009-1 Barrier Free Vanity Section Detail
6011-3 Typical Coat Rod and Shelf

8000 Series: Doors and Windows

8001-1 Door Elevations
8001-2 Frame Elevations
8002-1 Door Framing Details
8002-2 Door Framing Details Refer to 8002-1 for Legend and Notes
8002-3 Door Framing Details Refer to 8002-1 for Legend and Notes
8003-1 Overhead Door - Typical
8003-2 Overhead Door - Head and Jamb Detail
8005-1 Rolling Shutter – Typical Details
9000 Series: Finishes

9100-1-5 Finish Schedule
9001-1 Gypsum Wall Board Partition Plan Details
9001-2 Gypsum Wall Board Partition Details
9001-3 Gypsum Wall Board Partition Section Details
9002-1 Gypsum Wall Board Partition Acoustic Separation Details
9003-1 Gypsum Wall Board Column Fireproofing Details
9003-2 Gypsum Wall Board Partitions Under Steel Framing Section Details
9003-3 Metal Stud and Gypsum Wall Board Partitions Abutting Various Conditions Junction Details
9005-1 Ceramic Tile at Shower Trench and Floor Drain Section Details

10000 Series: Specialties

10000-1a Barrier Free ‘L’ Shaped Grab Bar and Toilet Accessory Locations for Manual Flush Tank Toilets
10000-1b Barrier Free ‘L’ Shaped Grab Bar and Toilet Accessory Locations for Manual Flush Valve Toilets
10000-4 Barrier Free Shower Elevations
10000-5 Barrier-Free Lavatory Mounting Heights and Distances
10000-6.1 Typical Washroom Accessory Mounting Heights 1 of 2
10000-6.2 Typical Washroom Accessory Mounting Heights 2 of 2
10000-7 Typical Fixture Mounting Heights Elevation

END OF SECTION
1. **GENERAL**

1.1 **Instructions**

1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **GEOTECHNICAL INVESTIGATION REPORT**

1.2.1 A copy of a geotechnical investigation report forming part of the Bid Documents is attached as appendix 5.19 and is identified as follows:

1. **Title:** Geotechnical Investigation, Proposed Concrete Slab for New Air Handling Units, 180 Derry Road, Mississauga, Ontario  
2. **Reference No.:** 191-09786-00  
3. **Dated:** October 10, 2019  
4. **Prepared By:** WSP Canada Inc. (WSP), 51 Constellation Court, Toronto, ON M9W 1K4  
5. **Telephone:** 416-798-0065

1.2.2 This report records properties of the soils and recommendations for the design of foundations, prepared primarily for the use of the Consultant. The recommendations given shall not be construed as a requirement of this Contract unless also contained in the Contract Documents.

1.2.3 The report, by its nature, cannot reveal all conditions that exist or can occur on the site. Should subsurface conditions, in the opinion of the Consultant, be found to vary substantially from the report, changes in the design and construction of foundations will be made, with resulting credits or expenditures to the Contract Price accruing to the Owner.

1.2.4 The Owner and Consultant assume no responsibility for any interpretation or deduction that a third party may make from the contents of the report. Third parties shall establish the nature of the existing soil conditions to their own satisfaction.

1.2.5 Direct questions pertaining to the geotechnical report to the soils engineer.

1.2.6 Boreholes locations indicated in the report are schematic only. Verify exact locations at the Place of the Work with the geotechnical investigation firm.

1.2.7 Additional costs incurred as a result of over excavation or other conditions within the control of the Contractor will not be approved.

1.2.8 Additional copies of the geotechnical investigation report may be obtained at the offices of the geotechnical investigation firm.
1.3 **Hazardous Building Material Report**

1.3.1 A copy of a report forming part of the Bid Documents is attached in Appendix 7.24, and is identified as follows:

.1 Title: Designated Substances and Hazardous Materials Survey, 7750 Hurontario Street, Brampton, Ontario

.2 Reference No.: 191-08416-00

.3 Dated: July 8, 2018

.4 Prepared By: WSP Canada Inc. (WSP).  
51 Constellation Court  
Toronto, ON M9W 1K4  
Telephone: 416-798-0065

1.3.2 A copy of a report forming part of the Bid Documents is attached in Appendix 7.24, and is identified as follows:

.1 Title: Designated Substances and Hazardous Materials Survey, 180 Derry Road East, Mississauga, Ontario

.2 Reference No.: 181-10995-00

.3 Dated: August 27, 2018

.4 Prepared By: WSP Canada Inc. (WSP).  
51 Constellation Court  
Toronto, ON M9W 1K4  
Telephone: 416-798-0065

1.3.3 The Agency and Consultant assume no responsibility for any interpretation or deduction that a third party may make from the contents of the report.

1.3.4 The Agency and Consultant assume no responsibility for the scope or accuracy of the information contained in the report.

END OF SECTION
# Application for Payment Form

To:  
Certificate No.: 001
Date:
Project Name:

Attn: Project No.:

Under the terms of the contract, by and between

<Enter Owner's Name>   (Owner), and

<Enter Contractor's Name>   (Contractor)

By law, the amount certified is subject to reduction by the amount of any lien of which you have received written notice. This certificate is not negotiable and is payable to the payee named in it. Issuance, payment and acceptance are without prejudice to any rights of the Owner or Contractor under their contract. The issuance of this certificate for payment shall not be taken as a representation that the Consultant has made the contract price or that the Contractor has discharged the obligations imposed on him by law under the Workers' Compensation Act, or other applicable statutes, non compliance with which may render the Owner personally liable for the Contractor's default.

This is to certify that the value of Work performed and Products delivered to the Place of the Work as of  
<enter month end date>  = $ 

## Statement of Account

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<tr>
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<td>Authorized Change Orders to Date</td>
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<tr>
<td>2b</td>
<td>Authorized Change Orders That Affect Contract Value</td>
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<tr>
<td>3</td>
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<tr>
<td>5b</td>
<td>Deficiency Holdback of 2% &lt;if applicable&gt;</td>
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<tr>
<td>6</td>
<td>Holdback Previously Released</td>
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</tr>
<tr>
<td>7</td>
<td>Holdback Released this Draw</td>
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<tr>
<td>8</td>
<td>Balance of Holdback ((5a+5b)-(6 + 7))</td>
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<td>9</td>
<td>Total Certified Less Balance of Holdback (4 - 8)</td>
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<tr>
<td>10</td>
<td>Less Previously Approved (Item 9 from previous Certificate)</td>
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<tr>
<td>11</td>
<td>Total Payment Recommended This Certificate (9-10)</td>
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<td>Value Added Tax at 13% (13% of line 11)</td>
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<td>15</td>
<td>EXCLUDING VALUE ADDED TAX</td>
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</table>
1. **GENERAL**

1.1 **Instructions**

1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.1.2 It is the Agencies expectation that the entire document 2019-165T including drawings, specifications, and appendices will be provided by the Contractor to all Subcontractors to ensure the full scope of the Contract is included. The Agency will not accept any additional costs for scope that is identified in document 2019-165T but may have not been carried by a Subcontractor.

1.2 **Section Includes**

1.2.1 Provide for all requirements related to setting out, co-ordination, administration, general construction, safety and protection of the Work, workers, Agency's personnel and the public, the ongoing and final cleaning, and any other Work specified or indicated on the Drawings.

1.3 **Notice Of Project**

1.3.1 Submit to the Ministry of Labour a Notice of Project indicating the Project's start date.

1.4 **Project Meetings**

1.4.1 Schedule and hold pre-construction, progress and pre-installation meetings throughout construction of Work.

1.4.2 Pre-Construction Meeting

   .1 Attend pre-construction meeting, to be held prior to commencement of Work at place and time to be announced by Consultant.

   .2 Agenda: Project co-ordination, administrative procedures, scheduling and other related subjects.

1.4.3 Progress Meetings

   .1 Schedule and administer bi-weekly progress meetings until Substantial Performance of the Work.

   .2 Make physical arrangements, prepare agenda, and distribute notice of each meeting to participants, Agency and to Consultant three days in advance of meeting date.

   .3 The Contractor shall preside at meetings. Provide schedule updates and performance track sheet to the Consultant for minutes to be issued by the Consultant. The Contractor shall provide track sheet for: requests for information, Change Orders, Shop Drawings at each site meeting.

   .4 Locations of meetings: Project site office.
.5 Minimum Agenda:
.1 Approval of minutes of previous meetings.
.2 Review of Work progress.
.3 Field observations, problems and decisions.
.4 Identification of problems which impede planned progress.
.5 Review of submittal schedule and status of submittals.
.6 Review of off-site fabrication and delivery schedules.
.7 Maintenance of progress schedule (schedule updates).
.8 Corrective measures to regain projected schedules.
.9 Planned progress during succeeding Work period.
.10 Co-ordination of projected progress.
.11 Maintenance of quality and Work standards.
.12 Effect of proposed changes on Progress Schedule and co-ordination.
.13 Other business relating to the Work.

1.4.4 Pre-installation Meetings
.1 Where required by the Specifications or when deemed appropriate by the Contractor, hold pre-installation meetings with members of relevant Trades involved to discuss installation of specific building products or elements.

1.4.5 Coordination Meetings with Subcontractors:
.1 From time to time, and as directed by Agency, attend and participate in coordination meetings dealing with interfacing between Subcontractors and Contractor.

1.4.6 Coordination Meetings with Owner Contractors:
.1 In addition to the Interior Building Renovations at the Sir Robert Peel Centre, 7750 Hurontario Street, Brampton, Peel Regional Police will be in contract with a Paving Contractor undertaking a complete revitalization of the existing parking lot. The scope of work will be completed in phases. The Contractor for the Interior Building Renovations project will need to coordinate access to the site, parking and the building facility accordingly with the Paving Contractor.

1.4.7 Attendance at Meetings
.1 Contractor, job superintendent, Subcontractors, and Suppliers as appropriate to agenda, and authorized to act on behalf of the entity each represents; Agency, Consultant, Professional Consultants and others may attend as appropriate.

1.5 Parking
1.5.1 Comply with local parking regulations.
1.5.2 Parking will be permitted in the Contractor’s staging area only.
1.6 **Site Access And Traffic Control**
1.6.1 Consult with authority having jurisdiction in establishing public thoroughfares to be used for site access haul routes.
1.6.2 Coordinate and comply with local authorities regarding necessary diversion of roads or sidewalks (if applicable).
1.6.3 Do not stack materials or supplies on existing roads or sidewalks.
1.6.4 Maintain access roads in good condition.
1.6.5 Protect permanent site improvements to remain such as curbs, pavement and utilities.
1.6.6 Maintain access for fire-fighting equipment and access to fire hydrants.

1.7 **Security**
1.7.1 Protect and secure site, building, materials and equipment from theft, vandalism and unauthorized entry.

1.8 **Protection Of Installed Work**
1.8.1 Refer to various sections of Specifications for specific requirements regarding protection of installed materials.
1.8.2 Provide protective coverings at walls, projections, corners and jambs, sills and soffits of openings in and adjacent to traffic areas.
1.8.3 Protect finished floors and stairs from dirt, wear and damage.
1.8.4 Waterproofed and Roofed Surfaces
   .1 Restrict traffic to waterproofed and roofed surfaces and restrict material storage on these surfaces.
   .2 When traffic or material storage is unavoidable, follow recommendations for protection of surfaces from manufacturer of roofing or waterproofing material.
   .3 Keep waterproofed and roofed surfaces free of debris at all times.
   .4 Protect pre-finished Work, including windows, louvers, finish hardware and doors from damage by mortar, paint, wallboard compounds and other construction materials and operations.
   .5 Replace or make good, to the satisfaction of the Consultant, any building surface or installed material damaged prior to acceptance by the Agency and/or due to failure to provide suitable protection.

1.9 **Fire Protection**
1.9.1 Provide and maintain, in good operating condition, adequate fire protection equipment suitable for fire hazards involved at convenient accessible locations during construction.
1.9.2 Avoid accumulations of combustible forms, form lumber and debris within building and vicinity.
1.9.3 Flammable Liquids
   .1 Store flammable or volatile liquids in open air or in small
detached structures or trailers.
   .2 Closely supervise storage of paint materials and other
combustible finishing and cleaning products.
   .3 Do not store oily rags in closets or other tight spaces.
1.9.4 Comply with recommendations regarding fire protection made by
representatives of insurance company carrying insurance on the
Work or by local Fire Chief or Fire Marshal.
1.9.5 The Contractor shall comply with the Region of Peel smoking by-
laws that are in place.

1.10 Salvaged Material
1.10.1 Refer to Section 02 41 19 – Selective Demolition.

1.11 Alterations To Existing Work
1.11.1 Where materials are to be removed for re-use or where existing
finishes are to be cut out and later made good, employ qualified
workers skilled in the handling of each particular material. Make
good to match existing adjoining construction.
1.11.2 Make good all damage to the existing building or contents due to
construction Work.
1.11.3 New Work in existing building shall conform to requirements of
applicable Sections.
1.11.4 Make certain that all services affected by Work are cut off and are
properly capped or diverted.
1.11.5 Do not interrupt services to or within the existing building without
prior consultation with Agency.
1.11.6 Remove and dispose of all demolition and construction debris
1.11.7 Remove, turn over to Agency:
   .1 All ASSA ABLOY hardware cylinders/locksets
   .2 All card readers
   .3 All card reader panels
   .4 Wireless Access Points
   .5 Proving chambers
   .6 Appliances

1.12 Construction Safety
1.12.1 The Contractor shall be liable for any costs, fines, penalties, etc.,
levied against the Agency or Consultant due to violations of the
Construction Safety Act by construction personnel.
1.12.2 Pursuant to the latest amendments to Ontario’s Occupational
Health and Safety Act, include the cost of management and non-
management representatives to attend Safety Committee
meetings as often as required by legislation.

1.13 Safety Statement And Program
1.13.1 Post a Safety Policy Statement at the Place of the Work and
submit a copy of the safety program to the Consultant, and Peel
Regional Police.
1.14 **Workplace Hazardous Materials Information System**

1.14.1 Ensure all workers are trained in WHMIS. Submit proof of training if requested by the Consultant.

1.14.2 Arrange for a complete set of material safety data sheets (MSDS) to be available at the Place of the Work for all Products being used in the Work.

**END OF SECTION**
1. **GENERAL**

1.1 **Instructions**
   1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes**
   1.2.1 Contractor's use of the Place of the Work.

1.3 **Intent**
   1.3.1 The Agency has arranged for easements for construction, storage and access as shown in the Contract Documents.
   1.3.2 Make arrangements with property Owner if additional areas are required. Obtain written agreements and submit copies to Consultant.

1.4 **Work Areas**
   1.4.1 Confine operations within easements for construction, storage and access as shown in the Contract Documents.
   1.4.2 Install and maintain metal fencing along working, storage areas and access routes.
   1.4.3 Do not enter upon or occupy with people, tools or materials any lands other than public streets, roadways, rights-of-way or easements indicated in the Contract Documents except after written consent has been received from property Agency and a copy submitted to the Consultant. Any rentals or damages paid for occupying private lands shall be at the Contractor's expense.
   1.4.4 Provide the Consultant with letters from Owners of adjacent property stating that the reinstatement Work carried out by the Contractor was satisfactory, in any case where damage has been caused to private property or Work carried out on it. A similar letter is required from the Agency of utilities damaged during construction.

1.5 **Work Hours**
   1.5.1 The building will continue to be occupied during construction. At the discretion of the Agency, the Contractor shall schedule all loud and noisy construction activities during off-working hours, weekends, and holidays. There should be no interruption to the operation of this building caused by construction.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**
1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes**
1.2.1 Cash allowances.

1.3 **Cash Allowances**
1.3.1 Refer to GC 4.1 - CASH ALLOWANCES.
1.3.2 Cash Allowances will not be subject to any Contractor markup.
1.3.3 The Contract Price includes the following Cash Allowances:
   .1 Cash Allowances carried by the Contractor:
     .1 Third Party Inspection and Testing Include the following cash allowance to cover the costs of the independent Inspection and Testing Company(s), as chosen by the Consultant, to perform quality control and material testing as outlined in Section 01 40 00 – Quality Requirements, and including the inspection and testing of the following portions of the Work. $15,000.00
     .2 Hazardous Materials Abatement $100,000.00
     .3 Temporary washroom trailer $25,000.00
     .4 Hardware supplied by Knell’s Hardware $75,000.00
     .5 Interior Wayfinding/Building Signage $35,000.00
     .6 Fire Alarm Graphic $5,000.00
     .7 Utility charges $40,000.00
     .8 Records Call System $10,000.00
     .9 Access Control Testing and Programing $7,000.00

END OF SECTION
1. **GENERAL**

1.1 **Instructions**
1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes**
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1.3.3 The Contract Price includes the following Cash Allowances:

- .1 Third Party Inspection and Testing Include the following cash allowance to cover the costs of the independent Inspection and Testing Company(s), as chosen by the Consultant, to perform quality control and material testing as outlined in Section 01 40 00 – Quality Requirements, and including the inspection and testing of the following portions of the Work. $15,000.00
- .2 Hazardous Materials Abatement $100,000.00
- .3 Temporary washroom trailer $25,000.00
- .4 Hardware supplied by Knell’s Hardware $75,000.00
- .5 Interior Wayfinding/Building Signage $35,000.00
- .6 Fire Alarm Graphic $5,000.00
- .7 Utility charges $40,000.00
- .8 Records Call System $10,000.00
- .9 Access Control Testing and Programing $7,000.00
- .10 Design and installation of Fiber-Reinforced Polymer (FRP) reinforcing of concrete shear Walls as noted on Architectural drawings A1-01 and A1-03 $50,000.00

END OF SECTION
1. **GENERAL**

1.1 **Instructions**
   1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes**
   1.2.1 Substitution procedures.

1.3 **General**
   1.3.1 Submit specified documentation for substitution requests.
   1.3.2 Substitution requests must be approved by Consultant and Agency before making submittals required by Section 01 33 00 – Submittal Procedures.

1.4 **Substitution Proposals**
   1.4.1 All products noted as “or Agency approved equivalent” are to be submitted for approval during the Bid process. If, following the Bid process, a substitution is required it must be for one of the following reasons.
   .1 Specified product or method cannot be provided within Contract Time.
   .2 Specified materials cannot receive approval of local governing authority.
   .3 Substitute material will offer Agency substantial advantages in terms of cost, time, energy conservation or other consideration.
   .4 Specified materials cannot be properly coordinated with other materials in Work.
   .5 Specified product or material cannot provide warranty required by Contract Documents.
   .6 Specified product or material cannot meet performance requirements specified.

1.4.2 Substitution proposals will not be considered if proposed for one of the following reasons:
   .1 Contractor has neglected to place an order for materials and labour early enough to conform to construction schedule.
      .1 Such failure or neglect is not grounds for extension of Contract Time under this Contract; nor will arbitrary substitutions be considered solely to expedite completion.
   .2 Revision of Contract Documents is required to accommodate substitute product.
   .3 Substitutions are indicated on Shop Drawing, product data or sample submittals without separate formal request.
   .4 Substitutions are requested directly by a Subcontractor or Supplier, without formal request from Contractor.
1.4.3 Substitute proposals submitted for consideration on any one Contract element shall be limited to maximum of two with not more than one substitute proposal submittal from any one manufacturer. If two separate substitution proposals are made for a single material and are rejected, provide specified item without further delay.

1.4.4 Substitutions for major building elements must be submitted for consideration within 90 days of Contract execution. Proposals for substitutions of major building elements after that time will not be considered.

1.4.5 Consultant will be the judge of equality or superiority for proposed substitutions. Do not purchase or install proposed substitute products without written acceptance of Consultant. Allow minimum of 15 Working Days for Consultant's review of substitution proposals.

1.5 **Substitution Request Submittals**

1.5.1 Submit separate request for each substitute proposal, supported by complete data, with Drawings and samples as appropriate, including:

.1 Itemized comparison of qualities of proposed substitution with product specified, showing proof of equality or superiority, substantiating compliance with Contract Documents, and including product identification and description, performance and test data, references and samples, where requested or applicable.

.2 Changes required in other elements of Work due to substitution.

.3 Substitutions must fit into original design space.

.4 Effect on construction schedule and Contract Time.

.5 Change in cost, if any, and amount of net change to Contract Price.

.6 Availability of maintenance service, and source of replacement materials, where applicable.

.7 Reason for substitution request.

1.5.2 Furnish additional information for substitute proposals upon request. If decision on use of substitute cannot be made or obtained within a reasonable time, use product specified.

1.6 **Installation Of Substitute Products Or Materials**

1.6.1 When an accepted substitute, or "equivalent to" item of equipment or material, requires changes or additions to Project, make adjustments and changes required to coordinate Work for installation without additional cost to Agency.
1.7 **Changes Due To Substitutions**

1.7.1 Any additional cost, loss, or damage arising from substitutions is Contractor’s responsibility, notwithstanding approval or acceptance of such substitution by Agency or Consultant, unless such substitution was made at written request or direction by the Agency or Consultant.

1.7.2 Modifications to Contract Price Due to Substitutions:

.1 Agency will receive full credit for cost differential between specified item and proposed substitution.

.2 Substitution proposals that increase Contract Price will be rejected, unless proposed substitution was made at written request or direction by the Agency or Consultant.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**
   1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes**
   1.2.1 Procedures for progress payments and final payments under the Contract.
   1.2.2 Changes in the Work.

1.3 **Application for Payment**
   1.3.1 Refer to CCDC 2-2008 Part 5 and Supplementary Conditions to Contract CCDC2-2008.
   1.3.2 Make applications for payment on account as provided in the Contract Documents as Work progresses.
   1.3.3 By the 1st day of the month following work complete, submit to Consultant a draft copy of Application for Payment.
   1.3.4 Following review of draft and no later than the 5th day of the month, submit to Consultant one original and two copies of final form of Application for Payment.
   1.3.5 Applications for payment must be submitted on the Contractor’s invoice and must include monthly progress payment Form 00 62 76 totally complete.
   1.3.6 Each application for payment must include a Statutory Declaration, (except the 1st payment), and a completed Schedule of Values.
   1.3.7 Each invoice must bear the Contractor’s HST Registration Number.
   1.3.8 The Consultant will prepare a Certificate of Payment and submit same to the Owner by the 15th of the month.
   1.3.9 Payment of approved claims will be made by the Owner to the Contractor by the first day of the month following.

1.4 **Changes in the Work**
   1.4.1 Allowable Mark-ups on Changes:
   .1 For extra work added to the Contract, the Contractor and Subcontractors are entitled to a total markup for overhead and profit of 10% on work carried out by their own forces and 5% on work carried out by their Subcontractors.
   .2 The proper interpretation of application of this markup shall be at the discretion of the Consultant.
   .3 Contractors and Subcontractors who subcontract work out to separate companies who are considered by the Consultant to be under the same "corporate umbrella" will be eligible for only a single markup on extra work.
1.4.2 Breakdown for Changes in the Work:

.1 In addition to the requirements stated in Supplementary Conditions to Contract CCDC2-2008, all Changes shall include quotation submitted in the following manner listing:

.1 Quantities of each material
.2 Unit cost of each material
.3 Man hours involved for each type of labour
.4 Cost per hour for each type of labour
.5 Overhead and profit (mark-up)
.6 Subcontractor quotations submitted listing items .1 thru .5 above.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**
   1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes**
   1.2.1 Construction schedule.
   1.2.2 Schedule of values.
   1.2.3 Schedule of Shop Drawings.
   1.2.4 Schedule of submittals.

1.3 **Submissions**
   1.3.1 Submit schedules in both hard copy and soft copy formats.
   1.3.2 Construction Schedule: Submit one copy of initial construction schedule within 15 days of Contract award.
   1.3.3 Schedule of Values: Submit Schedule of Values, including cash flow projection seven days after award of Contract.
   1.3.4 Schedule of Shop Drawings: Submit within 15 days of Contract award.
   1.3.5 Schedule of Submittals: Submit within 30 days of Contract award, but not later than seven days before first submittal.

1.4 **Co-Ordination**
   1.4.1 Coordinate information in construction schedule, schedule of values, listing of Subcontracts, schedule of submittals, progress reports and payment requests.

1.5 **Quality Assurance**
   1.5.1 Scheduler Qualifications: Employ thoroughly trained and experienced scheduler to compile schedule data, prepare schedules and issue updated schedules.
   1.5.2 Consultant’s Reliance upon Schedules: Consultant will rely upon revised schedules submitted with Application for Payment as basis for reviewing payment requests.

1.6 **Construction Schedule**
   1.6.1 Prepare a schedule and reports in consistent style and format, acceptable to the Consultant and Agency, throughout duration of Contract.
   1.6.2 Prepare a GANTT chart schedule using Microsoft Project (2010 or later) or Primavera (Version 5.0), converted to Microsoft Project format using Primavera Interface Program.
   1.6.3 Schedule Updating:
      .1 Update schedule on an ongoing basis, where revisions have been recognized or made.
      .2 Provide Consultant with copy of updated schedule, for issue with progress meeting minutes.
.3 Indicate progress of each activity to date of schedule submission.

.4 Indicate changes occurring since previous schedule submission:

.1 Major changes in scope of work.
.2 Activities modified since previous submission.
.3 Revised projections of progress and of completion dates.
.4 Other relevant identifiable changes.

.5 Provide narrative report as required to define:

.1 Problem areas, anticipated delays, and impact on schedule.
.2 Corrective action recommended, and its effect.
.3 Effect of changes on schedules of Subcontractors.
.4 Give Agency and Consultant one week’s notice of anticipated significant revisions to accepted construction schedule.

1.7 Schedule Of Values

1.7.1 Prepare schedule of values in coordination with preparation of construction schedule.

1.7.2 Itemized Data:

.1 Provide itemization of Contract Price in sufficient detail to facilitate continued evaluation of payment requests and progress reports.
.2 Itemize principal Subcontract amounts into separate labour and material items.
.3 Round off figures to nearest whole dollar, but make total equal to Contract Price.

1.7.3 Warranty Holdback: Refer to Region of Peel Tender Document 2019-165T.

1.8 Schedule Of Shop Drawings

1.8.1 Prepare a schedule of Shop Drawings to be submitted, including:

.1 Expected date of submittal.
.2 Trade division by Specification identification.
.3 Required date of return.

1.9 Schedule Of Submittals

1.9.1 Prepare chronological schedule of submittals including:

.1 Anticipated date of Consultant's receipt of submittal.
.2 Required date of Consultant's return of submittal.
.3 Specification Sections to which submittal relates.
.4 Subcontractor or material fabricator responsible for preparing the submittal.
.5 Decision dates for selection of finishes and products specified by allowances or specified to be selected during the Sample review process.
.6 Provide blank columns for actual date of submittal, resubmittal and final release or approval by Consultant.
1.9.2 Give Consultant two weeks' notice of anticipated significant revisions to accepted schedule of submittals.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**
   1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes**
   1.2.1 Photographs of construction prior to commencement of demolition, excavation and thereafter during the progress of the Work.

1.3 **Photographs**
   1.3.1 Submit electronic files and two hard copies of each required photograph, mounted and labelled.
   1.3.2 Prints: Colour, high resolution, low grain photographs with matte finish prints; 200 mm x 250 mm. Depth of field is to be maximum range and within focus to clearly show Work.
   1.3.3 Mounting: Insert each print in punched clear plastic sleeve suitable for insertion into binder.
   1.3.4 Labelling: Affix label to back of each print with the following information:
      1. Project Name.
      2. Date of Exposure.
      3. Description of location or view of exposure.
      4. Key plan of building, indicating general location and direction of photograph.
   1.3.5 Electronic files of photographs shall become property of Agency.

1.4 **Preconstruction Photographs**
   1.4.1 Prior to commencement of excavation, take three photographs of site from different views, where directed by Agency or Consultant.
   1.4.2 Survey condition of adjoining property and improvements.
   1.4.3 Take additional photographs to record prior settlement or cracking of structures, pavements and their improvements. Photograph interior and exterior conditions.
   1.4.4 Prepare a list of damages, verified by dated photographs and signed by Contractor and others conducting investigation.

1.5 **Progress Photographs**
   1.5.1 Upon commencement of construction and once a month, at same time of each month, through final completion of Work, provide the following photographs:
      1. The quantity of photographs provided bi-weekly, unless otherwise noted.
   1.5.2 Locations:
      1. Agency will determine locations from which photographs will be taken.
      2. Such locations will remain fixed during progress of Work, until otherwise directed by Agency.
.3 Provide complete above ceiling photographs of each acoustic sensitive space, four photos per interview room prior to ceiling installation.

1.5.3 Quantity:
.1 Five exterior views until interior Work commences.
.2 Once interior Work commences, three exterior views, and two interior views for each floor.

1.6 **Completion Photographs**
1.6.1 At completion of the Work, take ten final photographs from exterior and interior vantage points determined by the Agency.
1.6.2 Photographs to be taken by a professional architectural photographer with a digital single-lens reflex camera.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**
   1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes**
   1.2.1 Procedures for the submission of Shop Drawings, product data and samples.

1.3 **Administrative Requirements**
   1.3.1 Do not commence those portions of the Work requiring submittal review until reviewed submittals have been returned.
   1.3.2 Maintain reviewed submittals, including all Shop Drawings, product data and samples at the Place of the Work, available for reference by Agency and Consultant.

1.4 **Submittal Procedures**
   1.4.1 Submit Shop Drawings, product data and samples to the Consultant.
   1.4.2 Shop Drawings:
      .1 Refer to GC 3.10 – Shop Drawings.
      .2 Within 20 days of the contract execution, provide a Shop Drawing forecast with the anticipated submission date of each Shop Drawing.
      .3 Submit three copies of Shop Drawings for review.
      .4 Consultant will mark up all three copies: one copy will be retained by the Consultant, two copies will be returned to the Contractor.
      .5 Any additional marked up copies required by the Contractor will be the responsibility of the Contractor.
      .6 Electronic shop Drawings are preferred, provided that all required and relevant stamps have been included in the document submitted. The Consultant will print the submitted documents and all costs relating to printing will be deducted from the Contract amount of the Contractor.

   1.4.3 Product Data (Catalogue Cuts, Brochures, Performance Charts, Test Reports, Diagrams, Schedules and Other Standard Printed or Published Product Data and Letters):
      .1 Submit three original copies of each for review.
      .2 Consultant will retain one copy and return two copies to the Contractor, one of which is to be left at the Place of the Work.

   1.4.4 Samples:
      .1 Submit three samples or three sets of samples unless otherwise indicated.
.2 Consultant will retain one sample and return two samples to Contractor, one of which is to be left at the Place of the Work.

1.4.5 Product Data And Submittals:

.1 Furnish copies of submittals required by authorities having jurisdiction over portions of Work, by Agency's insurance carriers as requested by Agency and Suppliers for coordination of Work.

.2 Co-ordinate submittals into logical groupings to facilitate interrelation of associated items.

.3 Submit colour samples of finishes as a single group, unless otherwise accepted by Consultant.

.4 Submit required product data from each Section at same time.

.5 Identify each submittal and include the following information:

   .1 Name of Project.
   .2 Submittal number.
   .3 Contractor.
   .4 Manufacturer or Supplier.
   .5 Number and title or relevant Specification Section.
   .6 Where printed materials describe more than one product or model, clearly identify item to be furnished.

.6 Show previous applicable changes to the project made by Addendum, Change Directive or Change Order.

.7 Attach a transmittal to each submittal, containing the following information:

   .1 Contractor's signature.
   .2 Project name.
   .3 List of submittal titles and number of copies.
   .4 Date of submission.

.8 Resubmittals:

   .1 Make resubmittals in same form and number of copies as first submittal.
   .2 Note date and content of previous submittal made for this item of Work on resubmittals.
   .3 Note date and content of revision in title block and indicate extent of revision clearly.

1.5 Submittal Content
1.5.1 Interference Drawings

   .1 Prepare Drawings indicating relationship of new and existing and unforeseen conditions at congested areas prior to commencement of the Work in those areas.
.2 For congested locations, before installation, prepare Drawings showing relationships of ductwork, conduit, piping, sprinklers, ceiling supports and framing, communication and specialized equipment located within ceiling and shaft spaces.

.3 Indicate locations of visible items such as air handling outlets, light fixtures, smoke detectors, sprinkler heads, communication grilles and access panels occurring at these locations.

.4 Ensure interference Drawings are initialled by a responsible person of each Subcontractor involved along with Contractor’s signature and submitted to Consultant for review and record purposes.

1.5.2 Shop Drawings and Product Data:

.1 Illustrate fully requirements of Contract Documents.

.2 Identify products, materials and equipment.

.3 Shop Drawing packages for a single system or group (for instance lighting fixtures; air handling components; plumbing) MUST be submitted as a single package, even if several Manufacturers are involved. Such a package will NOT BE REVIEWED piecemeal; review will start once the entire package is submitted.

.4 Show methods of assembly, dimensions, connections and other data required for fabrication, coordination and installation.

.5 Clearly indicate relationship to adjoining Work, particularly in attachment to building envelope.

.6 Reproductions of Contract Drawings are not acceptable as Shop Drawings, unless specifically authorized in writing by Consultant. Even if reproductions or Contract Drawings are accepted as Shop Drawings, the final product must match Drawings exactly and must match adjoining Work perfectly; and responsibility for accuracy and dimensional coordination remains with the Contractor.

1.5.3 Do not make changes on reproducibles returned to Contractor with Consultant's review stamp applied.

1.5.4 Samples:

.1 Provide samples physically identical with proposed material or product, unless otherwise authorized by Consultant.

.2 If colour or pattern is to be selected from Manufacturer's standard range, submit full range of Manufacturer's standard finishes including available colours, textures, and patterns for Consultant's selection.

.3 Submit samples to illustrate functional characteristics of products, including parts and attachments.

.4 Submit product data for materials prior to or with material samples.
.5 For natural materials, submit sample sets showing full range of colour and texture anticipated in final Work.

1.5.5 Make notations of substitutions or deviations from requirements of Contract Documents in conspicuous manner on submittals.

1.6 Contractor’s Review Of Submittals

1.6.1 Prior to transmitting submittal, review and approve submittal, and affix Contractor's signature and stamp to submittal.

1.6.2 Consultant will not review submittals that do not bear the Contractor’s signature and in the case of mechanical and electrical, also the Subcontractors’ stamp and signature. If it appears a review has not taken place, the submittal will be returned to the Contractor not reviewed.

1.6.3 By signing and submitting Shop Drawings, product data, samples, and similar submittals, the Contractor represents that the item has been approved, determined and verified dimensions, quantities, field dimensions, relations to existing Work, coordination with Work to be installed later, coordination with information on previously accepted Shop Drawings, product data, samples, or similar submittals and verification of compliance with requirements of Contract Documents.

1.6.4 In reviewing Shop Drawings, product data, samples, and similar submittals, the Consultant shall be entitled to rely upon Contractor's representation that information in submittals is correct and accurate.

1.6.5 Submittals that are returned or rejected because of insufficient Contractor review or coordination will not be justification for a claim for extension of time.

1.7 Consultant’s Review Of Submittals

1.7.1 After receipt of submittal, Consultant will review it for conformance to Contract Documents and certify that this review has been performed by affixing Consultant's review stamp.

1.7.2 Review Time:

.1 Allow not less than ten working days for processing and review of any one submittal except as noted below, and except when processing must be delayed for coordination with subsequent submittals. Consultant will advise Contractor promptly of such delay.

.1 Allow an additional five working days for processing and review of submittals specified in Divisions 05, 09, 22, 23, 25, 26, 27, and 28.

.2 Identify those submittals for which review is necessary urgently.

.3 Allow two weeks after submission of all samples in Division 9, for the Consultant to select finishes and prepare a colour schedule.
.2 Review period begins on date of receipt of submittal by Consultant and extends to mailing date of return to Contractor.

1.7.3 Action Following Consultant’s Review: Process submittals according to notations placed on them by Consultant.

.1 Reviewed:
   .1 Proceed with fabrication, purchase, or both, of items in submittal, subject to the minor revisions or clarifications if any, included in the Consultant’s review.

.2 Reviewed as Modified:
   .1 Proceed with fabrication, purchase, or both, only after the original Drawing has been corrected. Contractors to include corrected Drawings in Maintenance and Operating Manuals.

.3 Resubmit:
   .1 Submission is rejected; therefore fabrication and Work indicated cannot proceed.
   .2 Correct submission and resubmit.

.4 Not Reviewed:
   .1 Submission was not reviewed for one of the following reasons:
      .1 Contractors stamp was not found on submission.
      .2 In the Consultant’s opinion, review was not necessary.

1.7.4 Limitations of Consultant’s Review:

.1 Consultant’s review is not a complete check, but only review of general methods of construction and detailing, subject to limitations and requirements set forth in GC 3.10.5.

.2 Consultant’s review does not authorize changes in Contract Amount or Contract Time unless so stated in a separate Proposed Change or Change Directive.

.3 If the Contractor feels the Shop Drawings have changed the Contract Price or Contract Time, notify the Consultant within seven working days from date of Consultant’s transmittal otherwise it will be assumed no change in Contract Price or Contract Time will be considered.
.4 Review of Shop Drawings is for the sole purpose of ascertaining conformance with the general design concept. This review shall not mean that the reviewer approves the detail design inherent in the Shop Drawings, responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the Contractor of the responsibility for errors or omissions in the shop Drawings or of the responsibility for meeting all requirements of the Contract Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the Place of the Work, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of the Work.

1.7.5 After the Consultant's review of a submittal or resubmittal, changes will not be considered unless accompanied by an explanation acceptable to the Consultant concerning reason substitution is necessary.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**
1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Intent**
1.2.1 The level and extent of inspection and testing, and the responsibilities of the Inspection and Testing Company, the Contractor and the Consultant shall be as described in this Section.

1.3 **Section Includes**
1.3.1 Mock-Ups.
1.3.2 Regulatory requirements.
1.3.3 Independent inspection and testing, including:
   .1 Storm sewer, sanitary sewer and water services:
      .1 Inspection of trench subgrade as required.
      .2 Inspection of pipe bedding material.
      .3 Compaction testing of pipe bedding material as required.
      .4 Compaction of trench backfill as required.
   .2 Cast-in-Place Concrete:
      .1 Slump tests
      .2 Concrete compressive strength tests
      .3 Percent air entrainment for air entrained concrete
      .4 Steel fibre content for fibre reinforced concrete
   .3 Roofing Inspection.
      .1 Visual inspection of roofing membrane application during installation.
      .2 Visual inspection of roof edge terminations and penetrations through the membrane.
      .4 Refer to individual Specification Sections for detailed testing and inspection requirements.

1.4 **Mock-Ups**
1.4.1 Procedures: Where sample installations or mock-ups are required, comply with requirements of relevant Specification Section.
1.4.2 Sample Installations:
   .1 Definition: A partial installation of selected materials for Consultant’s approval of quality of Work and visual acceptance of materials.
   .2 Construct sample installations prior to pre-installation meetings.
.3 Maintain sample installations during construction as a standard for Work.
.4 Properly finished and maintained sample installations may be incorporated into Work.

1.4.3 Mock-Ups:
.1 Definition: A sample panel specially erected near Project site or, upon the Consultant's approval or direction, at a remote location that incorporates several specified materials.
.2 Construct mock-ups prior to ordering final materials.
.3 Mock-ups display colour range, texture, bond, mortar colour and quality of Work expected of materials incorporated in Work.
.4 Mock-ups will be used by Consultant for final material selection.
.5 Maintain approved mock-ups in good condition until completion of relevant Work and use as standard for Work.
.6 Remove mock-ups from Project site at completion of Project.

1.4.4 Testing Mock-Ups:
.1 Provide full scale assemblies of components specified as test specimens. Simulate actual construction conditions as accurately as possible.
.2 Provide extra materials required to replace any which fail during tests, except intentional failure tests beyond specified performance requirements. Provide sufficient stock of replacement materials at test site to complete tests without delay.
.3 Refer to relevant Specification Sections for testing requirements.
.4 Shipping mock-up to test site:
   .1 Assemble test specimen in shop to verify completeness and adequacy.
   .2 Dismantle test specimen and ship to test site using same packing, loading procedures and mode of transportation as used for components shipped directly to Project site.
.5 Assembling mock-ups at test site:
   .1 Retain same Installer as will be assembling components at Project site to assemble test specimen at test site.
   .2 When possible, use personnel assigned to Project site to do assembly.

1.5 **Certificates**
1.5.1 Definition: Notarized certification of type specified.
1.5.2 Do not construe certification as relieving Contractor from furnishing satisfactory materials if, after tests are performed on selected samples, material does not meet specified requirements.
1.5.3 Professional Certification:
  .1 When professional certification of performance criteria of materials, systems or equipment is required by Contract Documents, Agency and Consultant are entitled to rely on such certifications.
  .2 Neither Agency nor Consultant shall be expected to make independent examination or verification of professional certifications.

1.6 Codes, Fees, Permits And Certificates
1.6.1 Refer to GC 10.2.
1.6.2 Execute the Work in accordance with the laws, rules, and regulations of the local and provincial codes and other authorities having jurisdiction.
1.6.3 In the event that specified Products do not meet these conditions, notify Consultant in writing before ordering or installing same.
1.6.4 If the Contractor chooses to carry out Work in contravention of any Code or By-law, the Contractor shall be responsible for all changes required to obtain Code acceptance.
1.6.5 Expedite obtaining the building permit from the municipality.
1.6.6 Obtain necessary permits and notices, pay all fees in order that the Work hereinafter specified may be carried out and the Contractor shall furnish any certificates necessary as evidence that the Work installed conforms to the laws and regulations of all authorities having jurisdiction before final certificates are issued.
1.6.7 All changes and alterations required by an authorized inspector of any authority having jurisdiction shall be carried out in accordance with the general conditions of the Contract.
1.6.8 All equipment supplied must have approval of CSA, ULC, NFPA, FM, and any other authority having jurisdiction.

1.7 Manufacturer's Field Services
1.7.1 When required by Contract Documents, have manufacturer provide qualified representative to observe field conditions, conditions of surfaces and installation, quality of Work to start-up equipment and to test, adjust and balance equipment as applicable.

1.8 Contractor's Quality Control
1.8.1 Maintain quality control over supervision, Subcontractors, Suppliers, manufacturers, Products, services, quality of Work and existing conditions, to produce Work in accordance with requirements of Contract Documents.

1.9 Independent Inspection And Testing
1.9.1 The Agency will appoint an independent inspection and testing company or companies to undertake quality control of identified portions of the Work.
1.9.2 Testing and inspection will be performed by qualified inspectors and technologists, certified by a professional engineer licenced to
practice in Ontario in conformance with applicable codes and certification programs.

1.9.3 Materials and quality of Work will be subject to inspection at any time by qualified inspectors representing the Agency.

1.9.4 The Inspection and Testing Company will operate under the direct supervision of the Consultant and will report directly to the Consultant representing the Agency.

1.9.5 In no case shall the Contractor influence the decisions and operations of the Inspection and Testing Company.

1.9.6 Start-up Meeting

.1 Conduct an initial start-up meeting with the Inspection and Testing Company, scheduled at least one week in advance of Work commencing at the Place of the Work.

.2 Ensure an up-to-date construction schedule is available such that the Inspection and Testing Company and Consultant can develop a testing program.

1.9.7 Re-inspection

.1 Any re-inspections that are required due to deficiencies uncovered at the initial inspection shall be at the expense of the Contractor.

1.9.8 Payment for Inspection and Testing Services

.1 Pay costs for inspection and testing from the cash allowance specified in Section 01 21 00 - Allowances.

.2 Re-inspection costs are not included in the cash allowance, and are to be paid directly by the Contractor outside of the Contract.

1.9.9 Reports

.1 The Inspection and Testing company shall issue written reports to the Contractor and to the Consultant indicating the location and results of specific material tests, as well as the results of visual inspections, and the instructions given at the Place of the Work.

.2 If, in the opinion of the Inspection and Testing Company, the specified materials are not being used or the required results are not being achieved, the Inspection and Testing Company shall verbally inform the Contractor of the deficiencies and promptly confirm the deficiencies in writing to the Contractor and the Consultant. Note in the written report corrective action taken by the Contractor and the results thereof.

.3 Accompanying each report shall be a key plan of the Project, clearly indicating the areas to which the report refers. These plans shall also be submitted with and keyed into the invoices for the inspection and testing.
1.10 **Responsibilities**

1.10.1 The following indicates the minimum responsibilities for each of the parties to ensure the quality of construction is maintained:

.1 **Contractor:**

.1 Ensure the quality of the Work meets the requirements of the Contract Documents.

.2 Once the testing program has been developed, notify the Testing Company and the Consultant in advance, to request the required inspection or test.

.3 Consult with the testing company on construction techniques, but retain responsibility for construction means, methods and techniques in accordance with the General Conditions of the Contract.

.4 Changes in construction means, methods and techniques required to meet quality requirements of the Contract Documents shall not be considered as cause for an extra to the Contract.

.5 Defective materials or quality of Work whenever found at any time prior to the final acceptance of the Work shall be rejected, regardless of previous inspection.

.6 Inspection does not relieve Contractor of responsibility, but is a precaution against oversight and error.

.7 Remove and replace defective Work at own expense, and be responsible for additional costs incurred by other Sections affected by this replacement.

1.10.2 **Inspection And Testing Company:**

.1 Provide the level of inspection, testing and reporting as described in the Contract Documents.

.2 Inform the Contractor and the Consultant immediately of any material, procedure or test that does not meet the Contract Documents.

.3 Advise the Contractor of any construction procedure that is likely to fail to meet the Contract Documents. Promptly inform the Consultant of questionable construction practices and submit a written report to the Consultant.

1.10.3 **Consultant:**

.1 As the Agency's representative, the Consultant shall consult with the Agency on final decision on changes that may increase or decrease the Contract Price or Contract Time.

.2 Upon notification by the Testing and Inspection Company of defective Work, respond expediently to resolve the issue.

END OF SECTION
1. GENERAL

1.1 Summary
1.1.1 This Section lists construction terms and related abbreviations and acronyms that may be used in the Contract Documents.

1.2 Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>AAMA</td>
<td>American Architectural Manufacturers Association</td>
</tr>
<tr>
<td>ACT</td>
<td>acoustic ceiling tile</td>
</tr>
<tr>
<td>AC</td>
<td>air conditioning</td>
</tr>
<tr>
<td>ADA</td>
<td>Americans with Disabilities Act</td>
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W west WC water closet
WD wood WHTR water heater
WP waterproof(ing) WR washroom
WS weatherstripping WT weight
WWF welded wire fabric WWM welded wire mesh

1.3 **Washroom Accessories Abbreviations**

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<td>napkin vending unit</td>
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<td>shower seat</td>
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<td>toilet tissue dispenser</td>
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1.4 **Symbols**

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END OF SECTION
1. **GENERAL**

1.1 **Instructions**
1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes**
1.2.1 Temporary utilities, services, and facilities.
1.2.2 Temporary controls.

1.3 **General**
1.3.1 Pay for installation and maintenance of temporary service, energy used, utility costs, filters and restoration of permanent systems.
1.3.2 Provide temporary meters. Pay for connect and disconnect charges, and costs of maintenance and operation.
1.3.3 Relocate temporary facilities and equipment as required by the progress of the Work.
1.3.4 Remove temporary materials, equipment and construction at completion of Work.

1.4 **Temporary Light And Power**
1.4.1 Temporary power and lighting shall be supplied by existing facility for building and site office to serve Contractor for duration of construction.
1.4.2 Ensure any temporary service interruptions to existing building is minimized and performed during work hours coordinated with Agency.
1.4.3 Materials in temporary construction:
   .1 Do not use materials of temporary service in permanent installation.
   .2 Materials used for temporary lighting and power shall meet the Electric Safety Code and Ontario Hydro Inspection standards.
1.4.4 Provide sufficient lighting levels as required to suit particular locations and operations, but not less than 5 lux and an average of 50 lux at floor level.
   .1 When finishing operations are underway, Provide illumination levels equivalent to final illumination levels required by the Contract Documents.
1.4.5 Pay all permits required.

1.5 **Temporary Heat And Ventilation**
1.5.1 Carry out the Work with all possible speed throughout all months from the date of commencement of the Work until Agency occupancy.
1.5.2 Where existing building HVAC is used, Provide all filters and temporary protection of existing systems to ensure that permanent building systems are not damaged or soiled.
1.5.3 In areas where rooms are temporarily disconnected from existing building HVAC:
   .1 Provide temporary ventilation for comfort and protection of workers and for proper drying of wet Work.
   .2 Provide temporary heat as necessary to ensure suitable working conditions for construction operations.
   .3 Provide temporary heat by use of self-contained portable heating units.

1.5.4 Comply with Codes, rules and regulations concerning operations of temporary heating units and with requirements of Agency’s insurer.

1.5.5 Do not permit temperature to reach a level that will cause damage to the Work.

1.5.6 Replace interior or exterior surfaces damaged by the use of space heaters with new materials or refinish at no cost to Agency.

1.5.7 As soon as practical after permanent heating and air circulation system is in place and operable, Provide heat from permanent building heating system, under operation and supervision of heating Trade, until building is complete. Use permanent building heating system only after the majority of dust (including drywall dust) is thoroughly vacuumed.

1.6 **Temporary Weather Protection**

1.6.1 Provide protection at all times against weather, rain, wind, storms, frost or excessive heat. At the end of the day’s Work, cover new Work liable to be damaged.

1.6.2 Remove snow and ice from any part of the structure (other than finished roofs) as soon as possible.

1.6.3 Make good Products and portions of the Work damaged as a result of improper weather protection.

1.7 **Temporary Water**

1.7.1 Provide temporary connections, valves, piping and hoses required for construction operations.

1.7.2 Provide temporary water meter.

1.8 **Use Of Permanent Systems**

1.8.1 Heating System: Permanent heating equipment may not be used to supply temporary heat unless approved by the Consultant. If approval for use is granted, all equipment and ductwork shall be thoroughly cleaned before turn over to the Agency. Temporary filters must be used in any fan equipment and replaced with the permanent filters before Substantial Performance of the Work.

1.8.2 Correct damaged or malfunctioning parts of permanent systems, balance, change filters, clean and restore systems to good working condition before date of Substantial Performance of the Work and acceptance by the Agency.

1.8.3 Commencement of warranties for permanent systems will be date of Substantial Performance of the Work regardless of Contractor’s use of such systems during construction period.
1.9  **Protection And Coordination Of Existing Utilities:**

1.9.1 Do not interrupt utilities located in or near Project which are providing services to general area without approval of Agency and coordination with local utility companies.

   .1 Provide Agency and local utility companies with at least ten Working Days written notice for outages or connections to utilities.

1.9.2 Send proper notices, make necessary arrangements and perform other services required for care, protection and maintenance of public utilities, including mail boxes, fire plugs, telephone poles and wires, and other items of this character on or around building site.

1.9.3 Permit entrance of public utilities or other parties to Project so that they may perform their necessary Work.

1.10  **Temporary Barriers And Enclosures**

1.10.1 Site:

   .1 Provide and maintain covered walkways to maintain pedestrian access along public rights-of-way.

   .2 Provide and maintain barriers to prevent unauthorized entry to construction areas and to protect existing facilities and adjacent properties from damage from construction operations.

   .3 Construction fence: Provide and maintain fence around construction site, to design indicated on Drawings; equip with gates and locks.

   .4 Repaint and re-letter walkways and construction fence during construction operations as may be required by Agency.

   .5 Paint fence of public sides with two coats of paint including signage as indicated on Drawings.

   .6 All fencing shall be removed at the completion of the Work.

1.10.2 Building Exterior: Provide and maintain temporary weather-tight closures at exterior openings to maintain suitable conditions and protection for interior Work.

1.10.3 Building Interior: Provide and maintain temporary enclosures to separate Work areas from areas occupied by Agency or tenants to prevent penetration of dust, moisture and noise into occupied areas.

1.10.4 Construct temporary barriers with adequate framing and surface with plywood or gypsum board, and polyethylene vapour barrier having closed joints and sealed edges at intersections with existing surfaces.

1.10.5 Erect, maintain and remove hoarding enclosures for each phase and at the time of completion. Such enclosure shall conform to requirements of all authorities having jurisdiction. Furthermore, erect all barricades required by authorities to protect occupants of the building and persons engaged on the work, from injury. Use new materials for hoarding.
1.10.6 Provide and maintain interior dust proof hoarding between work areas site and occupied areas. This project will require multiple erections and removals of hoarding for multiple phases.

1.10.7 Contractor shall be responsible for the design, engineering and construction for all hoardings throughout the duration of the project. Final location and extent of such hoardings shall be reviewed on site prior to erection with Agency.

1.10.8 Contractor shall be responsible for the design, engineering and construction for all scaffolding, hoardings and work platforms throughout the duration of the project. Locations of any such elements shall be reviewed with Agency prior to installations. Such installations shall not interfere or impede access or any existing traffic movements throughout the site.

1.11 Project Identification

1.11.1 Fabricate a project sign according to Consultant’s design.

1.11.2 Erect project sign at location directed by the Consultant.

1.11.3 Remove project sign and all related supports from the Place of the Work upon Substantial Performance of the Work.

1.11.4 No other construction signs will be allowed to be displayed on the premises without the approval and acceptance by the Agency.

1.12 Field Offices

1.12.1 Field office to be in garage bay.

1.12.2 Provide a facility for on-site meetings appropriate to the size of the Project.

1.12.3 Provide and maintain telephone service, including facsimile service, to field office for duration of construction.

1.13 Temporary Storage

1.13.1 Provide and maintain upon premises in an approved location suitable storage area for protection and storage of materials to be incorporated in Project.

1.13.2 Keep clean and tidy.

1.13.3 Provide light and heat as required.

1.13.4 Store combustible materials apart from building materials.

1.14 Temporary Stationary Conveyances

1.14.1 Furnish and maintain temporary construction lifts, hoists, chutes, scaffolds, staging, stairs, ramps, runways, ladders, platforms, railings and similar items required for proper execution of Work and in accordance with the latest edition of the Occupational Health and Safety Act.

1.14.2 Coordinate use of temporary conveyances, and provide necessary temporary protections to surrounding assemblies.

1.14.3 Upon removal of such temporary conveyances, remove temporary protections and complete the Work.
1.15 **Dust Control**
1.15.1 Execute Work by methods to minimize raising dust from construction operations.
1.15.2 Provide positive means to prevent air-borne dust from dispersing into atmosphere.

1.16 **Water Control**
1.16.1 Provide methods to control surface and ground water to prevent damage to site or adjoining properties.
1.16.2 Control fill, grading and ditching to direct surface drainage away from excavations, pits, tunnels and other construction areas, and to direct drainage to proper runoff.
1.16.3 Maintain excavations free of water. Provide, operate and maintain pumping equipment.

1.17 **Snow And Ice Control**
1.17.1 Keep access to building and Work Areas clear of snow while Work is in progress.
1.17.2 Do not allow snow or ice to accumulate over surfaces that can be damaged upon thawing.
1.17.3 Do not allow snow or ice accumulation to overload or otherwise endanger any part of the Work.
1.17.4 Take precautions against damage to materials stored and Work installed in freezing weather.

1.18 **Erosion And Sediment Control**
1.18.1 Plan and execute construction by methods to control surface drainage from cut and fill and from borrow and waste disposal areas.
1.18.2 Prevent erosion and sedimentation.
1.18.3 Minimize amount of bare soil exposed at one time.
1.18.4 Provide temporary measures to prevent water flow.
1.18.5 Locate fill and waste areas to avoid erosive surface silts or clays.

1.19 **Rodent And Vermin Control**
1.19.1 Retain an exterminator to protect premises from rodent and vermin infestation if deemed necessary by the Consultant.
1.19.2 Use extermination materials approved by local Health Department or other agency having jurisdiction.

1.20 **Fire Protection**
1.20.1 Provide and maintain temporary fire protection in the form of fire extinguishers, in accordance with the authorities having jurisdiction, including the local Fire Department and the insurance companies.
1.20.2 Protect the Work, adjacent properties, Agency’s equipment and Contractor’s equipment against fire hazards.
1.20.3 Adjust and modify temporary fire protection facilities to accommodate the progress of the Work.
1.20.4 Provide and maintain access routes to exits, clean and visibly identified.

1.20.5 Fire Watch

.1 A fire watch is required for each of the following activities, regardless of the number in a single area:
   .1 Any open flame activity, including soldering and welding.
   .2 Shut down of the fire detection system.
   .3 Shut down of the sprinkler system.

1.20.6 Temporary Buildings

.1 Locate temporary buildings and storage areas in relation to their hazards and probability of damage to existing buildings under construction. Unless constructed of non-combustible materials, wherever possible locate them at least ten metres away from buildings.

.2 If constructed of combustible materials separate these structures into small detached units.

1.20.7 Access To Fire Extinguishing Equipment and Exits

.1 Provide and maintain free access at all times from the street to fire hydrants and to outside connections for standpipes or other fire extinguishing equipment whether permanent or temporary. Do not place material or construction equipment within three metres of hydrants or connection, nor between them and centre line of the street.

.2 Maintain free access at all times to control valves and hose on fire lines within building and to all portable extinguishers.

1.20.8 Fire Doors

.1 Install fire doors and put into operating condition at the earliest possible time.

1.20.9 Rubbish

.1 Remove flammable rubbish promptly from the premises. If removal is unavoidably delayed reduce fire hazards by wetting down. Disposal of waste material by burning on or near the premises is not permitted.

.2 Clean up and remove rubbish into containers. Removal of containers and disposal off the site including all dumping fees will be the responsibility of the Contractor.

1.20.10 Cutting and Torching

.1 Where electric or gas welding or cutting is to be done within three metres of, or above space that may be occupied by persons, or combustible material interpose shields of incombustible material.

.2 Maintain appropriate fire extinguishing equipment near all welding and cutting operations.
1.20.11 Storage of Paints, Oils, and Gasoline
   .1 Store paints and volatile liquids in a separate shed, and inspect frequently. Place fire extinguisher at the door of paint storage shed.
   .2 Store gasoline outside under lock and key, well away from the structure.

1.20.12 Temporary Wiring
   .1 Inspect temporary wiring, drop cords or temporary extension cables frequently for defective insulation or connections.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**
1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes**
1.2.1 Noise control.

1.3 **Intent**
1.3.1 Establish and maintain site procedures such that construction noise levels are minimized.
1.3.2 Control noise level in accordance with local by-laws.

1.4 **Measures**
1.4.1 Use vehicles and equipment equipped with efficient muffling devices.
1.4.2 Provide devices and temporary barriers to restrict noise from the Place of the Work.

**END OF SECTION**
1. **GENERAL**

1.1 **Instructions**

1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes**

1.2.1 Temporary pollution control methods.

1.3 **Refuelling Areas**

1.3.1 Review in detail proposed route of construction to plan access routes and fuelling areas.

1.3.2 Establish suitable fuelling and maintenance areas and obtain approval from Consultant.

1.3.3 Do not fuel or maintain equipment adjacent to or in watercourses.

1.3.4 Do not fuel equipment within 30 metres of any watercourse unless non-spill facilities are used.

1.4 **Cleaning Equipment**

1.4.1 Do not clean equipment in streams or lakes.

1.4.2 Clean construction equipment prior to entering roadways.

1.4.3 Do not clean equipment in locations where debris can gain access to sewers or watercourses.

1.5 **Spills**

1.5.1 Submit procedures for interception, rapid clean-up and disposal of spillages that may occur, for Consultant’s review, prior to commencing Work.

1.5.2 Be prepared at all times to intercept, clean-up and dispose of any spillage that may occur whether on land or water.

1.5.3 Keep materials required for clean-up of spillages readily accessible at the Place of the Work.

1.5.4 Report immediately any spills causing damage to environment to local authority having jurisdiction.

1.6 **Use Of Pesticides**

1.6.1 Coordinate use of herbicides and pesticides with Agency, adjacent property Agency’s, building occupants, and the local authority having jurisdiction.

1.7 **Sensitive Areas**

1.7.1 Avoid encroachment on unique natural areas.

1.7.2 Do not disturb habitats of rare or endangered species.

1.7.3 Schedule construction in sensitive areas so that there will be minimal disruption of incubation period of eggs.

1.7.4 Keep removal of vegetation to a minimum.
1.8 **Disposal**

1.8.1 Do not empty fuel, lubricants or pesticides into sewers or watercourses.

1.8.2 Dispose of all construction debris in an approved location.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**

1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes**

1.2.1 Common Product requirements.
1.2.2 Delivery, storage and handling.

1.3 **Common Product Requirements**

1.3.1 Provide new materials in perfect condition, free from defects impairing physical and aesthetic performance.
1.3.2 To greatest extent possible, provide Products of same generic kind, from single source, for each unit of Work.
1.3.3 If Contractor proposes to use material which, while suitable for the intended use, deviates from requirements of the Contract Documents, Contractor shall inform Consultant in writing of the nature of such deviations when material is submitted for approval, and shall request written approval of deviation from Contract Documents.
1.3.4 Intent of Contract Documents:

.1 Contract Documents are intended to produce Work of consistent character and quality of design.
.2 Building components, including visible items of mechanical and electrical equipment, have been selected as a coordinated complete design.
.3 Consultant will judge design and appearance of proposed substitutes on the basis of their suitability in relation to overall design of the Project, as well as for intrinsic merits.
.4 Consultant will not approve as equal to materials specified proposed substitutes which, in Consultant's opinion, would be out of character, obtrusive or otherwise inconsistent with character or quality of design of Project.
.5 In order to permit coordinated design of colour and finishes, Contractor shall, if required by Consultant, furnish substituted material in colour, finish, texture or pattern specified for original material, at no additional cost to the Agency.
1.3.5 Compatibility of Products: If option of selecting between two or more Products exists, provide Product compatible with other Products previously selected.
1.3.6 Proprietary Products:

.1 Products specified by Trade or brand name are part of the Contract.
.2 Provide specific materials, equipment, fixtures, apparatus, appliances or other manufactured articles of types and makes specified or indicated, except for substitutions or changes specifically approved in writing by Consultant.

.3 When several named Products are listed, use any Product listed.

1.3.7 "Equivalent to" or "Approved Equivalent": Where one or more Products, materials or pieces of equipment are specified by reference to Trade or brand name or catalog number and the phrase "equivalent to" or "approved equivalent" accompanies listing, comply with provisions pertaining to substitutions to obtain acceptance from Consultant for use of unnamed Products.

1.3.8 Performance Specifications:
.1 Where Products require compliance with indicated performance requirements, and list of acceptable manufacturers is included in Contract Documents, provide Products that comply with specific performance requirements indicated from manufacturer listed.

.2 If Contractor proposes another Product, comply with Section 01 25 00 – Substitution Procedures to obtain Consultant's acceptance of unnamed manufacturer's Product.

.3 When Products are specified only by reference standard, performance criteria or descriptive requirements, without trade names, submit Products by any reputable manufacturer meeting or surpassing specified requirements or standard.

1.3.9 Visual Matching: Where matching an established sample is required, the Consultant has the final judgment of whether proposed Product matches sample.

1.4 **Delivery Requirements**

1.4.1 Packaging and Transportation:
.1 Require supplier to package finished Products in boxes or crates for protection during shipment, handling and storage. Protect sensitive Products against exposure to elements and moisture.

.2 Protect sensitive equipment and finishes against impact, abrasion and other damage.

1.4.2 Delivery and Receiving:
.1 Arrange deliveries of Products in accordance with construction schedule. Allow time for inspection prior to installation.

.2 Coordinate deliveries to avoid conflict with Work and conditions at site, limitations on storage space and availability of personnel and handling equipment.
.3 Deliver Products in undamaged, dry condition, in original unopened containers or packaging with identifying labels intact and legible.

.4 Clearly mark partial deliveries of component parts of equipment to identify equipment and contents to permit easy accumulation of parts and to facilitate assembly.

.5 Immediately on delivery, inspect shipment to assure:

   .1 Product complies with requirements of Contract Documents and reviewed submittals.
   .2 Quantities are correct.
   .3 Accessories and installation hardware are correct.
   .4 Containers and packages are intact and labels legible.
   .5 Products are protected and undamaged.

1.5 **Handling Requirements**

1.5.1 Provide equipment and personnel to handle Products by methods to prevent soiling and damage.

1.5.2 Provide additional protection during handling to prevent marring and otherwise damaging Products, packaging and surrounding surfaces.

1.5.3 Handle Product by methods to avoid bending or overstressing. Lift large and heavy components only at designated lift points.

1.6 **Storage Requirements**

1.6.1 Store Products, immediately on delivery, in accordance with manufacturer's instructions, with seals and labels intact. Protect until installed.

1.6.2 Arrange storage to provide access for maintenance of stored items and for inspection.

1.6.3 Enclosed storage:

   .1 Store Products subject to damage by elements in substantial weathertight enclosures.
   .2 Maintain temperature and humidity within ranges stated in manufacturer's instructions.
   .3 Provide humidity control and ventilation for sensitive Products as required by manufacturer's instructions.
   .4 Store unpacked and loose Products on shelves, in bins or in neat groups of like items.

1.6.4 Exterior storage:

   .1 Provide substantial platforms, blocking or skids to support fabricated Products above ground; slope to provide drainage.
   .2 Protect Products from soiling and staining.
   .3 For Products subject to discoloration or deterioration from exposure to elements, cover with impervious sheet material.
   .4 Provide ventilation to avoid condensation.
.5 Store loose granular materials on clean, solid surfaces such as rigid sheet materials or pavement. Prevent mixing with foreign matter.

.6 Prevent mixing of refuse or chemically injurious materials or liquids with building materials.

1.6.5 Periodically inspect stored Products to verify proper storage.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**
   1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes**
   1.2.1 Requirements for preservation and protection of existing services and structures.

1.3 **Regulatory Requirements**
   1.3.1 Comply with all requirements and regulations of Road Authorities, Utility Companies or Railway Companies, especially those pertaining to protective Work, inspection and safety.

1.4 **Notification To Utilities**
   1.4.1 Advise all Road Authorities and Utility Companies, in writing, at least 48 hours before approaching utility or entering right-of-way.
   1.4.2 Request Agencies of all underground services to locate, stake, and clearly mark in field all services, which are located on or near line of, proposed Work.
   1.4.3 Obtain certificates from all Utility Companies or Departments having facilities in area of proposed Work certifying that facilities have been marked to confirm utility location.

1.5 **Existing Services And Structures**
   1.5.1 Sustain in place and protect from damage, any and all water or gas mains, public or private sewers or drains, conduits service pipes, sidewalks, curbs and all other structures or properties in vicinity of Work, whether above or underground, and be entirely responsible for any damage caused to such service or structure.
   1.5.2 Provide access to all fire hydrants to satisfaction of local authority.
   1.5.3 Provide and maintain gas and water services, flow of all sewers, drains, house or inlet connections, and all watercourses that are encountered during progress of Work.
   1.5.4 Immediately repair all sewers and drains that have been damaged.
   1.5.5 If gas or water mains or services are broken, stop flow of gas or water from pipe and immediately notify Utility Company who will repair or supervise and inspect repair of damaged main or service. The Agency shall promptly be advised of estimated time of corrective Work. If repairs to water mains or sanitary lines are not addressed promptly the Agency, at their discretion, can request that the Contractor supply temporary facilities at no cost to the Agency.
1.5.6 Whenever construction approaches indicated location of buried services, carefully excavate by hand in advance of trench excavation to expose buried pipes, cables, conduits and structures.

1.5.7 Should pipes be laid with shallow cover, protect the pipe from the passage of trucks or other heavy equipment.

1.6 **Survey Monuments**

1.6.1 Do not remove survey monuments, iron bars, round iron pipes and stakes representing property boundaries and locations encountered on line of Work without written permission of Consultant.

1.6.2 Replacement of all monuments removed on written permission of Consultant to be done by Agency.

1.7 **Access**

1.7.1 Provide access route for land Agency's to cross rights-of-way, easements or temporary Work areas during all phases of construction.

1.8 **Contamination**

1.8.1 Do not allow contents of any sewer, drain or inlet connection to flow into trench.

1.8.2 Remove all offensive matter from proximity of Work as directed by Consultant.

1.9 **Basis Of Payment**

1.9.1 Cost of all repair to damaged utilities or contamination due to the Contractor's actions to be at Contractor's expense.

1.9.2 Cost for replacement of survey monuments removed without written permission of Consultant to be at Contractor's expense.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**
   1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes**
   1.2.1 Installation requirements.

1.3 **General**
   1.3.1 Before Product installation, verify space limitations, clearances, accessibility and other Project conditions that may affect installation. Notify Consultant if conditions are not satisfactory.
   1.3.2 Start of Work implies acceptance of conditions by Contractor.

1.4 **Manufacturer's Instructions**
   1.4.1 Manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the manufacturer's written or printed directions and instructions unless otherwise indicated in the Contract Documents.
   1.4.2 Maintain one set of installation instructions at job site during installation and until completion.
   1.4.3 Comply with instructions in full detail, including each step in sequence.
   1.4.4 If job conditions or specified requirements conflict with manufacturer's instructions, consult Consultant before proceeding.

1.5 **Quality Of Work**
   1.5.1 Comply with industry standards specified except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise quality of Work.
   1.5.2 Where no explicit quality or standards for materials or quality of Work are established for Work, such Work shall be of good quality for the intended use and consistent with the quality of the surrounding Work and of the construction of the Project generally.

1.6 **Anchorage**
   1.6.1 Secure products with positive anchorage devices designed and sized to withstand stresses, vibration and racking.

1.7 **Mounting Heights**
   1.7.1 Where mounting heights are not indicated, mount individual units of Work at industry-recognized standard mounting heights for applications indicated.
   1.7.2 Refer questionable mounting height choices to Consultant before proceeding.
1.7.3 Obtain exact locations of fixtures and outlets from Consultant before Work is roughed in; Work installed without such information from Consultant shall be relocated at Contractor's expense.

1.8 **Equipment Preparation**
1.8.1 Lubricate moving parts.
1.8.2 Test and start up motors and machinery.
1.8.3 Replace defective or damaged equipment.

1.9 **Alterations To Existing Work**
1.9.1 Where materials are to be removed for re-use or where existing finishes are to be cut out and later made good, qualified workers skilled in the handling of each particular material shall be employed.
1.9.2 Damage to the existing building components or contents due to construction Work shall be made good. New Work in existing building shall conform to requirements of applicable Sections.
1.9.3 All services affected by Work shall be cut off and properly capped or diverted. Interruption of services to or within existing building shall not take place without prior consultation with Agency.

1.10 **Cutting And Patching**
1.10.1 Cutting, patching and provision of openings, shall be performed by workers having sufficient training and experience with the type of construction and finishes involved, at the expense of the Contractor requiring the cutting or patching. The Contractor requiring the cutting or patching shall be responsible for layout of the required cutting in a timely manner.

1.11 **Overloading**
1.11.1 Precautions shall be taken to prevent overloading of any part of the structure, falsework or scaffolding during operations. If doubt exists, obtain approval from Consultant.

1.12 **Powder Activated Fasteners**
1.12.1 Powder activated fastenings shall not be used on any portion of the Work unless approval for a specific use is obtained from the Consultant.

1.13 **Load Bearing Members**
1.13.1 Load bearing members shall not be cut, bored or sleeved without written approval of the Consultant. All cuts shall be made with clean, true and smooth edges.
1.13.2 Where required by the Consultant, reinforcement of any such openings shall be made at the Contractor's expense. Any such reinforcement shall be detailed by the Contractor and bear the stamp of a Professional Engineer licensed to practice in the Province of Ontario.
1.14 **Relation To Other Trades**

1.14.1 The Contractor shall ensure that all Trades leave chases, slots and reglets required by other Trades and build in frames, sleeves, anchors, bolts, etc. and provide cutting and making good as required. Trades supplying materials for installation on the Project shall supply templates and information for their proper locations.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**

1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes**

1.2.1 General cleaning requirements.

1.3 **Cleaning Materials**

1.3.1 Use materials which will not create hazards to health or property and which will not damage surfaces.

1.3.2 Use materials and methods that comply with requirements of local authorities having jurisdiction over Work and are recommended by manufacturer or fabricator of material being cleaned.

1.4 **Garbage Disposal**

1.4.1 Keep building and site free from accumulations of garbage.

1.4.2 Remove cartons, crates, wrappings, lunch garbage and other garbage daily.

1.4.3 Provide dumpsters for each garbage type in accordance with the local regulations.

1.4.4 Do not burn paper, trash or other material on site.

1.4.5 Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary sewers.

1.4.6 Remove salvaged materials from site unless otherwise specified.

1.5 **Mud Control**

1.5.1 Clean earth and debris spillage from trucking involved in construction operations.

1.5.2 Keep paved public streets and thoroughfares clean.

1.5.3 If earth or debris spillage from construction operations is deposited on paved streets or thoroughfares, wash down and clean soiled surfaces as directed by Agency or by authorities having jurisdiction.

1.6 **Progressive Cleaning**

1.6.1 Maintain the Work, including roof and building systems, at least on a daily basis free from accumulations of waste material and debris.

1.6.2 Provide on-site dump containers for collection of waste materials, and debris. Sort waste as required by the local authority having jurisdiction.

1.6.3 Remove waste materials and debris from the Place of the Work.

1.6.4 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.
1.6.5 Vacuum clean interior building areas prior to start of finish painting and continue vacuum cleaning in each area on "as needed" basis until that area is ready for occupancy.

1.6.6 Damp mop and vacuum clean all spaces under access flooring on a regular basis during the construction period.

1.7 **Final Cleaning**

1.7.1 Exterior Cleaning:

.1 Remove debris, waste and surplus materials from site, from roofs and from drainage systems.

.2 Remove temporary protection and temporary construction.

.3 Remove stains, spills and foreign substances from exterior surfaces.

.4 Rake lawn areas and clean grounds.

.5 Sweep and hose down paving and walks.

.6 Clean exterior materials according to product manufacturer's directions.

1.7.2 Interior Cleaning:

.1 Remove temporary protection, tags, labels and markings from materials, fixtures, accessories and equipment.

.2 Clean transparent and glossy materials to polished condition; remove foreign substances.

.3 Polish reflective surfaces to clear shine.

.4 Clean switch and outlet plates, finish hardware, handrails and metal trim of smudges, paint and soiling.

.5 Clean aluminum, stainless steel, bronze and similar metals according to instructions of metal manufacturer.

.6 Vacuum clean carpeted and similar soft surfaces.

.7 Clean resilient floors thoroughly with well-rinsed mop containing only enough moisture to remove surface dirt and dust; then buff dry by machine, bringing surfaces to sheen.

.8 Clean tile in accordance with grout and tile manufacturer's recommendations.

.9 Broom clean with dust control and vacuum concrete floors.

.10 Clean under and behind convectors and other equipment.

.11 Clean inside cabinets and other concealed areas.

.12 Repaint surfaces and items that cannot be cleaned.

.13 Do not remove ULC or CSA Approved labels.

1.7.3 Cleaning Glass:

.1 Wash and polish both sides of glass.

.2 Remove temporary labels.

.3 Employ window-cleaning firm or personnel experienced in window cleaning work.

1.7.4 Cleaning Mechanical and Electrical Equipment:

.1 Clean surfaces of equipment; remove excess lubrication.

.2 Clean plumbing fixtures to sanitary condition.
.3 Clean permanent filters of ventilating equipment and replace disposable filters when units have been operated during construction; in addition, clean ducts, blowers and coils when units have been operated without filters during construction.

.4 Ongoing maintenance of equipment to be maintained by the Contractor until substantial completion.

.5 Light fixtures and lamps:
1. Wipe light fixtures with anodized aluminum louvers or reflectors free of dust, grease and fingerprints, using non-abrasive cloth and suitable cleaner, recommended by fixture manufacturer.
2. Replace burnt-out bulbs with new specified bulbs.
3. Replace construction bulbs with new specified bulbs.

1.8 **Damaged Materials**
1.8.1 Replace Products damaged during final cleaning.
1.8.2 Do not use extra stock materials for such replacement.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**

1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes**

1.2.1 Submittals and procedures required for closeout.

1.3 **Take Over Procedures**

1.3.1 For the purpose of closing out this construction project and the takeover of the project by the Agency from the Contractor, the "OAA/OGCA Take-Over Procedures" document will be used with the following additions, clarifications and modifications. Refer to The Region of Peel Document 2019-165T.

1.3.2 Provided below, for the Contractor’s benefit, is a list of minimum requirements for this Contract closeout.

.1 Contractor to notify Consultant, in writing, when the Project meets the requirements of Substantial Performance as set out in the "Take-Over Procedures".

.2 The Consultant and the Contractor shall prepare a list of incomplete and unsatisfactory Work.

.3 Contractor shall make written application to the Consultant for Substantial Performance which must include all of the following:

1. Statement that the Contract is Substantially Performed in compliance with the Contract Documents.

2. An invoice showing the amount of holdback owing accompanied by a Statutory Declaration and WSIB Certificate of Clearance.

3. Submission of closeout requirements.

4. A statement of completion with cost values as described in the "Take-Over Procedures - 3.2 (d)."

.4 If the Consultant finds the Contractor’s application complete, the Consultant will visit the Place of the Work and verify the validity of the application.

.5 If the application is approved by the Consultant, the Consultant will issue a Certificate of Substantial Performance of the Work to the Agency and the Contractor.

.6 The Contractor shall publish a copy of the Certificate of Substantial Performance of the Work in the "Daily Commercial News" and provide a copy to the Consultant.

.7 The 60 day lien period begins on the date of publication with the holdback monies due, if no liens exist, on the 61st day: For holdback terms, refer to The Region of Peel Tender Document 2019-165T.
.8 When all deficiencies have been completed and verified by the Contractor, the Contractor must notify the Consultant for further review. Upon becoming satisfied that all deficiencies have been corrected and upon receiving all certificates, warranties, balancing reports and tax rebates and upon verifying completeness of all final cleaning and demonstrations and upon receiving the Contractor's final invoice, a Final Payment Certificate will be issued by the Consultant.

.9 If the Contractor notifies the Consultant to re-review deficiencies, and upon visiting the project, the Consultant finds less than 75 per cent completion of the outstanding listed deficiency items, it will be judged that the Contractor has not verified the deficiencies prior to notifying the Consultant. If this occurs, all future re-review hours will be charged to the Contractor on an hourly basis. The hourly rate charged will be $110.00/hour plus Value Added Taxes and plus travel costs.

.10 If all deficiencies are not completed within a reasonable period of time, the Consultant will invoke the requirements of GC 7.1 - AGENCY'S RIGHT TO PERFORM WORK OR STOP THE WORK OR TERMINATE CONTRACT.

.11 The warranty period(s) commences on the date of Substantial Performance of the Work.

1. Assemble warranties, affidavits and certificates required by Contract Documents for various materials, systems and equipment.
2. Include copies of permits and certificates of inspection obtained by Contractor.
3. Place documents in order and list each document on transmittal letter or form.

1.4 Closeout Requirements

1.4.1 Project Record Documents: as specified in Section 01 78 39 – Project Record Documents.
1.4.2 Information Manuals: as specified in Section 01 78 39 – Project Record Documents.
1.4.3 Keys and keying schedule including statement that construction lock cylinders have been converted.

1.5 Extra Stock And Parts

1.5.1 Extra stock:
.1 For SRPC provide minimal extra stock where required by specifications.
1.5.2 Deliver to Agency extra stock of materials, spare parts and loose accessories required by Contract Documents to each location where stock is to be used later.
1.5.3 Include special tools for items such as thermostats and adjustable dampers and give instructions for use.
1.5.4 Provide protective wrapping or packaging labelled with full identification of item. Materials are to be provided in unbroken cartons, or if not supplied in cartons, they shall be strongly packaged.

1.5.5 Store neatly in the storage locations as predetermined by Agency.

1.6 **Certificates**

1.6.1 Provide to the Consultant any certificates required by all local authorities and all certificates of compliance or verification required throughout the Specification. Any certificates obtained prior to the maintenance manual submission should be included in the manual. Any certificates obtained after the maintenance manual submission shall be sent to the Consultant prior to Final Payment Certification.

1.7 **Warranties**

1.7.1 Provide to the Consultant, all specified warranties, extended warranties and free manufacturer extended warranties as applies to each individual section.

1.7.2 The warranty period(s) commence on the date of Substantial Performance of the Work, and shall be valid for the full duration specified.

1.7.3 Submit warranties to the Consultant prior to Final Payment Certification.

1.8 **Demonstration Of Systems**

1.8.1 Provide instruction to the Agency's operating and maintenance personnel, during regular Work hours, on the care, operation and maintenance of all equipment and systems as specified in the applicable sections. Refer to the various sections of the Specifications for the specific instructional requirements.

1.8.2 All instructional periods shall be prior to the acceptance and handover of systems to the Agency for operation responsibility and also prior to Final Payment Certification.

1.8.3 For equipment requiring seasonal operation, perform instructions for other seasons within six months.

1.8.4 Use Information Manual for basis of instruction. Review contents of manual with personnel in detail to explain operation and maintenance.

1.8.5 Prepare and insert additional data in the information manual when need for such data becomes apparent during instruction.

1.8.6 Demonstrate start-up, operation, control, adjustment, troubleshooting, servicing, maintenance and shutdown of each item of equipment at equipment location.

1.8.7 Refer to mechanical and electrical documents for additional requirements.

1.9 **Testing And Balancing Of Mechanical Systems**

1.9.1 The Contractor is to include all costs to employ an independent testing company to test and balance all mechanical systems.
Section 22 05 00 – Common Work Results for Plumbing and 23 05 00 – Common Work Results for HVAC describe the required scope of Work and execution details.

1.9.2 The Contractor must list on the Form of Tender the balancing Subcontractor to be used. If no Subcontractor is selected, the first name listed in Appendix 5.10 shall be provided.

1.9.3 The Consultant reserves the right to have the air and water balancing verified by an independent agency.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**

1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Project Record Documents**

1.2.1 The Project record documents consist of as-built Drawings and Specifications, and the accepted Shop Drawings, product data sheets, and samples.

1.2.2 Maintain the as-built documents, Shop Drawings, product data sheets and samples at the Place of the Work.

1.2.3 Request from the Consultant a complete set of the Contract Documents for creation of the as-built documents. Costs of obtaining these documents are the responsibility of the Contractor.

1.2.4 Record the actual "as-built" details of the Project throughout the duration of the Work.

1.2.5 Clearly mark each set as "As-Built Copy". It includes both hard copy and AutoCAD (the latest version) files. Maintain in good condition, available at all times for inspection by the Consultant. Do not use for construction purposes. The Contractor must submit all as-builts (hard copy and AutoCAD files) prior to the release of any holdback payments.

1.2.6 The original AutoCAD tender Drawings are available at the Consultant’s office at an extra cost to the Contractor of $3,000 for the entire set.

1.2.7 Keep as-built documents current and do not record irrelevant information.

1.2.8 Maintenance of the as-built documents to current stage of construction shall be considered a condition precedent for validation of any application for payment made by Contractor.

1.2.9 Date entries with proper reference to the appropriate Change Order or approval number. Call attention to the entry by a "cloud" around the area or areas affected.
1.2.10 At Substantial Performance of the Work, submit one complete set of final "Reviewed" or "Reviewed-As-Modified" Shop Drawings and product data sheets, on which corrections have been recorded of changes made during fabrication and installation of unforeseen conditions. Do not include Drawings which were "Returned and Resubmit."

1.2.11 Conversion of Schematic Layouts:
   .1 Drawings indicate mechanical and electrical conduits, circuits, piping, ducts and other similar items, in schematic form and do not indicate precise physical layout.
   .2 Indicate on as-built Drawings, by accurate dimension, centerline of each run for relevant items.
   .3 Clearly identify items by accurate note such as "cast-iron drain", "galv. water pipe" or "return air duct".
   .4 Indicate by symbol or note, vertical locations of items such as "under slab", "in ceiling plenum" or "exposed".
   .5 Identify elements and locations with description that can be related reliably to Contract Documents.
   .6 Site Plan: Refer to Section 01 10 00 – Summary for requirements for foundation verification and site compliance surveys.

1.3 Information Manual
1.3.1 Format:
   .1 Covers: Plastic covered, three-ring, loose-leaf binders bearing title of Project and date on typed label.
   .2 Sheets: letter size, except pullout sheets may be neatly folded to letter-size.
   .3 Organize contents into applicable sections of work to parallel Project section by labelled tabs protected with celluloid covers fastened to hard paper dividing sheets.
   .4 Provide manual in three separate volumes: one for mechanical, one for electrical and one for all other disciplines.
   .5 Provide a minimum of one copy of the information manual in electronic format on a USB key.
   .6 Submit three copies of each volume to the Agency.

1.3.2 Contents:
   .1 Provide the following information for products and systems scheduled for inclusion in manual:
     1. Names, addresses, phone and fax numbers
     2. Copy of hardware and finish schedule.
     3. Copies of final revised Shop Drawings. Reinforcing steel bar lists and structural steel detail Drawings need not be part of this manual.
     5. Description, operation and maintenance instructions for equipment and systems, including
complete list of equipment and parts list. Indicate nameplates information such as make, size, capacity and serial numbers.

6. Materials used on the Project as required by extras, alternates or substitutions showing name of manufacturer and source of supply.

.2 Where required in technical Specification Sections, include, as applicable, the following additional information provided by manufacturer or fabricator:

1. Written recommendations for cleaning agents, methods and precautions and recommended cleaning and maintenance schedules.

2. Written operating and emergency procedure instructions for equipment and recommended maintenance procedures and schedules.

3. Equipment or product catalogue data, wiring diagrams, spare parts lists for each piece of equipment, accessories, controls and fixtures.

4. Include name, address and telephone number of local representative for principal items of equipment.

.3 Roofing and waterproofing systems:

1. List manufacturer, installer, material properties and composition and details of installation.

2. List every component of system including insulation and flashings.

3. Provide manufacturer and installer recommendations for inspections, maintenance and repair.

.4 Mechanical, plumbing and electrical systems: See mechanical and electrical documents for specific requirements.

.5 Provide additional information for the information manual as may be specified in the technical Specification Sections.

END OF SECTION
1. **GENERAL**

1.1 **Applicability**

1.1.1 The Work in this section lays out the responsibilities and the Work required of the:

- .1 Contractor
- .2 Mechanical Subcontractor
- .3 Electrical Subcontractor
- .4 Controls Subcontractor
- .5 Testing, Adjusting, and Balancing Subcontractor

1.1.2 Other Subcontractors providing services under the requirements of this Contract as may be noted in this or other related parts of the Specifications.

1.2 **Description**

1.2.1 The Commissioning Agent (CxA) shall be hired by the Agency through the Consultant.

1.2.2 Commissioning is a systematic process of ensuring that all building systems installed in accordance with the drawings and specifications, manufacturer’s requirements and good industry practice. Commissioning also ensures that equipment operates and performs as individual components, as well as parts of overall higher level systems such as heating, cooling, and ventilation. In addition, commissioning ensures the Agency has the documentation and training required to operate the equipment and systems in an efficient and long lasting manner.

1.2.3 During the construction phase, commissioning will include the following specific activities:

- .1 Verify equipment is installed in accordance with the manufacturer’s recommendations and industry-accepted standards. This includes the provision and approval of completed manufacturers’ start-up sheets, supplemented where required with commissioning installation verification checklists as provided by the CxA.

- .2 Verify equipment is set-up, adjusted and balanced to perform as specified. This will include a review of Testing, Adjusting, and Balancing (TAB) procedures, review of TAB reports, and spot checking of measurements on site. The TAB Subcontractor shall cooperate with the CxA providing information requested and tools and manpower for spot checking measurements as required by the CxA.

- .3 Functional Performance Testing (FPT) of mechanical and electrical equipment and systems to ensure proper, complete and efficient operation under the range of conditions they are expected to encounter. Contractor shall provide manpower, tools and other services as required by the CxA to perform the FPT.
.4 CxA will review Operations and Maintenance Manual (O and M) documentation provided to the Agency to ensure it is complete and acceptable for ongoing operation and maintenance of the equipment.

.5 The CxA will witness the Contractor’s training of the Agency’s operating personnel to verify its adequacy. The CxA will supplement the specified training if and as needed.

1.2.4 Commissioning does not take away from, reduce responsibility of or in any way diminish the requirement for installing Contractors to provide a complete, finished and fully functioning Product.

1.3 Coordination

1.3.1 Commissioning Team:

.1 The following will be required to participate in commissioning and to assist the commissioning team with verification, testing and document preparation:

.1 Contractor (Contractor)
.2 Mechanical Subcontractor (MC)
.3 Electrical Subcontractor (EC)
.4 Testing, Adjusting and Balancing Subcontractor (TAB)
.5 Controls Subcontractor (CC)
.6 Contractors installing insulation, windows, doors, air barrier or other building shell components.
.7 Commissioning Agent (CxA)
.8 Agency’s Project Manager (PM)
.9 Designated representative of the Agency’s Operations and Maintenance personnel
.10 Architect and Design Engineers - particularly the mechanical and electrical engineers (A/M/E)

1.3.2 Management

.1 Contractor shall cooperate fully with the CxA who will be the Agency’s representative for commissioning during all commissioning activities. Contractor shall work together and with the other members of the commissioning team as required to fulfill their contracted responsibilities and meet the objectives of commissioning.

1.3.3 Scheduling

.1 The Contractor will work with the CxA to schedule the commissioning activities required. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process. The CxA will provide the initial schedule of primary commissioning events at the commissioning scoping meeting. As construction progresses more detailed schedules may be developed by the Contractor.
.2 The Contractor shall be responsible for returning to the building approximately 10 months after the start of the warrantee period to review system operation and to address operational issues.

1.4 Related Sections

1.4.1 DIVISION 01 General Requirements
   .1 01 10 00 Summary
   .2 01 25 00 Substitution Procedures
   .3 01 33 00 Submittal Procedures
   .4 01 42 13 Abbreviations and Acronyms
   .5 01 77 00 Closeout Procedures
   .6 01 78 39 Project Record Documents

1.4.2 DIVISION 22 Plumbing
   .1 22 10 00 Plumbing Piping and Pumps

1.4.3 DIVISION 23 HVAC
   .1 23 20 00 HVAC Piping and Pumps
   .2 23 70 00 Central HCAV Equipment
   .3 23 80 00 Decentralized HVAC Equipment

1.4.4 DIVISION 25 Integrated Automation
   .1 25 10 00 Integrated Automation Network Equipment
   .2 25 90 00 Integrated Automation Control Sequences

1.4.5 DIVISION 26 Electrical
   .1 26 09 23 Lighting Control
   .2 26 09 43 Networked Lighting Controls
   .3 26 36 00 Transfer Switches
   .4 26 52 13 Emergency and Exit Lighting
   .5 27 10 00 Structured Cabling
   .6 27 53 13 Clock Systems
   .7 28 13 00 Access Control
   .8 28 31 00 Fire Detection and Alarm

1.5 Responsibilities

1.5.1 Commissioning Agent (CxA)
   .1 Organize and chair commissioning coordination meetings.
   .2 Represent the Agency’s interests in obtaining an optimally operating building and systems.
   .3 Generate reports to the Agency and Consultants detailing all actions and recommendations.

1.5.2 Contractor
   .1 Attend initial commissioning coordination meeting.
   .2 Schedule all activities requiring CxA involvement at least one week in advance.
   .3 Send a copy of each submittal for commissionable equipment to CxA at same time as it is sent to the appropriate design engineer for review and/or approval.
   .4 Deliver all required documentation; obtain CxA approval prior to application for Substantial Performance.
.5 Integrate commissioning activities into overall construction schedule.
.6 Take all necessary steps to ensure Subcontractors perform their commissioning requirements.
.7 Set up and demonstrate samples depicting building envelope component construction methods and quality control.
.8 Schedule CxA visits to factory and/or site for inspection and approval of the building envelope components' construction, installation and/or application.
.9 Cooperate with CxA to correct all issues and concerns in a timely manner.
.10 Administer any charge-backs charged by the CxA for testing related to repeatedly incomplete Work.

1.5.3 Electrical Subcontractor
.1 Attend commissioning meetings scheduled by the CxA.
.2 Attend initial commissioning coordination meeting.
.3 Obtain CxA approval for manufacturer's start-up sheet in terms of format and content.
.4 Provide completed installation verification checklists as provided by CxA prior to equipment start-up.
.5 Prepare preliminary schedule for O and M manuals submission, Agency training, lighting system testing, megger testing, and protective device verification. Update schedule throughout the construction period.
.6 Coordinate with the Mechanical Subcontractor and all his Subcontractors to ensure that equipment naming and numbering is consistent within all documents and as-builts.
.7 Provide complete equipment and systems start-up. Include for involvement by manufacturer-trained personnel and tools, as required for safe, proper and complete start-up of all equipment listed in 1.6. Provide start-up reports containing all information requested by the CxA.
.8 Ensure all systems have been thoroughly tested and validated by all Subcontractors, and all required documentation has been submitted to the CxA prior to scheduling of training.
.9 Maintain marked-up drawings on site and make available for inspection by the CxA. Provide a complete set of as-built record drawings and schematics to the CxA prior to Functional Performance Testing.
.10 As-built drawings shall include, but not limited to, such items as power/control field wiring diagrams.
.11 Return to site with the Contractor, O and M and CxA approximately 10 months after the start of the warrantee period to review system operation and to address operational issues.
.12 Provide a copy of the Electrical Coordination Study.
.13 Coordinate with mechanical Subcontractor, TAB Subcontractor, and controls Subcontractor to ensure all mechanical equipment and systems are fully functional and in complete and proper working order.

.14 Prior to occupancy, but following the completion of all changes, certify that all protection devices have been checked and reset to conform to the Coordination Study settings.

.15 Participate in the verification of all protective device settings. Participate in the verification of all lighting control system settings and tests.

.16 Provide electrical system technicians to assist during system verification and functional performance testing as required by the CxA.

1.6 COMMISSIONABLE EQUIPMENT/SYSTEMS TO BE COMMISSIONED

1.6.1 Systems to be commissioned under this part are primarily associated with HVAC for the building and central plant but do not include process or special purpose equipment such as:

.1 Life safety systems such as fire alarm, sprinkler, fire pumps
.2 Security systems such as card readers, automatic door locks, CC cameras
.3 Communication systems such as data, paging and telephone systems
.4 Specialty equipment such as kitchen cooking and refrigeration equipment, elevators, laboratory equipment, etc. but scope does include exhaust hoods and fans
.5 Plumbing piping systems such as drainage and storm water management but scope does include booster pumps, hot water generation, cistern pumping and related control systems.

1.6.2 Mechanical

.1 All major mechanical equipment and their controls will be commissioned using a series of installation verification and functional checks. Equipment to be commissioned during the course of this Project includes but is not limited to:

.1 Building Automation System (Controls System)
.2 Split Type Air Conditioners
.3 Air Handling Units
.4 Heat/Energy Recovery Ventilators
.5 Pumps
.6 Exhaust Fans
.7 Unit Heaters, Cabinet Unit Heaters
.8 VAV Boxes
.9 Fan Coil Units
.10 Lighting Controls
.11 Heat Exchangers
.12 Piping Systems
.13 Ducting Systems
.14 VFDs
.15 Other major equipment as may be included in construction but may have been left off of this list will also be required to be included in commissioning.

1.6.3 Electrical
.1 The following electrical equipment and their controls will be commissioned using a series of installation verification and functional checks. Equipment to be commissioned during the course of this Project includes but is not limited to:
   .1 Back-up power systems
   .2 Lighting systems and associated controls
   .3 Emergency and exit lighting systems
   .4 Transfer switches
   .5 Protective devices
   .6 Structured cabling
   .7 Clock system
   .8 Access control system
   .9 Fire detection and alarm system

1.6.4 Products: Test Equipment
.1 All standard testing equipment required to perform start-up and installation verification and required functional performance testing shall be provided by the division contractor for the equipment being tested.
.2 All testing equipment shall have been calibrated by a certified agency a maximum of one year prior to its use. If not otherwise noted, temperature sensors and digital thermometers shall have an accuracy of ± 0.05°C, pressure sensors shall have an accuracy of ± 7 kPa.

1.7 Meetings:
1.7.1 Commissioning Meetings: Soon after construction commences, the CxA will conduct an initial commissioning scoping meeting with the entire commissioning team in attendance. Commissioning requirements, procedures, responsibilities and schedule will be reviewed.
1.7.2 Other commissioning meetings will be conducted as required throughout construction. These meetings will cover coordination, deficiency resolution and planning issues with particular Subcontractors.

1.8 Submittals
1.8.1 Contractor shall ensure subcontractors shall comply with specific requests for submittal documentation from the CxA in a timely fashion to ensure commissioning Work continues as scheduled. At a minimum, the request will include the manufacturer’s printed installation and start-up procedures, O and M data and manuals, final shop drawings, power and control field wiring drawings, sequences of operation, and results of required tests.
1.8.2 Final completion of the O and M manuals including all required submittals is the responsibility of the Contractor. The CxA will review and forward comments to the engineer of record for follow-up.

1.8.3 Contractor shall provide an extra set of O and M manuals, as built drawings and field power wiring diagrams to the CxA for review at same time as they are submitted to the design engineer. The CxA will review and forward comments to the engineer of record for follow-up.

1.9 **Start-Up And Installation Verification Checks**

1.9.1 In addition to completing Installation Verification Checklist as provided by CxA, the installing Subcontractor shall be responsible for performing and documenting start-up based on manufacturer’s requirements and/or good industry practice. They shall perform all required procedures and checks and document the results. Start-up documents as requested by the CxA shall be provided.

1.9.2 Controls and sensor point-to-point checks: control system point-to-point checks and calibration checks for all sensors shall be included as part of installation verification. The results shall be documented and provided to CxA.

1.9.3 Deficiencies and incomplete Work:

1.9.4 Dates for remedy shall be provided to the CxA.

1.9.5 The CxA will work with all parties as required to affect proper corrective measures, correct and retest deficiencies or uncompleted items.

1.9.6 Items left incomplete or not properly corrected, causing delays or multiple call-backs for retest may result in back-charges to the party at fault.

1.10 **Functional Performance Testing (Fpt)**

1.10.1 In general, functional performance testing is conducted after Installation Verification Checklists have been completed, submitted, and approved, the control system is fully verified and operational, and TAB is complete.

1.10.2 The installing Subcontractor, under the direction of the CxA, shall execute all FPT and shall maintain responsibility for all equipment tested.

1.10.3 In general, each system shall be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part-load, full-load). Proper responses to such modes and emergency conditions (e.g., power failure, freeze condition, no flow, equipment failure, etc.) shall be verified.

1.10.4 FPT verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system’s trend log capabilities or by stand-alone data loggers. The CxA will determine which method is most appropriate.
1.10.5 The CxA will schedule FPTs through the Contractor and affected Subcontractors.

1.10.6 Issues identified during FPT may be corrected by the Subcontractor during the tests.

1.10.7 Where an issue cannot be corrected immediately, the Subcontractor shall provide a reasonable timeline for correction. The CxA shall document the issue and reschedule the FPT.

1.10.8 Where there is a dispute regarding whether an issue is a deficiency or who is responsible, the issue shall be documented and resolution attempted by parties in attendance. Final acceptance of proposed resolution lies with the Agency and/or Design Engineer.

1.10.9 Cost of Retesting:

1.10.9.1 The CxA will direct the first retesting of the equipment at no charge.

1.10.9.2 If lack of adequate corrective action necessitates further re-testing, the CxA shall be compensated for second and subsequent retests through the Contractor, who will then administer charge-backs as appropriate.

1.11 Training Of Agency Personnel

1.11.1 The Subcontractor supplying each piece of equipment shall be responsible for providing complete and satisfactory training on that piece of equipment. Training may be performed by the Subcontractor, Supplier, manufacturer or others as the Subcontractor may decide best able to provide that training. The Contractor shall manage and direct the requirements to the Subcontractor.

1.11.2 Agency personnel shall be provided with completed O and M Manuals at least 1 week prior to training. In addition, up to five copies of the related maintenance booklet and wiring as-built shall be provided to Agency personnel for the purpose of training.

1.11.3 The Contractor shall be responsible for training coordination and scheduling and ultimately for ensuring that training is completed. The CxA shall be responsible for overseeing and approving the content and adequacy of training for all commissioned equipment.

1.11.4 Basic training for each piece of equipment shall include the following items at a minimum:

1.1 General description of the system and its operation (Design Intent).

2. Detailed itemization and identification of major components and access to same.

3. Detailed itemization and identification of operating controls and safeties including normal and abnormal sensor readings.

4. Review of the O and M manuals for identification of service requirements, procedures, wiring diagrams, parts identification, safety procedures, etc.
.5 Review of system drawings and schematics.
.6 Review of control drawings and schematics.

1.11.5 Operational review for:
.1 Start-up
.2 Normal operation
.3 Shut down
.4 Unoccupied operation
.5 Seasonal changeover
.6 Manual operation
.7 Controls set-up and programming
.8 Troubleshooting and alarms
.9 Interactions with other systems.
.10 Adjustments and optimizing methods for energy conservation.
.11 Health and safety issues.
.12 Regular maintenance requirements including frequency, parts and equipment, and tools needed, replacement parts sources.
.13 Special maintenance needs.
.14 Tenant interaction issues.
.15 Discussion of environmentally responsible system features.
.16 Identification of contacts for service support and maintenance parts.

1.12 CLOSEOUT SUBMITTAL CHECKLIST (PER PEEL BAS GUIDELINES)
1.12.1 Shall include the following;
.1 List of IP addresses
.2 All login IDs and passwords for all levels of access, including administrative, operator and read only
.3 Login ID description
.4 Software/ database backup (coding, programming etc.)
.5 Software/ database disaster recovery procedure
.7 As-built stamped control drawings
.8 As-built product shop drawings and specifications
.9 Schematic of enterprise architecture
.10 Points List
.11 Training guide
.12 Commissioning report
.13 Warranty signoff
.14 Checklist that all requirements have been met
.15 ESA inspection for all equipment and wiring
.16 Latest version of firmware and software installed at substantial completion plus submittals of all software disks and licences provided to owner.

.17 Certificate of Substantial Completion and Certificate of Final Completion

1.13 DEFERRED TESTING
1.13.1 If any check or test cannot be completed due to weather or other conditions, execution of FPT may be delayed upon approval of the Agency.

1.14 POST-OCCUPANCY REVIEW
1.14.1 The CxA, Contractor, mechanical, electrical, TAB, and controls Subcontractors shall return to the building approximately ten months after the start of the warranty period to review system operation, Agency concerns, unresolved deficiencies or warranty issues and to address any outstanding operational issues.

1.14.2 The exact date and time of this meeting will be coordinated by the CxA.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**
1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Intent**
1.2.1 Provide articles, labour, materials, equipment, transportation, hoisting and incidentals noted, specified and required to complete the Work of this Section.

1.3 **Reports**
1.3.1 A detailed Hazardous Materials report is attached by Appendix.
1.3.2 The Agency and Consultant assume no responsibility for any interpretation or deduction that the Contractor may make from third-party reports. Establish the nature of existing conditions to own satisfaction.

1.4 **Section Includes**
1.4.1 Complete all the removal and demolition Work as indicated on the Drawings and as specifically mentioned in these Specifications, including the following:
   .1 Installation of protective fencing, erosion control fencing, hoarding, etc.
   .2 Management and execution of Hazardous Material Abatement by qualified Contractor as outlined in Appendix 5.14.

1.5 **Examination**
1.5.1 Visit the Place of the Work and note conditions affecting the Work of this Section.
1.5.2 No allowance will be made for any difficulties encountered or any expenses resulting from conditions at the Place of the Work or any item existing thereon which is visible or known to exist at the time of bidding.

1.6 **Permits And Regulations**
1.6.1 Refer to GC 10.2.
1.6.2 Agency will apply and pay for the building permit.
1.6.3 Arrange and pay for landfill fees, notices, and inspections necessary for the proper execution and completion of the demolition.

1.7 **Protection**
1.7.1 The Contractor shall be entirely responsible for, and make good damage to adjoining properties and buildings, adjacent walks, curbs, etc.
1.7.2 The Contractor shall be entirely responsible for the safety of all persons lawfully engaged on the Work when such injury is caused by negligence or any act of the Contractor or any person or persons engaged in the Work of this Section.

1.7.3 It shall be the responsibility of the Contractor to protect the public from injury during the course of demolition by providing suitable barriers, fences, coverings, guardrails, etc., that may be required by the Agency or authorities having jurisdiction.

1.8 Existing Services

1.8.1 Locate and disconnect, cap and plug gas, water, sewer, hydro, telephone and other services as required. In each case, notify the authority having jurisdiction and obtain their written approval obtained before commencing that portion of the Work. Approximate locations of existing utilities have been indicated on the accompanying Drawings. No responsibility is assumed by the Consultant for the exact locations as shown.

1.9 Clean-Up

1.9.1 Leave the Place of the Work in a clean and orderly condition to the satisfaction of the Consultant. If the Contractor fails to do so the Consultant may order excess debris to be removed at the Contractor’s expense.

1.10 Submissions

1.10.1 The Contractor shall submit a detailed demolition methodology statement covering equipment to be used, safety procedures to be adopted, temporary shoring if required, demolition sequence, etc.

2. PRODUCTS

2.1 Salvage Material

2.1.1 All material from the demolition shall become the property of the Contractor unless noted, who shall remove all material and debris from the Place of the Work as quickly as possible. Burning debris at the Place of the Work will not be permitted.

2.1.2 Endeavour to sort and recycle materials wherever practical.

2.1.3 Refer to Drawings for list of items to be retained and given to the Agency.

2.1.4 Materials to Remove and Reinstall by another Section

.1 Refer to Drawings for list of items to be removed and reinstalled.

3. EXECUTION

3.1 General

3.1.1 Carry out demolition, removal and disposal in accordance with the methodology statement and with applicable provincial and local regulations and the demolition methodology statement submitted for demolition permit issuance.
3.1.2 Execute demolition in an orderly and careful manner with due consideration for adjacent structures and finishes.

3.1.3 Keep Work wetted down thoroughly to prevent dust and dirt from rising during demolition operations. Water shall be provided for this purpose by the Contractor. Upon completion of Work, any temporary water and power lines shall be removed.

3.1.4 Take necessary precautions to guard against movement or settlement of the remaining structure, including necessary bracing or shoring.

3.2 Asbestos Removal

3.2.1 Asbestos removal and disposal shall be undertaken by a licensed Asbestos Abatement Contractor in accordance with the requirements of Ontario Regulation 309 as amended. The Contractor is responsible for undertaking air monitoring and any other requirements of regulatory agencies or local municipalities. Disposal shall be at a licensed landfill.

3.2.2 Refer to Hazardous Material Report supplied for reference per Section 00 31 00 – Available Project Information.

3.3 PCB Ballasts

3.3.1 The Contractor, in conjunction with the Inspection and Testing Company, shall determine the ballasts containing PCB’s. These shall be stored in the designated storage facility. Handling and storage shall be undertaken in accordance with Ontario Regulation 11/82 as amended and any other provincial and municipal requirements. Non-PCB contaminated ballasts shall be disposed of at a licensed landfill.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**

1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Intent**

1.2.1 Provide articles, labour, materials, equipment and transportation to complete the Work of this Section.

1.3 **Section Includes**

1.3.1 Provide masonry units, and related products including but not limited to the following:

.1 Concrete masonry units.
.2 Mortar and mortar aggregate.
.3 Mortar net.
.4 Grout fill for interior door frames.
.5 Masonry lintels and reinforcement.
.6 Steel Angle Lintels
.7 Control joints and expansion joints in masonry walls.
.8 Concrete grout in the cells of reinforced block.
.9 Reinforcing in cells of concrete unit masonry for reinforced masonry construction.
.10 Masonry reinforcement, ties, anchors, connectors and accessories.
.11 Firestopping insulation as required of all masonry wall fire separations.
.12 Grout in all bearing plates in masonry walls.
.13 Infill all beam pockets in masonry walls.

1.3.2 The summarized breakdown of the above mentioned Work does not set out all the Work of this Section of the Contract but rather outlines the essentials. Provide any masonry Work indicated on the Drawings or hereinafter specified, all whether enumerated above or not.

1.4 **Related Sections**

1.4.1 Section 05 50 00 – Metal Fabrications.
1.4.2 Section 07 84 00 – Firestopping.
1.4.3 Section 07 92 00 – Joint Sealants.
1.4.4 Section 08 11 00 – Metal Doors and Frames.
1.4.5 Section 09 90 00 – Painting and Coating.

1.5 **References**

1.5.1 ASTM A82-05: Standard Specification for Steel Wire, Plain, For Concrete Reinforcement.
1.5.3 ASTM A153/A153M-05: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

1.5.5 ASTM A580/A580M-06: Standard Specification for Stainless Steel Wire.

1.5.6 ASTM A641/A641M-03: Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.

1.5.7 ASTM A1011/A1011M-06b: Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.

1.5.8 ASTM C207-06: Standard Specification for Hydrated Lime for Masonry Purposes.

1.5.9 ASTM C331-05: Standard Specification for Lightweight Aggregates for Concrete Masonry Units.

1.5.10 CAN/CSA A82.1-M87 (R2003): Burned Clay Brick (Solid Masonry Units Made from Clay or Shale).

1.5.11 CSA A165 Series-04: CSA Standards on Concrete Masonry Units.

1.5.12 CSA A179-04: Mortar and Grout for Unit Masonry.

1.5.13 CSA A370-04: Connectors for Masonry.

1.5.14 CSA A371-04: Masonry Construction for Buildings.

1.5.15 CAN/CSA-A3001-03: Cementitious Materials for Use in Concrete.

1.5.16 CAN/CSA-A3002-03: Masonry and Mortar Cement.

1.5.17 CAN/CSA-G30.18-M92 (R2002): Billet-Steel Bars for Concrete Reinforcement.

1.5.18 CSA S304.1-04: Design of Masonry Structures.

1.5.19 CAN/CGSB-1.40-M89: Primer, Structural Steel, Oil Alkyd Type.

1.5.20 CISC CPMA 2-75: Quick Drying Primer for Use on Structural Steel.

1.6 **Submittals**

   1.6.1 Submit a list of products to be used in the Work of this section, including insulation manufacturer, mortar Supplier, concrete unit masonry Supplier, and air barrier products for review by the Consultant.

   1.6.2 Prior to commencing the Work submit manufacturers’ complete set of standard details for the air/vapour barrier membrane system showing a continuous plane of air tightness throughout the building envelope.

1.7 **Samples**

   1.7.1 Submit samples as specified in Section 01 33 00 – Submittal Procedures

   1.7.2 Samples: duplicate full-size samples of each type of specified masonry unit; showing size, colour, design and pattern of faces.

1.8 **Quality Assurance**

   1.8.1 Submit documentation verifying that the air barrier applicator is a recommended installer by the air barrier manufacturer.
1.9 **Statement Of Compatibility**

1.9.1 Submit Statement of Compatibility from manufacturers of: insulation, air barrier, air barrier flashing and insulation fastener adhesive.

1.9.2 Statement of Compatibility to be on letterhead of manufacturer, and be signed by an individual with appropriate authority. Statement of Compatibility to indicated that the manufacturer warrants the performance of their product when it is used in contact with the other manufacturer’s products listed above.

1.10 **Environmental Requirements**

1.10.1 Remove masonry that has, in the opinion of the Consultant, been frozen or damaged due to weather conditions, before that section of wall is continued.

1.10.2 Do not lay masonry units that are wet or covered with ice.

1.10.3 Heating Requirements

.1 Provide heat enclosures and heat as required, in accordance with CSA A371.

.2 Observe the following heating requirements:

.1 Air Temperature 4°C to 0°C: Mortar aggregate or mixing water shall be heated to produce mortar temperatures between 5°C and 45°C.

.2 Air Temperature 0°C to -4°C: Mortar aggregate and mixing water shall be heated to produce mortar temperatures between 5°C and 45°C. Mortar temperatures shall be maintained above freezing on the boards.

.3 Air Temperature -4°C to -7°C: Mortar aggregate and mixing water shall be heated to produce mortar temperatures between 5°C and 45°C. Mortar temperatures shall be maintained above freezing on the boards. Salamanders or other sources of heat shall be used on both sides of walls under construction. Wind breaks shall be employed when wind is excess of 25 km/hour.

.4 Air Temperature -7°C and below: Mortar aggregate and mixing water shall be heated to produce mortar temperatures between 5°C and 45°C. Enclosure and auxiliary heat shall be provided to maintain air temperatures above 0°C. Temperature of units when laid shall not be less than -7°C.

1.10.4 Protection Requirements for Completed Masonry

.1 The following protection requirements apply to complete masonry and masonry not being worked:

.1 Air Temperature 4°C to 0°C: Masonry shall be protected from rain or snow for 24 hours by covering with a weather resistive membrane.

.2 Air Temperature 0°C to -4°C: Masonry shall be completely covered with weather resistive membrane for 24 hours.
.3  Air Temperature -4°C to -7°C: Masonry shall be completely covered with insulating blanket or equally protected for 24 hours.

.4  Air Temperature -7°C and below: Masonry temperature shall be maintained above 0°C for 24 hours by enclosure and supplementary heat, by electric heating blankets, infra-red heat lamps or other approved method.

1.10.5 Construct and maintain temporary protection as required to permit continuous progress of the Work. Areas so protected shall be of sufficient size to permit progress of all Work necessary to maintain an orderly and efficient sequence of construction operations.

1.10.6 Provide temporary lighting at levels adequate to permit Work to be performed in accordance with the Contract Documents.

1.10.7 Give adequate notification to the Consultant and Subcontractors prior to the erection and removal of temporary protective enclosures.

1.11  Delivery, Storage And Handling

1.11.1 Refer to Section 01 61 00 – Common Product Requirements.

1.11.2 Deliver Products in dry condition, and keep dry until use.

1.11.3 Deliver cement, lime and other packaged materials in original unbroken and undamaged packages with the marker's name and brand distinctly marked therein, and upon delivery store in a shed until used on the Work.

1.11.4 Deliver masonry units palletized and protected with Shrink-Film.

1.11.5 Store or pile mortar aggregate on plywood, asphalt or concrete area, and protect from dirt and rubbish.

1.11.6 Store masonry units off the ground with care to avoid damage. Damaged units will not be acceptable for face Work.

1.11.7 Do not double stack palleted masonry units.

2.  PRODUCTS

2.1  Mortar Materials

2.1.1 Portland Cement: to CAN/CSA-A3001, Type GU, Grey colour.

2.1.2 Masonry Cement: to CAN/CSA-A3002, Type N.

2.1.3 Hydrated Lime: to ASTM C207, Type N – Normal.

2.1.4 Sand: to CSA A179, standard masonry type; free from loam, clay, vegetable or organic matter, acid, alkali, salt or other soluble or deleterious matter.

2.1.5 Colour Pigment: liquid manufactured pigment, colour loading as selected by Consultant; by Bayer Pigments, Elementis Pigments or the Hamburger Company or Agency approved equivalent.

2.1.6 Water: clean, potable.

2.2  Masonry Units

2.2.1 Concrete Masonry Units – Normal Weight (CMU): to CSA A165.1, using N aggregate; 190 x 390 mm size, bed depth as indicated on Drawings; solid factory-finished ends with bull nosed corners for
use at exposed wall corners, special shapes as required; types as follows:
   .1 Hollow: Type H/15/A/M.
   .2 Solid (100 percent): SF/15/A/M.
   .3 Solid (75 percent): SS/15/A/M.

2.3 **Joint Reinforcement**
2.3.1 Single Wythe Joint Reinforcement: Ladder type, 4.8 mm side rods with 4.8 mm cross ties; to ASTM A82; mill galvanized; e.g. Blok-Lok BL-10 or Agency approved equivalent, unless noted on Drawings.
2.3.2 Multiple Wythe Joint Reinforcement: Ladder type, 4.8 mm side rods with 4.8 mm cross ties; to ASTM A82; hot dipped galvanized; e.g. Blok-Lok BL-12 or Agency approved equivalent, unless noted on Drawings.
2.3.3 Bed Joint Reinforcement: single 3.7 mm OD wire rod to ASTM A82; hot dipped galvanized.
2.3.4 Reinforcing Steel: to CSA G30.18; sizes as indicated on Drawings.
2.3.5 Strap Anchors: 6.35 mm thick steel plate, hot dipped galvanized; U-shaped and Z-shaped to suit application; e.g. BLT11Z by Blok-Lok or Agency approved equivalent.

2.4 **Accessories**
2.4.1 Firestop Insulation: as specified in Section 07 84 00 - Firestopping.
2.4.2 Control Joints: in accordance with PCA Concrete Masonry Handbook, latest edition, and as detailed in Standard Details described in Section 00 01 13 – List of Standard Details.
2.4.3 Expansion Joint: pre-compressed expanding foam sealant; Model 25V by Emseal Corporation or Agency approved equivalent.
2.4.4 Shop Paint: for steel angle lintels, CPMA 2-75.
2.4.5 Sealants: as specified in Section 07 92 00 – Joint Sealants.

2.5 **Air Barrier Membranes And Transitions**
2.5.1 Full Coverage A/V Barrier Membrane: Blueskin SA as manufactured by Bakor or Agency approved equivalent, an SBS modified bitumen, self-adhering sheet membrane complete with a cross-laminated polyethylene film. For application temperatures down to -12°C use Blueskin SA LT or Agency approved equivalent. Membrane shall have the following physical properties:
   .1 Thickness 1.0 mm (40mils)
   .2 Air leakage: <0.005 L/s m² @75 Pa to ASTM E283-91
   .3 Water vapour permeance: 2.8ng/Pa.m².s (0.05perms) to ASTM E96
   .4 Low temperature flexibility: -30°C to CGSB 37-GP-56M
   .5 Elongation: 200% to ASTM D412-modified
2.5.2 Through-wall flashing membrane and dampproof course (self-adhering): Blueskin TWF as manufactured by Bakor or Agency approved equivalent, an SBS modified bitumen, self-adhering
sheet membrane complete with a cross-laminated polyethylene film, having the following physical properties:

.1 Colour: Yellow  
.2 High temperature stability: 110°C min. to ASTM D5147 (resistance to flow)  
.3 Puncture resistance (film): 586N minimum to ASTM E154  
.4 Tear resistance (film): 213N MD; to ASTM D1004  
.5 Air leakage: <0.005 L/s m² @75Pa to ASTM E283-91  
.6 Water vapour permeance: 2.8 ng/Pa·m²·s (0.05 perms) to ASTM E96  
.7 Low temperature flexibility: -30°C to CGSB 37-GP-56M

2.5.3 Air Barrier Primer for self-adhering membranes: For all temperatures, Blueskin Primer as manufactured by Bakor or Agency approved equivalent, a synthetic rubber based adhesive type, quick setting, having the following physical properties:

.1 Colour: Blue  
.2 Weight: 0.8 kg/l  
.3 Solids by weight: 35%  
.4 Drying time (initial set): 30 minutes

2.5.4 Air Barrier Primer for self-adhering membranes: For temperatures above -4°C, Aquatac Primer as manufactured by Bakor or Agency approved equivalent, a polymer emulsion based adhesive type, quick setting, having the following physical properties:

.1 Colour: Aqua  
.2 Weight: 1.0kg/l  
.3 Solids by weight: 53%  
.4 Water based, no solvent odours  
.5 Drying time (initial set): 30 minutes at 50% RH and 20°C

2.6 Mortar Types

2.6.1 Mortar Types: to CSA A179 as follows:

.1 Non-loadbearing Interior Partitions: Type N (compressive strength 750 psi).  
.2 Loadbearing Walls, Inner-wythe of Exterior Walls, Piers, and Foundation Walls: Type S (compressive strength 1800 psi).  
.3 Exterior Masonry Veneer: Type N Mortar for exterior masonry veneer.  
.4 Parging Mortar: Type N.

2.6.2 Mortar Colour

.1 Colour of mortar as directed by the Consultant. Loading shall be as directed by the Consultant (6% maximum).  
.2 Use natural mortar (without colour additives) in all areas to be painted or covered.
2.7 **Concrete Grout**

2.7.1 Proportion normal density concrete to meet the following criteria for concrete grout in reinforced masonry units.

.1 Portland Cement Type GU

.2 Supplementary Cementing Materials Permitted

.3 Minimum 28 Day Compressive Strength 15 MPa

.4 Minimum Cementitious Content As required

.5 Normal Size for Course Aggregate 10 mm

.6 Slump Range at Point of Discharge 180 to 220 mm

.7 Air Content Less than 3%

.8 Water/Cementing Materials Ratio 0.55

2.8 **Mortar Mixing And Re-Tempering**

2.8.1 Add mortar colour, when specified, in rates determined by manufacturer. Provide 1 m x 1 m sample panel in an enclosed area for inspection after 24 hours drying, to determine if colour is correct. Wait for Consultant’s approval before proceeding with the Work.

2.8.2 Do not use anti-freeze compounds to lower the freezing point of mortar.

2.8.3 Machine mix masonry cement mortar in a drum type mixer for not less than 3 minutes and not more than 5 minutes with only enough water to produce a workable consistency.

2.8.4 Stiffened mortar due to the evaporation of water may be re-tempered within 2 hours of original mixing provided the temperature is not over 25°C. If the temperature is over 25°C, it may only be re-tempered within one hour of the original mixing.

2.9 **Shop Finishes**

2.9.1 Hot Dip Galvanizing:

.1 Horizontal Joint Reinforcement Wire and V-Ties: to ASTM A153/A153M, Class B2, minimum 458 g/m² zinc coating.

.2 Stud Mount RAP Tie Plates: to ASTM A123/A123M, minimum 610 g/m² zinc coating.

.3 Slotted L-Plates, Slotted Block Plates and AB-Clips: to ASTM A123/A123M, minimum 401 g/m² zinc coating.

.4 Strap Anchors: to ASTM A123/A123M, minimum 503 g/m² zinc coating.

2.9.2 Mill Galvanizing: to ASTM A641, Class 1; minimum 122 g/m² zinc coating.

3. **EXECUTION**

3.1 **Examination**

3.1.1 Prior to the commencement of Work, examine all areas that are to receive the Work of this Section.

3.1.2 Report misalignments that may affect the Work to the Consultant for correction.

3.1.3 Commencement of the Work or any parts thereof shall mean acceptance of the prepared substrate.
3.2 **Preparation**

3.2.1 Air Barrier Membranes for exterior infill walls:

.1 All surfaces must be sound, dry, clean and free of oil, grease, dirt, excess mortar or other contaminants. Fill spalled areas in substrate to provide an even plane.

.2 New concrete should be cured for a minimum of 14 days and must be dry before air/vapour barrier membranes are applied.

.3 Cracks in masonry and concrete shall be sealed with a strip of air barrier membrane lapped a minimum of 75 mm on both sides of the crack.

.4 Joints in plywood, drywall and other panel type substrates shall be taped with air barrier membrane lapped a minimum of 75 mm on both sides of the crack.

3.3 **Relationship To Others**

3.3.1 Co-operate with other Sections, leaving chases, slots and reglets.

3.3.2 Build-in frames, sleeves, anchors, bolts, etc. as supplied by others. Ensure items are set square and true.

3.3.3 Set metal, wood, and wood buck frames for louvres, pressed metal screens and doors, etc. All pressed metal and wood frames for doors and screens in masonry and concrete shall be set and braced by others. Be responsible for and ensure that all frames are set plumb, true and accurately remain in position. Solidly build-in all frames and anchor with the backs of all jambs solidly packed with mortar unless otherwise noted on Drawings.

3.3.4 Provide openings and lintels in masonry walls where required by other Sections or where indicated. Locations of such openings must be coordinated by the Subcontractor involved. Cutting and patching for openings that have been missed or incorrectly located shall be provided at no cost to the Agency.

3.3.5 Accurately locate and neatly finish chases and openings to the required sizes.

3.3.6 Do not cover pipe, conduit chases or enclosures until advised that the Work has been inspected and tested.

3.4 **Quality Of Work**

3.4.1 Perform Work by skilled workers under the continuous supervision and direction of skilled and experienced foremen in each branch of the Work. At least one thoroughly experienced and competent worker is to be in charge of all mortar mixing.

3.4.2 Build Work plumb, true, level and square, accurately to the dimensions shown and with all angles and reveals at right angles to faces unless distinctly shown otherwise.

3.4.3 Set out and build masonry Work to the respective dimensions called for on Drawings. Build and lay Work true in line, plumb, square and level; align vertical joints. Keep angles, reveals etc., strictly true and square and plumb.
3.4.4 All masonry courses to be of uniform height, and both vertical and horizontal joints to be of equal and uniform thickness.

3.4.5 Do not use chipped, cracked or otherwise damaged units in exposed and load-bearing masonry walls.

3.5 **Non-Loadbearing Partitions**

3.5.1 Extend non-loadbearing partitions in all cases from the top of the structural floor to the bottom surface of the floor or roof construction above unless noted otherwise on Drawings.

3.5.2 Anchor wall to the underside of the floor structure according to standard details.

3.5.3 In walls exposed to view, support tops of walls with concealed angle clips fastened to deck above wall.

3.6 **Dampproofing Membrane**

3.6.1 At the joint between foundation walls and masonry above, provide a continuous horizontal dampproofing membrane for the full width of masonry wall.

3.6.2 Use adhesive to seal spliced lapping joints minimum 100 mm.

3.7 **Moisture Control**

3.7.1 Interior wythes of masonry must be protected from rain with tarpaulins. Excessive moisture will cause blistering of the air vapour barrier, and will cause longer drying out periods before finishing Work can commence.

3.8 **Provision For Movement**

3.8.1 Leave 25 mm space between top of non load-bearing walls and partitions and structural elements.

3.8.2 Do not use wedges.

3.8.3 Fill space with mineral wool.

3.9 **Temporary Wall Bracing**

3.9.1 Provide temporary engineered wall bracing design.

3.9.2 Brace masonry walls to resist wind pressure and other temporary lateral loads during the construction period.

3.10 **Concrete Unit Masonry**

3.10.1 Lay units in face shell mortar bedding, plumb, level and true in line, in running bond and properly jointed with other connecting Work. Units with open cells exposed in walls will not be permitted.

3.10.2 Use lightweight concrete unit masonry for exposed interior walls and partitions. Normal weight concrete blocks may be used for all concealed surfaces unless otherwise noted.

3.10.3 Remove excess mortar and objects. Exercise special care to prevent breaking block corners and the tooled joints shall be made uniform on exposed Work.

3.10.4 Use special concrete unit masonry as indicated on the Drawings.

3.10.5 Use bull-nosed concrete unit masonry for all interior external corners unless noted otherwise on the Drawings.
3.10.6 While laying units, avoid over-plumbing and pounding of the corners and jambs to fit stretcher units after they are set in position. Where an adjustment must be made after the mortar has started to harden, remove mortar and replace with fresh mortar.

3.10.7 Exercise special care in laying up concrete unit masonry in locations where plastic wall coating finish or painting is indicated. Plumb and tool all joints of concrete unit masonry walls in these locations.

3.10.8 Tie tee-shaped intersecting walls together with truss-type joint reinforcement. Do not use masonry header bond. Rake and tool joints as indicated on Drawings.

3.10.9 Sealants to be completed by Section 07 92 00 – Joint Sealants.

3.11 **Air Barrier Membrane**

3.11.1 Primer

.1 Apply primer for self-adhering membranes at rate recommended by manufacturer.

.2 Apply primer to all areas to receive transition sheet and /or through-wall flashing membrane, as indicated on Drawings by roller or spray and allow minimum 30 minute open time. Primed surfaces not covered by transition membrane or through-wall flashing membrane during the same working day must be re-primed.

3.11.2 Membrane (self-adhering type)

.1 Align and position self-adhering transition membrane, remove protective film and press firmly into place. Ensure minimum 50 mm overlap at all end and side laps.

.2 Tie-in to window frames, aluminum screens, hollow metal doorframes, spandrel panels, roofing system and at the interface of dissimilar materials as indicated in Drawings.

.3 Promptly roll all laps and membrane with a counter top roller to effect seal.

.4 Provide full coverage over primed substrate.

3.11.3 Through-Wall Flashing Membrane (self-adhering type)

.1 Align and position the leading edge of self-adhering through-wall flashing membrane with the front horizontal edge of the foundation walls or shelf angles, partially remove protective film and roll membrane over surface and up vertically.

.2 Press firmly into place. Ensure minimum 50 mm overlap at all end and side laps.

.3 Promptly roll all laps and membrane to effect the seal.

.4 Ensure all preparatory Work is complete prior to applying self-adhering through-wall flashing membrane.

.5 Ensure through-wall flashing membrane extends fully to the exterior face of the exterior masonry veneer. Trim off excess as directed by the consultant.
.6 Apply through-wall flashing membrane along the base of masonry veneer walls, over windows, doors and all other wall openings. Membrane shall form continuous flashing and shall extend up a minimum of 200 mm up the back-up wall.

3.11.4 Inspection: Notify Consultant when sections of Work are complete so as to allow for review prior to installing insulation.

3.11.5 Protection: air barrier membranes are not designed for permanent exposure. Cover and protect from environment and UV radiation as soon as possible.

3.12 **Mortar Joints**


3.12.2 Mortar joints shall be straight, clean and uniform in thickness.

3.12.3 Tool joints to a dense, slightly concave curved surface well bonded to the unit at the edges.

3.13 **Pointing**

3.13.1 Cut out defective joints, refill solidly with mortar and tool to form a neat joint to match existing.

3.14 **Concrete Unit Masonry Reinforcing**

3.14.1 Continuously reinforce and tie together with reinforcing in every second block bed joint concrete unit masonry. Refer to Standard Details.

3.14.2 Provide horizontal reinforcing in first and second bed joints above and below openings. The first bed joint immediately above and below openings shall have continuous reinforcing. In second bed joint, the reinforcing shall extend 600 mm beyond each side of the opening. Refer to Standard Details.

3.14.3 Place continuous reinforcing in the second bed joint below the top of the wall. Refer to Standard Details.

3.14.4 Lap reinforcement a minimum of 150 mm at splices, and cut and bend at corners. Overall width of reinforcement shall be according to the manufacturer's recommendations for the various wall thicknesses.

3.14.5 Do not use crimped metal wall ties.

3.14.6 Where vertical bars are called for, fill cores of block full with concrete grout.

3.15 **Control Joints**

3.15.1 Provide control joints at locations in accordance with Portland Cement Association Concrete Masonry Handbook and determined by the Consultant unless indicated on the Drawings to maintain construction integrity.

3.15.2 Break vertical mortar bond with extruded neoprene gasket.

3.15.3 Prime control joint surfaces to prevent drying out of sealant.

3.15.4 Provide 2:1 width-to-depth joint for sealant Section 07 92 00 – Joint Sealants.
3.15.5 To form control joints in interior block walls, fill completely with mortar the core of a full height vertical joint after inserting a strip of building paper to keep the mortar from bonding to one side. Refer to Standard Details.

3.16 **Expansion Joints**
3.16.1 At locations in the building where expansion joints are indicated, provide specified jointing systems in both interior and exterior wythes of masonry.
3.16.2 Provide additional loop of air/vapour membrane flashing across the expansion joint.
3.16.3 Cut insulation vertically and leave dry butt joint.

3.17 **Bearing**
3.17.1 Fill concrete masonry units acting as bearing structural members solid with 15 MPa concrete for a width and depth equal to 3 times the length of bearing.
3.17.2 Use solid concrete masonry units where indicated on Drawings.

3.18 **Concrete Masonry Unit Lintels**
3.18.1 Unless otherwise noted, provide reinforced concrete masonry unit lintels for full thickness of the wall. Provide reinforcement as indicated on the Drawings.
3.18.2 Lintels shall have minimum bearing of 200 mm on the masonry walls.
3.18.3 Fill such lintels with concrete and the shoring left in place for at least seven days before removal.
3.18.4 Lintels may be precast on the ground.
3.18.5 Set concrete unit masonry over lintel units in full mortar bedding which shall have approved horizontal joint reinforcement laid therein as hereinbefore specified.

3.19 **Beams And Lintels**
3.19.1 Provide steel angle lintels in accordance with the Drawings unless indicated otherwise.
3.19.2 Clean steel lintels by scraping, wire brushing or other effective means to remove loose scale, rust, grease, oil or other foreign matter.
3.19.3 Apply one coat of paint prior to installation, unless lintels are galvanized.
3.19.4 Angle lintels shall have a bearing of not less than 150 mm at each end.

3.20 **Through-Wall Flashings**
3.20.1 Provide flashings in masonry in accordance with CSA A371.
3.20.2 Provide through-wall flashings in the following locations:
   .1 Under exterior masonry walls bearing on foundation walls or slabs
   .2 Over shelf angles
   .3 Over steel angle lintels
   .4 At window frame and door frame heads
3.20.3 Provide a soft joint at the soffit of shelf angles, and a slip joint at lintels for movement control.

3.20.4 Lap joints 150 mm and seal with compatible adhesive.

3.20.5 Flashing over openings shall be installed with dams at both ends to prevent water from travelling horizontally past the flashing ends.

3.20.6 Horizontal (base) flashing shall be returned a minimum of 100 mm around corner to overlap abutting flashing. Overlapped flashing shall be sealed with compatible adhesive.

3.20.7 Protect base wall flashing from mortar droppings.

3.20.8 Ensure that flashings have a drip edge extending 12 mm past exterior wall face. Provide safety edge on exposed edges.

3.21 **Sheet Metal Work**

3.21.1 Cut and form reglets in masonry walls as required for the securing of flashings.

3.22 **Anchorage To Concrete**

3.22.1 Provide continuous dovetail anchor slots to be supplied and set by the Concrete Contractor in the concrete for the anchorage of all masonry facing, furring, abutting walls and partitions to the concrete walls, concrete spandrels, concrete columns, etc. Slot shall be for full height as required equivalent to D & R galvanized steel dovetail type with fibreglass filler and provided complete with adjustable galvanized steel anchors to be placed at 400 mm vertically. Slots are to be at 400 mm.

3.23 **Field Quality Control**

3.23.1 **Drying Out**

1. When masonry Work is completed, provide ventilation and heat as required to reduce moisture level in masonry to maximum 15%, sustained for a 48 hour period. Timing for achieving this to be determined by Contractor, but no later than start of finishing Work.

2. Testing may be performed as specified in Section 01 40 00 – Quality Requirements. In the absence of such testing, random sampling with moisture meter will be conducted by the Consultant.

3.23.2 **Air Barriers**

1. Arrange for inspection of air barrier application by the air barrier manufacturer, of a 1.5 x 1.5 metre sample panel. Obtain report from air barrier manufacturer identifying any recommendations/requirements based on visual review.

2. Arrange for inspection of the air barrier application before the insulation is installed, as specified in Section 01 40 00 – Quality Requirements.

3. Provide inspection report from a qualified building sciences inspection company that the air vapour barrier has been satisfactorily installed in accordance with the performance criteria. Refer to Section 01 40 00 – Quality Requirements.

4. The air leakage rate of the air-barrier assembly is limited to a maximum of 0.1L/s.m².
.5 Site testing of assembled components will be done using ASTM E1186, if the inspection and testing company recommends and the Agency approves such testing.

.6 The Inspection and Testing company shall arrange a meeting to discuss the principal requirements of the air-barrier assembly with all Subcontractors involved in the assembly prior to commencement of construction.

.1 This meeting will be attended also by the Consultant and the Contractor.

.2 The meeting will also enable all parties to discuss the sequencing necessary to ensure a continuous air-barrier assembly.

.3 The Contractor will be responsible for carrying out the Work in the agreed sequence.

.7 A mock-up of the building exterior wall measuring 2.0 metres wide and incorporating the air-barrier connections at glazed areas, (sill, jamb, head) as well as the wall to roof transition is required to be constructed prior to commencing the building envelope.

.1 This mock-up will serve as the model for the Work on the building.

.2 The mock-up may become part of the final exterior wall as long as it is constructed before the main Work of the exterior wall assembly is started.

.3 If any mock-up assembly specimen is found to be defective with respect to specified requirements for the air-barrier assembly, further fabrication or installation of this assembly will be stopped until the cause(s) of the defect has been identified and a new test assembly has been retested.

.8 Based on a schedule of Work prepared by the Contractor, the inspection and testing company is to be notified by the Contractor at the following milestones: The inspection and testing company will attend the site at these times:

.1 completion of primer coat if applicable.

.2 completion of spray/trowel applied membrane, or installation of sheet material.

.3 during assembly of exterior wythe (in cavity wall construction) to inspect insulation adhesion; cavity clearance, continuity, and compartmentalization.

.4 installation of all transitions, prior to commencement of interior finishes.

.5 installation of flashings at roof.

.9 The Inspection and Testing Company will provide inspection reports at each milestone, indicating if the Work is satisfactory, or if re-inspection is required.
.1 If the performance of building envelope cannot be determined by visual inspection, the inspection and testing company may recommend that a differential pressure test be performed on the mock-up and again on the exterior wall assembly.

.1 If the performance of the overall building envelope does not meet the air leakage limitation, then the Contractor will be required to undertake remedial repairs at his own expense.

.2 Do not proceed with insulation installation until air/vapour barrier installation has been approved.

3.23.3 Hose Test: On completion of masonry cavity walls, and prior to installing parapets, perform a hose test at 5 metre intervals along length of walls by inserting water hose into top of cavity wall; have Consultant review the test in progress; continue until Consultant is satisfied that the cavities are clear and free draining.

3.24 Protection

3.24.1 Cover walls exposed to the elements with waterproof membranes at the end of each Working Day and keep covered until Work is re-commenced.

3.24.2 Protect visually-exposed Products from marks and damage.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**
   1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes**
   1.2.1 Provide lightweight steel framing including, wind bearing studs, and axial load bearing studs.
   1.2.2 Wind bearing studs includes:
      .1 Wall studs subjected to lateral loads (no axial load other than self-weight and the weight of applied finish.)
      .2 Steel bridging.
      .3 Top and bottom track.
      .4 Head and sill members and jamb studs for wall openings.
      .5 Stud, bridging and track connections.
      .6 Top and bottom track connections to main structure including detailing to accommodate floor deflections.
   1.2.3 Axial load bearing studs include:
      .1 Wall studs subjected to lateral and axial loads.
      .2 Steel bridging.
      .3 Top and bottom track.
      .4 Cross bracing for lateral loads.
      .5 Connections.

1.3 **Related Sections**
   1.3.1 Section 06 10 00 - Rough Carpentry: Wood support systems.

1.4 **References**
   1.4.1 ANSI/AWS D1.3 Structural Welding Code — Sheet Steel.
   1.4.2 ASTM A307-00: Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
   1.4.3 ASTM A325M-05: Standard Specification for Structural Bolts, Steel, Heat Treated, 830 MPa Minimum Tensile Strength (Metric).
   1.4.4 ASTM A653/A653M-04a: Standard Specification for Sheet Steel Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   1.4.7 CAN/CSA-S16-01: Limit States Design of Steel Structures.
   1.4.8 CAN/CSA-S136-01: North American Specification for the Design of Cold-Formed Steel Structural Members.
   1.4.9 CSA W47.1-03: Certification of Companies for Fusion Welding of Steel Structures.
   1.4.10 CSA W59-03: Welded Steel Construction (Metal Arc Welding).
1.4.12 CAN/CGSB-7.1-M86: Cold-Formed Steel Framing Components.

1.5 **Submittals**

1.5.1 Submit Shop Drawings as specified in Section 01 33 00 – Submittal Procedures.

.1 Shop Drawings: Include necessary shop details and erection diagrams. Indicate member sizes, locations, thicknesses exclusive of coating, coatings and materials. Include connection details for attaching framing to itself and for attachment to the structure.

.2 Show splice details where permitted. Indicate dimensions, openings, requirements of related Work and critical installation procedures. Show temporary bracing required for erection purposes.

.3 Include design loads.

1.5.2 Submit three copies of field review reports.

1.6 **Quality Assurance**

1.6.1 Retain a Professional Engineer registered in the Province of Ontario to design the Lightweight Steel Framing System; to prepare, seal and sign all Shop Drawings; and to perform field review. Shop Drawings shall show both design and installation requirements.

1.6.2 Installers: company specializing in installing lightweight steel framing systems, with minimum of ten years experience and a member in good standing of the Canadian Sheet Steel Building Institute (CSSBI).

1.6.3 Welders: Companies certified by the Canadian Welding Bureau to CSA W47.1, and having welders qualified for the base material types and thicknesses that are to be welded.

1.7 **Project Conditions**

1.7.1 Co-operate in co-ordinating Work of other Sections with Work of this Section, in order that the Work may proceed in an orderly and effective manner.

2. **PRODUCTS**

2.1 **Manufacturers**

2.1.1 Manufacturers of cold-formed metal framing and accessories having Products considered acceptable for use:

.1 Bailey Metal Products

.2 MiTek Canada Inc.

.3 Or Agency approved equivalent.

2.1.2 Substitutions: refer to Section 01 25 00 – Substitution Procedures.

2.2 **Design Requirements**

2.2.1 Design shall be based on Limit States Design principles using factored loads and resistances.

2.2.2 Loads and load factors shall be in accordance with applicable Codes.
2.2.3 Resistances and resistance factors shall be determined in accordance with applicable Codes and CAN/CSA-S136.

2.2.4 Conform to the requirements of specified fire rated assemblies.

2.2.5 Design bridging to prevent member rotation and member translation perpendicular to the minor axis. Provide for secondary stress effects due to torsion between lines of bridging. Collateral sheathing may be used to help restrain member rotation and translation perpendicular to the minor axis for wind-bearing studs. Provide bridging at 1500 mm OC maximum for wind bearing studs, 1200 mm OC maximum for axial load bearing studs and 2100 mm OC maximum for joists and rafters. Closer spacing may be required to satisfy structural requirements.

2.2.6 Sheathing materials that may lose their structural integrity when subject to a moist environment or when subjected to a sufficient number of load cycles will not be considered to provide structural bracing.

2.2.7 Maximum deflections under specified loads shall conform to the following:
   .1 Wall studs supporting masonry veneer, L/360.
   .2 Wall studs supporting other finishes L/360.

2.2.8 Design components or assemblies to accommodate specified erection tolerances of the structure.

2.2.9 The spacing of members shall not exceed the following:
   .1 Wall studs 410 mm OC.

2.2.10 Allow for movement of the structure. Design wind bearing stud end connections to accommodate floor deflections such that the studs are not loaded axially.

2.2.11 Connections between lightweight steel framing members shall be by bolts, welding or sheet metal screws.

2.2.12 Allow for appropriate end eccentricities in the design of axial load bearing members.

2.2.13 Resistances for sheet metal screws shall be based on the manufacturer's lowest bound test values multiplied by the appropriate resistance factor, given in CAN/CSA-S136.

2.3 Materials

2.3.1 Steel: to CAN/CSA-S136, identified as to specification, type, grade and mechanical properties; finished to ASTM A653/A653M, Z275 or ASTM A792/A792M, AZM150.
   .1 Wall members forming part of the exterior building envelope shall have a minimum coating of Z180 galvanizing in accordance with ASTM A653/A653M. Other coatings (eg. aluminum-zinc alloy) providing equal or better corrosion protection may be used.
   .2 Interior members not forming part of the exterior building envelope shall have a coating of Class C electrogalvanizing to ASTM A879. Other coatings, providing equal or better corrosion protection may be used.

2.3.2 Bolts and Nuts: to ASTM A307 or ASTM A325M; hot-dipped galvanized, c/w washers.
2.3.3 Screws: Sheet metal type, minimum zinc coating of .008 mm. Other coatings providing equal or better corrosion protection may be used.

2.3.4 Welding electrodes shall be of the 480 MPa minimum tensile strength series (eg. E480XXX, E480S-X).

2.3.5 Touch-up Paint: Zinc rich paint for touching up welds and damaged metallic coatings, to CAN/CGSB-1.181.

2.4 Fabrication
2.4.1 Except as noted herein, fabricate components to CAN/CGSB-7.1 and in accordance with approved Shop Drawings.

2.4.2 Where specified, provide cut-outs centred in the webs of members to accommodate services. Unreinforced cut-outs shall be limited to the dimensions as specified by the manufacturer. The effect of cut-outs on the strength and stiffness of the member shall be considered.

2.4.3 The distance from the centreline of the last unreinforced cut-out to the end of the member shall be not less than 300 mm.

2.4.4 The minimum steel thickness exclusive of coating shall be as follows:
.1 Wall studs 0.91 mm.
.2 Thicker material may be required to satisfy structural requirements.

2.4.5 Mark the steel thickness, exclusive of coating, on each member by embossing, stamping with indelible ink or by colour coding.

3. EXECUTION

3.1 Examination
3.1.1 Thoroughly examine all surfaces scheduled to receive Work of this Section to see that they are secure, rigid, true and not liable to impair performance or appearance of the Work.

3.1.2 Commencement of Work implies total acceptance of surface and site conditions.

3.2 Welding
3.2.1 Welding: to CSA W59 and/or ANSI/AWS D1.3, whichever is applicable.

3.2.2 For material less than 3 mm thick, Shop Drawings may show nominal weld leg sizes. For such material, the effective throats of welds shall not be less than the thickness of the thinnest connected part.

3.2.3 Touch-up welds with zinc rich paint.

3.3 Screws
3.3.1 Steel screws shall equal or exceed the minimum diameter indicated on the Drawings.

3.3.2 Penetration beyond joined materials shall be not less than three exposed threads.
3.3.3 Thread types and drilling capability shall conform to the manufacturer’s recommendations.
3.3.4 Screws covered by sheathing materials shall have low profile heads.

3.4 Erection
3.4.1 Methods of construction may be either piece by piece (stick-built) or by fabrication into panels (panelized) either on or off site.
3.4.2 Lightweight steel framing shall be erected true and plumb within the specified tolerances. Temporary bracing shall be employed wherever necessary to withstand all loads to which the structure may be subject during erection and subsequent construction. Temporary bracing shall be left in place as long as required for the safety and integrity of the structure. The Erector shall ensure that during erection a margin of safety consistent with the requirements of the applicable Code and CAN/CSA-S136 exists in the uncompleted structure.
3.4.3 Make all field measurements necessary to insure the proper fit of all members.
3.4.4 Cutting of members may be by saw or shear. Torch cutting is not permitted.
3.4.5 All axially loaded members shall be aligned vertically to allow for full transfer of the loads down to the foundation. Vertical alignment shall be maintained at floor/wall intersections.
3.4.6 Complete bearing shall be maintained under tracks to provide for load transfer in axially loaded assemblies. Any discrepancy shall be brought to the attention of the Consultant.
3.4.7 Field cut holes into lightweight steel framing members as described above.
3.4.8 Splicing of axial load bearing members is not permitted.
3.4.9 Insulation equal to that specified shall be placed in all jamb and header assemblies that will be inaccessible after their installation into the wall. Insure that insulation is kept dry and not compressed.
3.4.10 Handling and lifting of prefabricated panels shall not cause permanent distortion to any member or collateral material.

3.5 Erection Tolerances
3.5.1 For the purposes of this section, camber is defined as the deviation from straightness of a member or any portion of a member with respect to its major axis, and sweep is defined as the deviation from straightness of a member or any portion of a member with respect to its minor axis.
3.5.2 For axial load bearing studs, out of plumbness and out of straightness (camber and sweep) shall not exceed 1/1000th of the member length.
3.5.3 For wind bearing studs, out of plumbness shall not exceed 1/500th of the member length. Out of straightness (camber and sweep) shall not exceed 1/1000th of the member length.
3.5.4 For track, camber shall not exceed 1/1000th of the member length.
3.5.5 Studs shall seat into top and bottom tracks. The gap between the end of the stud and the web of the track shall not exceed 1.5 mm for axial load bearing studs or 4 mm for wind bearing studs.

3.5.6 Align adjacent prefabricated panels to provide surface continuity at the interface.

3.5.7 Spacing of studs shall not be more than ±3 mm from the design spacing. The cumulative error in spacing shall not exceed the requirements of the finishing materials.

3.6 Field Quality Control

3.6.1 The lightweight steel framing Design Engineer, responsible for the production of the Shop Drawings, shall provide periodic field review during construction and shall submit reports.

.1 The cost of this field review shall be paid for by the Contractor.

3.6.2 Additional field inspection and testing will be conducted by a qualified Independent Inspection Agency, as specified in Section 01 40 00 – Quality Requirements.

.1 Any testing or inspection required by the Consultant because of an error by the Contractor or due to departure from the contract documents by the Contractor, shall be paid for by the Contractor.

.2 Inspection shall include:

.1 Checking that test reports are properly correlated to materials.

.2 Sampling fabrication and erection procedures for general conformity to the requirements of the specification.

.3 Checking that the welding conforms to the requirements of the Contract Documents.

.4 Checking fabricated members against specified member shapes.

.5 Visual inspection of all welded connections including sample checking of joint preparation and fit-up.

.6 Sample checking of screwed and bolted joints.

.7 Sample checking that tolerances are not exceeded during fit-up or erection.

.8 Additional inspection and testing of welded connections as required by CSA W59.

.9 General inspection of field cutting and alterations required by other Sections.

.10 Submission of reports to the Consultant the Contractor and the authorities having jurisdiction covering the Work inspected with details of deficiencies discovered.

.3 The Contractor shall provide the necessary co-operation to insure that the inspection can proceed.
.4 The inspection provided in this Section does not relieve the Contractor of responsibility for the performance of the contract. The Contractor is solely responsible for quality control and shall implement supervisory and quality control procedures.

.5 Materials or workmanship not conforming to the requirements of the contract documents may be rejected at any time during the progress of Work.

3.6.3 Defective materials or quality of Work whenever found at any time prior to acceptance of the Work shall be rejected regardless of previous inspection. Inspection will not relieve responsibility, but is a precaution against oversight and error.

3.6.4 Remove and replace defective materials and Work of other Sections affected by this replacement, at no additional cost to the Agency.

3.7 Adjusting

3.7.1 Touch-up welds and coatings damaged by welding with zinc rich paint.

3.7.2 Prior to touch-ups, prepare surface in accordance with paint manufacturer's recommendations.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**

1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Intent**

1.2.1 Provide all articles, labour, materials, equipment, transportation, hoisting and incidentals noted, specified or required to complete the Work of this Section.

1.3 **Section Includes**

1.3.1 Provide all miscellaneous metal items as detailed on the architectural Drawings, specified herein or required for the proper execution of the project including those listed below. Provide each item complete with all the required anchorage and such accessories as are necessary for the proper installation and for correlation with the adjoining Work.

1.3.2 Itemized List

1. Lintel supports for caseworks where required complete with wall anchors.

2. Steel framing not shown on Drawings but required by architectural details.

3. Lintel at new doors openings.

1.4 **Related Sections**

1.4.1 Section 08 36 13 – Sectional Metal Doors

1.4.2 Section 09 90 00 – Painting and Coating: site finishing.

1.5 **References**

1.5.1 AAMA 2603-02: Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.


1.5.4 ASTM A269-04: Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

1.5.5 ASTM A325M-05: Standard Specification for Structural Bolts, Steel, Heat Treated, 830 MPa Minimum Tensile Strength (Metric).

1.5.6 ASTM B36/B36M-06: Standard Specification for Brass Plate, Sheet, Strip, and Rolled Bar.

1.5.7 ASTM B101-02: Standard Specification for Lead-Coated Copper Sheet and Strip for Building Construction.

1.5.8 ASTM B209M-06: Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
1.5.10 ASTM B221M-06: Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
1.5.11 ASTM B370-03: Standard Specification for Copper Sheet and Strip for Building Construction.
1.5.12 CSA G40.21-04: General Requirements for Rolled or Welded Structural Quality Steel.
1.5.14 CAN/CSA-S136-01: North American Specification for the Design of Cold-Formed Steel Structural Members.
1.5.15 CSA W47.1-03: Certification of Companies for Fusion Welding of Steel Structures.
1.5.16 CSA W59-03: Welded Steel Construction (Metal Arc Welding).

1.6 Submittals
1.6.1 Submit Shop Drawings and erection Drawings as specified in Section 01 33 00 – Submittal Procedures.
1.6.2 Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
1.6.3 Shop Drawings must be stamped, signed and dated by the fabricator's design engineer.
1.6.4 Shop Drawing list:
   .1 Casework support details
   .2 Lintels

1.7 Quality Assurance
1.7.1 Fabricator's Design Engineer: a professional Structural Engineer licensed in the Province of Ontario, experienced in design of steel stairs, guards and railings.
1.7.2 Fabricator: company specializing in fabricating metal fabrications with a minimum of five years documented experience.
1.7.3 Welders: individual or organization certified by the Canadian Welding Bureau to CSA W47.1.

1.8 Delivery, Storage And Handling
1.8.1 Refer to Section 01 61 00 – Common Product Requirements.
1.8.2 Handle and store Products in a manner to prevent damage to other materials, to any existing building or property, and to the Work.
1.8.3 Store Products to avoid disruption in the progress of the Work.
2. **PRODUCTS**

2.1 **Materials**
2.1.1 Sheet Steel: to CSA G40.20, Grade 300W.
2.1.2 Steel Sections and Plates: to CSA G40.21, Grade 300W.
2.1.3 Stainless Steel: to ASTM A167, Type 304.
2.1.4 Stainless Steel Tubing: to ASTM A269, Type 304 or 316.
2.1.5 Extruded Aluminum: to ASTM B221M, 6063 alloy, T6 temper.
2.1.6 Sheet Aluminum: to ASTM B209M, 5005 alloy, H14 temper.
2.1.7 Brass: to ASTM B36/B36M.
2.1.8 High Strength Bolts: to ASTM A325M, including suitable nuts and plain hardened washers; hot dipped galvanized for exterior members.
2.1.9 Checkerplate: 6 mm thick sheet steel, to CSA G40.20; 1.27 mm raised checker pattern.
2.1.10 Welding Materials: to CSA W59.
2.1.11 Shop Primer: to CPMA 2-75.

2.2 **Fabrication**
2.2.1 Fabricate components to CAN/CSA-S136 and in accordance with the approved Shop Drawings.
2.2.2 Fit and shop assemble components for delivery in largest practical sections.
2.2.3 Continuously seal joined pieces by continuous welds. Conform to CSA W59.
2.2.4 Grind exposed joints flush and smooth with adjacent finish surface.
2.2.5 Make exposed joints butt tight, flush and hairline.
2.2.6 Exposed Mechanical Fastenings: Flush countersunk screws or bolts; except where specifically noted otherwise.
2.2.7 Supply components required for anchorage of fabrications.
2.2.8 Quality of Work shall be the best grade of modern shop and field practice known to recognized fabricators specializing in this Work. Accurately fit joints and intersecting members and make in true planes with adequate fastening. All Work shall be plumb, true, square, straight, level, accurate to sizes detailed and free from distortion or defects detrimental to appearance and/or performance.
2.2.9 After fabrication, clean and scrape all surfaces to remove rust, mill scale, oil and grease of extraneous material.

2.3 **Shop Finishes**
2.3.1 Do not prime surfaces in direct contact with concrete or where field welding is required.
2.3.2 Prime paint items with two coats.
2.3.3 Galvanizing: to CAN/CSA-G164-M, hot dipped method, minimum 275 g/m² zinc coating.
2.3.4 Stainless Steel: No. 4 - Brushed.
2.3.5 Aluminum: two-coat thermosetting fluoropolymer coating, 0.03 mm thick; e.g. PPG Duranar; colour as selected by Consultant.

2.3.6 Baked Enamel Shop Finish: baked ceramic pigmentation coating, applied to a minimum 0.025 mm dry film thickness and having a specular gloss of 30 (plus or minus 5) gloss units when measured with a Gardner 60 degree gloss meter; e.g. Colorite HMP by Valspar, colour as selected by Consultant from standard range of colours.

3. **EXECUTION**

3.1 **Examination**

3.1.1 Prior to fabrication, verify all existing conditions which may affect the Work of this Section and take any field measurements necessary to ensure a perfect fit of all miscellaneous metal items.

3.2 **Preparation**

3.2.1 Supply items to be built into the Work for the anchorage of miscellaneous metal Work including templates or information required for sleeves or openings at the proper time.

3.3 **Erection**

3.3.1 Install miscellaneous metal items as required by welding, bolting or lagging to the building structure.

3.3.2 Erect all items square, plumb, straight and true, accurately fitted with tight joints and intersections.

3.3.3 Field weld components to CSA W59.

3.3.4 Field bolt and weld to match shop bolting and welding.

3.3.5 Supply necessary anchor bolts, washers, nuts, lag screws, expansion shields, toggles, straps, sleeves, brackets etc. required to complete the installation to the satisfaction of the Consultant. Secure items to be screwed with sufficient self-tapping "shake-proof" screws with flat countersunk heads.

3.3.6 Mechanically fasten joints butted tight, flush, and hairline.

3.3.7 Grind welds smooth and flush.

3.3.8 Carry out all cutting and drilling of concrete and masonry required for the installation of miscellaneous metal items. All making good after shall be carried out by the Trade whose Work was affected at the expense of the Contractor.

3.4 **Field Quality Control**

3.4.1 Defective materials or quality of Work whenever found at any time prior to final acceptance of the Work shall be rejected regardless of previous inspection. Inspection will not relieve responsibility but is a precaution against oversight and error.

3.4.2 Remove and replace defective materials and Work affected by this replacement, at no additional cost to the Agency.
3.5 **Adjusting**

3.5.1 Upon completion of erection, all areas from which shop paint has been scraped or chipped, bolts, nuts, welds, etc. shall receive one coat of primer as previously specified.

3.5.2 Touch-up galvanized materials with zinc-rich paint.

3.5.3 Grind smooth and prime paint field welded connections.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**
   1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Intent**
   1.2.1 Provide all articles, labour, materials, equipment, transportation, hoisting and incidental noted, specified or required to complete the Work of this Section.

1.3 **Section Includes**
   1.3.1 Rough Carpentry, including:
   - .1 Wood nailers and blocking.
   - .2 Wood strapping on interior and exterior walls.
   - .3 Wood furring.
   - .4 Exterior Plywood sheathing.
   - .5 Wood framing.
   - .6 Pressure treated wood curbs and blocking for mechanical and electrical equipment.
   - .7 Hardware for anchoring rough carpentry to masonry, concrete, steel, etc.
   - .8 Plywood backboards for electrical equipment, caseworks, millwork and whiteboards.
   - .9 Parapet pressure treated wood curbs.

1.4 **Related Sections**
   1.4.1 Section 06 20 00 – Finish Carpentry.
   1.4.2 Section 06 40 00 – Architectural Woodwork.

1.5 **References**
   1.5.2 CSA O80 Series-97 (R2002): Wood Preservation.
   1.5.3 CAN/CSA-O86-01: Engineering Design in Wood.
   1.5.4 CSA O121-M1978 (R2003): Douglas Fir Plywood
   1.5.5 CSA O141-05: Softwood Lumber.
   1.5.6 CSA O151-04: Canadian Softwood Plywood.
   1.5.7 National Lumber Grades Authority: Standard Grading Rules for Canadian Lumber.

1.6 **Delivery, Storage And Handling**
   1.6.1 Refer to Section 01 61 00 – Common Product Requirements.
   1.6.2 Store Products under waterproof cover both in transit and at the Place of the Work in such a manner as to prevent damage to other materials, to any existing building or property or to the Work.
   1.6.3 Co-ordinate delivery schedule of Products with Suppliers.
2. **PRODUCTS**

2.1 **Materials**

2.1.1 Lumber: well-seasoned stock, free from shakes, splits, dry rot, mildew or other defects which would impair strength and durability; SPF species, NLGA No. 2 and Better Grade Mix; S-Dry; sizes as indicated on Drawings.

2.1.2 Plywood Sheathing: DFP to CSA 0121, Grade "C" veneer; laminated using waterproof glue; thicknesses as indicated on Drawings; exterior grade for exterior applications.

2.1.3 Anchors: toggle bolt type for anchorage to hollow masonry, expansion shield and lag bolt type for anchorage to solid masonry or concrete, or bolts or ballistic fasteners for anchorages to steel.

2.1.4 Mineral Fibre Wool Insulation: by Roxul or Agency approved equivalent.

2.2 **Shop-Treatment Of Wood**

2.2.1 Fire Retardant Pressure Treatment: to CSA O80; chemically treated and pressure impregnated; capable of providing a maximum flame spread/fuel contribution/smoke development rating of 20 / 10 - 25 / 15; Dricon manufactured by Koppers Company Inc or Agency approved equivalent.

2.2.2 Wood Preservative - Surface Application: to CSA O80, brush-applied.

2.2.3 All composite wood and agrifiber products must contain no added urea-formaldehyde resins.

3. **EXECUTION**

3.1 **Co-Operation With Other Trades**

3.1.1 Give sufficient notice to Section 09 90 00 – Painting and Coating so that untreated or unprimed carpentry items or material can be primed immediately upon delivery to the Place of the Work.

3.1.2 Supply fasteners with installation locations and necessary templates to other trades to which wood is to be secured.

3.2 **Site-Applied Wood Preservative**

3.2.1 Treat wood nailers, blocking, wood sills, etc., in contact with concrete or masonry with green Pentox to ensure full protection against rot and decay.

3.2.2 Apply two coats of preservative to new surfaces when treated lumber is cut or sawn for fabrication or drilled and countersunk for bolts etc.

3.3 **Installation**

3.3.1 Provide wood blocking required for attachment of fitments and equipment by other Sections

3.3.2 Provide 19 mm thick plywood backer board on wood blocking for mounting electrical equipment where indicated on Drawings.
3.3.3 Provide wood copings, nailing strips, etc. as specified in Section 07 51 05 – Built-up Bituminous Hybrid Roof Membrane. Construct curb and cant members of single pieces per location. Curb roof openings except where prefabricated curbs are provided.

3.3.4 Form corners by lapping side members alternately.

3.3.5 Coordinate Work with installation of decking and support of decking at openings.

3.3.6 Provide mineral fibre wool insulation where required at curbs, parapets then in locations as shown on the architectural Drawings and details.

3.3.7 Fastenings to solid masonry or concrete surfaces shall be with expansion shields and lag screws, unless otherwise specified, and to steel with bolts and nuts. Wood or inorganic fibre plugs shall not be permitted. Powder activated fasteners and staples shall not be used unless permitted by the Consultant.

3.3.8 Accurately fit all Work to sit level and true and securely fastened.

3.4 Field Quality Control

3.4.1 Defective materials or quality of Work whenever found, at any time prior to final acceptance of the Work, shall be rejected.

3.4.2 Inspection will not relieve the Contractor of responsibility, but is a precaution against oversight or errors.

3.4.3 Defective materials shall be removed and replaced by the Contractor at the Contractor’s expense, and the Contractor shall be responsible for the cost of the Work affected by this replacement.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**
   1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Intent**
   1.2.1 Provide all articles, labour, materials, equipment, transportation, hoisting and incidental noted, specified or required to complete the Work of this Section.

1.3 **Section Includes**
   1.3.1 Finish Carpentry, including:
   1.3.2 Accept delivery, store and install the following:
      .1 Hollow Metal Doors and Frames
      .2 Wood Doors
      .3 Finishing Hardware

1.4 **Related Sections**
   1.4.1 Section 06 10 00 – Rough Carpentry.
   1.4.2 Section 06 40 00 – Architectural Woodwork.
   1.4.3 Section 08 11 00 – Metal Doors and Frames.
   1.4.4 Section 08 70 00 – Hardware.
   1.4.5 Section 09 90 00 – Painting and Coating.

1.5 **References**
   1.5.1 ANSI A208.1-99: Particleboard.
   1.5.2 ANSI A208.2-2002: Medium Density Fiberboard.
   1.5.3 ANSI / NEMA LD 3-2000: High Pressure Decorative Laminate.
   1.5.4 Architectural Woodwork Manufacturers Association of Canada (AWMAC): Architectural Woodwork Quality Standards Illustrated.
   1.5.5 CSA B111-1974 (R2003): Wire Nails, Spikes and Staples.
   1.5.6 CSA O80 Series-97 (R2002): Wood Preservation.
   1.5.7 CSA O115-M1982: Hardwood and Decorative Plywood.
   1.5.8 CSA O121-M1978: Douglas Fir Plywood
   1.5.9 CSA O141-05: Softwood Lumber.
   1.5.10 CSA O151-04: Canadian Softwood Plywood.
   1.5.11 CAN/CGSB-11.3-M87: Hardboard.
   1.5.12 National Lumber Grades Authority: Standard Grading Rules for Canadian Lumber.

1.6 **Samples**
   1.6.1 Submit samples as specified in Section 01 33 00 – Submittal Procedures.
   1.6.2 Samples: as follows:
      .1 Duplicate 300 x 300 mm size, illustrating full panel sheet, edge trim, joint trim, and applied finish.
1.7 **Quality Assurance**

1.7.1 Installer: Company specializing in custom carpentry work with three years documented experience.

1.7.2 Perform finish carpentry to AWMAC Quality Standards, Custom grade.

1.8 **Delivery, Storage And Handling**

1.8.1 Refer to Section 01 61 00 – Common Product Requirements.

1.8.2 Store Products under waterproof cover both in transit and at the Place of the Work in such a manner as to prevent damage to other materials, to any existing building or property or to the Work.

1.8.3 Co-ordinate delivery schedule of Products with Suppliers.

2. **PRODUCTS**

2.1 **Materials**

2.1.1 Softwood Lumber: to CSA O141, AWMAC Custom Grade; maximum moisture content of 7 percent, SPF species, with mixed grain, of quality capable of opaque finish.

2.1.2 Hardwood Lumber: AWMAC Premium Grade; maximum moisture content of 7 percent, Maple species, with vertical grain, of quality capable of transparent finish.

2.1.3 Softwood Plywood: DFP, AWMAC Custom Grade, G2S appearance; veneer core materials; rotary cut of clear grain capable of receiving high quality opaque finish.

2.1.4 Hardwood Plywood: to CSA O115-M, AWMAC Premium Grade, Architectural G2S appearance, lumber core material; rotary cut; Maple species, of clear grain capable of receiving transparent finish.

2.1.5 Particle Board: to ANSI A208.1, Grade M-3, minimum 700 kg/m³ density; 4.5 - 8.0 percent maximum moisture content; sanded faces.

2.1.6 Medium Density Fiberboard: to ANSI A208.2, Grade MD, minimum density of 740 kg/m³ density; 4.5 - 8.0 percent maximum moisture content.

2.1.7 Hardboard: To CAN/CGSB-11.3-M, Type 2, thickness indicated.

2.2 **Accessories**

2.2.1 Contact Adhesives: water base type.

2.2.2 Wall Adhesive: solvent release, cartridge type, compatible with wall substrate, capable of achieving durable bond.

2.2.3 Nails: to CSA B111, size and type to suit application, plain finish.

2.2.4 Lumber for Shimming, Blocking, and Strapping: softwood lumber, as specified in Section 06 10 00 – Rough Carpentry.

2.2.5 Wood Filler: Solvent base, tinted to match surface finish colour.
2.3 **Shop-Treatment Of Wood**
   2.3.1 Wood Preservative - Pressure Treatment: To CSA O80; Using Alkaline Copper quaternary (ACQ) preservative.
   2.3.2 Wood Preservative - Surface Application: To CSA O80, Brush-Applied.

3. **EXECUTION**

3.1 **Co-operation With Other Trades**
   3.1.1 Give sufficient notice to Section 09 90 00 – Painting and Coating so that untreated or unprimed carpentry items or material can be primed immediately upon delivery to the Place of the Work.
   3.1.2 Supply fastenings with installation locations and necessary templates to other trades to which wood is to be secured.

3.2 **Site-Applied Wood Preservative**
   3.2.1 Treat all wood nailers, blocking, wood sills, etc. in contact with concrete or masonry with surface applied wood preservative to ensure full protection against rot and decay.
   3.2.2 Apply two coats of preservative to new surfaces when treated lumber is cut or sawn for fabrication or drilled and countersunk for bolts etc.

3.3 **Installation**
   3.3.1 Install Products to AWMAC Custom Grade.
   3.3.2 Set and secure materials and components in place, plumb and level.
   3.3.3 Install components and trim with nails, screws, or bolts with blind fasteners at 400 mm OC; or wall adhesive by gun application as required by specific installation requirements.
   3.3.4 Install wire storage closet rod systems in accordance with manufacturer's installation guidelines.
   3.3.5 Machine sand all exposed surfaces of finished woodwork to an even smooth surface ready for finishing; fit all joints and mitres accurately with nail heads set and ready for finishing.
   3.3.6 Back out flat members of trim to prevent warping.
   3.3.7 Hand sand all finished materials, after erection to remove roughness, machine marks or other blemishes.
   3.3.8 Set exposed fasteners.
   3.3.9 Apply wood filler in exposed fastener indentations.
   3.3.10 Site Finishing: refer to Section 09 90 00 – Painting and Coating.

3.4 **Hollow Metal Door Frames**
   3.4.1 Set hollow metal frames, supplied under Section 08 11 00 – Metal Doors and Frames, plumb, square, level and at correct elevation. Brace solidly in position while being installed.
   3.4.2 Provide a temporary horizontal wood spreader at the mid height of the door opening to ensure the frame remains plumb and true until surrounding partitions are complete.
3.5 **Hollow Metal Doors**

3.5.1 Installation of hollow metal doors supplied under Section 08 11 00 – Metal Doors and Frames shall be carried out by workers skilled in this trade and done in strict accordance with the manufacturer's directions to produce a first class installation.

3.5.2 Hang doors so that they will operate freely, without tension or free swing.

3.6 **Wood Doors**

3.6.1 Installation of wood doors supplied under Section 08 14 00 shall be carried out by workmen skilled in this trade and done in strict accordance with the manufacturer's direction to produce a first class installation.

3.6.2 Condition doors to the average humidity of the location before hanging.

3.6.3 Trim square and accurately as to size, individually inspect, bench, belt sand and label all doors.

3.6.4 Cut down doors to fit openings smaller than those for which they are manufactured.

3.6.5 Trim equally from door sides when planing to fit. Trim equally from top and bottom if height is to be reduced more than 19 mm (3/4"), never more than 19 mm (3/4") from bottom.

3.6.6 Bevel the lock edge of the door, approximately 3 mm (1/8") for a 50 mm (2") thick door, for proper clearance.

3.6.7 Seal all door edges and routing for hardware.

3.6.8 Hang doors so that they will operate freely, without tension or free swing. Allow 5 mm (3/16") clearance in overall opening width and 3 mm (1/8") clearance at top to allow for swelling in extreme humidity.

3.7 **Finishing Hardware**

3.7.1 Finishing hardware shall be supplied by the Hardware Supplier under the Work of Section 08 70 00 – Hardware and installed by this Contractor.

3.7.2 Mortise and neatly fit finishing hardware. Cut mortises straight and sharp without ragged edges and size accurately to accommodate the hardware. Where mortising and application have not been done in a first class manner, such Work shall be replaced.

3.7.3 Install hardware in accordance with the manufacturer's recommendations.

3.7.4 Examine and adjust as required all doors and other moveable parts prior to completion of the building.

3.7.5 Hang doors 1½ pairs of butts, unless otherwise shown in the hardware list to be provided under Section 08 70 00 - Hardware. Neatly and accurately fit all finishing hardware.
3.8 **Field Quality Control**
3.8.1 Defective materials or quality of Work whenever found, at any time prior to final acceptance of the Work, shall be rejected. Inspection will not relieve the Contractor of responsibility, but is a precaution against oversight or errors. Defective materials shall be removed and replaced by the Contractor at the Contractor’s expense, and the Contractor shall be responsible for the cost of the Work affected by this replacement.

3.9 **Cleaning**
3.9.1 Remove kraft paper protective coating.
3.9.2 Visually inspect each installed item, wash and polish thoroughly all surfaces and remove debris from Work site and dispose.

3.10 **Protection**
3.10.1 Protect exposed and finished woodwork after installation until Substantial Performance of the Work.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**

1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes**

1.2.1 Provide millwork and casework as shown on the Drawings, including but not limited to the following:

.1 All built-in millwork.
.2 Finishing hardware for millwork.
.3 Plastic laminate counter tops.

1.3 **Related Sections**

1.3.1 Section 06 10 00 - Rough Carpentry.
1.3.2 Section 06 20 00 – Finish Carpentry.
1.3.3 Section 07 92 00 – Joint Sealants.
1.3.4 Section 08 70 00 – Hardware.
1.3.5 Section 09 90 00 – Painting and Coating.

1.4 **References**

1.4.1 ANSI A208.1-99: Particleboard.
1.4.2 ANSI A208.2-2002: Medium Density Fiberboard.
1.4.3 ANSI / NEMA LD 3-2000: High Pressure Decorative Laminate.
1.4.4 Architectural Woodwork Manufacturers Association of Canada (AWMAC): Architectural Woodwork Quality Standards Illustrated.
1.4.6 CSA O80 Series-97 (R2002): Wood Preservation.
1.4.7 CSA Series O112-04: Adhesives for Structural Wood Products.
1.4.8 CSA O115-M1982: Hardwood and Decorative Plywood.
1.4.9 CSA O121-M1978: Douglas Fir Plywood
1.4.10 CSA O141-05: Softwood Lumber.
1.4.11 CSA O151-04: Canadian Softwood Plywood.
1.4.12 CAN/CGSB-11.3-M87: Hardboard.
1.4.13 National Lumber Grades Authority: Standard Grading Rules for Canadian Lumber.

1.5 **Submittals**

1.5.1 Submit Shop Drawings as specified in Section 01 33 00 – Submittal Procedures.

1.5.2 Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, finishes, accessories, locations of outlets, anchorage, and hardware to a minimum scale of 1:10. Incorporate plans, elevations, sections and details for all architectural woodwork included in this Section.
1.6 **Samples**
   1.6.1 Submit samples as specified in Section 01 33 00 – Submittal Procedures.
   1.6.2 Samples:
   .1 Submit two samples of all finishes for the Consultant's review.
   .2 Submit samples of all hardware including products data, information and Specifications for the Consultant’s review.
   .3 Do not commence Work until reviewed samples have been returned.

1.7 **Quality Assurance**
   1.7.1 Fabricate millwork by a manufacturer that is a recognized millwork supplier, well experienced in the manufacturing techniques of a millwork shop.
   1.7.2 Employ fully trained mechanics who are regularly employed in this field.
   1.7.3 Perform Work to Architectural Woodwork Manufacturer's Association of Canada (AWMAC), Architectural Woodwork Quality Standards Illustrated, Premium Grade and Custom Grade.

1.8 **Mockups**
   1.8.1 Construct mockup as specified in Section 01 40 00 – Quality Requirements.
   1.8.2 Mockup: full size sample of all custom casework, including all materials, finishes and hardware specified.
   1.8.3 The accepted mockup will be used as a standard for acceptance of the Work.
   1.8.4 Remove mockup from the Place of the Work upon final acceptance of the Work.

1.9 **Delivery, Storage and Handling**
   1.9.1 Refer to Section 01 61 00 – Common Product Requirements.
   1.9.2 Deliver and store Products under waterproof cover, both in transit and at the Place of the Work.
   1.9.3 Store Products in a dry area that does not hinder the progress of the Work.

1.10 **Project Conditions**
   1.10.1 Prior to fabrication, verify any field measurements necessary to ensure a perfect fit.
   1.10.2 Co-operate in co-ordinating Work of related Sections in order that the Work may proceed in an orderly and effective manner.

1.11 **Warranty**
   1.11.1 Warranty: Complete two year warranty on material and labour of all installed or manufactured items.
2. PRODUCTS

2.1 Manufacturers
2.1.1 Refer to Finish Schedule 9000 series. Schedule located in Specification Section 00 01 13 - Standard Details.
2.1.2 Subject to conformance with the requirements of the Drawings, Schedules and Specifications, Products of other Manufacturers may be acceptable.
2.1.3 Submit all Substitutions in accordance with Section 01 25 00 – Substitution Procedures.

2.2 Materials
2.2.1 Softwood Lumber: to CSA O141, AWMAC Custom Grade; maximum moisture content of 7 percent, SPF species, with mixed grain, of quality capable of opaque finish.
2.2.2 Hardwood Lumber: AWMAC Premium Grade; maximum moisture content of 7 percent, Maple species, with vertical grain, of quality capable of transparent finish.
2.2.3 Softwood Plywood: DFP, to CSA O151; AWMAC Custom Grade, G2S appearance; veneer core materials; rotary cut; of clear grain capable of receiving high quality opaque finish.
2.2.4 Hardwood Plywood: to CSA O115-M, AWMAC Premium Grade, Architectural SEL TF appearance, lumber core material; rotary cut; Maple species, of clear grain capable of receiving transparent finish.
2.2.5 Particle Board: to ANSI A208.1, Grade M-3, minimum 700 kg/m³ density; 4.5 - 8.0 percent maximum moisture content; sanded faces.
2.2.6 Medium Density Fiberboard: to ANSI A208.2, Grade MD, minimum density of 740 kg/m³ density; 4.5 - 8.0 percent maximum moisture content.
2.2.7 Hardboard Panel: to CAN/CGSB-11.3-M, 6 mm thick, c/w ANSI/NEMA LD 3, Grade VGL decorative laminate thermo-fused to one side; colours and patterns as selected by Consultant.
2.2.8 Plastic Laminate: to ANSI/NEMA LD 3, velour or satin finish, solid colour; as follows:
   .1 General Purpose Type: Grade HGS; 1.2 mm thick.
   .2 Vertical Surface Type: Grade VGS; 0.7 mm thick.
   .3 Postforming Type: Grade HGP; 1.0 mm thick.
   .4 Vertical Postforming Type: Grade VGP; 0.7 mm thick.
   .5 Backing Type: Grade BKL; 1.2 mm thick
   .6 Scratch-resistant Type: FIN-SA (41) by Formica, or 90 finish by Wilsonart;
   .7 Acceptable Manufacturers: Formica, Wilsonart, Arborite, Nevamar, Laminart or Agency approved equivalent.
2.2.9 Solid Surfacing:

.1 Homogeneous sheet composed of blend of natural minerals and 100% acrylic resin; not coated, laminated or of composite construction; meeting ANSI Z124.3 and ANSI Z124.6, Type 6 and Fed. Spec. WW-P-541E/GEN meeting following criteria:

.2 Flammability: Class A when tested to CAN/ULC-S102.

.3 Tensile Strength 6000 psi min ASTM D638

.4 Tensile Modulus 1.5 x 10-6 psi min ASTM D638

.5 Tensile Elongation 0.4% min. ASTM D638

.6 Flexural Strength 10000 psi min ASTM D790

.7 Flexural Modulus 1.2 x 10-6 psi min ASTM D790

.8 Hardness >85-Rockwell "M" scale min. ASTM D785 56-Barcol Impresser min. ASTM D2583

.9 Thermal Expansion 3.02 x 10-5 in./in./0C ASTM D696 (1.80 x 10-5 in./in./0F)

.10 Gloss (60° Gardner) 5–75 (matte—highly polished) ANSI Z124

.11 Light Resistance (Xenon Arc) No effect NEMA LD Method 3.3

.12 Wear and Cleanability Passes ANSI Z124.3

.13 Stain Resistance Passes ANSI Z124.3

.14 Fungi and Bacteria Does not support microbial growth ASTM G21

.15 Boiling water Surface Resistance No Change NEMA LD 3, Method 3.6

.16 High Temperature Resistance No Change NEMA LD 3, Method 3.6

.17 Izod Impact 0.28 ft.-lbs/in. Of notch ASTM D256, Method A

.18 Ball Impact No fracture - 1/2 lb. Ball: NEMA LD3, 1/4" slab - 36" drop Method 3.8 1/2"* slab - 144" drop * - approximate weight per sq ft

.19 Weatherability E94<5 in 1,000 hrs ASTM G155

.20 Specific Gravity 1.7 min

.21 Water Absorption:

.1 Weight Long Term ASTM D570

.2 (% max.) 0.4% (3/4")

.1 0.6% (1/2")

.2 0.8% (1/4")

.22 Toxicity 99 (solid colours) "LC50 Protocol 66 (patterned colours) Toxicity Test (as used by NY State)

.23 Flammability ASTM E84, NFPA 255 & UL 723

.24 Solid Colours

.25 1/4" 1/2" 3/4"

.26 Flame Spread <25 <25 <25

.27 Smoke Developed <25 <25 <25

.28 Class 1 and A 1 and A 1 and A
.29 Particular Patterns
.30 1/4" 1/2" 3/4"
.31 Flame Spread 25 max 25 max 25 max
.32 Smoke Developed 30 max 30 max 30 max

2.2.10 Quartz countertops:

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<th>Typical Result</th>
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<td>Fungal and Bacterial Resistance</td>
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<td>High Temperature Resistance (356°F)</td>
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Toxicity
Passes, LC50=68-128 Pittsburgh Protocol

Flammability
For all colours tested
(Class 1 and Class A) ASTM E 84, UL 723 and NFPA 255

Flame Spread Index
FSI <10 for 3 cm and <15 for 2 cm

Smoke Developed Index
SDI <50 for 3 cm and <100 for 2 cm

Nominal Thickness
2 cm and 3 cm

Nominal Weight
10 lb./ft.2 (2 cm)
15 lb./ft.2 (3 cm)

.2 Nominal sheet thickness:
   .1 ½” for countertops

.3 Adhesives and Colour Matched Silicon Sealants: As recommended by manufacturer to suit details and conditions.

.4 Fabrication of Quartz Surfacing items:
   .1 Fabricate components in shop to the greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings.
   .2 Form joints between components using manufacturer's standard joint adhesive. Joints shall be inconspicuous in appearance and without voids.
   .3 Provide holes and cut-outs for plumbing and accessories, as indicated on the drawings.
   .4 Rout and finish component edges to a smooth, uniform finish.
   .5 All surfaces shall have a uniform finish.

2.3 Accessories
2.3.1 Adhesive for Plastic Laminate: water-resistant, pressure bonding type; urea resin to CSA O112.5 or resorcinol to CSA O112.7.

2.3.2 Fasteners: size and type to suit application, plain finish.

2.3.3 Lumber for Shimming, Blocking, and Strapping: softwood lumber, as specified in Section 06 10 00 – Rough Carpentry.

2.3.4 Wood Filler: Solvent base, tinted to match surface finish colour.

2.3.5 Joint Sealants: as specified in Section 07 92 00 – Joint Sealants.

2.3.6 Edging Material
   .1 Edging rigid PVC with a measured degree of hardness of “95 shore D” and thickness of 3 mm with the primer side having a concave measuring 0.10 to 0.25 mm.
   .2 Edging Adhesive: Ethylene vinyl acetate thermoset adhesive with a temperature resistance of not less than 100 degrees C; processing range of 190–200 degrees C, Natural colour.
.3 Apply edging using only equipment designed for the application of thick PVC in strict accordance with the Specifications of both the thick PVC and hot-melt adhesive manufacturers. All edges and all corners of PVC edgebanding are to be machined to a 3 mm radius for all cabinet parts.

.4 Care should be taken during application to achieve the thinnest glueline consistent with a good bond without causing skips or unspread areas.

2.3.7 Millwork Hardware:

.1 Hinges: Grass series 1200 or Eyromat 3955 by Hettich or Agency approved equivalent, self-closing, 176 degrees opening, complete with appropriate base plates to suit application. All cupboard doors shall have two rubber cushions. Use additional hinges as required. Do not use exposed hinges. Hinge size and type to be according to door weight.

.2 Door Pulls: Hager 2652 89 mm, 8 mm Rod diameter stainless steel or Agency approved equivalent.

.3 Drawer Slides: Full extension side mounted. Capable of carrying a minimum weight of 23 kg.

.4 For larger drawer slides use full extension heavy duty roller/bearing slide capable of carrying a minimum weight of 46 kg.

.5 Recessed Stainless Steel Pilasters: Metalwork BZ120 or Agency approved equivalent.

.6 Projection Brackets and Standards: KV 87 x 187 bracket, sized to suit shelf; brackets shall have 211 or 212 shelf resets depending on shelf material, glass shelves shall have rubber cushions.

.7 Door or Drawer Locks: 0737 pin tumbler as manufactured by CCL Eastern or Agency approved equivalent. See Drawings for location of millwork that is to be locked.

.8 Approved Manufacturers: Grass, Hager, Hafele, and Hettich or Agency approved equivalent.

2.4 Millwork Product/Assembly

2.4.1 Premium Grade Cabinets

.1 Surface Finish: Formica Amber Maple 7012.58.

.2 Substrates: Veneer core MDF, urea formaldehyde-free, FSC certified.

.3 Material Thickness:

.1 Door Fronts: 19 mm plastic laminate.
.2 Drawer Front: 19 mm plastic laminate.
.3 Gables (end, exposed): 19 mm plastic laminate.
.4 Gables (interior stiffeners): 19 mm melamine.
.5 Shelves (interior of case): 19 mm melamine.
.6 Shelves (exposed to view): 25 mm plastic laminate.
.7 Back Panel: 12 mm.
2.5 **Fabrication**

2.5.1 Assemble, where practical, all finished woodwork at the mill and deliver ready for installation.

2.5.2 Machine sand all exposed surfaces of finished woodwork to an even smooth surface ready for finishing; fit all joints and mitres accurately with nail heads set ready for finishing.

2.5.3 Cover all exposed edges of plywood with a 10 mm solid matching wood strip.

2.5.4 Apply plastic laminate to Architectural Woodwork Manufacturers Association of Canada (AWMAC) Standards.

2.5.5 Construction of plastic laminate finished millwork shall be:

2.5.6 Apply plastic laminate to edges first, trim flush with face and apply face laminate lapping edge. Chamfer edge of face laminate 20 degrees.

2.5.7 Install finishing hardware to manufacturer’s Specifications. All drawers shall be installed with drawer slides.

3. **EXECUTION**

3.1 **Examination**

3.1.1 Thoroughly examine all surfaces scheduled to receive architectural woodwork to see that they are secure, rigid, true and not liable to impair performance or appearance.

3.1.2 Commencement of Work implies total acceptance of surface and site conditions.

3.2 **Installation**

3.2.1 Set and secure all materials and components in place, rigid plumb and square.

3.2.2 Provide all furring strips and strapping required to fix millwork and casework to walls, etc.

3.2.3 Use draw bolts in counter top joints.

3.2.4 Apply a small bead of mildew-resistant silicone sealant at junction of plastic laminate counter back and adjacent wall finish.

3.2.5 After installation, fit and adjust operating hardware for wood and laminated plastic cabinet door, drawers and shelves.

3.2.6 Provide closers and filler strips in matching finish as required ensuring a neat and complete finished assembly.

3.3 **Field Quality Control**

3.3.1 Defective Products and Work, whenever found at any time prior to final acceptance of the Work, shall be rejected regardless of previous inspection. Inspection will not relieve responsibility but is a precaution against oversight and error.
3.4 Protection

3.4.1 Protect adjacent installations from damage.

3.4.2 Make good any resulting damage, to the satisfaction of the Consultant, at no additional cost to the Agency.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**

1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes**

1.2.1 Spray-applied fireproofing for patching where existing where required.

1.3 **Related Sections**

1.3.1 Section 07 84 00 – Firestopping.

1.3.2 Section 09 21 16 – Gypsum Board Assemblies.

1.4 **References**


1.4.2 ASTM E136-04: Standard Test Method for Behaviour of Materials in a Vertical Tube Furnace at 750°C.


1.4.11 CAN/ULC-S102-03: Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.


1.4.15 Underwriters Laboratories Inc. (ULI) Fire Resistance Directory.
1.4.16 Warnock Hersey certification listings.

1.5 Quality Assurance
1.5.1 Fireproofing Work shall be performed by a firm with expertise in the installation of fireproofing or similar materials. This firm shall be licensed or otherwise approved by the fireproofing material manufacturer.
1.5.2 Before proceeding with the fireproofing Work, approval of the proposed materials thicknesses and densities shall be obtained from the Consultant and other applicable authorities.

1.6 Submittals
1.6.1 Manufacturer’s Data: Submit manufacturer’s Specifications including certification as may be required to show material compliance with ULC requirements to achieve specified fire resistance rating.
1.6.2 Test Data: Independent laboratory test results shall be submitted for all performance criteria as specified.

1.7 Delivery, Storage and Handling
1.7.1 Refer to Section 01 61 00 – Common Product Requirements.
1.7.2 Deliver Products in manufacturer’s unopened packages, fully identified as to name, type and other identifying data, and bearing the ULC labels for fire hazard and fire-resistance classifications.
1.7.3 Store Products above ground in a dry location, protected from weather. Damaged packages will be considered unsuitable for use. Remove unsuitable Product from the Place of the Work.

1.8 Project Conditions
1.8.1 When the prevailing outdoor temperature at the Place of the Work is less than 4 degrees C, substrate and ambient temperature of 4 degrees C shall be maintained for 24 hours after application of the fireproofing. If necessary for job progress, Provide enclosures with heat to maintain temperatures.
1.8.2 Provide ventilation to allow for proper drying of the fireproofing during and subsequent to its application.

1.9 Sequencing and Scheduling
1.9.1 All fireproofing Work on a floor shall be completed before proceeding to the next floor.
1.9.2 The Contractor shall co-operate in the co-ordination and scheduling of fireproofing Work to avoid delays in job progress.
1.9.3 Adequately ventilate the area during and after installation. Any mould resulting from installation will be the sole responsibility of the Contractor to resolve and remediate.
2. **PRODUCTS**

2.1 **Manufacturers**

2.1.1 Submit requests for Product substitution as specified in Section 01 25 00 – Substitution Procedures.

.1 AD Fire Protection

.2 CAFCO

.3 W.R. Grace & Co.

.4 Or Agency approved equivalent

2.2 **Performance Criteria**

2.2.1 The sprayed fireproofing shall have been tested and reported by Underwriter’s Laboratories, or other certified testing agency to CAN/ULC-S101 or ASTM E119.

2.2.2 Conform to Code requirements of authorities having jurisdiction.

2.2.3 Spray fireproofing material onto structural members, the underside of floor decks after roofing applications have been completed, and to other members with proper thickness and density to provide the fire resistive rated as noted on the Drawings.

2.2.4 Conform to the following ULC Design Numbers:

.1 Floor Assemblies: ULC 1 hour.

.2 Columns: ULC 1 hour.

2.2.5 Adjust thickness of fireproofing to suit alternate beam and column sizes.

2.2.6 The sprayed on fireproofing shall be factory mixed cementitious material.

2.2.7 Deflection: When tested to ASTM E759, the material shall not crack or delaminate when the galvanized deck to which it is applied is subjected to a one-time downward deflection of 1/120 of the span.

2.2.8 Bond Impact: When tested to ASTM E760, the material shall not crack or delaminate from the concrete topped galvanized deck to which it is applied.

2.2.9 Cohesion/Adhesion (bond strength): When tested to ASTM E736, the material applied over uncoated or galvanized steel shall have an average bond strength of 3.8 kPa.

2.2.10 Air Erosion: When tested to ASTM E859, the material shall not be subject to losses from the finished appliance greater than 0.27 g/m².

2.2.11 Compressive Strength: When tested to ASTM E761, the material shall not deform more than 10 percent when subjected to a crushing force of 23.9 kPa.

2.2.12 Corrosion Resistance: Bare, shop-coated and galvanized sheets with applied fireproofing shall be tested to ASTM E937.

2.2.13 Indentation Hardness: When tested to ASTM E761, the material shall not indent more than 13 mm.

2.2.14 Non-Combustibility: When tested to CAN4-S114-M, the material shall be non-combustible.
2.2.15 Surface Burning Characteristics: When tested to CAN/ULC-S102, the material shall exhibit the following surface burning characteristics:
   .1 Flame Spread: 0
   .2 Smoke Developed: 0

2.2.16 Density: When tested to ASTM E605, the material shall meet the minimum individual and average density values as listed in the appropriate UL design, or as required by the authority having jurisdiction.

2.2.17 The material shall have been tested and reported by Underwriters’ Laboratories of Canada (ULC) or Underwriters Laboratories Inc. (ULI) in accordance with the procedures of CAN/ULC-S101 or UL 263 (ASTM E119).

2.2.18 Sprayed fireproofing materials shall be applied at the required thickness and density to achieve the following ratings:
   .1 Floor Assembly: 1 hour; 2 hours at interview rooms/detention cells.
   .2 Roof Assembly: 0 hour.
   .3 Beams: 1 hour.
   .4 Girders: 1 hour.
   .5 Columns: 1 hour.

2.2.19 Potable water shall be used for the application of sprayed fireproofing materials.

2.2.20 Sprayed fireproofing materials shall be free of all forms of asbestos and asbestos contamination, including actinolite, amosite, anthophyllite, chrysotile, crocidolite and tremolite. Material manufacturer shall provide certification of such, upon request.

2.3 Materials
2.3.1 Sprayed Fireproofing: Minimum applied dry density of 256 kg/m³; cementitious type, ULC labeled under guide No. 40U18.3 and formulated without asbestos.

2.3.2 Mixing Water: clean, fresh and suitable for domestic consumption and free from such amounts of mineral organic substances as would affect the set of the fireproofing materials.

2.3.3 Provide supporting information outlining design requirements to meet the required fire resistance rating.

3. EXECUTION

3.1 Examination
3.1.1 Thoroughly examine all surfaces scheduled to receive fireproofing to see that they are secure, rigid, true and not liable to impair performance or appearance.

3.1.2 Commencement of Work implies total acceptance of surface and site conditions.
3.2 **Preparation**

3.2.1 Make good any resulting damage, to the satisfaction of the Consultant, at no additional cost to the Agency.

3.2.2 Maintain uniform temperature in Work area, adequate for Work being performed, as recommended by materials manufacturer.

3.2.3 All surfaces to receive fireproofing shall be free of oil, grease, loose mill scale, dirt, paints/primers (other than those listed and tested), or other foreign materials which would impair satisfactory bonding to the surface. Any cleaning of surfaces to receive sprayed fireproofing shall be the responsibility of the Contractor and paid by the Agency.

3.2.4 Clips, hangers, supports, sleeves and other attachments to the substrate are to be placed by others prior to the application of sprayed fireproofing.

3.2.5 The installation of ducts, piping, conduit, or other suspended equipment shall not take place until the application of sprayed fireproofing is complete in an area.

3.3 **Application**

3.3.1 Equipment, mixing and application shall be in accordance with the manufacturer’s written application instructions.

3.3.2 Sprayed fireproofing shall not be applied to steel floor decks prior to the completion of concrete Work on that deck.

3.3.3 The application of sprayed fire-proofing to the underside of roof deck assemblies shall not commence until the roofing is completely installed and tight, all penthouses are complete, all mechanical units have been placed, and after roof traffic has ceased.

3.3.4 Temperature and enclosure conditions shall be as required by the fireproofing manufacturer.

3.3.5 Maintain an air and substrate temperature of 5 degrees C for 24 hours before and 24 hours after application of the fireproofing.

3.3.6 Provisions shall be made for ventilation to properly dry the fireproofing after application. In enclosed areas lacking natural ventilation, air circulation and ventilation must be provided.

3.3.7 For the application of fireproofing material to exposed galvanized supporting structure, follow manufacturer's guidelines precisely.

3.3.8 Provide masking, drop cloths or other suitable coverings to prevent overspray from resting on surfaces not intended to be sprayed.

3.3.9 Adhesive shall be applied as per the appropriate UL fire resistance design and manufacturer's written recommendations. Typical surfaces requiring adhesives are roof deck (without concrete), cellular floor deck, bottomless trench headers, and other electrified floor units.

3.3.10 The application of sprayed fire-proofing shall not commence until certification has been received by the Contractor indicating that surfaces to receive sprayed fireproofing have been inspected by the applicator and are acceptable to receive sprayed fireproofing.
3.4 **Field Quality Control**

3.4.1 Defective materials or quality of Work, whenever found at any time prior to final acceptance of the Work shall be rejected regardless of previous inspection. Inspection will not relieve responsibility but is a precaution against oversight and error.

3.4.2 Remove and replace defective materials and Work of other Sections affected by this replacement.

3.4.3 The Consultant may select, and the Agency will pay, an independent testing laboratory to sample and verify the thickness and density of the fireproofing to ASTM E605.

3.4.4 The sprayed fireproofing shall be tested for thickness and density in accordance with one of the following procedures:


3.5 **Cleaning**

3.5.1 All patching of and repair to sprayed fireproofing, due to damage by other trades, shall be performed under this Section and paid for by the Contractor.

3.5.2 After the completion of the Work of this section in an area, equipment shall be removed from that area, and all surfaces not to be sprayed shall be cleaned of all deposits of sprayed fireproofing material. All floor areas shall be broom cleaned.

3.5.3 After completion of the fireproofing Work, remove all equipment and clean all exposed wall and floor areas of deposits of fireproofing material.

3.5.4 Promptly, as the Work proceeds and upon completion, clean-up and remove from the site all rubbish and surplus material resulting from Work of the Contractor.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**
   1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes**
   1.2.1 Firestopping, smoke seals and accessories.

1.3 **Related Sections**
   1.3.1 Section 05 50 00 - Metal Fabrications: fire rated sleeves.
   1.3.2 Section 07 81 00 - Applied Fireproofing: sprayed fireproofing.
   1.3.3 Section 07 92 00 - Joint Sealants: non-rated joint sealants.
   1.3.4 Section 09 21 16 - Gypsum Board Assemblies: penetrations in rated gypsum board assemblies.
   1.3.5 Section 22 05 00 – Common Work Results for Plumbing: service penetrations in rated assemblies.
   1.3.6 Section 23 05 00 – Common Work Results for HVAC: service penetrations in rated assemblies.
   1.3.7 Section 26 05 00 – Common Work Results for Electrical: service penetrations in rated assemblies.

1.4 **References**
   1.4.4 ASTM E2174-04: Standard Practice for On-Site Inspection of Installed Fire Stops.
   1.4.5 CAN/CGSB-19.13-M87: Sealing Compound, One Component, Elastomeric, Chemical Curing.
   1.4.6 CAN/CGSB-19.24-M90: Multicomponent, Chemical Curing Sealing Compound.
   1.4.7 CAN/ULC-S102-03: Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
   1.4.9 CAN/ULC-S702-97: Standard for Thermal Insulation, Mineral Fibre, for Buildings.
   1.4.10 Underwriters’ Laboratories of Canada: List of Equipment and Materials.

1.5 **Submittals**
   1.5.1 Submit Shop Drawings and Product data as specified in Section 01 33 00 – Submittal Procedures.
1.5.2 Product Data: sealant manufacturer's installation instructions and standard Drawings, indicating ULC or WHI test designations.
1.5.3 Shop Drawings: Indicate sizes of openings, nature of penetrations, and tested method of firestop and smoke seal protection being proposed.
1.5.4 Shop Drawings are to be sealed, signed and dated by manufacturer's design engineer.
1.5.5 Submit Shop Drawings to Consultant and to the authority having jurisdiction for their review and approval.

1.6 Certificates
1.6.1 Submit certification as specified in Section 01 33 00 – Submittal Procedures.
1.6.2 Certificate: sealant manufacturer's letter of certification verifying that Products meet or exceed specified requirements.

1.7 Test Reports
1.7.1 Submit test reports as specified in Section 01 33 00 – Submittal Procedures.
1.7.2 Test Reports: certified laboratory reports, indicating that Products proposed for use conform to ASTM E814 and ULC-S115, and are so classified by the Underwriter's Laboratories of Canada or Warnock-Hersey International.

1.8 Quality Assurance
1.8.1 Manufacturer's Design Engineer: with experience in the province of Ontario and having a minimum of 10 years documented experience designing firestop and smoke seal systems.
1.8.2 Applicator:
   .1 Shall be qualified in the application of the Work of this Section and approved by the material manufacturer.
   .2 Shall have a minimum of 5 years' continuous experience successfully completing projects similar in size and complexity as the Work of this Section.
1.8.3 Firestopping compounds shall not contain volatile solvents or require special application to protect plastic pipe from firestopping compound.

1.9 Pre-Installation Meeting
1.9.1 Prior to commencement of firestopping, arrange and conduct a pre-installation meeting as specified in Section 01 10 00 - Summary.
1.9.2 Pre-installation Meeting: discuss proposed methods and materials to be used in all instances.
1.9.3 Representatives of the Agency, Consultant, Contractor, installer, manufacturer and the authority having jurisdiction are to be in attendance.
1.9.4 Do not conduct meeting unless all identified parties are present.
1.10 **Mock-Ups**

1.10.1 Construct job site mock-up as specified in Section 01 40 00 – Quality Requirements.

1.10.2 Apply one sample seal on representative substrates on each site for each fire rating required at each type of wall, floor or roof construction.

1.10.3 Comply with Project requirements as to thickness and density of application to achieve fire rating.

1.10.4 Proceed with installation only after Consultant has reviewed and accepted mock-up.

1.10.5 Acceptable mock-up may remain as part of the completed Work as standard.

1.11 **Delivery, Storage And Handling**

1.11.1 Refer to Section 01 61 00 – Common Product Requirements.

1.11.2 Deliver Products to the Place of the Work in their original unopened packages.

1.11.3 Store Products in an enclosed shelter, preventing damage to containers.

1.12 **Project Conditions**

1.12.1 Do not apply sealants when temperature of substrate material and surrounding air is below 5 degrees C.

1.12.2 Maintain sealant at a minimum 18 degrees C for best workability.

2. **PRODUCTS**

2.1 **Manufacturers**

2.1.1 Manufacturers of firestopping and smoke seals having Product considered acceptable for use:

.1 Flamemaster Corp.
.2 Thermal Ceramics
.3 3M Canada
.4 Tremco
.5 A/D Fire Protection Systems Inc.
.6 Dow-Corning Canada Inc.
.7 Hilti Canada.
.8 Or Agency approved equivalent

2.1.2 Substitution Procedures: refer to Section 01 25 00 – Substitution Procedures.

2.2 **System Description**

2.2.1 Firestopping and smoke seals are a complete and integrated system. Provide complete system for each installation.

2.2.2 Provide firestopping and smoke seals within mechanical (i.e.: inside ducts, dampers) and electrical assemblies (i.e.: inside bus ducts) as part of the Work of Divisions 22, 23, 26, 27 and 28 respectively. Firestopping and smoke seals around the outside of such mechanical and electrical assemblies where they penetrate rated fire separations shall be part of the Work of this Section.
2.2.3 Firestopping Materials: tested to ULC-S115 to achieve the required fire rating in accordance with ULC or Warnock Hersey Design Numbers.

2.2.4 Work of this Section comprises firestopping and smoke seal materials and systems to provide closures to fire and smoke at openings around penetrations, at unpenetrated openings, at projecting or recessed items, and at openings and joints within fire separations and assemblies having a fire-resistance rating, including openings and spaces at perimeter edge conditions.

2.2.5 Provide seals to form draft tight barriers to retard the passage of flame and smoke.

2.2.6 The installed seal shall provide and maintain a fire resistance rating equivalent to the rating of the adjacent floor, wall or other fire separation assembly to the requirements of and acceptable to the authorities having jurisdiction, and the Consultant.

2.2.7 ULC systems used must provide a flame, temperature in cable and cable tray penetrating and hose stream rating in accordance with those outlined in the applicable codes and provide an effective barrier against the passage of flame, smoke and gases.

2.2.8 All firestopping seals except for wall joints in visible areas must be of an easily identifiable colour, to be clearly distinguished from other building materials.

2.2.9 For firestopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control, use an elastomeric seal. Do not use a cementitious or rigid seal at such locations, unless penetrant is isolated by firestop pipe insulation or mechanical movement isolators.

2.2.10 Firestopping and smoke seals at joints and spaces designed and required to allow movement: A flexible, elastomeric seal suitable to withstand the required movement and capable of returning to original configuration without damage to the seal and without adhesive or cohesive failure; do not use a cementitious or rigid seal at building movement joints, sway joints, deflection spaces, control joints, expansion joints, and other such locations, unless used to minimize non-moving part of seal (i.e.: firestop mortar deck flute fill).

2.3 Materials

2.3.1 Firestop Sealant, Type A: non-sag; asbestos-free; single component sealant composed of high temperature ceramic fibers and organic and silica binders; ULC labelled; to ULC-S115 and CAN/ULC-S102-M.

2.3.2 Firestop Sealant, Type B: three component; epoxidized polyurethane terpolymer; accommodating joint movement of +40/-25 percent; ULC labelled; to CAN/CGSB-19.24-M and ULC-S115.

2.3.3 Firestop Sealant, Type C: three component; self-levelling; chemically curing polyurethane sealant; ULC labelled; to ULC-S115.
2.3.4 Firestop Sealant, Type D: single component; low modulus; silicone rubber; moisture curing; ULC labelled; to CAN/CGSB-19.13-M and ULC-S115.

2.3.5 Firestop Sealant, Type E: single component; modified polyurethane; moisture curing; ULC labelled; to CAN/CGSB-19.13-M and ULC-S115.

2.3.6 Primer: as recommended by sealant manufacturer for specific material, substrate and end use.

2.3.7 Firestop Insulation: to CAN/ULC-S702, Type 2; mineral fibre manufactured from rock or slag, suitable for manual application:

   .1 Density: 72 kg/m³ when tested to ASTM C303.
   .2 Combustibility: Non-combustible to CAN/ULC-S114.
   .3 Melt Temperature: greater than 1,175°C.
   .4 Surface Burning Characteristics: to CAN/ULC-S102, maximum flame spread of 0, smoke developed of 0.
   .5 Moisture Sorption: 0.04 percent when tested to ASTM C1104.
   .6 Smouldering Resistance: 0.01 percent when tested to CAN/ULC-S129.

2.4 Components

2.4.1 Provide firestopping and smoke sealing systems to ULC-S115 and as described below:

   .1 Asbestos free materials and systems fully capable of maintaining an effective barrier against gases, flame and smoke in compliance with ULC-S115, not exceeding opening sizes stated.

   .2 Service Penetration Assemblies: certified by ULC-S115 and used by ULC Guide 40 U19. Service components listed as certified in this guide are noted under Label Service of ULC.

   .3 Fire resistance rating of fire stopping material assembly must meet or exceed the fire resistance rating of the floor or wall section being penetrated.

   .4 Firestopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal; do not use a cementitious or rigid seal at such locations.

   .5 Damming and back up materials, supports and anchoring devices shall be to manufacturer's recommendations and in strict accordance with tested assembly being installed as acceptable to authorities having jurisdiction.

   .6 Sealants: non-sagging type for vertical joints.
3. **EXECUTION**

3.1 **Examination**

3.1.1 Confirm compatibility of surfaces to receive sealant materials.

3.1.2 Verify that surfaces of openings are sound, clean, dry and ready to receive application of sealant.

3.1.3 Verify that penetration elements are securely fixed and properly located.

3.1.4 Commencement of installation means acceptance of existing conditions.

3.2 **Preparation**

3.2.1 Protect adjacent surfaces and equipment from damage.

3.2.2 Clean contact surfaces of dirt, dust, grease, oil, loose material, or other matter that may affect bond of sealant.

3.2.3 Remove incompatible materials that affect bond by scraping, brushing, water or solvent cleaning, or sandblasting.

3.3 **Penetration Sizing**

3.3.1 The following shall regulate sizing of service penetrations to be fire stopped, in an effort to standardize and minimize penetration sizes:

   .1 Sleeve single, circular penetrations except in fire rated gypsum wallboard, under Work of mechanical and electrical.

   .2 Multiple penetrations of circular elements are defined as more than one circular penetration having a maximum space of 100 mm between closest faces of such penetrating elements. Forming of such multiple penetrations is responsibility of respective sections whose service penetrates the rated assembly, and such formed opening shall be a square or rectangular frame around a group of penetrations in which maximum clearance between outer penetration element and face of opening shall be 25 mm. This also applies to single circular penetrations in fire rated gypsum wallboard.

   .3 Fire rated pipe insulation, where applied is to be considered penetrant requiring above mentioned amounts.

   .4 Square penetrations shall be created in same manner as the above mentioned multiple circular penetrations, but the edge clearance may be increased to maximum 50 mm.

   .5 Exception: At fire dampers, clearances are governed by testing authorities’ requirements.

3.4 **Application**

3.4.1 Install mineral fibre insulation in compacted thicknesses required by ULC design. Compress insulation approximately 33 percent.

3.4.2 Apply sealant in strict accordance with manufacturer’s instructions and ULC certification.
3.4.3 Coordinate and cooperate with adjacent, contiguous and related materials Work, such as concrete, drywall, plumbing, conduit, electrical wiring, communication systems, etc., to ensure a proper and timely installation.

3.4.4 Seal holes or voids made by penetrating items to ensure an effective fire and smoke barrier.

3.4.5 Seal all intersections and all penetrations of floors, ceilings, walls and columns.

3.4.6 Seal around all cut-outs for lights, cabinets, pipes and plumbing, ducts, electrical boxes, etc.

3.4.7 Wrap non-insulated heated pipes that may be subject to movement with a non-combustible smooth material to permit the pipe to move without damaging the firestopping and smoke seal.

3.4.8 Maintain the integrity of any insulation and vapour retarders on insulated pipes and ducts at the fire separation.

3.4.9 Where floor openings exceed 100 mm in width and may be subjected to traffic or loading, install cover plate systems capable of supporting same loading as floor.

3.4.10 Apply tags on each mechanical and electrical seal, either on penetrant(s), on seal or next to seal, at Contractor’s option. Wall seals require tags on each side. Tag floor seals on the top only. Tags need not exceed 19.4 cm² in size but shall state seal number, installation date, installer’s initial and the following text, “Firestop system not to be severed unless prepared to repair immediately”.

3.5 Field Quality Control

3.5.1 Perform field testing and inspection as specified in Section 01 40 00 – Quality Requirements.

3.5.2 Conduct inspections to ASTM E2174.

3.5.3 Examine finished penetrations to ensure proper installation before concealing or enclosing any areas of Work.

3.5.4 Keep areas of Work accessible until inspection has been completed.

3.5.5 Manufacturer’s Field Service: inspect to verify and confirm that systems installation is in strict accordance with manufacturer’s and ULC requirements.

3.5.6 Correct unacceptable Work and provide further inspection to verify compliance with requirements.

3.6 Cleaning

3.6.1 Immediately remove all spots, smears, stains, residues, adhesives, etc., from the Work of this Section and from upon adjacent areas or surfaces which resulted from the Work of this Section.

3.6.2 Upon completion of firestopping, remove debris, trash, containers, residue, remnants and scraps from the Place of the Work.

3.6.3 Cleaning to be free of volatile solvents. Leave the Work in a clean and satisfactory condition.
3.7 **Protection**

3.7.1 After installation, and until Agency occupancy, protect the rated firestop systems from damage.

3.7.2 Remove damaged materials and replace with new, undamaged Product, at no additional cost to Agency.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**
   1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes**
   1.2.1 Joint Sealants.

1.3 **Related Sections**
   1.3.1 Section 06 40 00 - Architectural Woodwork: sealants used in conjunction with counters and casework.
   1.3.2 Section 07 84 00 - Firestopping: firestop sealants.
   1.3.3 Section 08 11 00 – Metal Doors and Frames: sealants used in conjunction with hollow metal frames.
   1.3.4 Section 08 80 00 – Glazing: sealants used in conjunction with glazing methods.
   1.3.5 Section 09 21 16 - Gypsum Board Assemblies: acoustical sealants.
   1.3.6 Section 09 51 00 - Acoustical Ceilings: sealants used in conjunction with suspended metal ceiling systems.
   1.3.7 Section 22 05 00 – Common Work Results for Plumbing: sealants used in conjunction with water supply and drainage components.

1.4 **References**
   1.4.2 CAN/CGSB-19.13-M87: Sealing Compound, One Component, Elastomeric, Chemical Curing.
   1.4.4 CAN/CGSB-19.22-M89: Mildew Resistant Sealing Compound for Tubs and Tiles.
   1.4.5 CAN/CGSB-19.24-M90: Multicomponent, Chemical Curing Sealing Compound.

1.5 **Submittals**
   1.5.1 Submit Product data and samples as specified in Section 01 33 00 – Submittal Procedures.
   1.5.2 Submit manufacturers’ test data as specified in Section 01 40 00 – Quality Requirements.

1.6 **Quality Assurance**
   1.6.1 Applicator: a recognized specialized applicator having skilled mechanics, thoroughly trained and competent in all phases of caulking Work, and a member in good standing of the Caulking Contractor's Association of Ontario.
1.7 **Pre-Construction Meeting**

1.7.1 Conduct a pre-construction meeting as specified in Section 01 10 00 - Summary.

1.7.2 Representatives of the Consultant, Contractor, applicator, and sealant manufacturer(s) are to be in attendance.

1.7.3 Confirm prior to application that correct Products and methods are being used in specific instances.

1.8 **Delivery, Storage and Handling**

1.8.1 Refer to Section 01 61 00 – Common Product Requirements.

1.8.2 Deliver and store Products in undamaged and original containers, with labels intact and showing the manufacturer's name, brand, colour, etc.

1.8.3 Ensure at time of use that Products are still within recommended shelf life.

1.8.4 Maintain storage area at a temperature in accordance with manufacturer's recommendations.

1.9 **Environmental Conditions**

1.9.1 Do not install solvent curing sealants in enclosed building spaces.

1.9.2 Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.10 **Warranty**

1.10.1 Submit extended warranties in accordance with the General Conditions of the Contract.

1.10.2 Extended System Warranty: for a period of two years, including coverage against delamination, cracking, running, loss of adhesion and cohesion, blistering, peeling, colour change and staining.

1.10.3 Extended Manufacturer Warranty: for a period of 10 years, including coverage against failure of the sealant material to achieve air tight and watertight seal, exhibit loss of adhesion or cohesion, maintain stability, or not cure.

2. **PRODUCTS**

2.1 **Manufacturers**

2.1.1 Manufacturers of joint sealants having Products considered acceptable for use:

.1 CSL Silicones Inc.
.2 Dow Corning.
.3 Momentive
.4 Sika Canada Inc.
.5 Tremco Canada.
.6 Or Agency approved equivalent

2.1.2 Substitution Procedures: refer to Section 01 25 00 – Substitution Procedures.
2.2 **System Description**

2.2.1 Remove sealant from existing joints indicated and clean joints.

2.2.2 Seal all areas indicated on Drawings, in list following and where required to make building watertight and weathertight:

.1 Exterior and interior of masonry control joints. If these are not indicated assume 8000 mm on centres for full height of wall.

.2 Abutting masonry walls.

.3 Both sides of hollow metal frames.

.4 Interior and exterior of aluminum window and door frames.

.5 All pipes, grilles and equipment passing through walls.

.6 Joint where two different materials abut.

.7 Exterior carpentry (fascias, trim).

.8 Plumbing fixtures.

.9 Acoustical sealants.

.10 The perimeter of housekeeping concrete pads for mechanical and electrical equipment.

2.3 **Materials**

2.3.1 Sealant A: 2-part, polysulphide; CAN/CGSB-19.24-M, Type 2, Class B

2.3.2 Sealant B: (non-sag, for non-glazing) 2-part, polysulphide; CAN/CGSB-19.24-M, Type 2, Class A

2.3.3 Sealant C: (non-sag, for glazing) 1-part, acrylic emulsion latex CAN/CGSB-19.17-M.

2.3.4 Sealant D: 1-part, chemical curing, silicone CAN/CGSB-19.22-M

2.3.5 Sealant E: 1-part, moisture curing, polyurethane CAN/CGSB-19.13-M

2.3.6 Joints In Washrooms, Locker Rooms, Showers, Etc.

.1 Sealant: Mildew Resistant

.2 Acceptable products:

.1 Silicone Sanitary Sealant (1702 Series) by Momentive

.2 786 by Dow Corning.

.3 Tremoil 600 by Tremco

.4 or Agency approved equivalent.

2.3.7 Sealing Around Piping, Ductwork, Conduit, Etc. Passing Through Fire Rated Walls and Floors

.1 Sealant: One-part silicone elastomer.

.2 Acceptable products:

.1 Pensil 851 by Momentive.

.2 Fire stop No. 2000 by Dow Corning.

.3 Fyre - Sil by Tremco.

.4 Fire stop by Hilti

.5 or Agency approved equivalent.
2.3.8 Sealing Around Multiple Cables and Conduits Passing Through Fire Rated Walls and Floors
   .1 Sealant: Two-part silicone elastomer.
   .2 Acceptable products:
       .1 Fire stop foam No. 2001 by Dow Corning.
       .2 or Agency approved equivalent.

2.3.9 Acoustical Sealant
   .1 Sealant: Blend of synthetic rubbers.
   .2 Use: Acoustical sealants around perimeter of partitions and electrical boxes, panels, etc., and openings in partition systems requiring acoustical treatment.
   .3 Product: Non-hardening acoustical sealant by Tremco or Agency approved equivalent.

2.3.10 Thinners and Primers: type compatible with appropriate sealant and substrate as recommended by manufacturer.

2.3.11 Cleaning material: As recommended by manufacturer.

2.3.12 Joint backing material: preformed, compressible, resilient, non-staining foam compatible with primers, sealants, outsize 30 percent, polyethylene, extruded closed cell foam, Shore "A" hardness 20, tensile strength 20-30 psi, such as PRC Backer Rod or equal. Outsize 50 percent, polyethylene, extruded open cell foam, Shore "A" hardness 10, tensile strength 140-150 psi, such as PRC open cell or Agency approved equivalent.

2.3.13 Bond breaker: where joint configuration does not allow for proper depth/width ratio with the use of backer rod (see Section 3.2.5.) - a pressure sensitive plastic tape such as 3M #226 or #481 or Agency approved equivalent which will not bond to the sealant shall be placed at the back of the joint.

2.3.14 Sealant Colours: as selected by Consultant from manufacturers’ extended colour range.

3. EXECUTION

3.1 Examination
   3.1.1 Commencement of Work implies total acceptance of surface and site conditions.
   3.1.2 Thoroughly examine surfaces scheduled to receive sealants to ensure that they are dry, clean, level; free from cracks, ridges, dusting, scaling, carbonation, mortar droppings, parging, curing compounds, rust, grease, oil, paint or other foreign material likely to impair adhesion, performance or appearance.
   3.1.3 Test substrate for adhesion and staining if any doubt exists.
   3.1.4 Verify at the site that joints and surfaces have been provided as specified under the Work of other Sections; and that joint conditions will not adversely affect execution, performance or quality of completed Work; and that they can put into acceptable condition by means of preparation specified in this Section.
3.1.5 Ascertain that sealers and coatings applied to sealant substrates are compatible with sealant used and that full bond between the sealant and substrate is attained.

3.1.6 Request samples of the sealed or coated substrate from their fabricators for testing of compatibility and bond if necessary.

3.1.7 Verify that specified environmental conditions are ensured before commencing Work.

3.1.8 Ensure that releasing agents, coating or other treatments have either not been applied to joint surfaces or that they are entirely removed.

3.1.9 Defective Work resulting from application to unsatisfactory joint conditions will be considered the responsibility of the Contractor.

3.1.10 Protect adjacent Products from damage, and make good any resulting damage in accordance with the Contract Documents.

3.2 **Preparation**

3.2.1 Remove dust, paint, loose mortar and other foreign matter and dry joint surfaces.

3.2.2 Remove dust, silt, scale and coating from ferrous metals by wire brush, grinding or sandblasting.

3.2.3 Remove oil, grease and other coating from non-ferrous metals.

3.2.4 Prepare concrete, masonry, glazed and vitreous surfaces as recommended by sealant manufacturer.

3.2.5 Examine joint sizes and modify to achieve proper width-to-depth ratio.

3.2.6 For joints wider than 50 mm, contact sealant manufacturer's representative for recommendations.

3.2.7 Install backer rod or apply bond breaker tape to achieve correct joint configuration.

3.2.8 Where necessary to prevent staining, mask adjacent surfaces with tape prior to priming and application of sealant.

3.2.9 Prime sides of joint in accordance with manufacturer's directions, immediately prior to sealing.

3.2.10 Prior to application, test each sealant with proposed substrate for indications of staining or poor adhesion.

3.2.11 At locations where another surface will cover the sealed joint (e.g. cove base) ensure the sealant is finished flush with adjacent surfaces.

3.3 **Quality of Work**

3.3.1 Quality of Work shall be in accordance with good practice and in strict compliance with the recommendations of the manufacturer of materials being used.

3.3.2 Check Work area for adequate light and heat.

3.3.3 Carefully mask adjacent surfaces, materials and items not scheduled to receive sealant, taking care to see that masking remains intact until application is complete. Remove masking immediately upon completion of caulking.

3.3.4 Do not apply sealant to substrate until thoroughly cured and dried.
3.4 **Application**

3.4.1 Prime sides of joints before placing joint backing. Use bond breaker where joint backing not required.

3.4.2 Mix and apply sealant in strict accordance with manufacturer's directions and under supervision of manufacturer's field representative.

3.4.3 Sealants shall be of gun grade or knife grade consistency to suit joint condition.

3.4.4 Apply sealants in accordance with manufacturer's directions, using a gun with proper size nozzle. Use sufficient pressure to fill voids and joints solid, as indicated on Drawings.

3.4.5 Form surface of the sealant with full bead, smooth, free from ridges, wrinkles, sags, and embedded impurities. Neatly tool surface to a slight concave joint.

3.4.6 Clean adjacent surfaces immediately and leave Work neat and clean. Remove excess and droppings using recommended cleaners as Work progresses. Remove masking tape immediately after tooling of joints.

3.4.7 In masonry cavity construction with an air seal, vent sealed joints from cavity to beyond external face of wall.

3.4.8 Superficial pointing with the skin bead is not acceptable.

3.4.9 Provide test results of pull test performed by the manufacturer representative before completion of sealant Work.

3.4.10 Promptly, as the Work proceeds and upon completion, clean-up and remove from the Place of the Work masking tapes, rubbish and surplus material.

3.5 **Schedule**

3.5.1 Sealant A and E:

- .1 Masonry to metal
- .2 Masonry to masonry
- .3 Masonry to stucco
- .4 Masonry to wood
- .5 Metal to metal
- .6 Wood to stucco

3.5.2 Sealant B:

- .1 Glass to all materials

3.5.3 Sealant C and E:

- .1 Gypsum board to gypsum board
- .2 Gypsum board to wood

3.5.4 Sealant D:

- .1 Plumbing fixtures to wall and floor surfaces

END OF SECTION
1. **GENERAL**

1.1 **Instructions**
   1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes**
   1.2.1 Supply only of:
   .1 Steel Frame Products including frames, transom frames (glazed or panelled), side light and window assemblies, fire labelled and non-labelled as indicated on Drawings and door schedule.
   .2 Steel doors, swing type, flush, glazed or louvred, fire labelled, with or without temperature rise ratings, and non-labelled as indicated on Drawings and door schedule.

1.3 **Related Sections**
   1.3.1 Section 06 20 00 – Finish Carpentry: Installation of frames, doors, surface mounted hardware and finishing hardware.
   1.3.2 Section 07 92 00 – Joint Sealants: sealing joints between frames and other building components.
   1.3.3 Section 08 70 00 – Hardware: Supply of finishing hardware.
   1.3.4 Section 08 80 00 – Glazing.
   1.3.5 Section 09 21 16 - Gypsum Board Assemblies: Gypsum board partitions.
   1.3.6 Section 09 90 00 – Painting and Coating.
   1.3.7 Section 26 05 00 – Common Work Results for Electrical: Wiring and / or conduit for electronic hardware in steel frame product.

1.4 **References**
   1.4.2 ASTM A653/A653M -03: Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   1.4.4 CGSB 41-GP-19Ma: Rigid Vinyl Extrusions for Windows and Doors.
   1.4.5 CAN/CSA-G40.21-04: Structural Quality Steel.
   1.4.7 CAN4-S104-M80: Fire Tests of Door Assemblies.

1.5 **Regulatory Requirements**
   1.5.1 Install fire labelled steel doors and frames products to NFPA 80.
1.6 **Shop Drawings**
1.6.1 Submit shop Drawings as specified in Section 01 33 00 – Submittal Procedures.
1.6.2 Shop Drawings: indicating type of door/frame/screen, material, steel core thickness, mortises, reinforcements and glazed openings and details. Include schedule identifying each unit, with door marks and numbers relating to numbering on Drawings and in door schedule.

1.7 **Quality Assurance**
1.7.1 Supply material manufactured to standards of Canadian Steel Door and Frame Manufacturers Association (CSDFMA) “Canadian Metric Guide for Steel Doors and Frames” (Modular Construction).
1.7.2 Fire rated doors frames glazing stops and fire door hardware shall bear U.L.C. labels. Refer to architectural Drawings for location of fire rated assemblies. All hollow metal Work in fire separations and fire walls shall be in accordance with NFPA 80 and CAN4-S104.

1.8 **Rejections**
1.8.1 Defective materials whenever found at any time prior to final acceptance of the Work shall be rejected regardless of previous site review. Site review will not relieve Contractor from responsibility but is a precaution against oversight and error.
1.8.2 Remove and replace defective materials and Work affected by this replacement at no additional cost to the Agency.

1.9 **Warranty**
1.9.1 Materials and quality of Work shall be warranted by Manufacturer in accordance with the CSDFMA members’ standard warranty for steel doors and frames.

2. **PRODUCTS**

2.1 **Materials**
2.1.1 Doors
.1 Acceptable Materials: All and only steel doors and frames product manufactured by CSDFMA members are eligible for use on this project.
.2 Minimum requirements for fire doors are that individual manufacturer’s proprietary designs must be successfully tested to CAN4-S104-M.
.3 Fire Rated Doors assembly and fire rated glazing stops, material and construction approved by ULC.
.4 Interior Door Faces: 1.2 mm base thickness as Commercial grade steel to ASTM A568, Class 1, hot-dip galvanized to ASTM A653, ZF75 (A25) coating designation, known commercially as “Colourbond”, “Satincoat” or “Galvanneal”. Minimum base steel thickness shall be as per Table 1 / CSDFMA.
.5 Use Z275 (G90) fully galvanized door faces on door numbers noted on the door schedule. Exterior Door Faces: 1.6 mm base thickness Commercial grade steel to ASTM A568, Class 1, hot-dip galvanized to ASTM A653, ZF75 (A25) coating designation, known commercially as “Colourbond”, “Satincoat” or “Galvanneal”. Minimum base steel thickness shall be as per Table 1 / CSDFMA.

.6 Cores for non-insulated interior doors: honeycomb structural core consisting of kraft paper having 20 mm cell size to thickness indicated to ULC Guide 40U8.8.

.7 Cores for insulated exterior doors: rigid, modified polyurethane or polyisocyanurate insulation, min. insulation value of RSI 1.9.

.8 Temperature Rise Rated (TRR): Core composition to limit temperature rise on the unexposed side of door to 250 degrees C at 30 or 60 minutes, as determined by governing building code requirements. Core to be tested as part of a complete door assembly to CAN4-S104 and shall be listed by a nationally recognized testing agency having a factory inspection service.

2.1.2 Frames

.1 Frames: 1.6 mm base thickness steel, zinc wipe coated steel for interior door frames and fully galvanized to Z275 (G90) for exterior door frames.

.2 Frames shall be blanked, reinforced, drilled and tapped for mortised, templated hardware minimum steel thickness.

.3 Mortised cutouts shall be protected with steel guard boxes minimum steel thickness 1.2 mm.

.4 Frames shall be reinforced, where required, for surface mounted hardware. Drilling and Hardware reinforcing minimum steel thickness 3.5 mm, tapping is by others on site, at time of installation.

.5 Provide for appropriate anchorage to floor and wall construction. Each wall anchor shall be located immediately above or below each hinge reinforcement on the hinge jamb and directly opposite on the strike jamb. For rebate opening heights up to and including 1520 mm provide two anchors, and an additional anchor for each additional 760 mm of height or fraction thereof, except as indicated below. Frames in previously placed concrete masonry or structural steel shall be provided with anchors located not more than 150 mm from the top and bottom of each jamb, and intermediate anchors at 660 mm on centre maximum. Minimum anchors steel thickness 1.6 mm.

.6 Each door opening shall be prepared for single grey or black stud neoprene door silencers, three for single door openings, and two for double door openings.

.7 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.
.8 Fire labelled frame products shall be provided for those openings requiring fire protection ratings, as scheduled on the Drawings. Such products shall be tested to CAN4-S104-M and listed by a nationally recognized agency having a factory inspection service and shall be constructed as detailed in Follow-Up Service Procedures / Factory Inspection Manuals issued by the listing agency to individual manufacturers.

.9 Corrugated Steel Frame Tee Anchors: Thickness and design approved by ULC.

.10 Glazing Stops in Fire Rated Frames: Commercial grade 1.5 mm sheet steel thickness and ULC approved design. All approved design.

.11 Glazing Stops-Non-Fire Rated Doors and frames: Minimum 0.8 mm base thickness sheet metal with zinc finish as per door, tamperproof on exterior doors, screw fixed on interior doors.

.12 Reinforcing Channel: To CAN/CSA-G40.21, Type 300W.

.13 Primer: For touch up, rust inhibiting primer to CAN/CGSB-1.181.

.14 Frame Thermal Breaks: rigid polyvinylchloride extrusion to CGSB 41-GP-19Ma.

.15 Exterior Top Caps: rigid polyvinyl chloride extrusion to CGSB 41-GP-19Ma.

2.2 Fabrication

2.2.1 Fabricate doors, panels, screens and frames as detailed in accordance with Canadian Steel Door and Frame Manufacturers Association, “Specifications for Commercial Steel Doors and Frames”, for insulated, hollow steel and honeycomb core construction, except where specified otherwise.

2.2.2 Fabricate fire rated doors and frames in accordance with details, approved shop Drawings and ULC requirements at the time of printing.

2.2.3 Provide temperature rise doors where indicated in the door schedule. Doors shall have fire rated mineral cores as manufactured by Rockwool or Georgian Pacific.

2.2.4 Stiffen interior doors with honeycomb core, laminated to face sheets under pressure. Insulate exterior doors, using manufacturer's recommended adhesive and pressure.

2.2.5 Fabricate interior doors and frames of wipe coat galvanized steel.

2.2.6 Fabricate interior steel frames in minimum thickness of 1.6 mm thick sheet steel.

2.2.7 Fabricate exterior steel frames in minimum thickness of 1.6 mm thick sheet steel. Fabricate exterior steel frames as thermally broken units where indicated.

2.2.8 Grind welded corners and joints to flat plane, fill with metallic paste filler and sand to uniform smooth finish.
2.2.9 Close tops of exterior doors with steel caps in minimum thickness 1.6 mm so they are flush with face edges. Close top of interior doors with PVC caps.

2.2.10 Mortise, reinforce, drill and tap doors and reinforcements to receive hardware using templates provided by finish hardware supplier.

2.2.11 Doors shall have edge seams mechanically interlocked, adhesive assisted. Seams may be unfilled and visible.

2.2.12 Make provision for glass where indicated and provide glazing stops.

2.2.13 Provide astragals for pairs of doors in accordance with ULC requirements.

2.2.14 Protect strike and hinge reinforcements using guard boxes welded to frames.

2.2.15 Weld in two channel spreaders per frame, to ensure proper frame alignment.

2.2.16 Provide for anchorage of frames to floors. Provide 1.6 mm angle clips, with two holes for floor anchorage welded to frame.

2.2.17 Reinforce head of frames wider than 1200 mm.

2.2.18 Provide frames with manufacturer's proprietary anchorage system suitable to secure frame rigidly to wall assembly. Secure frames set into previously constructed concrete or masonry openings by countersunk expansion bolts at same centres as for adjustable Tee-anchors. Reinforce frame at fastening location to prevent indentation of frame by fastening device.

2.2.19 Construct rail and stile doors in same manner as flush doors.

2.2.20 Construct matching panels in same manner as doors.

2.2.21 Touch up galvanized doors and frames with primer where galvanized finish damaged during fabrication.

2.2.22 Chemically treat surfaces of plain steel doors and frames and apply one coat of primer.

2.2.23 Attach ULC labels to doors and frames requiring fire rating.

2.2.24 Install three bumpers on strike jamb for each single door and two bumpers at head for pairs of doors.

3. **EXECUTION**

3.1 **Installation**

3.1.1 This part does not apply to this Section. Doors and frames shall be installed by Section 06 20 00 – Finish Carpentry.

3.1.2 Install fire rated frames, doors and fire door hardware to NFPA 80.

3.2 **Frame Installation**

3.2.1 Isolate from each other dissimilar metals and metal from concrete or masonry to prevent electrolysis.

3.2.2 Set frames plumb, square, level and at correct elevation, maintaining door widths and heights. Install fire rated frames to NFPA 80.

3.2.3 Secure anchorages and connections to adjacent construction.
3.2.4 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreaders at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.

3.2.5 Make allowances for deflection to ensure structural loads are not transmitted to frames.

3.2.6 Install trims to cover cut concrete block ends in walls where new doors installed in existing block walls. Do not impede installation of finish floor and base to make good materials to match typical existing condition.

3.3 Door and Hardware Installation
3.3.1 Install hardware to standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers Association, as modified for special mounting height requirements for elementary schools.

3.3.2 Where door stop contacts door pulls, mount stop to strike bottom of pull.

3.4 Glazing Installation
3.4.1 Refer to Section 08 80 00 - Glazing for glazing.

3.5 Adjusting and Cleaning
3.5.1 Adjust operable parts for correct function.

3.5.2 Upon completion of the Work of this Section, all surplus materials and debris caused by the Work shall be removed from the site to the satisfaction of the Consultant.

END OF SECTION
1. GENERAL

1.1 Instructions
1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 Intent
1.2.1 Provide all articles, labour, materials, equipment, transportation, hoisting and incidental noted, specified or required to complete the Work of this Section.

1.3 Section Includes
1.3.1 Supply of wood doors indicated on Drawings.

1.4 Work Installed In This Section But Furnished By Others
1.4.1 Install the following materials furnished by other trades and shall bed and secure same as required.
   .1 Section 08 70 00 – Hardware: Supply of finishing hardware.

1.5 Related Sections
1.5.1 Section 06 20 00 – Finish Carpentry: Installation of doors, surface mounted hardware and finishing hardware.
1.5.2 Section 08 11 00 Metal Doors and Frames.
1.5.3 Section 08 70 00 – Hardware: Supply of finishing hardware.
1.5.4 Section 08 80 00 – Glazing.
1.5.5 Section 09 90 00 – Painting and Coating

1.6 References
1.6.1 Architectural Woodwork Manufacturer's Association of Canada (AWMAC) - wood doors.
1.6.3 Underwriter's Laboratories of Canada - "List of equipment and materials" Volume II Building Construction.

1.7 Rejections
1.7.1 Defective materials or quality of Work whenever found at any time prior to final acceptance of the Work shall be rejected regardless of previous inspection. Inspection will not relieve responsibility but is a precaution against oversight and error.
1.7.2 Remove and replace defective materials and Work affected by this replacement, at no additional cost to the Agency.

1.8 Delivery, Storage and Handling
1.8.1 Pile doors flat on level supports to prevent warping. Protect face of first door by placing plywood or cardboard between supports and door. Cover the top door and edges in a similar manner.
1.8.2 Store doors in a dry, well ventilated area. Doors stored for an extensive period of time shall have top and bottom edges sealed.
1.8.3 Lift doors on and off piles, never dragged across each other to prevent surface damage and scratching. Do not stand doors on end for storage.

1.9 **Warranty**
1.9.1 Institutional doors, three years.
1.9.2 Fire doors, life of the installation. Interior use only.

2. **PRODUCTS**

2.1 **Materials**
2.1.1 Provide new materials in perfect condition, free from defects impairing strength, durability or appearance.
2.1.2 All materials shall be new and in perfect condition, free from defects impairing strength, durability or appearance.

2.2 **Interior Flush Doors**
2.2.1 AWMAC Quality Grade Institutional.
2.2.2 Faces for Clear Finish: Veneer shall be clear maple, rotary cut.
2.2.3 Core Construction: one piece particle board to AWMAC Standards.
2.2.4 Stiles and rails shall be hardwood not less than 28 mm bonded to core where core is solid.
2.2.5 Doors and transoms shall be veneered matched.
2.2.6 Rabett joint between doors and transoms.
2.2.7 Door as manufactured by Baillargeon or Agency approved equivalent, wood door series 86

2.3 **Exterior Flush Doors**
2.3.1 AWMAC Quality Grade: Institutional.
2.3.2 Faces for Clear Finish: Veneer shall be rotary cut maple.
2.3.3 Core Construction: Laminated in accordance with AWMAC Quality Standards.
2.3.4 Door Vertical Edges: AWMAC Edge No. one.

2.4 **Finishing**
2.4.1 All wood doors to be factory finished offsite. Provide samples for approval of door finish.

3. **EXECUTION**

3.1 Install doors as specified in Section 06 20 00 – Finish Carpentry.

3.2 **Examinations**
3.2.1 Do not commence until openings to receive wood doors and frames are plumb and free from defects or foreign material liable to impair the performance or appearance of the completed installation.
3.2.2 Commencement of Work implies total acceptance of all surface conditions by the Contractor.
3.2.3 Waive any after claims by failure to comply with the above procedure of examination.
3.3 **Quality of Work and Installation**

3.3.1 Carry out installation of wood doors and frames by workers skilled in the Work and in strict accordance with the manufacturer's direction to produce a first class installation.

3.3.2 Condition doors to the average humidity of the location before hanging.

3.3.3 Trim all doors square and accurately as to size, individually inspected, benched, belt sanded and labelled.

3.3.4 Cut down doors to fit openings smaller than those for which they are manufactured.

3.3.5 When planing to fit, trim equally from door sides. If height is to be reduced more than 19 mm, trim equally from top and bottom, never more than 19 mm from bottom.

3.3.6 Bevel the lock edge, of the floor, approximately 3 mm for a 51 mm thick door, for proper clearance.

3.3.7 Hang doors so that they will operate freely without tension or free swing. Allow 5 mm clearance in overall opening width and 3 mm clearance at top to allow for swelling in extreme humidity.

3.3.8 Seal all door edges and routings for hardware.

3.3.9 Double seal, with exterior sealer, all exterior doors having edges and areas exposed for hardware and glazing openings.

3.3.10 In preparing a door for light and/or louver openings (when not factory produced) the edge of an opening should be not less than 127 mm from any edge of the floor. The total area of all openings in slab doors shall not exceed 40% of the total door area. Seal opening edges.

3.3.11 Install finishing hardware relating to wood doors supplied under Section 08 70 00 - Hardware.

3.4 **Cleaning**

3.4.1 Upon completion of the Work of this Section, all surplus materials and debris caused by the Work shall be removed from the site to the satisfaction of the Consultant.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**
   1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes:**
   1.2.1 Provide manual insulated sectional metal doors including but not limited to:
      .1 Insulated sectional overhead door.
      .2 Operating hardware, tracks and support

1.3 **Related Sections:**
   1.3.1 The following is included for reference only and shall not be presumed complete:
      .1 Section 04 20 00 – Masonry
      .2 Section 05 50 00 – Metal Fabrications

1.4 **References:**
   1.4.1 American Society for Testing and Materials (ASTM):
      .1 ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
      .3 ASTM E 283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

1.5 **Administrative Requirements:**
   1.5.1 Coordination:
      .1 Coordination under this Section shall be in accordance with General Conditions and Division 01.
      .2 Coordinate with other work having a direct bearing on the Work of this Section.

1.6 **Submittals**
   1.6.1 Submittals under this Section shall be in accordance with Section 01 33 00 - Submittals.
   1.6.2 Product Data:
      .1 Submit manufacturer's Product data sheets for Products proposed for use in the Work of this Section. Include printed technical data, installation instructions and general recommendations for all materials and components. Include certification indicating compliance of materials with project requirements.
1.6.3 Shop Drawings:
   .1 Submit engineered shop drawings indicating the following:
      .1 Plans and elevations of each door type including
         materials, operating mechanisms, opening
         dimensions and required tolerances, connection
         details, anchorage spacing, hardware locations, and
         installation details.

1.7 Closeout Submittals
   1.7.1 Submittals under this Section shall be in accordance with Section
       01 77 00.
   1.7.2 Operation and maintenance instructions:
      .1 Submit manufacturer’s maintenance instructions for
         incorporation into the operation and maintenance manuals.

1.8 Quality Assurance
   1.8.1 Manufacturers: Firm with minimum of 5 years’ experience in
      fabrication and installation of sectional metal doors. Manufacturers
      proposed for use, which are not named in these specifications,
      shall submit evidence of ability to meet performance and
      fabrication requirements specified, and include a list of five
      projects of similar design and complexity completed within the
      past 5 years.
   1.8.2 Installers: Installation of sectional doors shall be performed by the
      authorized representative of the manufacturer.

1.9 Delivery, Storage And Handling
   1.9.1 Refer to Section 01 61 00 – Common Product Requirements.
   1.9.2 Deliver and store materials undamaged in original cartons or
      wrappings.
   1.9.3 Store material in a secure, dry area.

1.10 Warranty
   1.10.1 Provide manufacturer’s standard door and operators System
      Warranty for 10 year against delamination of polyurethane foam
      from steel face and all other components for 3 years or 20,000
      cycles, whichever comes first.

2. PRODUCTS

2.1 Manufacturers
   2.1.1 The products of the following manufacturers are acceptable
      subject to conformance with the requirements of the Drawings,
      Schedules and Specification:
   2.1.2 Basis of Design:
      .1 ‘592 Series Thermacore Insulated Steel Doors’ by
         Overhead Door Corporation
2.1.3 Comparable Products from manufacturers listed herein will be accepted provided they meet requirements of this Specification:
   .1 Garaga Inc.; www.garaga.com
   .2 Raynor; www.raynor.com
   .3 Or Agency approved equivalents
2.1.4 Subject to conformance with the requirements of the Drawings, Schedules and Specifications, Products of other Manufacturers may be acceptable.
2.1.5 Submit all Substitutions in accordance with Section 01 25 00 – Substitution Procedures.

2.2 Materials
2.2.1 Sectional door assembly: Metal/foam/metal sandwich panel construction, with thermal break. Units shall have the following characteristics:
   .1 Panel thickness: 51 mm (2") minimum.
   .2 Exterior surface: Ribbed, textured.
   .3 Exterior steel: 0.38 mm (0.015"), hot-dipped galvanized.
   .4 End stiles: 16 gauge with thermal break.
   .5 Insulation: CFC-free and HCFC-free polyurethane, fully encapsulated.
   .6 Thermal value: minimum R-value of 17.
   .7 Air leakage: Air infiltration and exfiltration through door panel longitudinal joints shall not exceed 0.4 L/s/m² (0.08 cfm/ft²) at 75 Pa (1.56 psf) pressure difference when tested in accordance with ASTM E283-04(2012).

2.2.2 Finish:
   .1 Two coat baked-on polyester:
     .1 Color, Grey.

2.2.3 Track:
   .1 Provide track as recommended by manufacturer to suit loading requirements.

2.2.4 Hardware:
   .1 Rollers: Full floating hardened steel, ball bearing, size to suit track.
   .2 Roller brackets: Adjustable, minimum 2.5 mm (0.1") galvanized steel.
   .3 Hinges: 1.8 mm (14 gauge) minimum, heavy duty, bolted-on, galvanized steel.

2.2.5 Counterbalance:
   .1 Head shaft: Minimum 25 mm (1") diameter solid steel, with ball bearings at end gusset plate supports, and intermediate brackets as required to support shaft.
   .2 Drum: to suit height and weight of door.
   .3 Lift cable: 4.8 mm (3/16") diameter aircraft cable, 7 x 9 construction.
   .4 Springs:
     .1 10,000 cycle grade.
.5 Counterbalance: Torsion springs mounted on shaft designed to counterbalance weight of door so that door remains open at any position and arranged for convenient adjustment.

.6 Locking: keyed lock with interlock switch for automatic operator.

2.2.6 Sealant: Single component type to CAN/CGSB 19.13-M87.

2.2.7 Finish ferrous hardware items with minimum zinc coating of 305 g/m (10 oz/ft) to CAN/CSA G164-M92

2.2.8 Door seals:
   .1 EPDM bulb type strip at bottom section, and flexible seals at jambs and header.

2.2.9 Operation:
   .1 Manual operation:
      .1 Manual chain operated type.
      .2 Chain door shall be secured by means of chain lock.

2.2.10 Fabrication:
   .1 Fabricate work of this section with materials, and with component dimensions and gauges, reinforcing, attached anchors and fastenings of adequate strength to prevent warping, buckling, opening of joints and seams, loosening of hardware, distortion, and displacement within limits of intended and specified use.
   .2 Conceal and weld connections wherever possible.
   .3 Fit joints and junctions between components tightly and in true planes.
   .4 Isolate from each other dissimilar metals, and metal from concrete or masonry to prevent electrolysis. On aluminum, use bituminous paint in concealed locations and lacquer where exposed to view.
   .5 Finishing:
      .1 File and grind exposed welds smooth.
      .2 Zinc coating: Clean and smooth ground surfaces at welds, fill if necessary, and prime all areas from which zinc coating has been removed with zinc rich paint applied in a minimum thickness of 0.102 mm (0.004").

3. **EXECUTION**

3.1 **Examinations**

3.1.1 Examine all work of other Sections upon which the Work of this Section depends.

3.1.2 Report in writing to the Consultant any defects of surfaces or work prepared by other Sections which affect the quality or dimensions of the Work of this Section.

3.1.3 Do not proceed with Work of this Section until all unsatisfactory conditions have been rectified and site conditions are ready to receive work. Commencement of work implies acceptance of existing conditions and work by others.
3.2 **Installation**
3.2.1 Install doors and operators in accordance with door manufacturer's printed instructions.
3.2.2 Work shall be performed by qualified personnel approved by door manufacturer.
3.2.3 Secure guides to steel framing members, header box to side guides as per manufacturer's instructions.
3.2.4 Drill and tap door frames to receive hardware. Fasten door tracks and stops to door frame by means of machine bolts; welding will not be permitted.
3.2.5 Fit doors snugly to edges of jambs and heads of frames. Doors shall operate smoothly and freely under all conditions of operation. Door shall sit in any position in door opening and shall not drift upward or downward.
3.2.6 Furnish necessary appurtenances relating to door installation, including those required on door frames.
3.2.7 Upon completion of installation of doors and operating equipment, lubricate moving parts prior to putting door into operation. Supply oil to gear reduction units and grease sprockets, bearings, cables, link chains and door guides. Check and re-adjust as required, items of operating hardware, including weather stripping.

3.3 **Site Quality Control**
3.3.1 Non-Conforming Work:
   .1 Defective materials or quality of Work, whenever found, at any time prior to acceptance of the Work, shall be rejected regardless of previous inspection. Inspection will not relieve responsibility, but is a precaution against oversight or errors.
   .2 Remove and replace defective materials and Work affected by this replacement, at no additional cost to the Agency.

3.4 **Adjusting**
3.4.1 Adjust work of this section to ensure free-running, tightly closing and properly counterbalanced operation. Ensure that installation is free from warp, twist or other distortion. Lubricate operating hardware.
3.4.2 Refinish damaged or defective work so that no variation in surface appearance is discernible. Refinish work at site only if approved.

3.5 **Cleaning**
3.5.1 Clean work area daily in accordance with Section 01 74 00.
3.5.2 Remove all excess materials from site as Work proceeds and at completion.
3.5.3 On completion of the Work remove all tools, containers, surplus materials, equipment, waste, etc., and leave Site neat, clean and tidy to the satisfaction of the Owner.
3.5.4 Clean and make good surfaces soiled or otherwise damaged as a result of Work of this Section at no additional cost to the Owner.
3.5.5 Leave surfaces clean and ready for subsequent Work.

3.6 CLOSEOUT ACTIVITIES

3.6.1 Demonstration:

.1 Demonstrate the operation of all sectional metal doors to the satisfaction of the Consultant at the same time of acceptance of the completed work.

.2 Submit to the Owner a copy of proposed preventative maintenance program for overhead sectional metal doors and other related components requiring regular maintenance and check-ups.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**
1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes:**
1.2.1 Provide manual insulated sectional metal doors including but not limited to:
   .1 Insulated sectional overhead door.
   .2 Operating hardware, tracks and support

1.3 **Related Sections:**
1.3.1 The following is included for reference only and shall not be presumed complete:
   .1 Section 04 20 00 – Masonry
   .2 Section 05 50 00 – Metal Fabrications

1.4 **References:**
1.4.1 American Society for Testing and Materials (ASTM):
   .1 ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   .3 ASTM E 283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

1.5 **Administrative Requirements:**
1.5.1 Coordination:
   .1 Coordination under this Section shall be in accordance with General Conditions and Division 01.
   .2 Coordinate with other work having a direct bearing on the Work of this Section.

1.6 **Submittals**
1.6.1 Submittals under this Section shall be in accordance with Section 01 33 00 - Submittals.
1.6.2 Product Data:
   .1 Submit manufacturer’s Product data sheets for Products proposed for use in the Work of this Section. Include printed technical data, installation instructions and general recommendations for all materials and components. Include certification indicating compliance of materials with project requirements
1.6.3 Shop Drawings:
   .1 Submit engineered shop drawings indicating the following:
   .1 Plans and elevations of each door type including materials, operating mechanisms, opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.

1.7 Closeout Submittals
   1.7.1 Submittals under this Section shall be in accordance with Section 01 77 00.
   1.7.2 Operation and maintenance instructions:
      .1 Submit manufacturer’s maintenance instructions for incorporation into the operation and maintenance manuals.

1.8 Quality Assurance
   1.8.1 Manufacturers: Firm with minimum of 5 years’ experience in fabrication and installation of sectional metal doors. Manufacturers proposed for use, which are not named in these specifications, shall submit evidence of ability to meet performance and fabrication requirements specified, and include a list of five projects of similar design and complexity completed within the past 5 years.
   1.8.2 Installers: Installation of sectional doors shall be performed by the authorized representative of the manufacturer.

1.9 Delivery, Storage And Handling
   1.9.1 Refer to Section 01 61 00 – Common Product Requirements.
   1.9.2 Deliver and store materials undamaged in original cartons or wrappings.
   1.9.3 Store material in a secure, dry area.

1.10 Warranty
   1.10.1 Provide manufacturer’s standard door and operators System Warranty for 10 year against delamination of polyurethane foam from steel face and all other components for 3 years or 20,000 cycles, whichever comes first.

2. PRODUCTS

2.1 Manufacturers
   2.1.1 The products of the following manufacturers are acceptable subject to conformance with the requirements of the Drawings, Schedules and Specification:
   2.1.2 Basis of Design:
      .1 ‘592 Series Thermacore Insulated Steel Doors’ by Overhead Door Corporation
2.1.3 Comparable Products from manufacturers listed herein will be accepted provided they meet requirements of this Specification:
   .1 Garaga Inc.; www.garaga.com
   .2 Raynor; www.raynor.com
   .3 Or Agency approved equivalents

2.1.4 Subject to conformance with the requirements of the Drawings, Schedules and Specifications, Products of other Manufacturers may be acceptable.

2.1.5 Submit all Substitutions in accordance with Section 01 25 00 – Substitution Procedures.

2.2 Materials

2.2.1 Sectional door assembly: Metal/foam/metal sandwich panel construction, with thermal break. Units shall have the following characteristics:
   .1 Panel thickness: 51 mm (2") minimum.
   .2 Exterior surface: Ribbed, textured.
   .3 Exterior steel: 0.38 mm (0.015"), hot-dipped galvanized.
   .4 End stiles: 16 gauge with thermal break.
   .5 Insulation: CFC-free and HCFC-free polyurethane, fully encapsulated.
   .6 Thermal value: minimum R-value of 17.
   .7 Air leakage: Air infiltration and exfiltration through door panel longitudinal joints shall not exceed 0.4 L/s/m² (0.08 cfm/ft²) at 75 Pa (1.56 psf) pressure difference when tested in accordance with ASTM E283-04(2012).

2.2.2 Finish:
   .1 Two coat baked-on polyester:
     .1 Color, Grey.

2.2.3 Track:
   .1 Provide track as recommended by manufacturer to suit loading requirements.

2.2.4 Hardware:
   .1 Rollers: Full floating hardened steel, ball bearing, size to suit track.
   .2 Roller brackets: Adjustable, minimum 2.5 mm (0.1") galvanized steel.
   .3 Hinges: 1.8 mm (14 gauge) minimum, heavy duty, bolted-on, galvanized steel.

2.2.5 Counterbalance:
   .1 Head shaft: Minimum 25 mm (1") diameter solid steel, with ball bearings at end gusset plate supports, and intermediate brackets as required to support shaft.
   .2 Drum: to suit height and weight of door.
   .3 Lift cable: 4.8 mm (3/16") diameter aircraft cable, 7 x 9 construction.
   .4 Springs:
     .1 10,000 cycle grade.
.5 Counterbalance: Torsion springs mounted on shaft designed to counterbalance weight of door so that door remains open at any position and arranged for convenient adjustment.

.6 Locking: keyed lock with interlock switch for automatic operator.

2.2.6 Sealant: Single component type to CAN/CGSB 19.13-M87.

2.2.7 Finish ferrous hardware items with minimum zinc coating of 305 g/m (10 oz/ft) to CAN/CSA G164-M92

2.2.8 Door seals:
.1 EPDM bulb type strip at bottom section, and flexible seals at jambs and header.

2.2.9 Operation:
.1 Manual operation:
.1 Manual chain operated type.
.2 Chain door shall be secured by means of chain lock.

2.2.10 Fabrication:
.1 Fabricate work of this section with materials, and with component dimensions and gauges, reinforcing, attached anchors and fastenings of adequate strength to prevent warping, buckling, opening of joints and seams, loosening of hardware, distortion, and displacement within limits of intended and specified use.

.2 Conceal and weld connections wherever possible.

.3 Fit joints and junctions between components tightly and in true planes.

.4 Isolate from each other dissimilar metals, and metal from concrete or masonry to prevent electrolysis. On aluminum, use bituminous paint in concealed locations and lacquer where exposed to view.

.5 Finishing:
.1 File and grind exposed welds smooth.
.2 Zinc coating: Clean and smooth ground surfaces at welds, fill if necessary, and prime all areas from which zinc coating has been removed with zinc rich paint applied in a minimum thickness of 0.102 mm (0.004").

3. EXECUTION

3.1 Examinations
3.1.1 Examine all work of other Sections upon which the Work of this Section depends.

3.1.2 Report in writing to the Consultant any defects of surfaces or work prepared by other Sections which affect the quality or dimensions of the Work of this Section.

3.1.3 Do not proceed with Work of this Section until all unsatisfactory conditions have been rectified and site conditions are ready to receive work. Commencement of work implies acceptance of existing conditions and work by others.
3.2 **Installation**

3.2.1 Install doors and operators in accordance with door manufacturer's printed instructions.

3.2.2 Work shall be performed by qualified personnel approved by door manufacturer.

3.2.3 Secure guides to steel framing members, header box to side guides as per manufacturer's instructions.

3.2.4 Drill and tap door frames to receive hardware. Fasten door tracks and stops to door frame by means of machine bolts; welding will not be permitted.

3.2.5 Fit doors snugly to edges of jambs and heads of frames. Doors shall operate smoothly and freely under all conditions of operation. Door shall sit in any position in door opening and shall not drift upward or downward.

3.2.6 Furnish necessary appurtenances relating to door installation, including those required on door frames.

3.2.7 Upon completion of installation of doors and operating equipment, lubricate moving parts prior to putting door into operation. Supply oil to gear reduction units and grease sprockets, bearings, cables, link chains and door guides. Check and re-adjust as required, items of operating hardware, including weather stripping.

3.3 **Site Quality Control**

3.3.1 Non-Conforming Work:

.1 Defective materials or quality of Work, whenever found, at any time prior to acceptance of the Work, shall be rejected regardless of previous inspection. Inspection will not relieve responsibility, but is a precaution against oversight or errors.

.2 Remove and replace defective materials and Work affected by this replacement, at no additional cost to the Agency.

3.4 **Adjusting**

3.4.1 Adjust work of this section to ensure free-running, tightly closing and properly counterbalanced operation. Ensure that installation is free from warp, twist or other distortion. Lubricate operating hardware.

3.4.2 Refinish damaged or defective work so that no variation in surface appearance is discernible. Refinish work at site only if approved.

3.5 **Cleaning**

3.5.1 Clean work area daily in accordance with Section 01 74 00.

3.5.2 Remove all excess materials from site as Work proceeds and at completion.

3.5.3 On completion of the Work remove all tools, containers, surplus materials, equipment, waste, etc., and leave Site neat, clean and tidy to the satisfaction of the Owner.
3.5.4 Clean and make good surfaces soiled or otherwise damaged as a result of Work of this Section at no additional cost to the Owner.

3.5.5 Leave surfaces clean and ready for subsequent Work.

3.6 CLOSEOUT ACTIVITIES

3.6.1 Demonstration:

.1 Demonstrate the operation of all sectional metal doors to the satisfaction of the Consultant at the same time of acceptance of the completed work.

.2 Submit to the Owner a copy of proposed preventative maintenance program for overhead sectional metal doors and other related components requiring regular maintenance and check-ups

END OF SECTION
1. **GENERAL**

1.1 **Instructions**
   1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes**
   1.2.1 Installation of hardware supplied under the hardware allowance.

1.3 **Related Sections**
   1.3.1 Section 01 21 00 – Allowances
   1.3.2 Section 06 20 00 – Finish Carpentry.
   1.3.3 Section 06 40 00 – Architectural Woodwork.
   1.3.4 Appendix 5.12 and 5.13 - Hardware Schedules.

1.4 **Submittals**
   1.4.1 Hardware Schedule: Submit a hardware schedule showing a detailed list of finish hardware complete with a description, purpose, location of each hardware item, and hardware cut sheets.
   1.4.2 Templates: Upon award of Contract, furnish promptly to the Contractor, any patterns, templates, template information and manufacturer's literature required to the proper preparation for the application of hardware, in ample time to facilitate the progress of the Work.

1.5 **Delivery, Storage and Handling**
   1.5.1 Deliver materials undamaged, in original wrappings or containers with manufacturer's labels and seals intact.
   1.5.2 Pack finishing hardware for each floor, etc., where possible, in the same carton complete with all screws, expansion shields and necessary fittings for fixing same.
   1.5.3 Clearly label cartons and packages designating contents and locations for which each item is intended. Indicate on packing memos carton in which each item is packed.

1.6 **Rejections**
   1.6.1 Defective materials or quality of Work whenever found at any time prior to final acceptance of the Work shall be rejected regardless of previous inspection. Inspection will not relieve responsibility but is a precaution against oversight and error.
   1.6.2 Remove and replace defective materials and Work affected by this replacement, at no additional cost to the Agency.

1.7 **Extra Materials**
   1.7.1 At the completion of the Work, supply Agency with the following:
      .1 Two sets of manufacturer's instructions for door closers, locksets, door holders and panic hardware.
2. **PRODUCTS**

2.1 **Materials**

2.1.1 Provide new materials in perfect condition, free from defects impairing durability or appearance. In every case hardware shall be of quality design, and finish suitable for the purpose for which it is intended.

2.1.2 Fastenings

.1 Provide hardware complete with screws, bolts, expansion shields and other fastening devices as required for the satisfactory installation and operating of the hardware.

.2 Provide fastening devices of the same finish as the hardware which is to be fastened.

2.1.3 Keying

.1 Lay out the keying system for the building in consultation with the Consultant and the Agency. Keying system shall include keying alike, keying differently, keying in groups, master keying and grand master keying locks as required. The Agency follows ASSA ABLOY system.

.2 Keying chart and related explanatory data shall be prepared to the current system used by the Agency and submitted to the Consultant for approval, and lock Work shall not be commenced until written confirmation of keying arrangements is received from the Consultant.

2.2 **Shop Finishes**

2.2.1 Provide hardware of type and finish in accordance with, and equal in all respects to the samples of hardware and finishes approved by the Consultant.

2.2.2 Metal finishes shall be free from defects, clean and unstained, and of a uniform colour and finish for each type of finish required.

3. **EXECUTION**

3.1 **Adjusting**

3.1.1 The services of a competent mechanic shall be provided without additional cost to the Agency.

3.1.2 Inspect the installation of all hardware furnished under this Section and supervise all adjustments (by the trades responsible for fixing) which are necessary to leave hardware in perfect working order.

3.2 **Demonstration**

3.2.1 Demonstrate proper care of hardware to Agency as specified in Section 01 77 00 – Closeout Procedures, including:

.1 lubrication of locksets,

.2 adjustments of door closers,

.3 cleaning, and

.4 general maintenance.

END OF SECTION
1. GENERAL

1.1 Instructions
1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 Intent
1.2.1 Provide all articles, labour, materials, equipment, transportation, hoisting and incidental noted, specified or required, to complete the Work of this Section

1.3 Section Includes
1.3.1 Provide all of the glazing materials and products indicated on the Drawings and room finish schedule including but not limited to the following:
   .1 Float glass
   .2 Safety glass
   .3 Fire rated glass
   .4 Insulated glazed units
   .5 Glazing gasketry, sealants, tapes, vision strips
   .6 Glazing compounds and glazing putty.

1.4 Work Installed In This Section But Furnished By Others
1.4.1 All items required for glazing installation supplied by door and frame Contractor.

1.5 Related Sections
1.5.1 Section 08 11 00 Metal Doors and Frames.

1.6 References
1.6.1 CAN/CGSB-12.1-M90: Tempered or Laminated Safety Glass
1.6.2 CAN/CGSB-12.3-M91: Flat, Clear Float Glass
1.6.3 CAN/CGSB-12.5-M86: Mirrors, Silvered
1.6.4 CAN/CGSB-12.8-97: Insulating Glass Units
1.6.5 CAN/CGSB-12.11-M90: Wired Safety Glass
1.6.6 CAN/CGSB-12.9-M91: Glass Spandrel
1.6.8 ASCE 7 – Minimum Design Loads for Buildings and Other Structures
1.6.9 ASTM C-162: Standard Terminology of Glass and Glass Products
1.6.10 ASTM C-1048: Standard Specification for Heat-Treated Flat Glass – Kind HS, Kind FT Coated and Uncoated Glass
1.6.11 ASTM C-1376: Standard Specification for Pyrolitic and Vacuum Deposition Coatings on Flat Glass
1.6.12 ASTM E-2188: Standard Test Method for Insulating Glass Unit Performance

1.7 **Rejections**

1.7.1 Defective materials or quality of Work whenever found at any time prior to final acceptance of the Work shall be rejected regardless of previous inspection. Inspection will not relieve responsibility but is a precaution against oversight and error.

1.7.2 Remove and replace defective materials and Work affected by this replacement, at no additional cost to the Agency.

1.8 **Warranty**

1.8.1 Manufacturer’s Warranty for Coated-Glass Products: Manufacturer’s standard form, made out to the glass fabricator, in which the coated glass manufacturer agrees to replace coated glass units that deteriorate during normal use within the specified warranty period. Deterioration of the coated glass is defined as peeling and/or cracking, or discolouration that is not attributed to glass breakage, seal failure, improper installation, or cleaning and maintenance that is contrary to the manufacturer’s written instructions. Warranty Period: 10 years from date of Substantial Completion.

1.8.2 Manufacturer’s Warranty on Insulating Glass: Manufacturer’s standard form in which the insulating glass unit manufacturer agrees to replace insulating-glass units that deteriorate during normal use within the specified warranty period. Deterioration of insulating-glass units is defined as an obstruction of vision by dust, moisture, or a film on the interior surfaces of the glass caused by a failure of the hermetic seal that is not attributed to glass breakage, improper installation, or cleaning and maintenance that is contrary to the manufacturer’s written instructions. Warranty Period: 5 years from date of Substantial Completion.

1.8.3 Manufacturer’s Warranty on Laminated Glass: Manufacturer’s standard form in which the laminated glass manufacturer agrees to replace laminated glass units that deteriorate during normal use within the specified warranty period. Deterioration of laminated glass is defined as defects, such as discolouration, edge separation, or blemishes exceeding those allowed by ASTM C 1172 that are not attributed to glass breakage, improper installation, or cleaning and maintenance that is contrary to the manufacturer’s written instructions. Warranty Period: 10 years from date of Substantial Completion.

1.8.4 Warrant mirrors for a minimum of 5 years against silver deterioration.
1.9 **Submittals**

1.9.1 Shop Drawings and Product Data:

.1 Product data on glass types specified – structural, physical and environmental properties, size limitations, special handling or installation requirements.

1.9.2 System Description:

.1 Glass and glazing materials shall provide continuity of building enclosure vapour and air barrier.

.2 Size of glass to withstand dead loads and positive and negative live loads acting normal on plane of glass.

.3 Limit glass deflection to 1/200 (confirm) or flexure limit of glass with full recovery of glazing materials; whichever is less.

1.9.3 Samples: Submit two – 300 mm x 300 mm size, illustrating glass plastic units colouration and design.

1.9.4 Quality Assurance:

.1 Standards

.1 FGMA Standard

.2 IGMAC Standard

2. **PRODUCTS**

2.1 **Manufacturers**

2.1.1 The products of the following manufacturers are acceptable subject to conformance with the requirements of the Drawings, Schedules and Specification:

.1 Acceptable Glass Manufacturers and Products:

.1 AGC Glass Company North America; [www.us.agc.com](http://www.us.agc.com)

.2 Guardian Industries Canada Corp.; [www.guardian.com](http://www.guardian.com)

.3 Pilkington Building Products; [www.pilkington.com](http://www.pilkington.com)

.4 Vitro Architectural Glass; [www.vitroglazings.com](http://www.vitroglazings.com)

.5 Viracon; [www.viracon.com](http://www.viracon.com)

.6 Or approved equivalent

.2 Acceptable Sealant Manufacturers and Products:

.1 The Dow Chemical Company; www.dow.com

.2 Sika Canada Inc.; www.can.sika.com

.3 Tremco (Canada) Limited; www.tremcosealants.com

.4 Or approved equivalent

2.1.2 Subject to conformance with the requirements of the Drawings, Schedules and Specifications, Products of other Manufacturers may be acceptable.

2.1.3 Submit all Substitutions in accordance with Section 01 25 00 – Substitution Procedures.
2.2 **Materials**

2.2.1 Provide new materials in perfect condition, free from defects impairing strength, durability or appearance.

2.2.2 Verify and confirm, to the Consultant, that the glass being installed in the designated lights is of the type, weight and quality specified.

2.2.3 Float Glass:
- **.1** Float glass: to CAN/CGSB-12.3-M, B Quality
- **.2** 4mm (1/8") for sizes up to 2794mm (110 United inches).
- **.3** 5mm (3/16") for sizes up to 3302mm (130 United inches).
- **.4** 6mm (1/4") for sizes up to 4 sq.m. (45 sq.ft.)
- **.5** Draw lines shall run horizontally.

2.2.4 Safety Glass:
- **.1** Tempered safety glass: 6mm (1/4") thick; to CAN/CGSB-12.1-M, Type 2, heat treated.
- **.2** Laminated safety glass: 6mm (1/4") thick; to CAN/CGSB-12.1-M.

2.2.5 Fire Rated Glass:
- **.1** FireLite as manufactured by Nippon Electric Glass Company Ltd. or agency approved equivalent.
- **.2** Thickness: 5mm (3/16").
- **.3** Weight: 12.5 kg/m2 (2.56 lbs/ft2).
- **.4** Approximate Visible Transmission: 88 percent.
- **.5** Approximate Visible Reflection: 9 percent.
- **.6** Hardness (Vickers Scale): 700.
- **.7** Fire-rating: 20 minutes to 90 minutes.
- **.8** Impact Safety Resistance: None.
- **.9** Positive Pressure Test: UL 10C; passes.
- **.10** Surface Finish: Standard Grade is polished for a surface quality that is comparable to alternative fire-rated ceramics marketed as having a premium finish.

2.2.6 Glazing Films:
- **.1** Decorative glazing film for interior use, applied to glass or plastic material as visual decorative film. The finished film shall be coated to minimize the effects of scratching and abrasions that occur in normal daily activity and also include absorbers and inhibitors for the purpose of reducing ultra violet rays.
- **.2** Materials:
  - **.1** Material: Polyester and Vinyl, refer to Finish schedule for products.
  - **.2** Thickness: 2mil to 5mil
  - **.3** Adhesive: Acrylic, pressure-activated with air release channels, clear in colour.
  - **.4** Tensile strength: 5 lb/inch at 73°F
  - **.5** Chemical resistant: to mild alkalis, acids and salt. Resistance to water.
.6 Flammability: Surface burning characteristics when tested in accordance ASTM E 84, demonstrating film applied to glass rated Class A for Interior Use:
   .1 Flame Spread Index: no greater than 25.
   .2 Smoke Developed Index: no greater than 55.
.3 Acceptable products: Film Fasara Glass Finishes, FASARA SH2MACRX2 1270MM X 30M MAT CRISTA by 3M or Agency approved equivalent.

2.3 Accessories
2.3.1 Glazing sealant shall be Tremco “Proglaze”. P.R.C. “Rubber Calk 2000” or Agency approved equivalent.
2.3.2 Glazing Tape:
   .1 Lites under 1900 mm united inches Tremco “440” tape or Agency approved equivalent.
   .2 Lites over 1900 mm united inches Tremco “Polyshim” tape Agency approved equivalent.
2.3.3 Setting blocks: Neoprene or EPDM with a Shore “A” hardness of 80-90 durometer.
2.3.4 Shims and spacers: as recommended by the glass manufacturer.

3. EXECUTION
3.1 Examinations
3.1.1 Commence the Work of this division when surfaces specified to receive glazing are dry, clean, level; free from cracks, ridges, dusting, scaling, carbonation, mortar droppings, parging, curing, compounds, grease, oil, or other foreign material liable to impair adhesion, performance or appearance.
3.1.2 Commencement of Work implies total acceptance of all surface conditions.
3.1.3 Waive any after claims by failure to comply with the above procedure of examination.

3.2 Breakage
3.2.1 Make good any and all breakage resulting from faulty quality of Work.

3.3 Quality of Work
3.3.1 Remove protective coatings and clean contact surfaces with solvent and wipe dry.
3.3.2 Apply primer-sealer to contact surfaces.
3.3.3 Place setting blocks as per manufacturer’s instructions.
3.3.4 Install glass, rest on setting blocks, ensure full contact and adhesion at perimeter.
3.3.5 Install removable stops, without displacing tape or sealant.
3.3.6 Provide edge clearance of 3 mm minimum.
3.3.7 Insert spacer shims to center glass in space. Place shims at 600 mm OC and keep 6 mm below sight line.
3.3.8 Apply cap bead of sealant at exterior void.
3.3.9 Apply sealant to uniform and level line, flush with sightline and tooled or wiped with solvent to smooth appearance.

3.3.10 Do not cut or abrade tempered, heat treated, or coated glass.

3.4 **Glazing (Interior)**

3.4.1 Dry method - tape/tape:

.1 Cut glazing tape to length and install against permanent stop, project 1.5 mm above sightline.

.2 Place glazing tape on free perimeter of glass in same manner described above.

3.5 **Cleaning**

3.5.1 Remove all debris and tools from site upon completion and acceptance of the Work.

3.5.2 Final cleaning of glass will be done by the Contractor at the completion of the Work.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**
1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes**
1.2.1 Non-load-bearing steel stud partitions
1.2.2 Ceiling and bulkhead framing
1.2.3 Wall furring
1.2.4 Acoustic insulation in walls and ceilings
1.2.5 All gypsum wallboard
1.2.6 Gypsum wallboard trims

1.3 **Related Sections**
1.3.1 Section 06 10 00 – Rough Carpentry: Wood support systems.
1.3.2 Section 09 51 00 – Acoustical Ceilings.
1.3.3 Section 09 90 00 – Painting and Coatings

1.4 **References**
1.4.1 CAN/CGSB-71.25-M88: Adhesive, for Bonding Drywall to Wood Framing and Metal studs.
1.4.2 CAN/CSA-A82.27-M91: Gypsum Board.
1.4.3 CSA A82.31-M1980: Gypsum Board Application.
1.4.4 Gypsum Drywall Construction Handbook by Canadian Gypsum Company.

1.5 **Quality Assurance**
1.5.1 Employ fully trained mechanics who are regularly employed in this field.

1.6 **Rejections**
1.6.1 Defective materials or quality of Work whenever found at any time prior to acceptance of the Work shall be rejected regardless of previous inspection. Inspection will not relieve responsibility, but is a precaution against oversight and error.
1.6.2 Remove and replace defective materials and Work affected by this replacement, at no additional cost to the Agency.

1.7 **Delivery, Storage and Handling**
1.7.1 Refer to Section 01 61 00 – Common Product Requirements.
1.7.2 Deliver and store Products in a dry area under cover, in original wrappings, cartons or containers clearly marked as to type, colour and manufacturer.
1.7.3 Store gypsum board flat. Take care to avoid undue sagging damage to ends, edges, or surfaces. Avoid stacking unequal lengths together.
1.7.4 Store gypsum board so that it is not in contact with new concrete floors - use dunnage at 400 mm OC to raise board piles.

1.7.5 Provide separate disposal container for all gypsum products left over from construction. Arrange for recycling of gypsum materials with Product Supplier.

1.8 **Project Conditions**

1.8.1 Co-operate in co-ordinating Work of other Sections with Work of this Section, in order that the Work may proceed in an orderly and effective manner.

2. **PRODUCTS**

2.1 **Manufacturers**

2.1.1 The products of the following manufacturers are acceptable subject to conformance with the requirements of the Drawings, Schedules and Specification:

.1 Manufacturers of gypsum products having Products considered acceptable for use:
   .1 CertainTeed.
   .2 Canadian Gypsum Company.
   .3 G-P Gypsum Company.
   .4 or Agency approved equivalent.

.2 Manufacturers of metal studs, track, trim and accessories having Products considered acceptable for use:
   .1 Bailey Metal Products.
   .2 Canadian Gypsum Company.
   .3 Chicago Metallic.
   .4 Gordon Arch. Alum. Specialties.
   .5 Pittcon Industries.
   .6 Fire Trak Corp.
   .7 or Agency approved equivalent.

2.1.2 Subject to conformance with the requirements of the Drawings, Schedules and Specifications, Products of other Manufacturers may be acceptable.

2.1.3 Submit all Substitutions in accordance with Section 01 25 00 – Substitution Procedures.

2.2 **Materials**

2.2.1 Steel Studs: Minimum 0.55 mm hot dipped or electro-galvanized sheet steel at 400 mm OC, to ASTM C645; knockout pass-through holes at 460 mm OC; Flanges minimum 30 mm wide, edges bent back 90 degrees and doubled over; single length floor to ceiling.

2.2.2 Floor and Ceiling Track (standard application): Minimum 0.55 mm hot dipped or electro-galvanized sheet steel at 400 mm OC, to ASTM C645; Leg design minimum 25 mm high; width to suit studs. Provide deflection track as required to suit deflection anticipated by structural conditions.
2.2.3 Ceiling Track (deflection application): Inner and outer deflection type tracks; minimum 0.91 mm x size to fit 92 mm stud, and full galvanized G60 steel; by Bailey or Agency approved equivalent. Refer to Standard Details.

2.2.4 Ceiling Deflection Track and Firestop System: Fire Trak System by Fire Trak Corp., Kimball, MN (1-800-394-9875) or Agency approved equivalent. System shall include 16 gauge galvanized steel ceiling runner profile (Shadowline, Cavity Shadowline, Reveal or Cavity Reveal) and Fire Trak Stud Clips.

2.2.5 Furring Channels: 19 mm, 22 mm - minimum .55 mm G90 galvanized steel at 400 mm OC.

2.2.6 Fasteners: Manufacturer's standard, suitable for application intended.

2.2.7 Tie Wire: 1.6 mm galvanized soft annealed steel wire.

2.2.8 Hangers: 6 mm OD mild steel rods.

2.2.9 Carrying Channels: 39 mm x 19 mm - 1.6 mm G90 galvanized steel channel, for bulkhead construction.

2.2.10 Ceiling Suspension Systems

.1 Rigid "X" drywall suspension system by CGC Inc. or Agency approved equivalent.

.2 System shall be comprised of 30 mm x 24 mm tee sections of 0.60 mm steel and 73 mm x 22 mm cross channels of 0.38 mm hot dipped galvanized steel.

2.2.11 Furring Clips: Snap-on clips - 2.6 mm wire.

2.2.12 Partition Attachment to T-bar: Use partition attachment clips PACS15 (standard edge) or PACR15 (Reveal Edge) by CGC Interiors or Agency approved equivalent.

2.2.13 Gypsum Board: to CAN/CSA A82.27-M, as follows:

.1 Gypsum Board (GB or GWB): Conforming to ASTM C1396/C1396M. Unless indicated otherwise use 1200 mm (4') wide standard facing board in maximum continuous lengths up to 3600 mm (12'), beveled and/or tapered edges to suit design requirements with butted square ends:

.1 Gypsum Board (Walls): Provide 12.7 mm (1/2") thick gypsum board on wood framed construction unless otherwise noted.

.2 Gypsum Board (Ceiling): Provide 12.7 mm (1/2") thick with tapered edges unless otherwise specified use anti sag sheets.

.2 Fire Rated Gypsum Board having Testing Agency Fire Rating Identification Stamp on Each Sheet: ASTM C1396/C1396M, Type X, 12.7 mm (1/2") and/or 15.9 mm (5/8") thick gypsum board 1200 mm (4') wide, maximum practical length and tapered edge as required by each fire resistance assembly. “Gyproc Fireguard Type X or Type C” by Georgia-Pacific Canada, Inc., “CGC Sheetrock Firecode or Firecode C” by CGC Inc. or “ProRoc Type X or Type C” by CertainTeed Corporation or Agency approved equivalent.
.3 Moisture Resistant Gypsum Board (MRGB): ASTM C1658/C1658M, glass mat reinforced, silicone treated core gypsum board, ASTM D3273 with a rating of 10, no mould growth after 4 weeks exposure, 12.7 mm (1/2") or Type X, 15.9 mm (5/8") “DensArmor Plus® High Performance Interior Panel” by Georgia-Pacific Canada, Inc. or “CGC Sheetrock® Brand Glass-Mat Panel Mold Tough®” by CGC Inc. or Agency approved equivalent.

.4 Abuse-Resistant Board: 16 mm Sheetrock Abuse-resistant gypsum panels; tapered edges; panel weight minimum 0.001g/m².

2.3 Accessories
2.3.1 Corner Bead, Casing Bead "L" Type: 0.55 mm G90 galvanized sheet metal with perforated flanges.
2.3.2 Trim for curved drywall edges: (where shown on Drawings): STF-063 or STF-100 by Pittcon, or Agency approved equivalent; size to suit particular application.
2.3.3 Wall reveal trims: (where shown on Drawings)
   .1 within drywall face: SWR-038-063 by Pittcon, or Agency approved equivalent.
   .2 at drywall panel edge: STR-100-063 by Pittcon or Agency approved equivalent; size to suit particular application.
2.3.4 Wall cap for exposed wall ends (where required): SWC-358-8 (for 92 mm stud) by Pittcon, or Agency approved equivalent. Size to suit wall stud width.
2.3.5 Screws: Self-drilling, self-threading case hardened steel; length as recommended by board manufacturer for each application.
2.3.6 Adhesive: High strength, waterproof, compatible with materials; to CAN/CGSB-71.25-M.
2.3.7 Joint Filler: Casein, vinyl or latex base, slow setting, as recommended by board manufacturer.
2.3.8 Joint Tape: 50 mm wide perforated paper as recommended by board manufacturer.
2.3.9 Primer Sealer: Alkyd based material recommended by board manufacturer.

2.4 Acoustic Products
2.4.1 Resilient Channel: Minimum 0.55 mm G90 galvanized steel channel 400 mm OC designed to reduce sound transmission.
2.4.2 Acoustic Insulation: Minimum 89 mm thick, friction fit sound attenuation blanket by Owens Corning Canada, (non-combustible) or Agency approved equivalent, minimum density to achieve 0.95 with a 50 mm unfaced sample.
2.4.3 Neoprene Gasket (at partitions): Continuous 25 mm x 6 mm, 80 durometer hardness, black.
2.4.4 Acoustical Sealant: Acoustiseal manufactured by Mulco Incorporated or PR 181 manufactured by P.R.C. Chemicals or Agency approved equivalent.
2.5 **Expanded Security Mesh**

2.5.1 Security mesh to be ASM.50-BF maximum security level. SWD x LWD opening to be 6 mm x 25 mm at 6.8 kg/m², 57 percent open.

2.5.2 Install using Secura Clips.

2.5.3 Security mesh and clips are manufactured by Amico Security Products or Agency approved equivalent.

3. **EXECUTION**

3.1 **Examination**

3.1.1 Thoroughly examine all surfaces scheduled to receive Work of this Section to see that they are secure, rigid, true and not liable to impair performance or appearance of the Work.

3.1.2 Commencement of Work implies total acceptance of surface and site conditions.

3.2 **Preparation**

3.2.1 Make good any resulting damage, to the satisfaction of the Consultant, at no additional cost.

3.2.2 Maintain uniform temperature in Work area, adequate for Work being performed, as recommended by materials manufacturer.

3.2.3 Keep temperature as uniform as possible with deflectors or screens.

3.2.4 Provide air circulation if humidity is excessive. Avoid high temperature with low humidity. Avoid force drying.

3.2.5 Allow concrete and masonry to dry thoroughly before installing gypsum board.

3.2.6 Protect installed materials from weather and dampness.

3.2.7 Replace any damaged Work before further Work proceeds.

3.2.8 Promptly, as the Work proceeds and upon completion, clean-up and remove from the site all rubbish and surplus material resulting from the Work.

3.3 **Quality of Work**

3.3.1 Erect framing level, plumb and true; to a tolerance of 5 mm in 3 metres, and square with adjoining Work.

3.4 **Application**

3.4.1 **Framing System**

3.4.1.1 **Metal Stud Partitions**

3.4.1.1.1 Place studs vertically at 400 mm centres and not more than 50 mm from abutting walls, openings and each side of corners. Install studs in tracks at floors and ceiling.

3.4.1.1.2 Provide freedom for deflection under beams and structural slabs.

3.4.1.1.3 Permanently attach studs for cornice height partition to top and bottom track.

3.4.1.1.4 Full-height stud each side of opening.
.5 Erect track at head and/or sill of opening to accommodate intermediate studs above and/or below opening in same manner and spacing as wall studs. Screw fasten members together adjacent to openings.

.2 Deflection Head Allowance
.1 Allow for a maximum of 50 mm deflection under beams and structural slabs by utilizing outer and inner top tracks as per Standard Details in this Section.

.3 Fire Dampers in Fire Rated Partitions
.1 Frame openings for fire dampers required by the Contractor. Provide a 13 mm drywall filler piece inside the perimeter of opening before installation of the damper so as to maintain the partition fire rating.

.4 Ceiling Suspension System
.1 Hangers for suspended gypsum board ceilings shall support the grillage independent of walls, columns, pipes, ducts: erect plumb and securely anchor to the structural frame or imbed into concrete slabs.
.2 Install angle moulding at wall perimeter at a level above the finished ceiling line equal to the total thickness of wallboard to be used. Install only on walls perpendicular to cross channels.
.3 Hang main tees in parallel rows spaced 1220 mm apart and supported by hanger wires spaced 1220 mm apart at same level as angle moulding. Main tees in adjacent rows must have cross tee slots in perpendicular alignment.
.4 Install cross-channels by snap locking into position in perpendicular rows spaced 400 mm apart and not less than 200 mm from parallel walls. Fasten ends of cross-channels to angle moulding with screws or pop rivets.
.5 Fire rated assemblies shall have additional cross-channels within 200 mm of all butt joints and openings for ducts or light fixtures. Allowable percentage of openings and additional wallboard enclosures shall conform to U.L.C. design criteria.

3.4.2 Wall Furring
.1 Attach furring channels to masonry or concrete surfaces at 400 mm OC and not more than 100 mm from corners and openings.
.2 Wallboard Application: Always leave a 3 mm to 6 mm gap between wall board and floor.
3.4.3 Single Layer Board
   .1 Screw-on Application
   .1 Erect gypsum board horizontally or vertically on walls; across framing on ceilings; and secured to the framing with drywall screws at:
      1. Ceilings: 300 mm OC
      2. Walls: 300 mm OC along ends of board
             200 mm OC at perimeters of board
             300 mm OC through centre of board.
   .2 Where it must be applied parallel, support or furring must be provided at maximum 400 mm OC.
   .3 Allow for 6 mm gap between bottom of gypsum board and top of floor.
   .4 Ceiling board: 12.7 mm minimum thickness.

3.4.4 Double (Multi) Layer Cladding
   .1 Apply gypsum wallboard in alternating vertical and horizontal layers using backing board for base layer.
   .2 Screw-on Application
      .1 Apply base layer horizontally and screw fasten. Apply face layer vertically and screw fasten in the same manner as base layer.
      .2 Screw fastening spacing shall be at 300 mm, 600 mm centres.
      .3 Locate joints over framing and secure with screws.

3.4.5 Control Joints
   .1 Gypsum board surfaces should be isolated with control joints or other stress relief where:
      .1 partition or furring abuts a structural element or dissimilar wall or ceiling;
      .2 ceiling abuts a structural element, dissimilar wall or partition or other vertical penetration;
      .3 construction changes within the plane of the partition or ceiling;
      .4 partition or furring run exceeds 9 m;
      .5 ceiling dimensions exceed 15 m for drywall in either direction;
      .6 exterior soffit dimensions exceed 9 m in either direction;
      .7 wings of “L”, “U” and “T” -shaped ceiling areas are joined;
      .8 expansion or control joints occur in the structural elements of the building.
   .2 Ceiling-height door frames may be used as control joints, as may less-than-ceiling-height door frames if control joints extend to ceiling from both corners.
   .3 Leave a 13 mm continuous opening between gypsum boards for insertion of surface-mounted joint.
.4 Interrupt wood floor and ceiling plates with a 13 mm gap, wherever there is a control joint in the structure.
.5 Do not attach steel studs on one side of control joint.
.6 Provide separate supports for each control joint flange.
.7 Provide an adequate seal behind control joint where sound and/or fire ratings are prime considerations.
.8 Agree on exact locations of joints with the Consultant.
.9 Use drywall screws to fasten board to framing.
.10 Minimum fastener length to provide:
   .1 10 mm minimum penetration into steel framing.
   .2 16 mm minimum penetration into wood framing.
.11 Drive screws perpendicular to face of board with sufficient penetration of screw head to sink below the surface of board without breaking the paper face.
.12 Start securing board from the centre and Work towards perimeter.
.13 Hold board firmly to framing while fastening.
.14 Do not set unlike edges together; always mate square to square or tapered to tapered edges.
.15 Install casing bead at junction with dissimilar materials.

3.4.6 Sound Insulated Walls/Ceilings
.1 Install sound attenuation blanket within stud spaces of wall, where called for.
.2 Install sound attenuation blanket over wallboard ceiling suspension system where called for.
.3 Install resilient channel where called for transversely across framing members at 400 mm OC and not more than 150 mm from edges, fastened with drywall screws.
.4 Install 100 mm high strip of gypsum board of the appropriate thickness along base of partitions to ensure further discontinuity of sound transmission from floors into walls.
.5 Erect gypsum board with long length at right angles to channels.
.6 Do not screw board to channel directly over framing.
.7 Double layer:
   .1 Install base layer in normal fashion.
   .2 Install resilient channel as above, over base layer.
   .3 Fasten face layer to channels, keeping fastenings away from those of layer below.
.8 Seal edges and around openings with acoustical sealant so that trim will cover sealant.

3.5 Finishing
3.5.1 Install corner bead and other metal trims as required to finish board.
3.5.2 Fill and tape joints and fill over fastenings. Sand lightly.
3.5.3 Where painted surfaces are required fill and tape all joints and nail holes in the conventional manner. Allow to dry thoroughly and then skim coat all board surfaces by mixing the joint compound slightly thinner than for joint taping. Lightly cover the entire board surface using a trowel or board knife. Immediately scrape the excess joint compound off to fill surface texture and variations. Allow the skim coat to dry completely then carefully sand away any ridges in preparation for painting.

3.5.4 Leave finished Work smooth, plumb and true ready for painting (vinyl wall covering) by others.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**
   1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Intent**
   1.2.1 Provide all articles, labour, materials, equipment, transportation, hoisting and incidentals noted, specified or required, to complete the Work of this Section.

1.3 **Section Includes**
   1.3.1 Provide all ceramic tile and required accessories as indicated on the Drawings, room finish schedule, and colour schedule, including but not limited to, the following:
   .1 floor tiles.
   .2 wall tiles.
   .3 tile coves.
   .4 tile base.
   .5 grouting.
   .6 adhesives.
   .7 setting materials: Sand, cement, lime.
   .8 membranes under ceramic floor tiles.
   .9 ceramic accessories.
   .10 cleaning of ceramic tile installation.
   .11 Anti-fracture membrane and waterproof membrane.

1.4 **Related Sections**
   1.4.1 Section 04 20 00 – Unit Masonry.
   1.4.2 Section 09 21 16 – Gypsum Board Assemblies.
   1.4.3 Section 22 10 00 – Plumbing Piping and Pumps: floor drains.

1.5 **References**
   1.5.1 ANSI A108.5-2005: Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
   1.5.2 ANSI A118.3-2005: Water Cleanable Tile Setting and Grouting Epoxy.
   1.5.3 ANSI A118.4-2005: Latex-Portland Cement Mortar.
   1.5.4 ANSI A118.6-2005: Ceramic Tile Grouts.


1.5.18 ASTM C1028-06: Standard Test Method for Evaluating the Static Coefficient of Friction of Ceramic Tile, and Other Like Surfaces by the Horizontal Dynamometer Pull Meter Method.

1.5.19 CAN/CGSB-75.1-M88: Tile, Ceramic.


1.6 Rejections

1.6.1 Defective materials or quality of Work whenever found at any time prior to acceptance of the Work shall be rejected regardless of previous inspection. Inspection will not relieve responsibility, but is a precaution against oversight and error.

1.6.2 Remove and replace defective materials and Work affected by this replacement, at no additional cost to the Agency.

1.7 Submittals

1.7.1 Submit manufacturer test and performance data as specified in Section 01 33 00 – Submittal Procedures.

1.7.2 Manufacturer Test and Performance Data: indicating slip resistance, compressive strength, water absorption, coefficient of expansion, conductivity, and other pertinent values for each type of tile specified.

1.7.3 Do not commence Work until the performance data sheets are reviewed.

1.8 Samples

1.8.1 Submit samples as specified in Section 01 33 00 – Submittal Procedures.

1.8.2 Selection Samples: Supply 3 sets of tile sizes, shapes, and colours as specified.
1.9 **Mock-up**
1.9.1 Provide a mock-up of the final tile installation of the showers c/w rim, cove, and grout. Mock-up to extend around end walls. Provide four day review and acceptance by the Consultant.

1.10 **Close-out Submittals**
1.10.1 Submit three copies of the manufacturer’s maintenance instructions, for ceramic floor and wall tile, to the Consultant upon completion of the ceramic installation. Refer to Section 01 78 39 – Project Record Documents.

1.11 **Delivery, Storage and Handling**
1.11.1 Refer to Section 01 61 00 – Common Product Requirements.
1.11.2 Deliver and store Products in original cartons, clearly marked as to type, colour and manufacturer.
1.11.3 Store Products in a warm, dry area.
1.11.4 The Contractor will be responsible to insure the timely arrival of installation materials on site and will order the appropriate approved materials with sufficient lead time to insure that no delays are incurred due to late material procurement.

1.12 **Warranty**
1.12.1 Manufacturer’s Extended Warranty: Submit a written warranty stating that the products used on each assembly will be free from manufacturing defects so that these products will not breakdown or deteriorate for a period of five years from the date of substantial completion when installed in accordance with the manufacturers written Specifications and guidelines.
1.12.2 Provide a mock up the typical wall tile to floor tile transition at the showers and around the shower end walls. Provide for review no less than three weeks prior to full installation or use one shower at the mock up review. Allow two weeks for review and comment of the mock up.

2. **PRODUCTS**

2.1 **Manufacturers**
2.1.1 Refer to Finish Schedule 9000 series. Schedule located in Specification Section 00 01 13 Standard Details.
2.1.2 Subject to conformance with the requirements of the Drawings, Schedules and Specifications, Products of other Manufacturers may be acceptable.
2.1.3 Submit all Substitutions in accordance with Section 01 25 00 – Substitution Procedures.

2.2 **Performance Requirements**
2.2.1 Provide tile products manufactured and tested in accordance with ANSI A108.1 and ANSI A137.1 as appropriate to the Basis-of-Design Materials listed in Finishes Schedule.
2.2.2 Slip Resistance:
   .1 Provide tiles suitable for level interior spaces expected to be walked upon when wet having a minimum Dynamic Coefficient of Friction (DCOF) of 0.42 in accordance with ANSI A137.1 when tested using the BOT 3000 Digital Tribometer.
   .2 Provide tiles suitable for ramped interior spaces expected to be walked upon when wet having a minimum Dynamic Coefficient of Friction (DCOF) of 0.47 in accordance with ANSI A137.1 when tested using the BOT 3000 Digital Tribometer.

2.2.3 All installation assemblies will be composed of materials from the same manufacturer and be completely compatible.

2.2.4 Floor Traffic Load Bearing Performance: Provide installations rated for the following load bearing performance in accordance with ASTM C627 for ceramic tile installed on walkway surfaces:
   .1 Extra Heavy: Passes cycles 1 through 14
   .2 Heavy: Passes cycles 1 through 12

2.2.5 Frost Resistance: Provide exterior tiles having a maximum water absorption rating of 0.5% or less when measured in accordance with ASTM C373 for ceramic materials and ASTM C97 for dimensional stone or ISO 10545-3; submit proof of freeze-thaw stability for tile materials having water absorption higher than 0.5%.

2.2.6 Substrate and Backing Surface Flatness Tolerances: Work of this Section requires a flatness of FF25 for slabs on grade and FF20 for suspended slabs for in place concrete and is considered as the starting flatness for work of this Section; final measurement for flatness and level using mortar bed or self-levelling screed materials provided by this Section will be measured in same manner as specified in Section 03 35 00 to achieve the following:
   .1 Small Format Floor Tile: Tiles having dimensions less than 100 mm x 100 mm require floor flatness as specified in Section 03 35 00.
   .2 Standard Format Floor Tile: Tiles having dimensions from 100 mm x 100 mm and less than 400 mm x 400 mm require floor flatness measured to a minimum FF35; equivalent to 5 mm with no more than 2 gaps under a 3000 mm straightedge measurement.
   .3 Large Format Floor Tile: Tiles having dimensions 400 mm x 400 mm and larger require floor flatness measured to a minimum of FF50; equivalent to 3 mm with no more than 2 gaps under 3000 mm straightedge measurement.
   .4 Wall Tiles: Provide wall levelling similar to that specified for floors for tiles having similar sizes listed above.

2.2.7 Install tiles to comply with ANSI A108.5 (80% uniform bonding mortar contact between the tile and the substrate. 95% uniform bonding mortar contact for exterior application).
2.3 **Materials**

2.3.1 Refer to Finish Schedule for all tile product selections. All alternates to be prior approved. Finish Schedule located in Specification Section 00 01 13 – List of Standard Details, 9000 series.

2.3.2 Tiles:

.1 Conforming to ANSI A137.1, ISO 13006. Provide bullnoses, copings, caps, cove base, nosings, corner pieces, and other special units as specified, indicated, and required. Colour as selected by Consultant from manufacturer's full ranges. Provide tile with minimum following characteristics:

.1 Water Absorption: ASTM C373 - < 3.0%.
.2 Breaking Strength: ASTM C648 - > 250 lbs.
.3 Abrasion Resistance: ISO 10545-7 - Class Four Heavy Traffic.
.4 Scratch Hardness: MOH's - 7.
.5 Chemical Resistance: ASTM C650 - Resistant.

2.3.3 Crack Isolation Membrane:

.1 Crack Isolation Membranes: Load bearing, membrane meeting requirements of ANSI A 118.12; thickness as recommended by manufacturer to accommodate in-plane substrate movement of 3 mm in thin set applications meeting or exceeding requirements of ANSI A108.1 and as follows:

.1 “Ardex 8+9 Crack Isolation and Waterproofing” by Ardex
.2 “WP-980 Crack Isolation Membrane” by Flextile Ltd.,
.3 “Mapelastic Crack Isolation Membrane” by MAPEI,
.4 “HYDRO BAN Crack Isolation Membrane” by Laticrete,
.5 “Ditra” membrane – Schluter.
.6 or Agency approved equivalent.

2.3.4 Patching and repair:

.1 Polymer-modified, cement-based patching compound; Ardex TL Patch Underlayment Patch and Skimcoat or Planipatch by Mapei, or Agency approved equivalent.

2.3.5 Self-Levelling Underlayment (Levelling or Repair requiring 1/2" up to 4"):

.1 For thickness up to 1/2", "Flex-Flo 59" Self-Leveling Underlayment by Flextile Ltd. or Ardex Liquid BackerBoard Self Leveling Underlayment or approved alternate by Mapei or Laticrete or Agency approved equivalent.

.2 For thickness up to 2", "5900 Flex-Flo Plus" Self-Leveling Underlayment by Flextile Ltd. or Ardex LU100 Self Leveling Underlayment or approved alternate by Mapei or Laticrete or Agency approved equivalent.
.3 For thickness more than 2", Flexiteile "Dry Pack Mortar" by Flextile Ltd. or Ardex A38 Mix Rapid Set, Pre Mixed Screed or Mapcem Premix by Mapei or approved alternate by Laticrete or Agency approved equivalent.

2.3.6 Floor Tile Systems: Provide the following setting materials:

.1 Large and Heavy Tile Dry-set mortar Set Interior Installation: Latex-portland cement mortar meeting or exceeding requirements of ANSI A 118.1, rated for floor traffic load bearing performance indicated above and as follows:

.1 Acceptable Materials:

.1 Fast curing setting material to be Flextile 62 Full Coverage Fast Set Mortar, by Flextile Ltd. or ARDEX N23 Rapid Set Natural Stone & Tile Mortar or Ultra/Contact RS by Mapei or approved alternate by Laticrete or Agency approved equivalent.

.2 Concrete, Blockwall, Cement Board, Tile Backer Boards: Laticrete 4237 Latex thin-set. Mortar additive mixed with Laticrete 211 Crete Filler powder. (ANSI A118.4 for Latex Thinset Mortars), or Agency approved equivalent.

.3 Plywood Substrates: Laticrete 333 super flexible admix with Laticrete Drybond floor/wall thinset or Agency approved equivalent.

2.3.7 Tile Grout:

.1 Polymer-Modified Un-sanded Cement Wall Grout: Conforming to ANSI A118.7 and ISO 13007-3 (CG1) performance level for normal cementitious grout, joint width less than 3 mm (1/8") for porous and absorbent body glazed tiles, marbles or soft glazed wall tiles; "500 Polymer Modified Unsanded Grout" by Flextile Ltd., "Laticrete Un-sanded Grout, 600 series" with "Laticrete 1776" grout admixture by Laticrete International, Inc. or "Keracolor-U" by Mapei Corporation or Agency approved equivalent.

.2 Polymer-Modified Sanded Cement Grout: Conforming to ANSI A118.7 and ISO 13007-3 (CG2A) performance level for improved cementitious grout with high abrasion resistance for joint width 3 mm (1/8") to 9 mm (3/8") for impervious and vitreous type tiles; "600 Polymer Modified Sanded Grout" by Flextile Ltd., "Laticrete sanded grout, 500 series" with "Laticrete 1776" grout admixture by Laticrete International, Inc. or "Keracolor-S" by Mapei Corporation or Agency approved equivalent.

.3 "600 Polymer-Modified Sanded Grout" by Flextile Ltd., "Laticrete sanded grout, 500 series" with "Laticrete 1776" grout admixture by Laticrete International, Inc., "Keracolor-S" by Mapei Corporation or ARDEX FH Sanded Wall & Floor Grout by ARDEX Americans or Agency approved equivalent.
.4 Epoxy Grout by Mapei or Laticrete or Custom. Latapoxy SP100 stainless epoxy grout by Laticrete or Agency approved equivalent. The epoxy grout shall be resistant to urine, acids, alkalis, petroleum distillates, oil, solvents, food wastes and shall meet the required physical properties. Epoxy installation materials must be non-toxic, low odour, water cleanable and manufactured to exceed ANSI A118.3.

2.3.8 Trim and Control Joints: Schluter - Systems Trims and Control Joints or approved equal by Bengard Manufacturing Ltd or Agency approved equivalent.

2.3.9 Outside Corner Trim: Schluter - “Jolly” or Agency approved equivalent anodized aluminum trim for all outside corners on tile surfaces.

2.3.10 Transition Trim: Schluter - “Reno” or Agency approved equivalent extruded aluminum edge trim for barrier free access.

2.3.11 Control Joint: Schluter - “Dilex” BWS or Agency approved equivalent for control joints, colour to match adjacent grout.

2.3.12 Perimeter Control Joint: Schluter - “Dilex” - BWA or Agency approved equivalent for control joints at perimeter and around columns.

2.3.13 Anti-fracture Membrane for showers: Schluter - “Ditra” membrane or Agency approved equivalent anti-fracture membrane below all main floor tile.

2.3.14 Waterproof Membrane for showers: Schluter – Kerdi or Agency approved equivalent complete in shower, toweling areas and shower corridor. Provide full floor and wall coverage for inspection prior to tile installation.

3. **EXECUTION**

3.1 **Examination**

3.1.1 Before starting the Work, examine existing surfaces to be covered and report to the Consultant, in writing, all defects or unsatisfactory existing conditions.

3.1.2 Do not commence until surfaces specified to receive tile are dry, clean, level: free from cracks, ridges, dusting, scaling, carbonation, mortar droppings, parging, curing compounds, grease, oil, or other foreign material liable to impair adhesion, performance or appearance.

3.1.3 Commencement of Work implies total acceptance of surface conditions.

3.1.4 Dry or dusty concrete or masonry surfaces shall be wet down or washed and excess water removed just prior to the application of finish.

3.1.5 Waive the right to any after claims by failure to comply with the above procedure of examination.

3.2 **Breakage**

3.2.1 Make good any and all breakage resulting from faulty materials or installation.
3.3 **Quality of Work**

3.3.1 Ceramic tile application shall comply with TTMAC Tile Specification Guide 09300, the Tile Council of America Handbook for Ceramic Tile Installation, and relevant ANSI Standards.

3.3.2 Provide 80% uniform bonding mortar contact between the tile and the substrate for interior applications and 95% uniform bonding mortar for exterior application.

3.3.3 Install ceramic tiles over a “crack-free” substrate. All concrete joints or cracks should be in direct alignment with the tile expansion joints.

3.3.4 **Control Joints**

.1 For interior ceramic tile the control joint should be placed every 4.88 – 6.10 metres apart.

.2 All area control joints should also be placed around perimeter, around columns and where tile abuts other hard materials. Control joints must always be placed directly over all slab control and expansion joints.

3.3.5 The ambient air temperature and structural base temperature should be no less than 12°C during application of ceramic tile and during curing period. Epoxy mortars and grouts require temperatures between 10° and 30°C.

3.3.6 Neatly cut tile around fitments, fixtures and drains. Form intersections, corners and returns accurately.

3.3.7 Make joints in tile uniform in width, subject to normal variance in tolerance allowed in tile size. Joints shall be watertight without voids, cracks, excess mortar, or grout. Joints between sheets to be of same width as joints between individual tiles.

3.3.8 All internal angles of base to be square. External angles to be bullnose. Bullnose to be from full size tile.

3.3.9 Where floor tile is required to be laid so floor slopes to drains it will be the Contractor’s responsibility to ensure that the slopes are achieved and that no water ponds or lodges behind ridges. Use Laticrete 3701 Latex Mortar Admix with Laticrete 226 thick bed mortar as per manufacturer’s instructions to achieve required consistencies and a five year warranty mortar bed.

3.3.10 Sound tile after setting; remove and replace hollow backed tile.

3.3.11 Allow minimum 24 hours after setting prior to grouting. Do not permit foot traffic for a minimum of 48 hours.

3.3.12 Completed Work shall be free of broken, damaged or faulty tile.

3.3.13 Carry out layout of tile in accordance with the Consultant’s approved tile colour percentages and patterns.

3.3.14 Pattern to be uninterrupted through doorways.

3.3.15 All tiles should be fully embedded with at least 95% coverage of mortar on the back of tiles. Backbutter tiles larger than 200 x 200 mm in size.

3.3.16 Install anti-fracture membrane under the entire ceramic tile floor in the following locations:

.1 All tile on the main floor.

.2 All shower tile.
3.3.17 Install waterproof membrane under tile floor/walls in the following locations:
   .1 All shower floors and walls full height/coverage.
   .2 All towelling area floors and wall full coverage.
   .3 All shower corridor full floor coverage and up walls 600 mm.
   .4 All waterproof membranes are to be inspected by the Consultant/manufacturer with four days' notice, prior to installation of tile or scratch coat.

3.4 **Cleaning and Protection**

3.4.1 Protect the ceramic tile Work during the period of construction.
3.4.2 Remove all excess material and debris from the site and thoroughly wash and clean the tile Work upon completion of the ceramic tile installation.
3.4.3 Do not use muriatic acid for cleanup.
3.4.4 Protect the finish floor installation with a suitable and durable material or by keeping traffic off the floor until the area is ready for occupancy.

**END OF SECTION**
1. **GENERAL**

1.1 **Instructions**
1.1.1 Comply with Instructions to Vendors, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Intent**
1.2.1 Provide all articles, labour, materials, equipment, transportation, hoisting, and incidentals noted, specified or required, to complete the Work of this Section.

1.3 **Section Includes**
1.3.1 Provide all acoustic tile and required accessories as indicated on the working Drawings, room finish schedule, including but not limited to the following:
   - Acoustic tile
   - "T" grid suspension system
   - Hold down clips to achieve specified fire rating
   - Sound attenuation blankets above ceiling
   - Wall moulds for valance lighting
   - Sound isolation anchors.

1.4 **Related Sections**
1.4.1 Section 09 21 16 - Gypsum Board Assemblies.
1.4.2 Section 23 30 00 – HVAC Air Distribution: Installation of grilles, diffusers, etc.

1.5 **References**
1.5.1 ASTM C635-00: Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
1.5.2 ASTM C636-04: Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
1.5.4 ASTM E1264-98: Standard Classification for Acoustical Ceiling Products.

1.6 **Samples**
1.6.1 Submit minimum 300 mm x 300 mm samples of acoustic tile, as required for completion of the Work for the Consultant's review before proceeding with the acoustic tile Work.
1.6.2 Submit samples of acoustic Products in type specified for approval by the Consultant.

1.7 **Close-out Submittals**
1.7.1 Submit two copies of the manufacturer's maintenance directions for each type of acoustic panel or tile.
1.8 **Rejections**
1.8.1 Defective materials or quality of Work whenever found at any time prior to acceptance of the Work shall be rejected regardless of previous inspection. Inspection will not relieve responsibility, but is a precaution against oversight and error.

1.8.2 Remove and replace defective materials and Work affected by this replacement, at no additional cost to the Agency.

1.9 **Performance Requirements**
1.9.1 Design and install the ceiling system to support the weight of the light fixtures, maximum deflection of 1/360 of the span.

1.9.2 Submit a letter stating that the ceiling system is capable of supporting the light fixtures. This letter is required to obtain Ontario Hydro-Electric Commission approval.

1.10 **Delivery, Storage and Handling**
1.10.1 Refer to Section 01 61 00 – Common Product Requirements.

1.10.2 Deliver acoustic tile and materials in undamaged and original containers and make certain that the storage area is dry.

1.11 **Extra Materials**
1.11.1 Furnish the Agency with two percent extra materials of each type of ceiling tile for each building to be used for future repair Work.

2. **PRODUCTS**

2.1 **Manufacturers**
2.1.1 The products of the following manufacturers are acceptable subject to conformance with the requirements of the Drawings, Schedules and Specification:

1. Armstrong World Industries Limited
2. CGC Limited
3. CertainTeed
4. Rockwool
5. Or Agency approved equivalent.

2.1.2 Subject to conformance with the requirements of the Drawings, Schedules and Specifications, Products of other Manufacturers may be acceptable.

2.1.3 Submit all Substitutions in accordance with Section 01 25 00 – Substitution Procedures.

2.2 **Acoustic Ceiling**
2.2.1 Acoustical Panels: to ASTM E1264.

2.2.2 ACT 1:

1. Composition: Mineral Fiber or Fiberglass
2. Colour: White
3. Edge Profile: Square lay-in.
4. Size: standard panel size, 610mm x 1220mm x 25mm thick (24” x 48” x 1” thick) modular panel.
2.2.3 ACT 2:

.1 Composition: Mineral Fiber or Fiberglass
.2 Colour: White
.3 Surface Texture: Fine
.4 Edge Profile: notched for concealed grid.
.5 Size: standard panel size, 610mm x 1220mm x 25mm thick (24” x 48” x 1” thick) modular panel.
.6 Flame spread rating of 25 or less in accordance with CAN/ULC-S102.
.7 Smoke developed 50 or less in accordance with CAN/ULC-S102.
.8 Noise reduction coefficient (NRC) designation minimum 0.90 in accordance with ASTM C423.
.9 Ceiling Attenuation Class (CAC), in accordance with ASTM E1264.
.10 Acceptable Products:
   .1 Alaska by Rockfon
   .2 Halcyon by CGC
   .3 Symphony F by CertainTeed
   .4 Optima by Armstrong
   .5 Or Agency approved equivalent

2.3 Metal Suspension System:

2.3.1 Suspension system: to ASTM C635.
2.3.2 Provide interior metal suspension system with the following characteristics:
2.3.3 Hot-dipped galvanized steel with high recycled content, heavy duty 15/16-inch suspension T-Grid system using main runners, cross-tees, wall angle of types.
2.3.4 Structural Classification: ASTM C 635 Heavy Duty.
2.3.5 Color: White; matching the ceiling tile unless noted otherwise.
2.3.6 Acceptable Products:
.1 PRELUDE XL 15/16" Exposed Tee by Armstrong
.2 DONN DX/DXL by CGC
.3 15/16" Classic Stab by CertainTeed.
.4 Or Agency approved equivalent

3. **EXECUTION**

3.1 **Examinations**
3.1.1 Commencement of the Work of this Section implies total acceptance of all applicable conditions by the Contractor.
3.1.2 Waive the right to any after claims by failure to comply with the above procedure of examinations.

3.2 **Quality of Work and Application**
3.2.1 Install the tile and suspension system to ASTM C636, and in accordance with the manufacturer's Specifications.
3.2.2 Plumb and square finish Work with adjoining Work.
3.2.3 Lay the Work out, in accordance with the Consultant's approved reflected ceiling plan, symmetrical within each area to obtain uniform borders of at least half the acoustic panel size.
3.2.4 Distribute variations in shades of finish from several cartons of panels uniformly over the ceiling area.
3.2.5 Erect the suspension system level with tolerance of 3 mm in 3600 mm.
3.2.6 Exposed main tees shall be as long in length as practical to minimize joints. Joints shall be tight, square flush, and reinforced with splines. Distribute jointing over the ceiling area.
3.2.7 Use edge moulding or shadow moulding where ceiling abuts vertical surfaces as indicated on the Drawings. Use corner moulding along external edges at ceiling steps.
3.2.8 Secure acoustic panels with hold-down clips in areas where differential air pressures occur.
3.2.9 Install the ceiling system in an approved method capable of achieving the fire resistance time design rating as listed by the Underwriter's Laboratories of Canada Assembly Conditions. Use hold down clips to secure acoustic panels. Secure the last tile with clips removable from below.

3.3 **Cleaning and Protection**
3.3.1 Be responsible for protection of all materials and Work from damage during period of construction.
3.3.2 Make good any resulting damage, to the satisfaction of the Consultant, at no additional expense to the Agency.
3.3.3 Promptly, as the Work proceeds and on completion, clean-up and remove from the premises all rubbish and surplus materials resulting from the foregoing Work.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**

1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Intent**

1.2.1 Provide all articles, labour, materials, equipment, transportation, hoisting and incidental noted, specified or required, to complete the Work of this Section.

1.3 **Section Includes**

1.3.1 Provide resilient floors, adhesives and bases as indicated on the working Drawings and room finish schedule, including but not limited to the following:

- .1 Floor preparation, self-levelling where required
- .2 Sheet Vinyl
- .3 Rubber Flooring
- .4 Rubber Base
- .5 Adhesives and Surface Preparation
- .6 Reducer Strips
- .7 Transition Mouldings

1.3.2 Include levelling of existing surfaces as required to achieve slopes and/or finished floor elevations as noted on Drawings.

1.4 **References**

1.4.1 ASTM F1861-02: Standard Specification for Resilient Wall Base.

1.5 **Samples**

1.5.1 Submit samples as specified in Section 01 33 00 – Submittal Procedures.
1.5.2 Selection Samples: duplicate 300 mm x 300 mm size samples, illustrating available colours and patterns for selection by Consultant.

1.6 **Rejections**

1.6.1 Defective materials or quality of Work whenever found at any time prior to acceptance of the Work shall be rejected regardless of previous inspection. Inspection will not relieve responsibility, but is a precaution against oversight and error.
1.6.2 Remove and replace defective materials and Work affected by this replacement, at no additional cost to the Agency.
1.7 **Delivery, Storage and Handling**
1.7.1 Refer to Section 01 61 00 – Common Product Requirements.
1.7.2 Deliver and store materials undamaged in original wrapping or cartons.
1.7.3 Store materials in warm, dry room; stack rolled sheet goods on end, stack tiles not more than four cartons high.

1.8 **Extra Materials**
1.8.1 Furnish the Agency with two percent extra stock of each type of resilient flooring except rubber flooring on access floor to be used for future repair work.
1.8.2 Provide 10% of rubber flooring on access floor.
1.8.3 Sheet Goods: Sort, bundle and tag all usable cuttings and leave with the Agency.

2. **PRODUCTS**

2.1 **Manufacturers**
2.1.1 Refer to Finish Schedule 9000 series. Schedule located in Specification Section 00 01 13 Standard Details.
2.1.2 Subject to conformance with the requirements of the Drawings, Schedules and Specifications, Products of other Manufacturers may be acceptable.
2.1.3 Submit all Substitutions in accordance with Section 01 25 00 – Substitution Procedures.

2.2 **Materials**
2.2.1 Sheet Vinyl:
   .1 Homogeneous vinyl sheet flooring conforming to ASTM F1913, 2mm (0.08”) thick.
   .2 Polyurethane Reinforced (ASTM F 410): Yes
   .3 Tile Squareness (ASTM F 2055): Passes
   .4 Tile Dimensional Stability (ASTM F 2199): Passes
   .5 Flexibility (ASTM F137): Passes
   .6 Total Thickness (ASTM F 386): 0.080 in. (2 mm)
   .7 Static Load Limit (ASTM F 970): Passes
   .8 Resistance to Heat (ASTM F 1514): ΔE ≤ 8
   .9 Resistance to Light (ASTM F 1515): ΔE ≤ 8
   .10 Slip Resistance (ASTM D 2047): SCOF ≥ 0.5
   .11 Fire Performance (ASTM E648 Flooring Radiant Panel): Class 1
   .12 Chemical Resistance (ASTM F925): Passes

2.2.2 Rubber Flooring:
   .1 Elongation at Break ASTM D412 - >200%
   .2 Tensile Strength ASTM D412 - >600psi
   .3 Static Coefficient of Friction ASTM D2047 ≥0.50 >0.80
   .4 Hardness (Shore A) ASTM D2240 - 80 ±5 (wear layer) 70 ±5 (backing)
Regional Municipality of Peel  
Document 2019-165T  
Division 09  
Purchasing Section  
MAJOR RENOVATION PROJECT AT  
TWO PEEL REGIONAL POLICE  
COMMERCIAL SITES  

.5 Abrasion Resistance (H18 wheel, 1000g, 1000 cycles)  
   ASTM D3389 1mm

.6 Critical Radiant Flux ASTM E648 ≥0.45 ≥0.45W/cm²  
   (Class 1)

.7 Optical Density of Smoke ASTM E662 1mm

.8 Thickness ASTM F386 - 10mm (±0.2mm)

.9 Wear Layer Thickness ASTM F410 - >1mm

.10 Resistance to Chemicals ASTM F925 – Compliant

.11 Static Load Limit (tested at 250psi) ASTM F970 - ≤0.005in

.12 Heat Stability ASTM F1514 ΔE ≤8.0 Compliant

.13 Light Stability ASTM F1515 ΔE ≤8.0 Compliant

.14 Dimensional Stability ASTM F2199 - ≤0.15%

.15 Indoor Air Quality CA 01350 - Compliant

.16 Greenguard Certification Greenguard - Yes

.17 Greenguard Gold Greenguard - Yes

2.2.3 Rubber Base:

.1 Meets performance requirements for ASTM F 1861  
   Standard Specification for Resilient Wall Base, Type TP,  
   Group 1.

.2 ASTM E 648, Standard Test Method for Critical Radiant  
   Flux of 0.45 watts/cm² or greater, Class I.

.3 ASTM E 84, Standard Test Method for Surface Burning  
   Characteristics of Building Materials, Class A, Smoke  
   <450.

.4 Flexibility: Does not crack, break, or show any signs of  
   fatigue when bent around a 32mm (1 1/4") diameter  
   cylinder when tested according to ASTM F 137 Standard  
   Test Method for Flexibility of Resilient Flooring Materials  
   protocols.

.5 Color Stability: Meets or exceeds ASTM F 1861  
   requirements for color stability when tested to ASTM F  
   1515 Standard Test Method for Measuring Light Stability of  
   Resilient Flooring protocols.

.6 Phthalate-free.

.7 Height: 102mm (4") coved rubber wall base

2.3 Accessories

2.3.1 Floor Leveller: Mapei “Ultra-Plan” or “Plani-Patch” as  
   recommended by the manufacturer for the specific application or  
   Agency approved equivalent.

2.3.2 Patching compound: “Pro Patch” polymer modified patching  
   compound, manufactured by Proma Adhesives Inc. or Agency  
   approved equivalent.

2.3.3 Transition Mouldings: suitable for wheel traffic and ADA compliant  
   (Barrier free); as follows:
   .1 CTA-XX-H: 6 mm carpet to 3 mm resilient.
   .2 CTA-XX-J: 8 mm carpet to substrate
   .3 CTA-XX-K: 10 mm ceramic to 3 mm resilient.
   .4 CTA-XX-L: 10 mm ceramic to 6 mm carpet.
2.3.4 Floor Adhesive: Adhesive shall be waterproof, (bath, washroom, laundry, shower area, locker rooms and rooms with floor drains).

2.3.5 Base Adhesive
   .1 Johnsonite #960 or Agency approved equivalent wall base adhesive for porous wall surfaces (unpainted) gypsum or masonry substrates) or Agency approved equivalent.
   .2 Johnsonite #945 or Agency approved equivalent contact bond adhesive for non-porous wall surfaces (metal, painted, ceramics, etc.) or Agency approved equivalent.

2.3.6 Heat Welding Rods: as recommended by flooring manufacturer. Colour to match flooring.

3. **EXECUTION**

3.1 **Examinations**
   3.1.1 Report to the Consultant, in writing, all defects of Work or unsatisfactory site conditions.
   3.1.2 Do not commence Work until surfaces specified to receive resilient flooring are dry, clean level; free from cracks, ridges, dusting, scaling, carbonation, mortar droppings, parging, curing compounds, grease, oil, or other foreign material liable to impair adhesion, performance or appearance.
   3.1.3 After the concrete slab has cured, test for excessive moisture by a method acceptable to the Consultant and resilient flooring manufacturer. Concrete slab must be true and smooth and assessed as such before application commences.
   3.1.4 Commencement of Work implies total acceptance of all surface conditions by the Contractor.
   3.1.5 Waive the right to any after claims by failure to comply with the above procedure of examination.

3.2 **Quality of Work**
   3.2.1 Install resilient flooring employing mechanics with the necessary training and experience as certified by the manufacturer.
   3.2.2 Do not commence laying resilient floor until just prior to completion of the building (except painting).
   3.2.3 Temperature of room and material shall be maintained at a minimum 20 degrees C 72 hours before, during and at least 72 hours after installation.
   3.2.4 Concrete slabs shall be a minimum of 28 days old before commencing application and be below 2.5 percent moisture content at centre of slab and free of surface moisture.

3.3 **Preparation**
   3.3.1 Perform calcium chloride moisture test, if requested, and submit results to Consultant.
   3.3.2 Fill cavities, cracks, saw cuts and joints with an approved filler such as “Pro Patch”.
   3.3.3 Install leveler as required to achieve slopes and levels indicated, and allow to cure for minimum 48 hours.
3.3.4 Clean floor and base surfaces to be covered: using a vacuum cleaner. Remove all substances deleterious to adhesive bond.

3.3.5 Pack around and under floor duct junction boxes and the like and fill recessed covers with latex to ensure flush level surface.

3.3.6 Cut and trim sheet vinyl flooring to fit neatly around fixed or excessively heavy objects. Seams shall be formed by overlapping and double-cutting or by scribing and cutting.

3.4 Application

3.4.1 Adhesive

.1 Apply adhesive uniformly with an approved notch-tooth spreader at the Manufacturer’s recommended rate. Do not spread more adhesive than can be covered before initial set takes place.

3.4.2 Vinyl Sheet Goods:

.1 Unroll sheet goods and allow to relax for at least 24 hours prior to installation.
.2 Cement sheets parallel to longitudinal axis of room with joints symmetrically arranged. Abrupt variations in shade or pattern will not be permitted.
.3 Minimize joints by using full width rolls where possible. Minimum width at edges of room shall be 600 mm; minimum length between cross joints shall be 1800 mm. Avoid concentrating cross joints in one area.
.4 Double cut seams to produce square, straight, flat joints without gap. Joints shall be heat welds using welding rods.
.5 Roll sheet vinyl immediately after laying, using clean polished roller weighing minimum of 45 kg to ensure adhesion and to remove air pockets. Roller and all point load objects must be kept off surface for 24 hours.
.6 Install the integral base by rolling sheet vinyl up the wall. Use a fillet strip as back up to reinforce the flooring as it bends up the wall. Install a cap strip at the top of the base.
.7 Sand bag double-cut seams for positive adhesion.
.8 Lay and roll sheet vinyl within the time period recommended by the manufacturer for the recommended adhesive.

3.4.3 Rubber Flooring:

.1 Install rubber flooring in strict accordance with manufacturers written instructions.
.2 Allow to flooring to acclimatize for at least 24 hours prior to installation.
.3 Rubber flooring to be laid on access flooring by installation method determined by manufacturer to maintain access to access floor beneath.
3.4.4 Cove Base:
.1 Install cove base on top of flooring.
.2 Install top set cove base in accordance with manufacturer's recommendations. Set base in adhesive tightly against wall and floor surfaces. Space joints uniformly.
.3 Accurately scribe around door-frames, fitments and other obstructions.
.4 Install base at all columns, walls and built-in fitments, in rooms where base is indicated.
.5 Form external corners and end stops from preformed units. Internal corners to be coped (not mitered) to produce a tight fit.

3.5 Maintenance
3.5.1 Furnish Agency with two copies of manufacturer's maintenance instructions.
3.5.2 Arrange with Agency to replace small furniture glides with suitable large glides or cups.

3.6 Adjustments
3.6.1 Work shall be examined approximately ten days after completion and all adjustment of defects made good.

3.7 Cleaning and Protection
3.7.1 Protect all resilient flooring Work during period of construction.
3.7.2 Upon completion of the resilient flooring installation, remove all excess tiles, clipping, etc., and remove any dirt spots and foreign materials to the satisfaction of the Consultant.
3.7.3 Protect the finished floor with suitable and durable material or by keeping traffic off the floor until the building or room is ready for occupancy.
3.7.4 Upon completion of Work, remove equipment and debris resulting from the Work of this Section.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**

1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes**

1.2.1 Supply and Installation of carpet tile, including accessories, glues, cutting and binding of base.

1.2.2 Colour schedule will determine final selection of materials which the Contractor is supplying. i.e., binding tape.

1.3 **References**

1.3.1 Americans with Disabilities Act (ADA): Accessibility Guidelines for Buildings and Facilities

1.3.2 American Association of Textile Chemists and Colours (AATCC):

   .1 16, Option E Colourfastness to Light
   .2 165 Colourfastness to Crocking

   Carpets - AATCC Crockmeter Method

1.3.3 Aachener Test: Dimensional Stability (DIN Standard 54318): 175 - Stain Resistance: Pile Floor Covering

1.3.4 ASTM D2859: Flammability of Finished Textile Floor Covering

1.3.5 ASTM E648: Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source (NFPA 253)

1.3.6 ASTM E662: Specific Optical Density of Smoke Generated by Solid Materials (NFPA 258)

1.3.7 Consumer Product Safety Commission (CPSC): EF-1-70 Methenamine Pill Test

1.4 **Pre-installation Meeting**

1.4.1 After approval of submittals, but prior to beginning installation of Work of this Section, conduct a meeting at the site attended by Consultant, Contractor, carpet installer and carpet material manufacturer to describe in detail the installation process and to establish agreement, co-ordination and responsibilities.

1.4.2 Prepare a detailed report of this meeting and furnish copies to the Consultant and all attendees.

1.5 **Submittals**

1.5.1 Submittals under this Section shall be in accordance with General Conditions and Section 01 33 00 - Submittals.

1.5.2 Product Data:

   .1 Submit manufacturer's Product data sheets for Products proposed for use in the Work of this Section.

   .2 Include printed technical data and general recommendations for all materials and components.

   .3 Product data sheets shall describe physical characteristics, sizes, patterns, colours available, and method of installation.
1.5.3 Shop Drawings:
   .1 Submit shop drawings illustrating tile lay-out and locations of edge strips.

1.5.4 Samples
   .1 Verification Samples: Submit four tiles for each colour selected for Project, demonstrating colour, backing and pattern.

1.5.5 Test Reports
   .1 Test Reports: Provide certified test reports, prepared by an independent testing laboratory, showing conformance to specified performance standards. Test results shall represent average results for production goods, and shall not be over two years old.

1.6 Closeout submittals
1.6.1 Maintenance Data: Submit manufacturer’s recommended cleaning and maintenance data.
1.6.2 Include maintenance procedures, recommended maintenance materials and suggested schedule for cleaning.

1.7 Extra Materials
1.7.1 Supply five percent, but not less than one carton or bundle, of each colour and pattern, minimum of one carton to provide allowance for waste factor and future replacement stock.
1.7.2 Sort, bundle and tag all usable cuttings to be left with Agency.

1.8 Quality Assurance
1.8.1 Manufacturer: Company specializing in carpet tile manufacturing with a minimum of ten continuous years of documented experience. We do use installers that are just approved and not certified.
1.8.2 Installer: Company with a minimum of five years documented experience in the installation of carpet tiles, approved by manufacturer.
   .1 Submit a list of at least five installations that have been in use for a minimum of three years using carpet tile as described in this document. Include contact name and phone numbers.
   .2 Installer shall have documented experience with a formal lift system when applicable to job. Lift system to be approved by both manufacturer and architect.

1.9 Rejections
1.9.1 Defective materials or poor workmanship whenever found at any time prior to final acceptance of the Work shall be rejected regardless of previous inspection. Inspection will not relieve responsibility but is a precaution against oversight and error. Remove and replace defective materials and Work affected by this replacement at no additional cost to the Project.
1.10 **Delivery, Storage and Handling**

1.10.1 Refer to Section 01 61 00 – Common Product Requirements.

1.10.2 Deliver Products in manufacturer’s original packaging. Packaging shall contain manufacturer’s name, Product, colour and pattern name, identification number, and other related information.

1.10.3 Store carpet tiles between 4 degrees C and 34 degrees C and shall be conditioned to between 14 degrees C and 29 degrees C and 48 hours prior to installation.

1.11 **Project Conditions**

1.11.1 Existing conditions:

.1 Permanent building lights or lighting of equal brilliance available during installation.

.2 Read and follow carefully the adhesive instruction written on the adhesive container.

1.11.2 Ambient conditions:

.1 Floor temperature shall be a minimum of 14 degrees C for proper adhesive performance.

.2 Areas in which vinyl backed carpet tiles are to be installed should have a temperature of 16 – 19 degrees C for at least 72 hours prior to the start of the installation.

.3 Store all materials at this temperature for at least 48 hours before commencing installation.

.4 At no time should the temperature exceed 31 degrees C while the installation is being made.

.5 Floor pH shall not exceed 10.0 (acid etch using a 50/50 vinegar and water on a 1/20 muriatic acid and water solution if greater than 10.0).

.6 Water vapour transmission of sub-floor shall not exceed 1.3 kg per 6.6 m² per 24-hour period as determined by the #625 Calcium Chloride Test.

1.12 **Warranty**

1.12.1 Submit manufacturer’s extended warranty for a period of 15 years, protecting against excessive surface wear, latent defects, pattern match, tuft bind, lifetime floor compatibility, lifetime antistatic, and lifetime antistatic warranty - electronic office.

1.12.2 Warranty shall be sole source responsibility of the manufacturer. Second source warranties or warranties that involve parties other than the manufacturer are unacceptable.

1.12.3 Warranties are official documents and shall not be issued on job sheets.
2. **PRODUCTS**

2.1 **Manufacturers**

2.1.1 Refer to Finish Schedule 9000 series. Schedule located in Specification Section 00 01 13 Standard Details.

2.1.2 Subject to conformance with the requirements of the Drawings, Schedules and Specifications, Products of other Manufacturers may be acceptable.

2.1.3 Submit all Substitutions in accordance with Section 01 25 00 – Substitution Procedures.

2.2 **Performance/Design Criteria**

2.2.1 Tile carpeting furnished under this Section shall comply with the following test requirements:

.1 CRI Indoor Air Quality Testing Program:
  .1 VOC’s not to exceed 0.5 milligrams per square meter per hour.
  .2 Styrene not to exceed 0.4 milligrams per square meter per hour.
  .3 4-PC (phenylcyclobexene) not to exceed 0.1 milligrams per square meter per hour.
  .4 Formaldehyde not to exceed 0.05 milligrams per square meter per hour.

.2 ASTM D 2859, or CPSC FF-I-70 Methenamine Pill Test: Pass

.3 ASTM E 648, Critical Radiant Panel Flux: Class 1, greater than 0.45 watts per square centimeter.

.4 AATCC 16, Option E: Minimum rating of 4 on grey scale after 80 hours exposure.

.5 ASTM E 662 (NFPA 258): Smoke density less than 450 optical density.

.6 AACHEN Test: Minimum rating of 4 wet and dry.

.7 AACHEN Test: 46 cm x 46 cm Dimensional stability 0.2 percent shrinkage or growth.

2.2.2 Performance requirements:

.1 Radiant Panel: (ASTM E - 648) Class 1
.2 Smoke Density: (ASTM E 662) ≤ 450
.3 Flammability: Passes Methenamine Pill Test (DOC-FF1-70)
.4 Lightfastness: (AATCC 16 - E) ≥ 4.0 @ 60 AFU's
.5 Static: (AATCC - 134) < 3.0 KV
.6 Dimensional Stability: AACHEN Din 54318 <.10%
.7 Traffic Classification: Severe
.8 Fiber Modification Ratio: 1.9 to 2.2
.9 Preservative Efficacy: (AATCC 174 Parts 2&3) 99% Reduction/No Mold 7 Days (ASTM E-2471) Complete Inhibition
.10 Machine Gauge: 1/10 in
.11 Backing: GlasBac
2.3 **Materials**
   2.3.1 Carpet Tile: refer to Finish Schedule
   2.3.2 Colour and size: refer shown in finish schedule

2.4 **Accessories**
   2.4.1 Adhesive: release type; as per manufacturer’s written instruction.
   2.4.2 Sub-floor filler “Planicrete 20”, “Ardex K-15” or approved equivalent Portland cement based floor patching compound.
   2.4.3 Edge strips: Flooring material. Purpose made extruded aluminum or P.V.C., locking cap, colour as selected by Consultant.
   2.4.4 Sub-floor Filler: Pre-mixed latex, mixed with water to produce cementitious paste.
   2.4.5 Concrete Floor Sealer: to CAN/CGSB-25.20, Type 1.
   2.4.6 Carpet Base Cushion Backed Complete With Edging: Same carpet as field carpet complete with matching binding tape and exposed edges.

3. **EXECUTION**

3.1 **Examination**
   3.1.1 Report to the Consultant, in writing, all defects of surfaces or Work or unsatisfactory site conditions.
   3.1.2 Thoroughly examine all surfaces scheduled to receive carpet to see that they are dry, clean, level; free from cracks, ridges, dusting, scaling, carbonation, mortar droppings, parging, curing compounds, grease, oil, or other foreign matter liable to impair adhesion, performance or appearance.
   3.1.3 Commencement of Work implies total acceptance of all surface conditions.
   3.1.4 Verify that surfaces are smooth and flat and are ready to receive Work.
   3.1.5 Verify that floor temperature is a minimum of 14 degrees C for proper adhesive performance.
   3.1.6 Verify that floor pH does not exceed 10.0.
   3.1.7 Verify that water transmission does not exceed 1.3 kg per 6.6 m² per 24 hour period as determined by the #625 Calcium Chloride Test.
   3.1.8 Beginning of installation means acceptance of existing substrate and site conditions.

3.2 **Preparation**
   3.2.1 Ensure that concrete slabs are minimum 28 days old and below 2.5 percent moisture content at centre of slab.
   3.2.2 The sub-floor shall be structurally sound, clean, dust free, smooth and level. Cracks and holes in excess of 1.5 mm should be filled with an underlayment material such as “Plancrete 20”, “Ardex K-15” or other Portland cement based floor patching compound Agency approved equivalent.
3.2.3 Due to the non-PVC nature of EverWher backing, it is not necessary to remove existing flooring adhesive such as “cut back” emulsion, residual latex based general purpose adhesive. If alternate to Specification has a P.V.C. backing then any existing “cut back” emulsion must be removed and the floor sealed.

3.2.4 Residual trowel notches shall be reduced to 0.8 mm by mechanical scraping or grinding or by light patching.

3.2.5 Do not sand or mechanically abrade any asphaltic (black) adhesive. These type adhesives may contain asbestos fibers from vinyl asbestos tile.

3.2.6 Vacuum clean surfaces to be covered.

3.2.7 Prime concrete floor surfaces with sealer.

3.3 Installation

3.3.1 Apply carpet tiles and adhesive in accordance with manufacturer’s installation instructions.

3.3.2 Carpet to be secured to the floor in compliance with applicable Disabilities Act.

3.3.3 Proper layout and planning must be completed prior to any application of adhesive or carpet tile.

3.3.4 Two working chalk lines must be applied to the floor to insure a straight, square properly aligned installation. These chalk lines intersect at the starting point and are exactly 90 degrees to each other.

3.3.5 Carpet tiles are to be installed with a full spread of adhesive applied with a paint roller with a 19-25 mm nap. Allow releasable adhesive to fully dry so is does not transfer to a finger or module placed on it.

3.3.6 Begin installation using a pyramid technique and aligning the first tile at the intersection of the two chalk lines.

3.3.7 Always slide each module into position from the side to prevent trapped yarn. Set each module by firmly rubbing both joints.

3.3.8 Modules should be tight but not compressed. Peaking will occur when modules are too tight. Too loose an installation can slip and create obvious gaps with use.

3.3.9 Arrows are embossed and printed on the back of each module indicating pile direction. All arrows shall run in the same direction.

3.3.10 A parallel or “scribe” cutting technique may be used when cutting the modules. Any method leading to a clean, properly sized cut is acceptable.

3.3.11 Cuts are most easily and cleanly done through the face of the module.

3.3.12 Provide unobstructed spaces for removing and replacing furniture and equipment in the installation area.

3.3.13 Carpet base to be 1.83 metres long roll goods x 100 mm high, tape bound or serged to match field carpet and adhered to wall surface by low VOC permanent adhesive.

3.3.14 Colour of binding tape or serge lace to be determined by Consultant.
3.4 **Quality Of Work**

3.4.1 Arrange for carpet manufacturer to provide field service specialist at commencement of installation to instruct installer on methods and to assure that Project conditions are satisfactory.

3.4.2 Do not commence laying carpet until other Sections have completed Work.

3.4.3 Install materials according to manufacturers printed instructions.

3.4.4 Run all carpet in the same direction.

3.4.5 Seams to be hairline and inconspicuous to normal inspection.

3.4.6 Finished carpeted areas shall present a smooth wearing surface free from burring or other faults or embedded foreign material.

3.5 **Cleaning**

3.5.1 Remove excess adhesive from floor, base and wall surfaces without damage.

3.5.2 Clean floor and base surfaces in accordance with manufacturer’s instructions.

3.5.3 Vacuum entire carpeted area with commercial beater-bar vacuum.

3.5.4 Remove all spots and stains per manufacturer’s instructions.

3.6 **Protection**

3.6.1 Remove all excess cuttings, ends, tapes, etc. Remove stains and foreign material.

3.6.2 Protect finished Work with suitable material.

3.6.3 Protect finished installation from soiling by installation of 0.15 mm thick polyethylene. Tape all joints with 50 mm wide tape.

3.6.4 Prohibit traffic on floor finish for 24 hours after installation.

**END OF SECTION**
1. **GENERAL**

1.1 **Instructions**

1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes:**

1.2.1 Provide low-profile fixed height access floor system including but not limited to:

- Series of modular, removable, interchangeable steel base units, corner plates, channel plates, border units and accessories that form an accessible under floor cavity to accommodate electrical, voice and data services.

1.3 **Related Sections:**

1.3.1 The following is included for reference only and shall not be presumed complete:

- Division 09 – For Floor finishes on access flooring
- Division 26 – For Electrical requirements

1.4 **References:**

1.4.1 American Society of Civil Engineers (ASCE):


1.4.2 American Society for Testing and Materials (ASTM):

- ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
- ASTM E-136 - Behavior of Materials in a Vertical Tube Furnace at 750o C

1.4.3 Underwriters Laboratory (UL):

- UL 514A - Standard for Metallic Outlet Boxes.

1.5 **Administrative Requirements:**

1.5.1 Coordination:

- Coordination under this Section shall be in accordance with General Conditions and Division 01.
- Coordinate with other work having a direct bearing on the Work of this Section.
- Coordinate the Work with Communications systems furniture installer Bramic.
1.5.2 Pre-installation Meetings:
   .1 Convene one (1) month before starting work of this section.
   .2 Review requirements for access flooring, floor finishes and furniture and equipment to be installation on access flooring, including coordination and sequencing of this Work with Work of other Sections
   .3 The following shall be included in the meeting:
      .1 The Contractor
      .2 The Consultant
      .3 The access flooring supplier and installer
      .4 The owner contracted supplier/installer Bramic

1.6 Rejections
1.6.1 Defective materials or quality of Work, whenever found, at any time prior to acceptance of the Work, shall be rejected regardless of previous inspection. Inspection will not relieve responsibility, but is a precaution against oversight or errors.
1.6.2 Remove and replace defective materials and Work affected by this replacement, at no additional cost to the Agency.

1.7 Submittals
1.7.1 Submittals under this Section shall be in accordance with Section 01 33 00 - Submittals.
1.7.2 Product Data:
   .1 Submit manufacturer's Product data sheets for Products proposed for use in the Work of this Section. Include printed technical data, installation instructions and general recommendations for all materials and components. Include certification indicating compliance of materials with project requirements
1.7.3 Shop Drawings:
   .1 Submit shop drawings indicating the following:
      .1 Floor panel layout, including ramp locations, outlet and data locations
      .2 Detail components of assembly and edge details
1.7.4 Samples:
   .1 Submit samples of low-profile access floor base unit, channel plate and corner plate.

1.8 MAINTENANCE MATERIALS SUBMITTALS
1.8.1 Tools:
   .1 Provide three (3) sets of tools required to access raised floor system.

1.9 Quality Assurance
1.9.1 Installers: An entity consisting of installers who have been trained and experienced in installation of the low-profile access floor system or under supervision of access-flooring manufacturer’s authorized representative.
1.9.2 Testing Agency: Product tests shall be witnessed or performed by an independent ISO-17025 / ISO-17020 engineering and testing laboratory with specific accreditation in AC-151, AC-175, or AC-300 and a minimum of two years of experience inspecting and testing access floor components.

1.9.3 Mockups: Build mockup to demonstrate quality standards of materials and ease of accessibility. Use mockup to familiarize trades with adaptive cabling installation procedures.

.1 Build mockup where shown on Drawings. Size to be a nominal area of 3- by 3-feet consisting of two base units in length by two base units in width with connecting channel and corner plates.

1.10 **Delivery, Storage And Handling**

1.10.1 Refer to Section 01 61 00 – Common Product Requirements.

1.10.2 Deliver and store materials undamaged in original cartons or wrappings.

1.10.3 Store material in a secure, dry area.

2. **PRODUCTS**

2.1 **Manufacturers**

2.1.1 Subject to conformance with the requirements of the Drawings, Schedules and Specifications, Products of other Manufacturers may be acceptable.

2.1.2 Submit all Substitutions in accordance with Section 01 25 00 – Substitution Procedures.

2.2 **Design/Performance Criteria**

2.2.1 Provide access flooring systems capable of withstanding uniform and concentrated loads as required and specified herein.

2.2.2 Standard Base Units / Channel Plates / Corner Plates:

.1 Concentrated Live Load Performance Over an Area of 6.25 square feet (2.5- by 2.5-feet): Minimum concentrated live-load capacity of low-profile access floor system, in pounds (lbs), when applied uniformly over this area and located so as to produce the maximum load effects in the structural member, shall conform to the building code or local authorities having jurisdiction requirements, whichever is the more stringent, but with a factor of safety of 5 shall not be less than:

.1 2,000 lbs.
Concentrated Live Load Performance Over an Area of 1 square inch (1- by 1-inch): Minimum concentrated live-load capacity of low-profile access floor system, in pounds per square inch (psi), when applied uniformly over this area and located so as to produce the maximum load effects in the structural member, shall conform to the building code or local authorities having jurisdiction requirements, whichever is the more stringent, but at 0.1-inch deflection and 0.06-inch set and a factor of safety of 2 shall not be not less than:

.1 200 psi.

Uniform Live Load Performance over Entire Floor Area: Minimum uniformly-distributed-live load capacity of low-profile access floor system, in pounds per square foot (psf), shall conform to the building code or local authorities having jurisdiction requirements, whichever is the more stringent, but at maximum deflection of L/240 or 0.15-inch and 0.06-inch set, shall not be less than:

.1 100 psf.

All Base Units / Channel Plates / Corner Plates:

.1 Floor assembly: Floor assembly to be rigid, free of vibration, rocking parts, and squeaks.

.2 Seismic Performance: Adaptive cabling distribution access flooring shall withstand the effects of earthquake motions determined according to ASCE/SEI 7, Chapter 13. To resist design seismic loads, anchor each load carrying storage unit and other heavy equipment directly to existing structure.

.3 Flame Spread Rating: Flame spread and smoke development rating of low-profile access floor system when tested per ASTM E-84, shall conform to the building code or local authorities having jurisdiction requirements, whichever is the more stringent, but shall not be less than:

.1 Class A Rating: Flame Spread less than 25; Smoke Development less than 75.

.4 Combustible Rating: When tested in accordance with ASTM E-136, conform to the building code or local authorities having jurisdiction requirements, whichever is the more stringent, but at a minimum classified as:

.1 Non-Combustible.

.5 Corrosion Resistance: Galvanizing thickness rating of metallic outlet boxes and base units, corner plates, channel plates and border units when tested per UL514A, shall conform to the building code or local authorities having jurisdiction requirements, whichever is the more stringent, but not less than:

.1 Galvanized Coating – G40 Minimum (Per ASTM A-653)
2.3 **Materials**

2.3.1 Access Flooring must be ULC-listed.

2.3.2 All steel construction, no plastic substructure, wood or concrete materials permitted.

2.3.3 Standard Components: Provide adaptive cabling distribution flooring assembly consisting of base units, corner plates, channel plates, and undersheet.

   .1 Module Size: One Base Unit, 2 Channel Plates and 1 Corner Plate consist of the assembly’s modular size of 19.625- by 19.625-inches (500 by 500mm).

   .2 Low-profile system height: 2.75 inches (70mm) fixed height.

   .3 All steel construction.

2.3.4 Border Components: Provide border components to infill all gaps between the standard components and edges of field penetrations and boundary walls.

2.3.5 Additional Components:

   .1 Ramps: Manufacturer’s standard ramp construction of slope indicated. Provide internal and external angle slopes as indicated on drawings.

   .1 Slope: as required to suit project conditions.

   .2 Fascia Closures: Where edge of ramps or underfloor cavities do not abut other fixed construction provide steel primed for field painting channel frames with factory-formed corners and end caps.

   .3 Floor Boxes: Coordinate electrical requirements of Division 26 and with Bramic; furniture console coordinator.

   .1 Power, Voice, Data: Provide manufacturer’s floor box with standard device plates to accommodate the following

   .1 Size: 9- by 13-inches, by 2.75 inches (70mm) deep.

   .2 Number of Power Receptacles: minimum 4.

   .3 Number of Low Voltage jacks: minimum 3.

2.3.6 Wiring/cabling installed under the floor must conform to the applicable sections of the Electrical Code in effect. The low-profile access floor is not part of the grounding system and not intended to enclose splices or other types of wiring that are required to be enclosed in raceway.

2.3.7 Model: Gridd70

2.3.8 As Manufactured by: FreeAxez Manufacturing LLC or Agency approved equivalent

3. **EXECUTION**

3.1 **Examinations**

3.1.1 Report to the Consultant, in writing, all defects of Work or unsatisfactory site conditions.
3.1.2 Do not commence the Work of this Division until surfaces, area, conditions specified or indicated on Drawings, to receive manufactured specialties, are compatible with the manufacturer's installation requirements.

3.1.3 Commencement of Work implies total acceptance of all preliminary installation requirements by the Contractor.

3.1.4 Waive any after claims by failure to comply with the above procedure of examination.

3.2 Preparation

3.2.1 Prior to installation, provide subfloors that are dry and free of any surface irregularities that could reasonably be anticipated to adversely affect access flooring system appearance or performance.

3.2.2 Confirm minimum subfloor flatness (FF=25) and subfloor levelness (FL=20) is achieved in accordance with specified overall values (SOV) of ASTM E1155.

3.2.3 Site verify dimensions including level of abutting floors, ledges and doorsill interfaces.

3.2.4 Before beginning installation complete necessary subfloor preparations. Vacuum clean subfloor to remove dust, dirt, and construction debris. Where required provide floor leveling to accommodate access flooring installation. Refer to Section 09 30 00 – Tiling for acceptable floor leveling materials.

3.2.5 Provide clear access to subfloor area free of construction debris and other trades throughout installation of access floor system.

3.3 Installation

3.3.1 Perform installation in accordance with the manufacturer’s installation instructions.

3.3.2 Individual parts shall be easily placed and removed, without disturbing adjacent assembly, by one person with no special tools.

3.3.3 Electrical boxes and openings shall be established so that work does not interfere with the integrity of the flooring system.

3.3.4 Coordinate installation with tradesmen to maintain the integrity of the installed system.

3.3.5 Manage schedule to ensure work by trades requiring wheeled traffic exceeding floor capacity is completed prior to installation of low-profile access floor.

3.3.6 During installation, all traffic on access floor shall be controlled such that the floor capacity is never exceeded.

3.3.7 Keep the subfloor broom clean as installation progresses.

3.3.8 Place under-sheet without wrinkles.

3.3.9 Layout according to manufacturer’s installation instructions.

3.3.10 Secure ramps according to manufacturer’s installation instructions.

3.4 Cleaning

3.4.1 Clean work area daily in accordance with Section 01 74 00.

3.4.2 Remove all excess materials from site as Work proceeds and at completion.
3.4.3 On completion of the Work remove all tools, containers, surplus materials, equipment, waste, etc., and leave Site neat, clean and tidy to the satisfaction of the Owner.

3.4.4 Clean and make good surfaces soiled or otherwise damaged as a result of Work of this Section at no additional cost to the Owner.

3.4.5 Leave surfaces clean and ready for subsequent Work.

3.5 Protection

3.5.1 Control traffic on low-profile access floor after installation. Do not allow traffic that exceeds the published floor capacity.

3.5.2 Before construction or delivery traffic is permitted travel on the access floor provide minimum 3/4-inch plywood sheathing over partially or fully-completed floors per manufacturer's requirements.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**
   1.1.1 Comply with Instructions to Vendors, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Intent**
   1.2.1 Provide all articles, labour, materials, equipment, transportation, hoisting, and incidentals noted, specified or required, to complete the Work of this Section.

1.3 **Section Includes**
   1.3.1 Provide all acoustic tile and required accessories as indicated on the working Drawings, room finish schedule, including but not limited to the following:
   - .1 Acoustic panels
   - .2 Suspension system

1.4 **Related Sections**
   1.4.1 Section 09 21 16 - Gypsum Board Assemblies.

1.5 **References**
   1.5.3 CAN/ULC-S102 – Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.6 **Samples**
   1.6.1 Submit minimum 300 mm x 300 mm samples of acoustical treatment panel, as required for completion of the Work for the Consultant's review before proceeding with the acoustic tile Work.
   1.6.2 Submit samples of acoustic Products in type specified for approval by the Consultant.

1.7 **Close-out Submittals**
   1.7.1 Submit two copies of the manufacturer's maintenance directions for each type of acoustic panel.

1.8 **Rejections**
   1.8.1 Defective materials or quality of Work whenever found at any time prior to acceptance of the Work shall be rejected regardless of previous inspection. Inspection will not relieve responsibility, but is a precaution against oversight and error.
   1.8.2 Remove and replace defective materials and Work affected by this replacement, at no additional cost to the Agency.
1.9 **Delivery, Storage and Handling**
   1.9.1 Refer to Section 01 61 00 – Common Product Requirements.
   1.9.2 Deliver acoustical panels and materials in undamaged and original containers and make certain that the storage area is dry.

1.10 **Extra Materials**
   1.10.1 Furnish the Agency with two percent extra materials of each type of panel to be used for future repair Work.

2. **PRODUCTS**

2.1 **Manufacturers**
   2.1.1 The products of the following manufacturers are acceptable subject to conformance with the requirements of the Drawings, Schedules and Specification:
      .1 EzoBoard
      .2 FitzFelt
      .3 Or Agency approved equivalent.
   2.1.2 Subject to conformance with the requirements of the Drawings, Schedules and Specifications, Products of other Manufacturers may be acceptable.
   2.1.3 Submit all Substitutions in accordance with Section 01 25 00 – Substitution Procedures.

2.2 **Acoustic Ceiling**
   2.2.1 Acoustical Panels:
      .1 Composition: Polyester
      .2 Colour: refer to the Finish Schedule
      .3 Size and design: refer to drawings
      .4 Thickness: 9mm (3/8”) or 12mm (1/2”) as indicated in schedule.
      .5 Flame spread rating of 25 or less in accordance with CAN/ULC-S102.
      .6 Smoke developed 50 or less in accordance with CAN/ULC-S102.
      .7 Noise reduction coefficient (NRC) designation minimum 0.70 in accordance with ASTM C423.

2.3 **Suspension System:**
   2.3.1 Suspension system: as recommend by the Manufacturer.

3. **EXECUTION**

3.1 **Examinations**
   3.1.1 Commencement of the Work of this Section implies total acceptance of all applicable conditions by the Contractor.
   3.1.2 Waive the right to any after claims by failure to comply with the above procedure of examinations.
3.2 **Application**

3.2.1 Install the panels in accordance with the manufacturer's Specifications.

3.2.2 Plumb and square finish Work with adjoining Work.

3.2.3 Lay the Work out, in accordance with the Consultant's approved Drawings, symmetrical within each area to obtain uniform installation.

3.2.4 Distribute variations in shades of finish from several cartons of panels uniformly over the wall area.

3.3 **Cleaning and Protection**

3.3.1 Be responsible for protection of all materials and Work from damage during period of construction.

3.3.2 Make good any resulting damage, to the satisfaction of the Consultant, at no additional expense to the Agency.

3.3.3 Promptly, as the Work proceeds and on completion, clean-up and remove from the premises all rubbish and surplus materials resulting from the foregoing Work.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**

1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes**

1.2.1 Complete painting of all surfaces noted on Drawings, on room finish schedule and as follows:

- **Interior:**
  - Wood surfaces
  - Gypsum surfaces
  - Metal surfaces - prime painted and galvanized, including but not confined to hollow metal doors and frames, convectors, grilles, louvres, diffusers, access panels, handrails and stairs
  - Masonry surfaces
  - Concrete surfaces

- Mechanical and electrical conduit, piping and ductwork including hangers in exposed locations.

- Painting of walls and floors below access flooring.

- Top, bottom and edges of wood and plastic laminate doors.

- Painting electrical backboards.

- Exposed electrical raceways.

1.3 **Related Sections**

1.3.1 Refer to all technical sections for painting requirements within those sections.

1.4 **References**

1.4.1 Abbreviations and Acronyms:

- DFT: Dry Film Thickness
- HVAC: Heating, Ventilating and Air Conditioning
- MPI: The Master Painters Institute; [www.mpi.net](http://www.mpi.net)
- MSDS: Material Safety Data Sheets
- OPCA: Ontario Painting Contractors Association; [www.ontpca.org](http://www.ontpca.org)
- SSPC: The Society for Protective Coatings (formerly known as Steel Structures Painting Council); [www.sspc.org](http://www.sspc.org)
- TSP: Tri-sodium Phosphate
- ULC: Underwriters Laboratories of Canada; [www.ulc.ca](http://www.ulc.ca)
- VOC: Volatile Organic Compound
1.4.2 Definitions:

.1 General: Standard coating terms defined in ASTM D 16.

.2 Flat: A lusterless or matte finish with a gloss range below 15 when measured at an 85 degree meter.

.3 Eggshell: Low-sheen finish with a gloss range between 20 and 35 when measured at a 60 degree meter.

.4 Semi-Gloss: Medium-sheen finish with a gloss range between 35 and 70 when measured at a 60 degree meter.

.5 Full Gloss: High-sheen finish with a gloss range more than 70 when measured at a 60 degree meter.

.6 Environments: The following terms distinguish between different corrosive exposures:

.1 Severe Environments: Highly corrosive industrial atmospheres with sustained exposure to high humidity and condensation and with frequent cleaning using strong chemicals. Environments with heavy concentrations of strong chemical fumes and frequent splashing and spilling of harsh chemical products are severe environments.

.2 Moderate Environments: Corrosive industrial atmospheres with intermittent exposure to high humidity and condensation, occasional mold and mildew development, and regular cleaning with strong chemicals. Environments with exposure to heavy concentrations of chemical fumes and occasional splashing and spilling of chemical products are moderate environments.

.3 Mild Environments: Industrial atmospheres with normal exposure to moderate humidity and condensation, occasional mold and mildew development, and infrequent cleaning with strong chemicals. Environments with low levels of mild chemical fumes and occasional splashing and spilling of chemical products are mild environments. Normal outdoor weathering is also considered a mild environment.

1.4.3 Reference Standards: Versions of the following standards current as of the date of issue of the project apply to the Work of this Section.

.1 American Society for Testing and Materials (ASTM):


.2 ASTM D523 – Standard Test Method for Specular Gloss

.2 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-1.57-2003: Interior Alkyd Semigloss Enamel.

.2 CAN/CGSB-1.100-99: Interior Flat Latex Paint.
Regional Municipality of Peel  
Document 2019-165T  
Division 09  
Purchasing Section  
MAJOR RENOVATION PROJECT AT  
Section 09 90 00  
TWO PEEL REGIONAL POLICE  
Painting and  
COMMERCIAL SITES  

.3 CAN/CGSB-1.119-2000: Interior Latex Primer-Sealer.
.4 CAN/CGSB-1.175-97: Polyurethane Interior Coating.
.5 CAN/CGSB-1.188-2004: Emulsion Filler for Masonry Block.
.6 CAN/CGSB-1.195-99: Interior Latex Semigloss Paint.

.3 Master Painters Institute (MPI):
.1 The Master Painters Institute – Architectural Painting Specification Manual by PDCA.

.4 Society for Protective Coatings (SSPC):
.2 SSPC-SP 1 - Solvent Cleaning.
.3 SSPC-SP 2 - Hand Tool Cleaning.
.4 SSPC-SP 3 - Power Tool Cleaning.
.5 SSPC-SP5/NACE No. 1, White Metal Blast Cleaning.
.6 SSPC-SP6/NACE No. 3, Commercial Blast Cleaning.
.7 SSPC-SP7/NACE No. 4, Brush-Off Blast Cleaning.
.8 SSPC-SP10/NACE No. 2, Near-White Blast Cleaning.
.9 SSPC-SP11, Power Tool Cleaning to Bare Metal.
.10 SSPC-SP12/NACE No. 5, Surface Preparation and Cleaning of Metals by Water-jetting Prior to Recoating.
.11 SSPC-SP 13 / NACE No. 6 Surface Preparation for Concrete.
.12 SSPC-SP 16 – Brush-off Blast Cleaning Non-Ferrous Metals

1.5 **Samples**

1.5.1 Submit brushouts 150 mm x 150 mm of each paint application, labelled as to Product and location.

1.5.2 Proceed with painting and staining mock-up only when colour and finish has been approved.

1.6 **Quality Assurance**

1.6.1 Employ fully trained workers who are regularly employed in this field.

1.6.2 Arrange for testing of paint/coatings by Product manufacturer. Obtain in writing from manufacturer representative, approval of surface preparation methods, and obtain reports that materials and application methods conform to specification.

1.6.3 Comply with VOC limits set out by Green Seal Organization for all non-alkyd and non-epoxy coatings/paints.
1.7 **Mock-Up**

1.7.1 Consultant will locate testing area to establish standard of workmanship, texture, gloss and coverage.

1.7.2 Apply 300 x 300 mm samples of each finish on each type of surface to be coated with:

- .1 correct material,
- .2 number of coats,
- .3 colour,
- .4 texture, and
- .5 degree of gloss required.

1.7.3 Alternately, apply full size test samples in areas designated by Consultant of each finish on each type of surface to be coated with:

- .1 correct material,
- .2 number of coats,
- .3 colour,
- .4 texture, and
- .5 degree of gloss required.

1.7.4 Provide additional panels, if required, to obtain approval. Do not continue painting until panels have been approved.

1.7.5 Approved panels shall become standard of comparison for painting Work on site. Approved full size mock-up panels may become integral part of finished Work if permitted by Consultant.

1.8 **Rejections**

1.8.1 Defective materials or quality of Work, whenever found, at any time prior to acceptance of the Work, shall be rejected regardless of previous inspection. Inspection will not relieve responsibility, but is a precaution against oversight or errors.

1.8.2 Remove and replace defective materials and Work affected by this replacement, at no additional cost to the Agency.

1.9 **Delivery, Storage and Handling**

1.9.1 Refer to Section 01 61 00 – Common Product Requirements.

1.9.2 Bring materials to the site in the original unopened containers labelled to indicate the name of the manufacturer, brand, colour and quality of the contents.

1.9.3 Store thinners, loose soaked rags and similar combustible materials in closed containers. Remove from site or store in an assigned area.

1.9.4 Store paint materials at temperatures recommended by manufacturer.

1.10 **Project conditions**

1.10.1 If requested, provide proof of purchase of all paint materials needed for the job.
1.11 **Environmental Conditions**
1.11.1 Maintain minimum interior temperature of 18 degrees C during application and drying of paint, and maintain until handover to Agency.
1.11.2 Do not paint when ambient air and surface temperatures are less than 15 degrees C for 24 hours before or during painting application.

1.12 **Scheduling**
1.12.1 Unoccupied Areas: minimize touch-ups, but to ensure completion prior to installation of floor coverings and furniture.
1.12.2 Occupied Buildings: schedule painting to prevent disruption to occupants. Painting shall be carried out or as arranged/agreed with Agency.

2. **PRODUCTS**

2.1 **Manufacturers**
2.1.1 Refer to Finish Schedule 9000 series. Schedule located in Specification Section 00 01 13 Standard Details.
2.1.2 Subject to conformance with the requirements of the Drawings, Schedules and Specifications, Products of other Manufacturers may be acceptable.
2.1.3 Submit all Substitutions in accordance with Section 01 25 00 – Substitution Procedures.

2.2 **Materials**
2.2.1 Use only top line of products from any manufacturer.
2.2.2 Interior Latex Primer Sealer
   .1 ICI Paints “ICI dulux”
   .2 Para - “PrimeTech Hi-Hide Latex Primer”
   .3 or Agency approved equivalent.
2.2.3 Interior Latex Eggshell
   .1 Benjamin-Moore & Co. Limited “Regal Aquavelvet”
   .2 ICI Paints “CIL Professional Interior Latex Pearl”
   .3 ICI Paints “Glidden Ultra Interior Latex Pearl”
   .4 PPG “Satin Latex Interior Acrylic”
   .5 Sherwin Williams-MPI-52 Gloss Level 3 Interior Latex Eggshell
   .6 or Agency approved equivalent.
2.2.4 Interior Latex Flat (Ceilings)
   .1 Benjamin-Moore & Co. Limited “Moorespec”
   .2 PPG “Speedhide”
   .3 or Agency approved equivalent.
2.2.5 Interior Latex Semi-gloss
   .1 Sherwin Williams Promar 2000 Interior Semi-gloss Latex
   .2 PPG “Pure Performance” Interior Semi-gloss Latex
   .3 or Agency approved equivalent.

2.2.6 Galvanized Primer (Interior)
   .1 Benjamin-Moore & Co. Limited “Acrylic Metal Primer”
   .2 ICI Devoe “Devflex”
   .3 Para “Waterborne Galvanized Primer”
   .4 PPG “Pitt Tech” DTM High Performance Primer
   .5 or Agency approved equivalent.

2.2.7 Dry Fall for Galvanized Steel
   .1 Benjamin-Moore & Co. Limited “Sweep-up” Spray Latex Semi-gloss”
   .2 Benjamin-Moore & Co. Limited “Moorespec” Latex DTM Dryfall Coating
   .3 ICI Paints “Spraymaster” Unigrip Arcrylic Dryfall
   .4 PPG “Speed hide” Supertech WB Dry-fog Latex
   .5 or Agency approved equivalent.

2.2.8 Wood Stain Blocker / Gypsum Primer
   .1 Benjamin-Moore & Co. Limited “Freshstart” 100 percent Acrylic Primer
   .2 ICI Paints CIL Professional Interior Acrylic Stain Bloc
   .3 PPG “Seal Grip” Acrylic Latex Stain Blocking Primer
   .4 Sherwin Williams “PrepRite” Pro Block Latex Interior/Exterior Primer/Sealer
   .5 or Agency approved equivalent.

2.2.9 Floor Paint
   .1 ICI Paints “ICI Xpert” Latex Floor Paint
   .2 Benjamin Moore Porch and Floor 122 Latex Satin enamel.
   .3 or Agency approved equivalent.

2.2.10 Interior Wood Lacquer
   .1 ICI Paints “Woodpride” Interior Aquacrylic Gloss/Satin Varnish
   .2 or Agency approved equivalent.

2.2.11 Paint and Interior Stain for Other Products Not Specifically Listed
   .1 Benjamin-Moore & Co. Limited
   .2 Glidden Company
   .3 Olympic Stain, Comerco Inc.
   .4 Pittsburgh Paints
   .5 Pratt & Lambert Inc.
   .6 International Paints
   .7 or Agency approved equivalent.

2.2.12 Fire Retardant Coating
   .1 Ocean Fire Retardants Inc.
   .2 Pratt & Lambert Inc.
   .3 Sico Ltd.
   .4 Glidden Company
   .5 Laco Ad Film
   .6 or Agency approved equivalent.
2.3 **Materials**

2.3.1 No claim as to unsuitability or unavailability of any material specified, or unwillingness to use same, or inability to produce first class Work with same will be entertained unless such claims are made in writing and submitted with Tender.

2.3.2 Select materials for application on each type surface from a single manufacturer.

2.3.3 Where required to meet sustainable design program requirements, use only low VOC products with a VOC limit of 150 g/L for non-flat, and 50 g/L for flat finishes.

2.4 **Finish and Colours**

2.4.1 Gloss/Sheen Ratings:

.1 Paint gloss shall be defined as the sheen rating of applied paint, in accordance with the following values:

<table>
<thead>
<tr>
<th>Gloss Level</th>
<th>Description</th>
<th>Units @ 60 Degrees</th>
<th>Units @ 85 Degrees</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1</td>
<td>Matte or flat finish</td>
<td>0 to 5</td>
<td>10 max.</td>
</tr>
<tr>
<td>G2</td>
<td>Velvet finish</td>
<td>0 to 10</td>
<td>10 to 35</td>
</tr>
<tr>
<td>G3</td>
<td>Eggshell finish</td>
<td>10 to 25</td>
<td>10 to 35</td>
</tr>
<tr>
<td>G4</td>
<td>Satin finish</td>
<td>20 to 35</td>
<td>35 min.</td>
</tr>
<tr>
<td>G5</td>
<td>Semi-gloss finish</td>
<td>35 to 70</td>
<td></td>
</tr>
<tr>
<td>G6</td>
<td>Gloss finish</td>
<td>70 to 85</td>
<td></td>
</tr>
<tr>
<td>G7</td>
<td>High-gloss finish</td>
<td>&gt;85</td>
<td></td>
</tr>
</tbody>
</table>

.2 Gloss level ratings of all painted surfaces shall be as specified herein and as noted on finish schedule.

2.4.2 The submitted brushouts and approved mock-up shall be the only determining factors in assessing approved colour tone and shade.

2.4.3 Colours will be based on three base colours and two accent colours with a maximum of one deep or bright colour. No more than six colours will be selected for the entire Project. Note that this does not include pre-finished items by others.

2.4.4 Unless otherwise noted or scheduled, wall shall be painted the same colour within a given area.

2.4.5 Ceilings (except those having a spray textured coating) shall be painted white in a G1 finish.

2.4.6 Designated rooms / spaces shall be painted using different colours or more than one colour than typical rooms in accordance with finish schedule requirements with a minimum of two colours required.

2.4.7 Except as noted herein or indicated on the finish schedule, interior walls and ceiling surfaces shall be painted in accordance with the following criteria over appropriate prime / sealer coat:

.1 All areas (except as noted): Washable latex with G3 (eggshell) finish.
.2 Laundry facilities / rooms, public wash / shower / bathrooms, residential kitchens and bathrooms and ensuites: washable latex with G5 (semi-gloss) finish.

.3 Public change / wash / shower rooms and institutional facility bathing and shower rooms: Epoxy (tile-like) G5 (semi-gloss) finish for wet surfaces.

.4 Public and institutional facility “clean” or “sanitary” areas such as food preparation and laboratory areas: epoxy (tile-like) G5 (semi-gloss) finish for dry surfaces.

2.4.8 Access doors, prime coated butts and other prime painted hardware (e.g. door closers), registers, radiators and covers, exposed piping and electrical panels shall be painted to match adjacent surfaces (i.e. same colour, texture and sheen), unless otherwise noted or where pre-finished.

2.4.9 Plywood service panels (e.g. electrical, telephone and cable vision panels) including edges shall be back-primed and painted flat grey to match painted wall mounted on.

2.4.10 The inside of light valances shall be painted gloss white.

2.4.11 The inside of all ductwork behind louvres, grilles and diffusers for a minimum of 460 mm or beyond sight line, whichever is greater, shall be painted using flat black (non-reflecting) paint.

2.5 **Mixing and Tinting**

2.5.1 Deliver paints and enamels ready mixed to jobsite. Job mix and tint only when approved by the Consultant.

2.5.2 Tint undercoats and each finish coat progressively to enable confirmation of number of coats.

2.6 **Paint and Stain Applications for Various Uses**

2.6.1 Interior

.1 Iron and Steel Items:
   - Stairs
   - Structural Steel
   - Doors and frames
   - Steel decking
   - Grilles
   - Convector
   - Piping and conduit
   - Duct Work

.1 1-coat interior primer

.2 2-coats finish G4
.2 Painted Woodwork
   Items:    - Beam
             - Decking
             - Walls
             - Doors
             - Trim
             - Millwork

   .1 1-coat interior primer
   .2 2-coats finish G3

.3 Woodwork to be Stained and Varnished
   Items:    - Benches
             - Millwork
             - Doors
             - Trim
             - Panelling

   .1 Finish:
      1-coat paste filler
      1-coat wood stain
      2-coats varnish (gloss)
      1-coat varnish (gloss, satin, dull)

.4 Plaster and Drywall
   Items:    - Ceilings/Bulkheads
             - Walls

   .1 1-coat latex primer
   .2 2-coats finish G3, Ceiling/Bulkhead Finish G1

.5 Concrete
   Item:    - Ceilings

   .1 Finish:  (Flat, eggshell, semi-gloss, gloss)
      1-coat latex primer
      2-coats finish G3

   Item:    - Floors

   .1 Satin Finish, epoxy modified acrylic latex-2 coats

   Item:    - Walls and Floors below access flooring

   .1 Finish:  3-coats "Palgard" epoxy coating by Pratt and Lambert,
               colour yellow.

.6 Masonry and Concrete
   Item:    - Walls

   .1 1-coat primer filler
   .2 2-coats finish G3
3. **EXECUTION**

3.1 **Examination**

3.1.1 Report to the Consultant, in writing, all defects of surfaces or Work or unsatisfactory site conditions.

3.1.2 Thoroughly examine all surfaces scheduled to receive paint to see that they are dry, clean, free from cracks, scaling, grease, oil, or other foreign materials liable to impair adhesion, performance or appearance. Take moisture readings.

3.1.3 Commencement of Work implies total acceptance of all surface conditions.

3.2 **Verification of Surface Conditions**

3.2.1 Do Work only when surfaces and conditions are satisfactory for production of quality Work. Report in writing any surfaces which are found to be unsatisfactory. Commencement of Work shall imply acceptance of substrate surfaces.

3.2.2 Ensure temperature of surfaces to be finished between 10 and 20 degrees C and surfaces are dry and free of dirt, grease or other contaminants that may affect applied finish.

3.2.3 Verify moisture content of surfaces with electronic moisture metre. Do not proceed without written directions if moisture reading is higher than 12-15 percent.

3.2.4 If substrate is steel, do not apply coatings over moisture or when surface temperature is within 3 degrees C of dew point.

3.2.5 If substrate is wood, do not stain or paint if moisture reading is higher than 12 percent. Inspect Work to assure surfaces are smooth, free from machine marks and nail heads have been countersunk.

3.2.6 If substrate is plaster or masonry, allow to cure for 30 to 90 days. Ensure that moisture content is below 12 percent and test for alkalinity and neutralize (pH 6.5-7.5) before proceeding with priming.

3.2.7 If substrate is gypsum board, inspect to ensure joints are completely filled and sanded smooth. Inspect surfaces for “nail popping”, screw heads not recessed and taped, breaks in surface or other imperfections and have repaired as required.

3.2.8 Conduct all moisture tests using a properly calibrated electronic moisture meter.

3.2.9 Test concrete floors for moisture using a cover patch test.

3.2.10 Test concrete, masonry and plaster surfaces for alkalinity as required.
3.3 **Surface Preparation**

3.3.1 Remove dust, grease, rust and extraneous matter from surfaces (except rust occurring on items specified to be primed under other Sections shall be removed and Work re- primed under those Sections). Vacuum (fibre acoustic tile and) insulation covering surfaces. Vacuum clean floors before painting; wipe clean adjacent surfaces and surfaces to be painted before Work is commenced to prevent dust and debris damage to wet paint.

3.3.2 Remove mildew by scrubbing affected area with solution of tri- sodium-phosphate (TSP)(150 g) and bleach (125 g) in 3.5 L water. Rinse will with clean water and allow to dry. If condition is serious, source out finishes with extra mildew resistance.

3.3.3 Be responsible for surface preparation to suit surface condition and conform to level of cleaning based on (SSPC), recommended metal cleaning procedures most commonly used to suit site conditions.

3.3.4 **Ferrous Metal**

.1 Clean to SSPC-SP1/2/3 described herein, to suit site conditions. Remove loose rust and prime bare metal with rust inhibitive steel primer. Touch-up damaged shop applied primer using compatible Product. Provide full coat primer only if damage is extensive. Treat all weld areas with phosphoric acid (5 percent solution).

.2 SSPC-SP1 (Solvent Cleaning): Use of solvents (such as mineral spirits, xylene, toluene) or cleaning action to remove oil, grease, soil drawing and cutting compounds or similar solvent soluble contaminants. Use of gasoline or benzene shall be prohibited.

.3 SSPC-SP2 (Hand Tool Cleaning): Use of scrapers, sandpaper, wire brushing or hand impact tools to remove loose mill scale, non-adherent rust and scaling paint or other foreign matter. Do not use hand tool cleaning procedure for areas subject to corrosive environment or on surfaces for vinyl chloride top coating. Remove weld flux and spatter to avoid localized paint failure.

.4 SSPC-SP3 (Power Tool Cleaning): Use of power sanders and wire brushes, impact tools, grinders and power chipping hammers to remove loose mill scale, loose rust, paint or other foreign matter. Do not employ power tool cleaning excessively causing burnished mill scale preventing primers to adhere properly.

3.3.5 **Structural Steel/Miscellaneous Steel (previously painted and exposed by alterations Work):**

.1 Remove oil, grease dirt, rust scale, loose mill scale, loose paint or coating by brush-off blast cleaning to SSPC-SP7 or by water blasting at minimum 215.4 kPa/sq. cm at minimum flow rate of 0.25 l/sec.
.2 SSPC-SP7 (Brush-Off Blast Cleaning): Use blast cleaning method used to remove loose mill scale, rust and other contaminants. Employ other methods to remove tightly adhered contaminants. Do employ to clean rusty galvanized metal siding and old finishes in poor condition.

.3 SSPC-SP6 (Commercial Blast Cleaning): Use this method of cleaning that removed minimum two thirds of mill scale, rust and other foreign matter from steel surface. Prime blast cleaned surfaces as soon as possible.

3.3.6 Hot Dipped Galvanized Steel (Unweathered):
.1 Allow to weather minimum of 26 weeks and xylene clean to SSPC-SP1 specified herein prior to coating to remove dust, dirt, grease, oxides and other foreign material. Remove silicates or similar surface treatments or any deposits of white rust by sanding or similar abrasive methods (bronze wool). Use of acetic acid to prepare galvanized surfaces is not acceptable.

3.3.7 Galvanized Steel (Weathered):
.1 Remove dust, dirt, grease, oxides and other foreign material and clean to SSPC-SP1 specified herein prior to coating.

3.3.8 Galvanized Steel (Pre-treated)(Non-crystal Appearance):
.1 Follow manufacturer’s recommendations for preparation, priming and coating of pre-treated galvanized steel.

3.3.9 Woodwork for Painting:
.1 Seal all knots and sapwood in surfaces to receive paint with alcohol-based primer-sealer. Sand smooth rough surfaces of all woodwork to be finished and clean surfaces free of dust before applying first coat. Fill nail holes, splits and scratches with non-shrinking filler after first coat is dry. Remove salt deposits that may appear on wood surfaces treated with fire retarder.

3.3.10 Previously Finished Surfaces:
.1 Clean existing interior surfaces to be repainted or varnished to provide bond. Remove rust, scale, oil, grease, mildew, chemical and other foreign matter. Remove loose paint and fill flush with suitable patching material. Clean off bubbled, cracked, peeling or otherwise defective paint by stripping with suitable environmental strippers or by burning. Do not burn off paints suspected of having lead content. Treat residue from stripping as hazardous waste.

.2 Flatten gloss paint and varnish with sandpaper and wipe off dust. If previous coating have failed so as to affect proper performance or appearance of coatings to be applied, remove previous coatings completely and prepare substrates properly and refinish as specified for new Work. Leave entire surface suitable to receive designated finishes and in accordance with finish manufacturer’s instructions.
3.3.11 Concrete Block Masonry:
.1 Fill voids and cracks in masonry block wall to provide uniform surface for subsequent coats.
.2 Where necessary to neutralize surfaces, wash or paint with a solution of 1.36 kg of zinc sulphate to 4.5 litres of water. Brush off any crystalline residue on drying.

3.3.12 Existing Plaster:
.1 Clean dry, free from dust, dirt, powdery residue, grease, oil, wax or any other contaminant accumulated since application. Do not sand plaster before painting.
.2 Cut out scratches, cracks and abrasions, undercut if cracks are large. Fill with approved patching plaster or spackling compound. Bring flush with adjoining surface. When dry sand smooth and seal before applying prime coat.

3.3.13 Gypsum Board:
.1 Examine surfaces after for imperfections showing through and fill small nicks or holes with patching compound and sand smooth. Examine surfaces after priming for imperfections showing through. Clean surfaces dry, free of dust, dirt, powdery residue, grease, oil, wax or any other contaminants. Sand and dust as necessary prior to painting.

3.3.14 During Work of this Section cover finished floors, walls, ceilings, and other Work in vicinity and protect from paint and damage.

3.3.15 Clean adjacent surfaces which have been painted, soiled or otherwise marred.

3.4 Application
3.4.1 Spraying not allowed without written permission.
3.4.2 Paint entire plane of areas exhibiting incomplete or unsatisfactory coverage and of areas which have been cut and patched. Patching not acceptable.
3.4.3 Do not paint baked enamel, chrome plating, stainless steel, aluminum, or other surfaces finished with final finish in factory. Finish paint all primed surfaces.
3.4.4 Advise Consultant when each applied paint coat can be inspected. Do not re-coat without inspection. Tint each coat slightly to differentiate between applied coats.
3.4.5 Sand smooth enamel and varnish undercoats prior to re-coating.
3.4.6 Apply primer coat soon after surface preparation is completed to prevent contamination of substrate.
3.4.7 Prime woodwork designated for painting as soon as possible after delivery to site and before installation. Prime all cut surfaces, whether exposed or not, i.e. all six edges of wood doors, before installation. Prime all cut surfaces of woodwork to receive transparent finish with one coat of transparent finish reduced 25 percent.
3.4.8 Fill open grain wood with filler tinted to match wood and work well into grain. Wipe excess from surface before filler sets.
3.4.9 Apply primer-sealer coats by brush or roller. Permit to dry in accordance with manufacturer’s recommendations before applying succeeding coats. Touch-up suction spots and sand between coats with No. 120 sandpaper.

3.4.10 Apply primer coat to unprimed ferrous metal surfaces. Where sandblast preparation is specified, apply specified primer immediately after blast cleaning.

3.4.11 Apply final coats on smooth surfaces by roller or brush. Hand brush wood trim surfaces.

3.4.12 Apply additional paint coats, beyond the number of coats specified for any surface, to completely cover and hide the substrate and to produce a solid, uniform appearance.

3.4.13 Allow each coat of paint to cure and become dry and hard before application of succeeding coats (unless manufacturer’s directions require otherwise).

3.4.14 Before finishing paint coats are applied, inspect and touch-up shop coats of primers previously applied.

3.4.15 Apply paint in accordance with manufacturer’s directions.

3.4.16 Provide paint coating thicknesses indicated, measured as minimum dry film thicknesses.

3.5 Existing Spaces

3.5.1 Refinish existing surfaces of rooms or areas that have been damaged, altered or otherwise specified. Use same procedure as for new Work but primer (or filler, stain and sealer in case of varnish finish) may be omitted. Prepare existing surfaces as specified herein. Finish shall match previous finish.

3.5.2 Paint or repaint rooms or areas where noted on room finish schedule and/or as indicated on Drawings.

3.5.3 Repaint surfaces entirely between changes of plane.

3.5.4 Extend painting to a suitable boundary to avoid a “patched” effect. Sand, wire brush, or scrape such existing finished surfaces to remove loose paint and to reduce gloss. Also clean existing films of dirt, grease or wax. If metallic surfaces are rusted, remove loose scale to provide a firm surface. Patch and sand cracks and other imperfections.

3.5.5 Provide paint to interior existing spaces effected by alterations and shelled-in spaces in accordance with following:

.1 Paint walls to the nearest inside and outside corners for the full wall height.

.2 Paint columns floor to ceiling.

.3 Paint full ceilings to the nearest wall or bulkhead.

.4 Unless indicated otherwise match the existing colour.
.5 Where room finish schedule indicates existing and/or new wall finishes to be painted, existing surfaces such as, existing door and frames, mechanical supply and return air grilles (both on walls and ceilings), access doors and electrical panels which has been previously painted shall be painted for a complete finish room. If the room finish schedule indicates “-“ it denotes the entire room need not be painted, only the patched areas to be painted.

3.5.6 Apply at least the number of coats specified to produce a finish of even colour, texture and sheen.

3.5.7 Lightly sand all finishes between coats and clean.

3.5.8 Finish tops, bottoms and edges of doors, after doors are fitted.

3.5.9 Finish interior of closets same as nearest or adjoining surface unless otherwise directed by the Consultant.

3.5.10 Fill screw heads, holes and other defects in metal Work with mineral filler. Putty nail holes, cracks and other defects in Work, other than metal to match finish intended.

3.5.11 Spray Work may be acceptable for certain surfaces with Consultant’s written permission. Roller application of paint is acceptable over drywall and concrete block surfaces. Apply all other finishes by brush.

3.5.12 Should spray Work be permitted, take every precaution necessary to preserve the health of the employees by complying with regulations issued by Provincial or Federal Governments governing the use of materials prejudicial to health.

3.5.13 Prepare surfaces to receive fire retardant coating in strict accordance with the manufacturer’s instructions for type of substrate to receive coating.

3.6 **Re-touching**

3.6.1 Make a close inspection of all surfaces decorated, after completing this Work, and ensure that they are properly and perfectly re-touched where damaged before removing equipment.

3.7 **Cleaning**

3.7.1 Do not wash brushes, rollers, clothes etc. in running water; fill two suitably sized containers with clean water. Use first clean and second clean process for all paint. Final rinse only may be in running water.

3.7.2 Keep closed container of paint thinners on hand for ongoing cleaning. Do not dispose of paint thinners to sewer; take off site at end of each day and take to hazardous waste disposal depot.

3.7.3 Collect all emulsion from cleaning into containers and recycle or dispose at hazardous waste disposal depot, in accordance with local, provincial and federal environmental regulations.

3.7.4 Provide proof of proper disposal by receipt from hazardous waste disposal depot.
3.8 **Protection**
3.8.1 Remove finish hardware, electrical switch and outlet covers, receptacle plates, fittings and fastenings, to protect from paint splatter. Mask items not removable. Use sufficient drop cloths and protective coverings for full protection of floors, furnishings, mechanical, electrical and special equipment, all other components of building which do not require painting or to be removed, from paint spotting and other soiling. Re-install items when paint is dry. Clean any components that are paint spotted or soiled.

3.8.2 Keep waste rags in covered metal drums containing water and remove from building at end of each day.

3.8.3 Prohibit traffic, where possible, from areas where painting is being carried out and until paint is cured. Post “wet paint” or other warning signage during and on completion of Work.

3.8.4 When handling solvent coating materials, wear approved vapour/particulate respirator as protection from vapours. Dust respirators do not provide protection from vapours.

3.9 **Schedules**
3.9.1 Colour Coding for Mechanical and Electrical Equipment:
   .1 Refer to Mechanical and Electrical Divisions for colour coding requirements.
   .2 Electrical Conduit: Colour to match wall or ceiling finish.

3.9.2 Refer to Finish Schedule for colour selection. Finish Schedule located in Specification Section 00 01 13 - Standard Details, Series 9000.

**END OF SECTION**
1. **GENERAL**

1.1 **Instructions**
   1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Intent**
   1.2.1 The following prefabricated items to be supplied and installed:
   .1 Glass Marker Boards
   .2 Dry Erase White Boards.
   .3 Aluminum Trim.

1.3 **Submittals**
   1.3.1 Shop Drawings:
   .1 Submit Shop Drawings as specified in Section 01 33 00 – Submittal Procedures, specifically provide the following:
   1. Glass Marker Boards
   2. Dry Erase White Boards.
   3. Aluminum Trim.

1.4 **Rejections**
   1.4.1 Defective materials or quality of Work, whenever found, at any time prior to acceptance of the Work, shall be rejected regardless of previous inspection. Inspection will not relieve responsibility, but is a precaution against oversight or errors.
   1.4.2 Approved Manufacturers: The manufacturers listed are only approved if they can provide the Product as described.
   1.4.3 Remove and replace defective materials and Work affected by this replacement, at no additional cost to the Agency.

1.5 **Delivery, Storage and Handling**
   1.5.1 Refer to Section 01 61 00 – Common Product Requirements.
   1.5.2 Deliver and store materials undamaged in original cartons or wrappings.
   1.5.3 Store material in a secure, dry area.

2. **PRODUCTS**

2.1 **Manufacturers**
   2.1.1 The products of the following manufacturers are acceptable subject to conformance with the requirements of the Drawings, Schedules and Specification:
   .1 Architectural School Products
   .2 Clarus Glassboards LLC; [www.clarus.com](http://www.clarus.com)
   .3 Egan Visual; [www.egans.com](http://www.egans.com)
   .4 Global Industrial; [www.globalindustrial.ca](http://www.globalindustrial.ca)
   .5 Quartet Manufacturing; [www.quartet.com](http://www.quartet.com)
   .6 or Agency approved equivalent.
2.1.2 Subject to conformance with the requirements of the Drawings, Schedules and Specifications, Products of other Manufacturers may be acceptable.

2.1.3 Submit all Substitutions in accordance with Section 01 25 00 – Substitution Procedures.

2.2 **Dry Erase White Boards**

2.2.1 White Boards: including trim and marker rail shall be:

1. Model No.: “Rite-on, Wipe-off” as supplied by Architectural School Products or Agency approved equivalent.
2. Facing: White porcelain enamel steel
3. Wearability: G.2 for thirty hours (126,000 strokes)
4. Backing Sheet: 26 gauge zinc coated steel sheet
5. Core: Fibreboard to CSA A247

2.2.2 Backing for white boards by Section 06 10 00 – Rough Carpentry.

2.2.3 Location: 1220 mm x 2440 mm board as shown on Drawings.

2.2.4 Coordinate final location on site.

2.2.5 Aluminum Trim:

1. Extruded aluminum: Aluminum Association alloy AA6063-T5, minimum 3mm thick. 19mm exposed face perimeter trim. 50mm width map-rail above white board, c/w Forbo insert, end stops, and two (2) combination roller map hooks per six 1.8 lineal metres of rail. Marker tray - projecting, enclosed, sloping bottom marker tray.
3. Appearance and properties of anodized finished designated by Aluminum Association as Architectural Class 1, Architectural Class 2, and protective and decorative category, shall meet requirements of CG5B 63-GP-25 + amdt-Apr. 86, for coating, classes 1, 2, and 3 respectively.
4. Perimeter trim or frame: 19mm exposed face perimeter trim. Series 200, #205 as manufactured by ASP. Limited.
5. Bottom rail with integral marker tray: Projecting, enclosed, sloping bottom tray Model #264 as manufactured by ASP Limited.

2.3 **Markerboards (Glass)**

2.3.1 All glass markerboards shall conform to the following:

1. Material:
   1. ¼” tempered safety glass to CAN/CGSB-12.1-M
   2. Pyrolytic coating for stain and abrasion resistance
   3. Polished edges and rounded corners.

2.3.2 Marker tray as shown on Drawings.

2.3.3 Size and location as indicated on Drawings.
2.3.4 White Glassboard:
   .1 Magnetic white glass board, frameless, concealed mounting, complete with marker rail and magnets.
   .2 Magnets: rare-earth magnets as recommended by the magnetic glass markerboard manufacturer.
   .3 Finish: 3mil back-paint, colour as selected by Consultant on low Iron – optically clear glass laminated to 26 gauge steel.

2.3.5 Mounting:
   .1 Concealed mounting as per manufacturers standard. Must be mechanically fastened, not adhered.
   .2 All anchors, screws and attachment hardware as recommended by the glass markerboard manufacturer.

3. EXECUTION

3.1 Examination
   3.1.1 Report to the Consultant, in writing, all defects of Work or unsatisfactory site conditions.
   3.1.2 Do not commence the Work of this Division until surfaces, area, conditions specified or indicated on Drawings, to receive manufactured specialties, are compatible with the manufacturer's installation requirements.
   3.1.3 Commencement of Work implies total acceptance of all preliminary installation requirements by the Contractor.
   3.1.4 Waive any after claims by failure to comply with the above procedure of examination.

3.2 Installation
   3.2.1 Carry out installation of information specialties by workers with the necessary training and experience, and certified by the manufacturer or the Contractor.
   3.2.2 Conform to manufacturer's printed installation instructions and/or Shop Drawings.
   3.2.3 Install components to ensure a rigid, straight, square, plumb installation with horizontal lines level.
   3.2.4 Securely attach aluminum trims to ensure that all fastenings are concealed.
   3.2.5 Join white boards together using steel spline and extruded polyvinyl slotted inserts to ensure a flush butt joint with a hairline appearance.
   3.2.6 Install glass markerboards together to ensure a flush butt joint with a hairline appearance.
3.3 Cleaning and Protection
3.3.1 Be responsible for protection of all manufactured specialty Work during period of construction.
3.3.2 Upon completion of installation of all manufactured specialty items remove all excess material, empty cartons, wrappings, etc. and remove any dirt spots and foreign material from the installed items, leaving them in a clean, usable condition.

3.4 Clean-up
3.4.1 Upon the completion of Work, remove from the site all surplus materials and debris caused by this Work and leave the site in a clean condition to the satisfaction of the Consultant.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**
   1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Intent**
   1.2.1 The following prefabricated items to be supplied and installed:
   .1 Access panels for drywall ceilings other than those for access to mechanical equipment, which are specified in Mechanical Sections
   .2 Wall Protection

1.3 **Submittals**
   1.3.1 Product Data Sheets
   .1 Submit PDS as specified in Section 01 33 00 – Submittal Procedures, specifically provide the following:
   .1 Access panels
   .2 Wall Protection

1.4 **Rejections**
   1.4.1 Defective materials or quality of Work, whenever found, at any time prior to acceptance of the Work, shall be rejected regardless of previous inspection. Inspection will not relieve responsibility, but is a precaution against oversight or errors.
   1.4.2 Remove and replace defective materials and Work affected by this replacement, at no additional cost to the Agency.

1.5 **Delivery, Storage and handling**
   1.5.1 Refer to Section 01 61 00 – Common Product Requirements.
   1.5.2 Deliver and store materials undamaged in original cartons or wrappings.
   1.5.3 Store material in a secure, dry area.

2. **PRODUCTS**

2.1 **Materials**
   2.1.1 Provide new materials in perfect condition, free from defects impairing strength, durability or appearance.
   2.1.2 Refer to the architectural plans for location and required quantity of items specified.

2.2 **Access Panels For Drywall Ceilings**
   2.2.1 Non-rated Drywall Ceiling Access Panels:
   .1 Material: 0.080” Aluminum extrusion with 5/8” drywall in door panel.
   .2 Finish: Mill finish, drywall ready to be finished to match surrounding ceiling surface.
Regional Municipality of Peel  Document 2019-165T  Division 10
Purchasing Section  MAJOR RENOVATION PROJECT AT  Section 10 20 00
TWO PEEL REGIONAL POLICE  Interior Specialties
COMMERICAL SITES

.3 Hinge: Spring loaded hinge pin, open to 90 degrees, safety chain on door and frame
.4 Locking: standard concealed touch lock (cam latch, opened with allen head)
.5 Size: 600mm X 600mm

2.2.2 Approved Products and Manufacturers:
.1 Bauco Plus II by Access Panel Solutions; www.accesspanelsolutions.com
.2 DW-5058 by Acudor; www.acudor.com
.3 Or equivalent by Nystrom Products Co.; www.nystrom.com
.4 Or Agency approved equivalent.

2.3 Wall Protection
2.3.1 Provide stainless steel corner guards in locations as shown on Drawings.
2.3.2 Medium duty stainless steel corner guards, 1220 mm high, 1.2 mm (18 gauge), leg lengths to accommodate locations.
2.3.3 Fully adhered corner guards to wall as per manufacturer’s instructions.
2.3.4 Approved Manufacturers:
.1 Construction Specialties Group
.2 Pawling Corporation
.3 Or Agency approved equivalent.

3. EXECUTION

3.1 Examinations
3.1.1 Report to the Consultant, in writing, all defects of Work or unsatisfactory site conditions.
3.1.2 Do not commence the Work of this Division until surfaces, area, conditions specified or indicated on Drawings, to receive manufactured specialties, are compatible with the manufacturer’s installation requirements.
3.1.3 Commencement of Work implies total acceptance of all preliminary installation requirements by the Contractor.
3.1.4 Waive any after claims by failure to comply with the above procedure of examination.

3.2 Installation
3.2.1 Carry out installation of manufactured specialty items by workers with the necessary training and experience, and certified by the manufacturer or by the Contractor.
3.2.2 Conform to manufacturer’s printed installation instructions and/or Shop Drawings.
3.3 **Cleaning and Protection**
3.3.1 Be responsible for protection of all manufactured specialty Work during the period of construction.
3.3.2 Upon completion of installation of all manufactured specialty items, remove all excess material, empty cartons, wrappings, etc. and remove any dirt spots and foreign material from the installed items, leaving them in a clean, usable condition.

3.4 **Clean-up**
3.4.1 Upon the completion of Work, remove from the site all surplus materials and debris caused by this Work and leave the site in a clean condition to the satisfaction of the Consultant.

END OF SECTION
1. **GENERAL**

1.1 **General Instructions**

1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Summary**

1.2.1 Section Includes:

.1 Provide all articles, labour, materials, equipment, transportation, hoisting, and incidentals noted, specified or required, to complete the work of this Section. Provide all acoustic tile and required accessories as indicated on the working drawings, room finish schedule, including but not limited to the following:

.1 Toilet Compartments
.2 Urinal Screens
.3 Privacy Screens
.4 Work of this Section shall include the furnishing of all necessary screws, special screws, bolts, special bolts, expansion shields and all other devices and accessories necessary for the proper installation of the Work of this Section

1.2.2 Related Sections: The following description of work is included for reference only and shall not be presumed complete:

.1 Section 05 50 00 – Metal Fabrications
.2 Section 06 10 00 – Rough Carpentry
.3 Section 09 21 16 – Gypsum Board Assemblies
.4 Section 09 30 00 – Tiling
.5 Section 10 28 13 – Toilet Accessories

1.3 **References**

1.3.1 Reference Standards: Versions of the following standards current as of the date of issue of the project apply to the Work of this Section.

1.3.2 American Society for Testing and Materials (ASTM):


.2 ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

1.3.3 Canadian Standards Association (CSA):

.1 CAN/CSA B651 – Accessible Design for the Built Environment.
1.4 Administrative Requirements
1.4.1 Coordination:
   .1 Coordination under this Section shall be in accordance with General Conditions and Division 01.
   .2 Coordinate with other work having a direct bearing on the Work of this Section. Supply items to be built in, in ample time to be incorporated into work of other Subcontractors. Proceed with Work of this Section as soon as walls and roof decks are ready to receive same.

1.5 Submittals
1.5.1 Product Data:
   .1 Submit manufacturer’s technical product data for each type of Product required including on material characteristics, performance, limitations, methods of installation, compliance with applicable reference standards, material safety data sheets, transportation, storage and handling requirements for each product used.
1.5.2 Shop Drawings:
   .1 Submit shop drawings indicating partition plan, elevation views, dimensions, details of supports, door swings, hardware and installation details. Show locations and sizes of cutouts and holes for items installs in toilet compartments.
1.5.3 Samples
   .1 Submit duplicate samples, 300 mm x 300 mm for panels illustrating finish and colour, 203mm samples for suspension system, trims, moldings and hardware.

1.6 Closeout Submittals
1.6.1 Submittals under this Section shall be in conformance with Section 01 77 00.
1.6.2 Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials and suggested schedule for cleaning and care of all products.
1.6.3 Warranty Documents in accordance with Section 01 77 00.
1.6.4 Sustainable Design Closeout Documentation:
   .1 Submit LEED submittals in accordance with Section 01 60 13.
   .2 Submit documentation to verify compliance with LEED objectives and requirements.

1.7 Quality Assurance
1.7.1 Qualifications:
   .1 Manufacturer’s:
      .1 Manufacturer shall have a minimum of 5 years’ experience having successfully supplied products required for the Work of this Section for other projects of similar size and complexity.
.2 Installer’s:
  .1 Installer shall have a minimum of 5 years’ continuous Canadian experience successfully completing projects similar in size and complexity as the Work of this Section. Submit proof of experience upon Consultant's request.

1.8 Delivery, Storage and Handling
1.8.1 Delivery and acceptance requirements:
  .1 Toilet Partitions must be delivered to the job site in the manufacturers’ original packages and marked to correspond with the approved shop drawings.

1.8.2 Storage and Handling procedures:
  .1 Handle with care so as not to scratch product surfaces.
  .2 Store products in upright position in secure location until ready for installation.

1.9 Project Conditions
1.9.1 Ambient Conditions:
  .1 Do not deliver materials or begin construction activities of this section until building is enclosed, with complete protection from outside weather, and building temperature maintained at a minimum of 15°C (60°F).

1.9.2 Existing Conditions:
  .1 Do not begin installation of Work of this Section until any work creating dust or debris has been complete and cleaned up and all wet work is completed and dry.

1.10 Warranty
1.10.1 Provide a written material, labour and workmanship warranty, commencing from the date of Substantial Performance, covering the replacement and making good of defects in materials and workmanship, for a period of (5) year from date of Substantial.

2. PRODUCTS
2.1 Manufacturers
2.1.1 The products of the following manufacturers are acceptable subject to conformance with the requirements of the Drawings, Schedules and Specification:
  .1 ASI Global Partitions
  .2 Bradley Corp
  .3 Hadrian
  .4 Or Agency approved equivalents.

2.1.2 All substitutions must be submitted in accordance with Section 01 25 00.
2.1.3 Single source responsibility: Obtain each type of toilet compartment from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work. Products installed as part of the Work of this Section shall be from the same production run.

2.2 Materials

2.2.1 Construction: Doors, Panels and Pilasters shall be constructed of two sheets of panel flatness Type 304, embossed finish stainless steel, laminated under pressure to a "Verticel" 13mm (1/2") honeycomb core for impact resistance, rigidity and sound deadening. Formed edges to be welded together and interlocked, under tension, with a roll-formed oval crown locking bar, mitred, welded and ground smooth at the corners. Honeycomb to be of virgin, long fiber paper with a maximum 12.5mm (1/2") cell size.

2.2.2 Doors: Shall be 25mm (1") thick with cover sheets not less than 22ga. (0.8mm).

2.2.3 Panels: Shall be 25mm (1") thick with cover sheets not less than 22ga. (0.8mm).

2.2.4 Pilasters: Shall be 32mm (1.25") thick with cover sheets not less than 18ga. (1.2mm).

2.2.5 Hardware and Fittings:  
  .1 All panel and pilaster brackets and all door hardware shall be chrome plated zinc die castings, standard.
  .2 Fasteners are 12 x 1-3/4 and 12 x 5/8 TR-27 6-lobe security screws.
  .3 Doors shall be equipped with a gravity type hinge mounted on the lower pilaster hinge bracket. Door hinges shall be the wraparound type and adjustable to permit the door to come to rest at any position when not latched.
  .4 Each door to be fitted with a combined coat hook and bumper and a concealed latch, with face mortised flush with edge strip of door Barrier-free doors shall include thumb-turn lever to activate latch without fingertip grip application. Both standard and barrier-free latches shall have a turn slot designed to allow emergency access from exterior.
  .5 The combined stop and keeper shall have a 19mm (0.75") diameter bumper locked in place.
  .6 Threaded upper hinge pin shall have a metal core and self-lubricating nylon sleeve to ensure smooth, quiet operation.
  .7 Pilaster shoes shall be a welded one-piece design made from polished stainless steel. Two-piece shoes that can disassemble when kicked are unacceptable.

2.2.6 Mounting Studs for ceiling hung: as provided by toilet compartment manufacturer.

2.2.7 Models:  
  .1 Ceiling Hung, stainless steel, toilet partitions with stainless steel locking bars in locations as shown on Drawings.
.2 Floor mounted, stainless Steel, Toilet Partitions with Stainless Steel Locking Bars:

2.2.8 Fabrication:
.1 Fabricate doors, panels and pilasters as described in materials, to sizes indicated on the Drawings.

2.2.9 Finishes:
.1 Embossed stainless steel finish.

3. EXECUTION

3.1 Examination
3.1.1 Verification of Conditions:
.1 Examine all work of other Sections upon which the Work of this Section depends.
.2 Do not proceed with installation until all wet work has been completed and thoroughly dried.
.3 Report in writing to the Contractor any defects of surfaces or work prepared by other Sections which affect the quality or dimensions of the Work of this Section.
.4 Do not proceed with Work of this Section until all unsatisfactory conditions have been rectified and site conditions are ready to receive work.
.5 Commencement of work implies acceptance of existing conditions and work by others.

3.2 Installation
3.2.1 Install products of this Section to CAN/CSA-B651 and per manufacturer’s written instructions.
3.2.2 Install Work of this Section plumb and level, securely and rigidly anchored to substrate.
3.2.3 Use tamper proof screws/bolts for fasteners.
3.2.4 Mounting:
.1 All toilet compartments must be mounted according to manufacturer’s written instructions and reviewed Shop Drawings.
.2 Pilasters shall be rigidly fastened to structural supporting member (wood support is NOT acceptable) by means of two, manufacturer supplied, heavy hanging studs permitting vertical adjustment between the bottom of supporting member and finished ceiling line. The bottoms of all pilasters shall be truly aligned and the top connection shall be concealed by a 4” (102mm) high die-formed stainless steel pilaster shoe.
3.2.5 Leave 12mm space between wall and panel or end pilaster.
3.2.6 Spaces which could facilitate views into the stall to be closed with adjustable channel from partition manufacturer.
3.2.7 Attach panel and pilaster to brackets with through sleeve bolt and nut.
3.2.8 Equip each door with hinges, latch set and coat hook. Adjust and align hardware for easy proper function.
3.2.9 Anchor urinal screen panels to walls with brackets and vertical upright consisting of tubular head rail stock and end sockets, anchored to floor and ceiling.

3.2.10 Tolerances:
   .1 Maximum Variation From True Position: 6 mm (1/4 inch).
   .2 Maximum Variation From Plumb: 3 mm (1/8 inch).

3.3 **Site Quality Control**

3.3.1 Non-Conforming Work:
   .1 Defective materials or quality of work, whenever found, at any time prior to acceptance of the work, shall be rejected regardless of previous inspection. Inspection will not relieve responsibility, but is a precaution against oversight or errors.
   .2 Remove and replace defective materials and work of other trades affected by this replacement, at no additional cost to the Owner.

3.4 **Adjustment**

3.4.1 Make all final adjustments. Where toilet compartment operation is found to be defective, make adjustments for smooth operation to the satisfaction of the Project Manager.

3.5 **Cleaning**

3.5.1 Clean work area daily in accordance with Section 01 74 00.
3.5.2 Remove all excess materials from site as Work proceeds and at completion.
3.5.3 On completion of the Work remove all tools, containers, surplus materials, equipment, waste, etc., and leave Site neat, clean and tidy satisfactory to the Owner.
3.5.4 Clean exposed surfaces of toilet compartments. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage. At final completion, toilet compartments shall be left clean and free from disfigurement.
3.5.5 Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.
3.5.6 Leave surfaces clean and ready for use.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**

1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes:**

1.2.1 Provide demountable partition system including but not limited to:

.1 Interior aluminum doors and frame system
.2 Hardware
.3 Attachments for proper installation of system.

1.3 **Related Sections:**

1.3.1 The following is included for reference only and shall not be presumed complete:

.1 Section 07 92 00 Joint Sealants
.2 Section 08 70 00 Hardware
.3 Section 08 80 00 Glazing

1.4 **Submittals**

1.4.1 Submittals under this Section shall be in accordance with General Conditions and Section 01 33 00 - Submittals.

1.4.2 **Product Data:**

.1 Submit manufacturer’s printed technical data, installation instructions, and general recommendations for all materials and components. Submit manufacturer’s detailed materials and fabrication specifications and installation instructions. Include catalog cuts of hardware, fastenings and other data as required.

1.4.3 **Shop Drawings:**

.1 Submit shop drawings including plans, elevations, sections and attachments details at floors, columns, adjacent partitions and ceilings.

.2 Indicate materials, methods of construction, attachment or anchorage details, erection diagrams of pre-assembled components, connections, explanatory notes and other information necessary for completion of work. Cross reference to design drawings and specifications.

.3 Indicate wall layout, including doors and hardware, elevations, opening locations, special panels and conditions at adjacent construction.

.4 Include diagrams for power and control wiring raceways and details of access to raceways.

1.4.4 **Samples:**

.1 Submit 300mm x 300mm (12” x 12”) samples of each required panel finish and color, 300mm (12”) long samples of each trim colour and shape. Prepare samples on same materials which will be used in partition assemblies.
1.5 **Quality Assurance**

1.5.1 Manufacturer’s:
- .1 Manufacturer shall have a minimum of 5 years’ experience having successfully supplied products required for the Work of this Section for other projects of similar size and complexity.

1.5.2 Installer’s:
- .1 Installer shall have a minimum of 5 years’ continuous Canadian experience successfully completing projects similar in size and complexity as the Work of this Section. Submit proof of experience upon Consultant’s request.
- .2 Work of the Section shall be completed by manufacturer’s certified installers. Provide proof of certification upon Consultant’s request.

1.6 **Project Conditions**

1.6.1 Ambient Conditions:
- .1 Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install the system components under environmental conditions outside manufacturer's absolute limits.
- .2 Environmental Limitations: Do not deliver or install the system components until building is enclosed and finishing operations, including ceiling and floor covering installation and painting, are completed.

1.6.2 Existing Conditions:
- .1 Field measurements: Indicate all site dimensions including ceiling heights and “hold-to” dimensions on shop drawings.
- .2 Coordination of work: Coordinate layout and installation of the system components with other units of work. Installation of ceilings, floor coverings, lighting fixtures, HVAC equipment and fire suppression systems should be complete before the system components are installed.

1.7 **Delivery, Storage And Handling**

1.7.1 Refer to Section 01 61 00 – Common Product Requirements.

1.7.2 Deliver and store materials undamaged in original cartons or wrappings.

1.7.3 Store material in a secure, dry area.

1.8 **Warranty**

1.8.1 Provide a warranty for storefront framing for a period of five (5) years from the date of Substantial Completion of the project. Warranty to cover installation and materials for workmanship and system design against structural failure, leakage or failure to meet specified performance requirements.
1.9 **Rejections**

1.9.1 Defective materials or quality of Work, whenever found, at any time prior to acceptance of the Work, shall be rejected regardless of previous inspection. Inspection will not relieve responsibility, but is a precaution against oversight or errors.

1.9.2 Remove and replace defective materials and Work affected by this replacement, at no additional cost to the Agency.

2. **PRODUCTS**

2.1 **Manufacturers**

2.1.1 The products of the following manufacturers are acceptable subject to conformance with the requirements of the Drawings, Schedules and Specification:

- .1 Acceptable products and manufacturers:
  - .1 Elite by PC350.
  - .2 Tek Vue Butt Joint Glazing by Teknion
  - .3 Equivalent by mywall
  - .4 Equivalent by Trendway Corporation
  - .5 Or Agency approved equivalent

2.1.2 Requests for substitutions shall be made in conformance with Section 01 25 00.

2.1.3 Single source responsibility: Aluminum door and frame system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work. Products installed as part of the Work of this Section shall be from the same production run.

2.2 **Materials**

2.2.1 Aluminum Swing Doors:

- .1 All sections shall comprise of Aluminum extrusions of 6063 alloy with a T5 heat treatment.
- .2 Wall thicknesses shall be 3.2mm (.125") on exposed surfaces and 4.75mm (.187") on internal webs.
- .3 Narrow Stile Doors: Narrow stile door with 50.8mm (2") wide stiles, 60.3mm (2 3/8") top rail and 104.7 (4 1/8") bottom rail.
- .4 Wide Stile Doors: Wide stile door with 127mm (5") wide stiles, 139.7mm (5 1/2") top rail and 177.8mm (7") bottom rail.
- .5 Components:
  - .1 Door construction shall consist of butt joined corners with reinforcing at top and bottom corners consisting of an aluminum bracket not less than 4.75mm (.187") thick with a 7.5mm (.30") bolt and an aluminum retaining bracket on the inside section of the side rails.
.2 The bracket shall be welded to the top and bottom of the door stile through an access hole. All butt joints shall be welded on the concealed corners to form a true and square corner. Welds shall be of maximum penetration without weld holes or discoloration.

.3 Door glass stops shall be square for ¼" (6mm) or 3/8" (10mm) glass or 1" sealed unit and be dry glazed with Santoprene glazing spline. Application of door stops by compression ft, wedged and hooked into rails and stiles by means of mechanical ft.

.6 Finish shall be:

.1 Factory finish extruded frame components so that any part exposed to view upon completion of installation will be uniform in finish and color.

.2 Standard Powder Coat Finish: Comply with AAMA 2603.2002; multiple-stage electrostatic applied thermoset polyester finish, baked to assure hardness.

.3 Colour: Black

2.2.2 Aluminum Sliding Doors:

.1 All sections shall comprise of Aluminum extrusions of 6063 alloy with a T5 heat treatment.

.2 Wall thicknesses shall be 3.2mm (.125") on exposed surfaces and 4.75mm (.187") on internal webs.

.3 Sliding Doors: Narrow stile door with 50.8mm (2") wide stiles, 60.3mm (2 3/8") top rail and 104.7 (4 1/8") bottom rail.

.4 Components:

.1 Door construction shall consist of butt joined corners with reinforcing at top and bottom corners consisting of an aluminum bracket not less than 4.75mm (.187") thick with a 7.5mm (.30") bolt and an aluminum retaining bracket on the inside section of the side rails.

.2 The bracket shall be welded to the top and bottom of the door stile through an access hole. All butt joints shall be welded on the concealed corners to form a true and square corner. Welds shall be of maximum penetration without weld holes or discoloration.

.3 Door glass stops shall be square for ¼" (6mm) or 3/8" (10mm) glass or 1" sealed unit and be dry glazed with Santoprene glazing spline. Application of door stops by compression ft, wedged and hooked into rails and stiles by means of mechanical ft.

.5 Finish shall be:

.1 Factory finish extruded frame components so that any part exposed to view upon completion of installation will be uniform in finish and color.
.2 Standard Powder Coat Finish: Comply with AAMA 2603.2002; multiple-stage electrostatic applied thermoset polyester finish, baked to assure hardness.

.3 Colour: Black

2.2.3 Aluminum door frames and sidelight frames

.1 All sections shall be comprised of Aluminum extrusions of 6063 alloy with a T5 heat treatment.

.2 Framing wall thicknesses shall be 3.2MM (.125") on exposed surfaces and 4.75MM (.187") on internal webs.

.3 Steel members to be galvanized

.4 Provide framing with the following characteristics:

.1 Aluminum framed swing door frame with stationary sidelight system to fit standard 3½", 3¾", 4-5/8", 4-7/8", 5½", 6¼", 7¼" wall thicknesses.

.2 Aluminum framed sliding doors

.3 Trackless threshold: System is surface mounted to finished or unfinished floor.

.4 Aluminum Glazed Doors are 1¾", heights as specified

.5 Components:

.1 Door Frame and Sidelight System: Provide frames with the following characteristics: Rectilinear design. 1¼ inch face profile. Snap on Trim: 1¼" Aluminum or 1½" Aluminum. Other Trim options as selected from manufacturer’s catalogue. 0.070 inch rabbet wall thickness. Throat sizes 3½" up to 7¼"

.2 Aluminum: Controlled alloy billets of 6063 T5, to assure compliance with tight dimensional tolerances and maintain color uniformity

.6 Finish shall be:

.1 Factory finish extruded frame components so that any part exposed to view upon completion of installation will be uniform in finish and color.

.2 Standard Powder Coat Finish: Comply with AAMA 2603.2002; multiple-stage electrostatic applied thermoset polyester finish, baked to assure hardness.

.3 Colour: Black

3. **EXECUTION**

3.1 **Examinations**

3.1.1 Report to the Consultant, in writing, all defects of Work or unsatisfactory site conditions.

3.1.2 Do not commence the Work of this Division until surfaces, area, conditions specified or indicated on Drawings, to receive manufactured specialties, are compatible with the manufacturer's installation requirements.

3.1.3 Commencement of Work implies total acceptance of all preliminary installation requirements by the Contractor.
3.1.4 Waive any after claims by failure to comply with the above procedure of examination.

3.2 **Installation**

3.2.1 Perform installation in accordance with the manufacturer’s installation instructions.

3.2.2 Glass framing members shall provide for flush glazing on all sides with through sight lines, and no projecting stops.

3.2.3 Door frames shall be glazed by Glazing Subcontractor, Section 08 80 00.

3.2.4 Provide fully resilient settings for glass and panels by use of E.P.D.M. elastomeric glazing gaskets on both sides of glass installed in window frames and doors, and make provision for thermal shrinkage.

3.2.5 See that all door mouldings are fitted accurately to flush hairline joints and mechanically fastened with screw and spline joinery at door corners and sub-frame intersections. Doors shall be dual-moment welded at all corners.

3.2.6 Set all items under this heading in their correct locations as shown on the details and shall be level, square, plumb and at proper elevations and in alignment with other work.

3.2.7 Provide a maximum sealed joint size of 3/8" wide between aluminum frame and masonry. Adequate backing shall be inserted to support sealant application by Sealant Subcontractor, Section 07 92 00.

3.2.8 Screw all materials in place using backing, masonry plugs, or anchor straps as required.

3.2.9 Accurately cut and fit joined mouldings to result in a tightly closed joint.

3.3 **Cleaning**

3.3.1 Clean work area daily in accordance with Section 01 74 00.

3.3.2 Remove all excess materials from site as Work proceeds and at completion.

3.3.3 On completion of the Work remove all tools, containers, surplus materials, equipment, waste, etc., and leave Site neat, clean and tidy to the satisfaction of the Owner.

3.3.4 Clean and make good surfaces soiled or otherwise damaged as a result of Work of this Section at no additional cost to the Owner.

3.3.5 Leave surfaces clean and ready for subsequent Work.

3.4 **Protection**

3.4.1 Protect all aluminum work during period of construction.

3.4.2 Remove protective materials and clean aluminum work with plain water or water with soap or household detergent. Be responsible for damages to all aluminum work resulting from the use of improper materials or carelessness on the part of other trades.

**END OF SECTION**
1. **GENERAL**

1.1 **Instructions**
   1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Intent**
   1.2.1 Section Includes:
   .1 Provide all labour, materials, equipment, transportation, hoisting and incidentals noted, specified or required for the complete and proper installation of the Work of this Section including but not limited to:
   .1 Toilet accessories as shown on Drawings and specified herein.
   .2 Attachment hardware.

1.2.2 Related Sections: The following description of work is included for reference only and shall not be presumed complete:
   .1 Section 05 50 00 – Metal Fabrications
   .2 Section 06 10 00 – Rough Carpentry
   .3 Section 09 21 16 – Gypsum Board Assemblies
   .4 Section 09 30 00 – Tiling
   .5 Section 10 21 13 – Toilet Compartments

1.3 **References**
   1.3.1 Reference Standards: Versions of the following standards current as of the date of issue of the project apply to the Work of this Section.
   .1 American National Standards Institute / National Electrical Manufacturers Association (ANSI/NEMA):
     .1 ANSI/NEMA LD3 - High Pressure Decorative Laminates (HPDL).
   .2 American Society for Testing and Materials (ASTM):
     .4 ASTM A1008/A1008M – Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.

.3 Canadian Standards Association (CSA):

.1 CSA-B651 - Accessible Design for the Built Environment.

1.4 **Submittals**

1.4.1 Submittals under this Section shall be in accordance with General Conditions and Section 01 33 00 - Submittals.

1.4.2 Product Data:

.1 Submit manufacturer’s product data sheets for Products proposed for use in the Work of this Section. Include printed technical data, installation instructions and general recommendations for all materials and components. Include certification indicating compliance of materials with project requirements.

1.4.3 Samples:

.1 Submit samples of proposed products for review by Consultant.

1.5 **Rejections**

1.5.1 Defective materials or quality of Work, whenever found, at any time prior to acceptance of the Work, shall be rejected regardless of previous inspection. Inspection will not relieve responsibility, but is a precaution against oversight or errors.

1.5.2 Remove and replace defective materials and Work affected by this replacement, at no additional cost to the Agency.

1.6 **Delivery, Storage and handling**

1.6.1 Refer to Section 01 61 00 – Common Product Requirements.

1.6.2 Deliver and store materials undamaged in original cartons or wrappings.

1.6.3 Store material in a secure, dry area.

2. **PRODUCTS**

2.1 **Manufacturers**

2.1.1 The products of the following manufacturers are acceptable subject to conformance with the requirements of the Drawings, Schedules and Specification:

.1 ASI Group Watrous; [www.asigroupwatrous.ca](http://www.asigroupwatrous.ca)

.2 Bobrick Washroom Equipment Inc., [www.bobrick.com](http://www.bobrick.com)

.3 Bradley Corporation; [www.bradleycorp.com](http://www.bradleycorp.com)

.4 or Agency approved equivalent.

2.1.2 Subject to conformance with the requirements of the Drawings, Schedules and Specifications, Products of other Manufacturers may be acceptable.

2.1.3 Submit all Substitutions in accordance with Section 01 25 00 – Substitution Procedures.
2.2 **Materials**

2.2.1 Sheet Steel: ASTM A1008/A1008M.

2.2.2 Stainless Steel Sheet: ASTM A167, Type 304.

2.2.3 Tubing: ASTM A269, stainless steel.

2.2.4 Adhesive: type in conformance with manufacturers written instructions, waterproof.

2.2.5 Fasteners, Screws, and Bolts: Hot dip galvanized, temper-proof.

2.2.6 Expansion Shields: Fibre, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.3 **Fabrication**

2.3.1 Fabricate accessories true, square, rigid, free from distortion and from defects detrimental to appearance and performance. Assemble sheet metal accessories by welding in accordance with CSA W59. Conceal welds, or grind smooth such as to be undetectable in finished work. Ensure assembly fastenings, hardware fixings and mounting or installation devices are concealed in finished work.

2.3.2 Use non-corrosive metal fasteners of expansion type, toggle type and tamperproof.

2.3.3 Fabricate Products with materials and component sized, metal gauges, hardware, reinforcing, anchors and fastenings of adequate strength to ensure that washroom accessories will remain free of warping, buckling, opening of joints and seams and distortion with limits of intended use.

3. **EXECUTION**

3.1 **Examinations**

3.1.1 Report to the Consultant, in writing, all defects of Work or unsatisfactory site conditions.

3.1.2 Do not commence the Work of this Division until surfaces, area, conditions specified or indicated on Drawings, to receive manufactured specialties, are compatible with the manufacturer's installation requirements.

3.1.3 Commencement of Work implies total acceptance of all preliminary installation requirements by the Contractor.

3.1.4 Waive any after claims by failure to comply with the above procedure of examination.

3.2 **Installation**

3.2.1 Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
3.3 **Cleaning and Protection**

3.3.1 Be responsible for protection of all manufactured specialty Work during period of construction.

3.3.2 Upon completion of installation of all manufactured specialty items, remove all excess material, empty cartons, wrappings, etc. and remove any dirt spots and foreign material from the installed items, leaving them in a clean, usable condition.

3.4 **Clean-up**

3.4.1 Upon the completion of Work, remove from the site all surplus materials and debris caused by this Work and leave the site in a clean condition to the satisfaction of the Consultant.

3.5 **Schedule**

3.5.1 Washroom Accessory Schedule: locations and sizes as indicated on Drawings or scheduled:

1. **Grab bars as shown on Drawings:**
   
   .1 Grab bars shall be 18 gauge stainless steel tubing with Mandrel bends. Knurled grab bars to be peened grip full length of the tubing to within 4 in. of ends of bends. Secure concealed fastening grab bars with 2½ in. No. 14 screws to solid backing, capable of supporting a 500 lb pull. Sizes:
   
   .1 No. 1: 1-½” diameter stainless steel, 24 in. long straight bar, standard flange position at back of water closet.
   
   .2 No. 2: L-shaped bar as detailed 1-½” diameter stainless steel, 30 in. long horizontal and vertical 30 in. at side of water closet.

   .2 Install No. 1 and No. 2 grab bars at each barrier free water closet as shown on Drawings and in details at barrier free washrooms.

   .2 Toilet Paper Dispenser (one per toilet compartment), surface mounted, multi-roll vertical type, lockable, commercial grade, stainless steel.

   .3 Waste Receptacles (one per washroom), wall-mounted, stainless steel, vertical type with a capacity of 20L minimum, commercial grade.

   .4 Napkin Disposal (one per washrooms): Floor unit, foot pedal activated hinged lid, self-closing lid, embossed with "Napkin Disposal", removable stainless steel receptacle, spring clip for deodorizer block.

   .5 Soap dispensers (one per lavatory), wall-mounted, commercial grade, stainless steel.

   .6 Room deodorizers (one per washroom).

   .7 Feminine Napkin Disposal Bin (one per toilet compartment in female washrooms), free-standing.
.8 Coat Hooks:
   .1 For barrier free washroom - two: one at standard height, one at barrier-free height, refer to 10 21 13 – Toilet Compartments
   .2 Coat hooks
.9 Semi-recessed electric hand dryers (one per washroom)
.10 Tilt mirrors(one per barrier free lavatory), stainless steel frames (barrier-free)
.11 Flat mirrors(one per lavatory), stainless steel frames.
.12 Baby Change Station (refer to drawings), surface mounted.
.13 Refer to equipment schedules on Drawings for additional accessories and information.

END OF SECTION
1. GENERAL

1.1 Instructions
1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 Intent
1.2.1 The following prefabricated items to be supplied and installed:
   .1 Fire extinguishers

1.3 Rejections
1.3.1 Defective materials or quality of Work, whenever found, at any time prior to acceptance of the Work, shall be rejected regardless of previous inspection. Inspection will not relieve responsibility, but is a precaution against oversight or errors.
1.3.2 Remove and replace defective materials and Work affected by this replacement, at no additional cost to the Agency.

1.4 Submittals
1.4.1 Shop Drawings
   .1 Submit shop Drawings as specified in Section 01 33 00 – Submittal Procedures, specifically provide the following:
      1. Fire extinguishers
      2. Fire extinguisher cabinets

1.5 Delivery, Storage And Handling
1.5.1 Refer to Section 01 61 00 – Common Product Requirements.
1.5.2 Deliver and store materials undamaged in original cartons or wrappings.
1.5.3 Store material in a secure, dry area.

2. PRODUCTS

2.1 Manufacturers
2.1.1 The products of the following manufacturers are acceptable subject to conformance with the requirements of the Drawings, Schedules and Specification:
   .1 Guardian Fire Equipment; www.guardianfire.com
   .3 Wilson & Cousins; www.wilsonandcousins.com
   .4 or Agency approved equivalent.
2.1.2 Subject to conformance with the requirements of the Drawings, Schedules and Specifications, Products of other Manufacturers may be acceptable.
2.1.3 Submit all Substitutions in accordance with Section 01 25 00 – Substitution Procedures.
2.2 **Materials**
2.2.1 Provide new materials in perfect condition, free from defects impairing strength, durability or appearance.
2.2.2 Refer to the plans for location and required quantity of items specified.

2.3 **Fire Extinguishers**
2.3.1 Provide fire extinguishers ULC labelled for A, B and C class protection A:B:C 2.28 kg multi-purpose dry chemical.

3. **EXECUTION**

3.1 **Examinations**
3.1.1 Report to the Consultant, in writing, all defects of Work or unsatisfactory site conditions.
3.1.2 Do not commence the Work of this Division until surfaces, area, conditions specified or indicated on Drawings, to receive manufactured specialties, are compatible with the manufacturer's installation requirements.
3.1.3 Commencement of Work implies total acceptance of all preliminary installation requirements by the Contractor.
3.1.4 Waive any after claims by failure to comply with the above procedure of examination.

3.2 **Installation**
3.2.1 Carry out installation of manufactured specialty items by workers with the necessary training and experience, and certified by the manufacturer or by the Contractor.
3.2.2 Conform to manufacturer's printed installation instructions and/or shop Drawings.

3.3 **Cleaning and Protection**
3.3.1 Be responsible for protection of all manufactured specialty Work during period of construction.
3.3.2 Upon completion of installation of all manufactured specialty items remove all excess material, empty cartons, wrappings, etc. and remove any dirt spots and foreign material from the installed items, leaving them in a clean, usable condition.

3.4 **Clean-up**
3.4.1 Upon the completion of Work, remove from the site all surplus materials and debris caused by this Work and leave the site in a clean condition to the satisfaction of the Consultant.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**

1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes:**

1.2.1 The following prefabricated items to be supplied and installed:

   .1 Long Gun Lockers
   .2 Change Room Lockers
   .3 Adjustable Metal Storage Shelving

1.2.2 Approved Manufacturers: The manufacturers listed are only approved if they can provide the product as described.

1.3 **Rejections**

1.3.1 Defective materials or quality of Work, whenever found, at any time prior to acceptance of the Work, shall be rejected regardless of previous inspection. Inspection will not relieve responsibility, but is a precaution against oversight or errors.

1.3.2 Remove and replace defective materials and Work affected by this replacement, at no additional cost to the Agency.

1.4 **Submittals**

1.4.1 Shop Drawings

   .1 Submit Shop Drawings as specified in Section 01 33 00 – Submittal Procedures, specifically provide the following:

   .1 Long Gun Lockers
   .2 Change Room Lockers
   .3 Adjustable Metal Storage Shelving

1.5 **Delivery, Storage And Handling**

1.5.1 Refer to Section 01 61 00 – Common Product Requirements.

1.5.2 Deliver and store materials undamaged in original cartons or wrappings.

1.5.3 Store material in a secure, dry area.

2. **PRODUCTS**

2.1 **Manufacturers**

2.1.1 Refer to Finish Schedule 9000 series. Schedule located in Specification Section 00 01 13 Standard Details.

2.1.2 Subject to conformance with the requirements of the Drawings, Schedules and Specifications, Products of other Manufacturers may be acceptable.

2.1.3 Submit all Substitutions in accordance with Section 01 25 00 – Substitution Procedures.
2.2 **Materials**

2.2.1 **General:**

.1 Provide new materials in perfect condition, free from defects impairing strength, durability or appearance.

.2 Refer to the architectural plans for location and required quantity of items specified.

2.2.2 **Sheet steel:** Cold rolled, stretcher levelled, plain commercial galvanized or wipe coated conforming to ASTM A526.

2.2.3 **Finish paint:** Electrostatically applied, thermosetting polymer powder coating, providing good flexibility, adhesion, hardness and resistance to marring.

2.2.4 Dummy panels where required shall match construction and appearance of locker front and door.

2.2.5 Sloping tops, trim and bases shall be 1.6 mm thick cold rolled steel.

2.2.6 **Finishes:**

.1 Clean and degrease all metal.

.2 Chemically pre-treat galvanized surfaces, apply abrasion and graffiti resistant powder coating and bake on under controlled temperature conditions.

.3 Produce uniform, smooth, lustrous and hard furniture finish.

.4 Colours:

.5 Inside lockers: manufacturer’s standard.

.6 Outside lockers: doors, dummy and end panels: colours will be selected by the Agency. Five colours will be used for outside of lockers and doors in any one bank.

2.2.7 Refer to Appendix 5.16 for details of lockers.

2.3 **Change Room Lockers with Integrated Boot/Bench Lockers**

2.3.1 **Model:** Freestyle vented with built-in bench drawers

2.3.2 **As Manufactured by:** Space Savers or Agency approved equivalent

2.3.3 Colour selected from full colour range.

2.3.4 **Dimensions:** 457 mm wide x 609 mm deep x 2388 mm high

2.3.5 Provide lockers by an authorized representative or manufacturer’s own forces.

2.3.6 **Locker to include the following:** refer to Appendix 5.12.

2.3.7 **Locker to have recessed door pulls, with hasp for padlock.**

2.3.8 **Locker interior and exterior to have smooth round edges.**

2.3.9 **Bench Housing for built-in bench drawer:**

.1 Welded frame construction shall consist of top, bottom, and side components joined by using resistance welding. Riveting of bench housing structural members will not be permitted.

.2 Corner gussets shall be welded in the two (2) front bottom corners of the bench housing for increased stiffness and rigidity.
.3 Horizontal front flanges will be a minimum of 25.4mm (1”)
.4 Vertical front flanges will be a minimum of 25.4 mm (1”)
.5 Horizontal and Vertical front flanges will overlap and shall be secured with minimum of one (1) resistance weld per corner.
.6 Side panels – Lances symmetric and evenly spaced to provide optimum component locations (standard based on 76.2mm on center vertical placement to match mating locker lance design).
.7 Return flanges on housing to securely fasten housing to welded frame of locker.
.8 Base of bench housing shall include four (4) 3/8”-16 UNC threaded weld-nuts and corresponding leveling feet.
.9 Top of bench housing shall include hole pattern for mating bench seat.
.10 Sides of bench housing shall include mounting holes in the event lockers are ganged together

2.4 Long Gun Storage Lockers
2.4.1 Provide fully welded storage lockers complete with one adjustable shelf. 13ga expanded metal small ¾” x 1-1/2” diamond-shaped openings. Fully welded construction, doors swing open a full 270 degrees. Units measure 1219mm (48”) wide x 609.6mm (24”) deep x 1981.2mm (78”) high. Unit must include mechanism for locking.
2.4.2 Lockers as manufactured by Little Giant, supplied by www.globalindustrial.ca or Agency approved equivalent.
2.4.3 Finish: galvanized steel.
2.4.4 Location: As shown on Drawings

2.5 Adjustable Metal Shelving
2.5.1 Adjustable metal storage shelving shall be heavy gauge (14 gauge) steel shelves and rigid 50mm x 50mm (2” x 2”) angle posts. Shelves reinforced with flanged channel construction, adjustable on 25mm (1”) increments, 1360 kg (3000 lb.) shelf capacity. Gray enamel finish.
2.5.2 Refer to Drawings for locations and dimensions.

3. EXECUTION

3.1 Examinations
3.1.1 Report to the Consultant, in writing, all defects of Work or unsatisfactory site conditions.
3.1.2 Do not commence the Work of this Division until surfaces, area, conditions specified or indicated on Drawings, to receive manufactured specialties, are compatible with the manufacturer's installation requirements.
3.1.3 Commencement of Work implies total acceptance of all preliminary installation requirements by the Contractor.
3.1.4 Waive any after claims by failure to comply with the above procedure of examination.

3.2 *Installation*

3.2.1 Carry out installation of manufactured specialty items by workers with the necessary training and experience, and certified by the manufacturer or by the Contractor.

3.2.2 Conform to manufacturer's printed installation instructions and/or Shop Drawings.

3.2.3 Securely anchor lockers and associated trim to supporting building elements. Use concealed fasteners.

3.2.4 Install locker banks and trim sections in true alignment, plumb and level.

3.2.5 Rigidly bolt lockers back to back and side to side in banks.

3.2.6 Provide 16 ga. thick dummy panels where required or where indicated to close of locker run.

3.2.7 Recessed lockers shall be trimmed at each battery end with recessed trim as detailed.

3.2.8 Install closures, fillers and trim where shown and where required to provide finished appearance. Provide trim, fillers and closures of profile acceptable to The Agency. Install in longest possible lengths.

3.2.9 Provide continuous metal angle dust stop between locker top and adjacent end walls.

3.2.10 Upon completion, test doors, and adjust, if required for proper functions. Touch up minor surface scratches. Replace damaged components as directed by The Agency.

3.3 *Cleaning and Protection*

3.3.1 Be responsible for protection of all manufactured specialty Work during period of construction.

3.3.2 Upon completion of installation of all manufactured specialty items remove all excess material, empty cartons, wrappings, etc. and remove any dirt spots and foreign material from the installed items, leaving them in a clean, usable condition.

3.4 *Clean-up*

3.4.1 Upon the completion of Work, remove from the site all surplus materials and debris caused by this Work and leave the site in a clean condition to the satisfaction of the Consultant.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**
   1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Intent**
   1.2.1 Provide all labour, materials, equipment, transportation, hoisting and incidentals noted, specified or required to complete the Work of this Section.

1.3 **Section includes**
   1.3.1 Provide all manual Roller Window Shades as detailed on Architectural Drawings and as described herein:
   .1 Include all hardware and incidentals to provide a complete installation.
   .2 Coordinate installation and operation of Roller Window Shades with related trades.

1.4 **Related Sections**
   1.4.1 Section 06 10 00 – Rough Carpentry.
   1.4.2 Section 09 21 16 – Gypsum Board Assemblies

1.5 **Quality Assurance**
   1.5.1 Sun control device shall be installed by manufacturer’s authorized and trained personnel. The Work shall be done in strict compliance with the manufacturer’s recommendations.
   1.5.2 Products will comply with UL listed standard 325, CSA standards and all OBC standards.

1.6 **Submittals**
   1.6.1 Requirements for Shop Drawings submission are described in Section 01 33 00 – Submittal Procedures, specifically provide the following:
   .1 Mounting details and fabric samples.
   1.6.2 Submit Shop Drawings showing assembly and installation details, methods and location of fastenings.

1.7 **Product Handling**
   1.7.1 Deliver materials undamaged, in original wrappings or containers with manufacturer’s labels and seals intact.
   1.7.2 Clearly label cartons and packages designating contents and locations for which each item is intended. Indicate on packing memos carton in which each item is packed.
1.8 **Rejections**
1.8.1 Defective materials or quality of Work whenever found at any time prior to final acceptance of the Work shall be rejected regardless of previous inspection. Inspection will not relieve responsibility but is a precaution against oversight and error.
1.8.2 Remove and replace defective materials and Work affected by this replacement at no additional cost to the Agency.

1.9 **Guarantee**
1.9.1 Provide a written guarantee of Work of this Section against defects in material and quality of Work for a period of two years from the date of publication of the Certificate of Substantial Performance.

2. **PRODUCTS**

2.1 **Manufacturers**
2.1.1 The products of the following manufacturers are acceptable subject to conformance with the requirements of the Drawings, Schedules and Specification:
   1. Solarfective Products Limited.
   2. Sun Project of Canada – Moduline System.
   3. Or Agency approved equivalent
2.1.2 Subject to conformance with the requirements of the Drawings, Schedules and Specifications, Products of other Manufacturers may be acceptable.
2.1.3 Submit all Substitutions in accordance with Section 01 25 00 – Substitution Procedures.
2.1.4 Prior-approved equal.

2.2 **Performance**
2.2.1 Design products to meet or exceed the performance criteria of the applicable C.G.S.B. 4-GP-152MA.

2.3 **Location**
2.3.1 Provide full coverage on all exterior windows, throughout the facility.
2.3.2 Warranty: Manufacturer shall provide warranty that all components are free of manufacturing defects for two years from date of installation. This warranty is void if the product has been improperly installed, wired or subjected to improper care.

2.4 **Manual Sunshade System**
2.4.1 Provide manual roller shade in rooms as shown on Drawings.
2.4.2 Operation:
   1. Easy-lift (chain operated) action with infinite positioning. Left or right hand operation available.
2.4.3 Assembly:
.1 Provide fully assembled shade unit consisting of two end brackets, shade tube, extruded aluminum fascia, hem bar and fabric specified. Mounting type: Above-the-Ceiling PUSH-UP. Removal must not require the disassembly of the shade unit.
.2 Side track for 45 degree angled windows for shade operation at same angle.
.3 End Bracket: The 76 mm x 95 mm end bracket shall be a two piece moulded ABS construction with a 64 mm diameter nylon drive sprocket. Brackets colour to match clear anodized aluminum.
.4 Shade Tube: 38 mm extruded aluminum shade tube shall be 1.5 mm thick with three internal continuous fins 1.5 mm high, for strength and drive capabilities when attached to the nylon sprocket. The fins shall be spaced 120° apart.
.5 Fascia: The extruded aluminum fascia shall be 1.5 mm thick, complete with three continuous screw flute, clear anodized finish.
.6 Drive Assembly:
.1 Shall be factory set for size and travel of shades.
.2 Capable of being field adjusted from the exterior of the shade unit without having to disassemble the hardware.
.3 Provided with a built-in shock absorber system to prevent chain breakage under normal usage conditions.

2.5 Shade Fabric
2.5.1 RB-1: Eco screen 8300 5% open or prior approved equal non-PVC shade/fabric meeting 2.6.2. Colour to be selected from full range.

2.6 Hem Bar
2.6.1 Hem bar to be extruded aluminum exterior hem bar with plastic end finials.

2.7 Chain
2.7.1 Chain to be stainless steel ball chain type.
2.7.2 Performance: As a “shade cloth” the fabric shall hang flat without buckling or distortion. The edge, when trimmed, shall hang straight without ravelling. An unguided or guided roller shade cloth shall roll true and straight, without shifting sideways more than + 3 mm in either direction due to warp distortion or weave design.
2.7.3 Flame Retardance: Fabric shall be certified by an Independent Laboratory to pass the “Small Scale Vertical Burn Requirement Test” CAN and ULC-S109-M98 and NFPA 701.
3. **EXECUTION**

3.1 **Examination**
3.1.1 Verify that the openings are plumb and are dimensioned properly. Insure adequate support has been provided for the sunshade hood. Proceed with the installation only after conditions have been deemed satisfactory.

3.2 **Installation and Adjustment**
3.2.1 Install equipment in accordance with manufacturer’s instructions.

3.3 **Final Adjustment**
3.3.1 The services of a competent mechanic shall be provided without additional cost to the Agency and this Mechanic shall inspect the installation of all hardware furnished under this Section and shall supervise all adjustments which are necessary to leave hardware in perfect working order.

3.4 **Maintenance**
3.4.1 At the completion of the Work, provide the building maintenance staff with the following:
   .1 Two sets or wrenches.
   .2 Two sets of manufacturer’s instructions.
3.4.2 Brief the maintenance staff regarding the proper care of all hardware such as lubrication, adjustments, cleaning and general maintenance.

END OF SECTION
1. **GENERAL**

1.1 **Related Sections**

1.1.1 Division 01 – General Requirements  
1.1.2 Section 21 12 00 – Fire-Suppression Standpipes  
1.1.3 Division 22 – Plumbing  
1.1.4 Division 26 – Electrical

1.2 **General Notes**

1.2.1 The Instructions to Bidders, the General Conditions of CCDC 2 - 2008, Supplementary Conditions of all sections of Division 1 are part of and apply to every division of this Specification.  
1.2.2 In this Specification the "Contractor" refers to the General Contractor responsible for the total Project. The "Trade" refers to the particular “Sprinkler Trade”.  
1.2.3 The term “Sprinkler Trade” includes all Trades that perform Work specified within this Division.

1.3 **Scope of Work**

1.3.1 It is the intent of these Specifications to modify the existing standpipe system as more thoroughly defined in each section of this Specification. All materials and equipment as hereinafter specified and/or shown on the Drawings will be furnished and installed in such a manner as to leave each of the systems of the Sprinkler Trades complete and in satisfactory operating condition.  
1.3.2 These Specifications are to be considered an integral part of the plans which accompany them. Neither the plans nor the Specifications shall be used alone. Any item or subject omitted from one but which is mentioned or reasonably implied in the other shall not relieve this Trade of responsibility.

1.4 **Inspection of Premises and Site**

1.4.1 Each Trade shall visit the site and examine the existing conditions and make necessary allowances in their Bid Price for removal, relocation, re-routing, reconnection of existing fire suppression, mechanical, and electrical equipment and wiring as may be necessary for the execution and completion of this Project. Extra charges for premium time labour shall be included in the Bid Price allowing for after hours, weekend and holiday labour requirements. No extras will be allowed for failure to properly evaluate conditions which affect the scope of the Work included in this Contract.

1.5 **Compliance and Co-Operation**

1.5.1 The Drawings upon which this Contract is based show the arrangement, general design and extent of the systems. These systems are suitably outlined on the Drawings with regard to sizes, locations, general arrangement and installation details. The mains and connections thereto are shown more or less in
diagrammatic form except where in certain cases the Drawings may include details giving the exact location and arrangements required.

1.5.2 Where any parts of the system and/or pieces of equipment are located by dimensions on the Drawings, said dimensions shall be checked and verified in the field. Each Trade shall make, without additional charge or expense to the Agency, any necessary changes or additions to accommodate structural conditions or other equipment. The Consultant shall be notified immediately and authority secured in writing for such revisions before proceeding with the work.

1.5.3 This Trade must exercise the utmost care and diligence in order that all Work shall be done in strict compliance with the full intent and meaning of the Drawings and these Specifications.

1.5.4 This Trade shall be expected and required to confer and cooperate with the other trades in order to eliminate any unnecessary delays to any Work being done in the building. He will also be required to store up materials neatly and out-of-the-way and to clean up all refuse caused by this Work daily.

1.5.5 This Trade shall carefully study all Drawings, Specifications, and other instructions and shall at once report to the Consultant any errors, inconsistencies, or omissions discovered. In no case shall proceed in uncertainty.

1.5.6 As the Work progresses and before installing fixtures, other fittings and equipment which may interfere with the Work of other Trades, each Trade shall consult with the Consultant and obtain detail Drawings or instructions for the exact location of such equipment.

1.6 Shop Drawings

1.6.1 Submit for review, three (3) complete sets of Shop Drawings and data sheets covering all items or equipment to be installed under the Contract. One copy will be retained by WalterFedy. Shop Drawings shall show all relevant performance and installation information. The Drawings and data required shall generally be as outlined under each Section of the Specification, but shall not be restricted to the items listed. Submit copies of reviewed Shop Drawings to other trades as required for completion of their related work.

1.6.2 Shop Drawings may be submitted electronically in Adobe Portable Document Format (.pdf). Electronically submitted Shop Drawings shall comply with all requirements for Shop Drawings noted herein including bearing the review mark of the submitting Trade. Electronically submitted Shop Drawings shall be returned electronically.

1.6.3 All submitted Shop Drawings must have been reviewed in detail by this Trade and must bear a stamp. Should the Drawings not have been reviewed and stamped, they will be returned to the Trade immediately through the Contractor.
1.6.4 Show on each submittal the "Mark Number" used to designate each piece of equipment.

1.6.5 Clearly indicate manufacturer, model, performance data including pump curves and capacities, materials of construction, dimensions, shipping and operating (wet) weights, colours (or colour selection chart if choice available), and supplied options.

1.6.6 Clearly indicate any discrepancies between the specified and supplied equipment, particularly those that affect the performance of the equipment.

1.6.7 Show electrical characteristics of equipment.

1.6.8 Show service connection sizes and locations for equipment including electrical, water, and compressed air. Include characteristics of supplied external services (that is: voltage, temperatures, pressures, flow rates).

1.6.9 Show applicable standards such as CSA, ULC, FM, etc.

1.6.10 Show support points for all equipment including anchor bolt/hanger rod sizes, dead/live loads, etc. Indicate required service clearance around, above and below equipment for opening access doors, removal of internal components (filters, coils, shafts) etc.

1.6.11 Equipment will not be accepted on site until approval of Shop Drawings. Shop Drawings designated as "Reviewed as Modified" are conditionally approved such that this Trade shall ensure equipment satisfies all Contract requirements. Delivery of equipment may proceed but final, corrected Shop Drawings must be submitted prior to completion of Contract.

1.6.12 Within ten working days of the award of the Contract, submit a list of all equipment for which delivery dates exceed six (6) weeks.

1.6.13 Indicate the manufacturer's estimated time of delivery, expressed in weeks after receipt of approved Shop Drawings.

1.6.14 Equipment with long delivery dates that are critical for the progress of the Work are to be followed closely by this Trade. Submit these Shop Drawings as soon as possible, separating them from the bulk of all other equipment, and mark "Urgent" on the front page of the submission.

1.6.15 All manufacturers and Suppliers shall Provide parts lists and maintenance information for specific equipment on compact disc (CD), digital versatile disc (DVD) or other common storage standard compatible with BAS.

1.6.16 Refer to Section 01 33 00 Submittal Procedures.
1.7 **Materials and Equipment Specified and Alternates**

1.7.1 This is a name type Specification and the following applies:

.1 Material and equipment are specifically described and named in this Specification for the purpose of establishing a standard of materials and quality of Work and specific requirements to which each Trade shall adhere.

.2 The price submitted for this Contract shall be based on the use of materials and equipment as specified. If this Trade wishes to quote on materials and equipment other than that specified, the Trade may select from the Approved Manufacturer's List. The Trade may use this equipment in the base bid but must submit the name of the manufacturer with the bid. Otherwise only the specified manufacturer's equipment will be accepted.

.3 All of the materials required for the performance of the Work shall be new, the best of their respective kinds and a uniform pattern throughout the work.

.4 Any equipment substituted must not exceed space requirements allocated on the Drawings. Where equipment is substituted for that which is shown on the Drawings, this Trade is to submit Shop Drawings showing revised layouts of equipment rooms, mechanical rooms, etc., for approval.

.5 Specified equipment or equipment listed by Model Number is usually used as a base for design performance, physical arrangements, weights, shape, wiring, controls and starter requirements, etc. If other equipment is proposed, it is a requirement that all pertaining factors listed above are checked by this Trade, and allowance be made in the tender on a "Turn-key" basis. Furthermore, it is this Trade's responsibility to co-ordinate all above items prior to roughing in, in conjunction with other trades. Should the Work of other Trades be affected, the cost shall be borne by this Trade.

1.8 **Liability Insurance**

1.8.1 This Contractor must maintain such insurance as will fully protect both the Agency and the Contractor from any and all claims under the Workplace Safety and Insurance Act.

1.9 **Codes, Fees and Certificates**

1.9.1 All Work shall be executed and all materials shall conform to and be inspected in strict accordance with all the laws, rules, and regulations of the local and provincial codes and all other authorities having jurisdiction.

1.9.2 This Trade shall obtain all necessary permits and all notices, pay all fees in order that the Work hereinafter specified may be carried out and shall furnish any certificates necessary as evidence that the Work installed conforms with the laws and regulations of all authorities having jurisdiction before final certificates are issued.
1.9.3 All changes and alterations required by an authorized inspector of any authority having jurisdiction shall be carried out without charge or expense to the Agency.

1.9.4 All equipment supplied must have approval of NFPA, CSA, ULC, FM, Agency’s Underwriter and any other authority having jurisdiction.

1.10 **Quality of Work**

1.10.1 Each respective trade must supply to this Project, Certified Mechanics and Apprentices in accordance with current Ministry of Labour regulations. Each trade shall Provide installations and workmanship of a professional level of quality.

1.11 **Protection**

1.11.1 This Contractor shall protect finished and unfinished Work from damage due to carrying out of this work. This Contractor shall be responsible for the condition of all materials and equipment supplied under this Contract and shall Provide all necessary protection for same and shall be responsible for the protection and maintenance of the Work of this section until the building/Project has been completed and accepted.

1.11.2 At the end of each day, each Trade shall seal the open ends of piping with 6 mil poly and maintain seals until Work continues. Remove seals prior to the continuation of the work.

1.12 **Extras and Credits**

1.12.1 In the event of additional Work of any nature being required, this Trade must state in writing the costs of such extras at the time when the Contractor is required to do the work, and unless any such extras are approved, they will not be allowed. In the event of omissions, a fair and reasonable adjustment will be made to the Contract price by negotiation with the Consultant. Such an adjustment to the Contract shall not in any sense be construed to render the Contract invalid. Any extras or credits submitted for approval shall be priced individually, and be accompanied by an itemized list of materials and corresponding price breakdown.

1.12.2 All quotations shall be based on the submitted hourly rates and the latest issue of MCAA pricing manual.

1.13 **Sleeves, Inserts, and Chrome Plates**

1.13.1 This Trade shall be responsible for supplying and setting of all sleeves, inserts, etc., on all piping.

1.13.2 Sleeves shall be flush with finished ceilings and wall faces and shall be sized large enough to allow for any lateral movement of piping due to expansion or contraction, pipe and duct insulation, and sound packing. Floor sleeves into equipment rooms shall extend 100 mm (4 in.) above floor. All sleeves are to be made from schedule 40 steel pipe.

1.13.3 Where pipes pass through walls, floors, and ceilings, the area between the pipe and sleeves shall be packed with 100 kg/m³ (6
½ lb/ft³) density fibreglass the full wall or floor depth. Minimum width of packing shall be 25 mm (1 in.) for piping and 50 mm (2 in.) for ductwork with all joints sealed with caulking.

1.13.4 Where exposed, the packing and sleeve shall be covered completely with a chrome plated cast brass solid ring escutcheon plate with set screw.

1.13.5 Ensure that openings through fire separations do not exceed the maximum size wall openings, and maximum and minimum dimensions, indicated in ULC Guide No. 40U19 for service penetrations assemblies and fire stopping material.

1.13.6 Patch all openings around installations of this Division that pierce fire or smoke separations with an approved watertight smoke and fire stop sealant.

1.14 Cutting and Patching

1.14.1 This Trade shall be responsible for all costs of cutting and patching of any building construction made necessary by the installation of the Work and/or due to lack of co-ordination in the new construction, except only in such instances as may be otherwise assigned by the Specifications or shown on the Drawings.

1.14.2 Under no circumstances shall any cutting or burning of the structural parts, including concrete slabs of the building be undertaken without the written authority of the Consultant.

1.14.3 All cutting and patching must be carried out by a Trade experienced in that particular type of work, but the costs of such Work shall be borne by the Sprinkler Trade.

1.15 Hazardous Materials

1.15.1 Certain equipment, piping and ductwork as well as building systems on this Project may have been manufactured using asbestos material.

1.15.2 All Trades on this Project should be aware of this and notify the Consultant if any asbestos is to be disturbed during this Project.

1.15.3 The Agency will arrange to have such material removed from the premises and the area cleaned and made ready before any Trade can commence Work in that area.

1.15.4 The cost for the removal of hazardous materials as related to the Work of this Trade, shall be the responsibility of the Agency.

1.16 Existing Building Renovations

1.16.1 The Sprinkler Trade shall visit the site and include in the price all costs for removal revisions and resetting of piping, ducts, grilles, diffusers, and all items in general where ceilings, walls, floors, duct and pipe shafts, etc., are revised. Refer to architectural room finish schedules.

1.16.2 Perform all Work in the existing building indicated on the Drawings, specified herein, and as may be necessary to carry out the Work of this Contract.
1.16.3 Disconnect and cap all piping not reused at the mains so that all remaining piping is self-draining without dead pockets. All draining and filling of system required shall be a part of this work.

1.16.4 Relocate and reconnect any piping or other Work pertaining to this Trade presently concealed in walls, partitions, or ceiling spaces and which become exposed during the renovation Work so that these services are concealed in the renovated layout, and put back into operation.

1.16.5 All equipment, etc., to be reused shall be carefully removed and stored. Any piece of equipment or fitting, accessory, etc., which forms a part of the equipment to be reused which is lost or damaged shall be replaced with a new device, fitting, accessory, etc.

1.16.6 All existing equipment, fixtures, superfluous piping, etc., being removed shall become the property of the Contractor or Agency and be removed from site.

1.16.7 Make certain that all services affected by Work are cut off and are properly capped or diverted.

1.16.8 Do not make interruption of services to or within existing building without prior consultation with Agency.

1.17 **Temporary and Trial Usage**

1.17.1 It is especially understood and agreed that the temporary and trial usage by the Agency of any mechanical device, machinery, apparatus, equipment or any other Work or materials, supplied under this Contract, before Date of Substantial Completion and written acceptance by the Consultant, is not to be construed as evidence of the acceptance of same by the Agency. It is further understood and agreed that the Agency shall have the privilege of such temporary and trial usage as soon as this Trade shall claim that the said Work is completed and in accordance with the Drawings and Specifications for such reasonable length of time and as the Consultant shall deem to be sufficient for making a complete and thorough test of the same. No claims for damage shall be made by this Trade for the injury to or breaking of any parts of such Work which may be so used whether caused by weakness or inaccuracy of structural parts; or by defective material or quality of Work of any kind whatsoever. All equipment used on a temporary basis must be brought back to new condition by the Manufacturer's service department and new full guarantee period to begin on date the building/Project is accepted by the Agencies.

1.18 **Deficiencies**

1.18.1 All deficiencies as identified in Field Review Reports or Commissioning Reports shall be corrected by the applicable Trade in a timely manner after being made aware of said deficiencies. The Sprinkler Trade shall subsequently inform the Consultant that deficiencies have been corrected in writing.
1.19 **Completion**

1.19.1 Each Trade shall keep the premises in a clean and orderly condition during construction. All waste and unusable materials shall be promptly removed from the site.

1.19.2 Upon completion of the work, each Trade shall go over the entire installation; clean and polish all fixtures, and equipment; remove all surplus materials and rubbish of every description, incident to this work, leaving the installation neat and orderly and in completely satisfactory working conditions subject to the approval of the Consultant.

1.20 **Record Drawings**

1.20.1 Provide record Drawings in compliance with NFPA requirements.

1.20.2 The final record Drawings shall be produced on a clean set of Drawings and submitted to the Consultant at the completion of the work. All Work on the Drawings must be neat and complete and carried out by an experienced draftsperson. After approval of the Consultant these Drawings will be submitted to the Agency.

1.20.3 Refer to Sections 01 33 00 - Submittal Procedures and 01 78 39 - Project Record Documents.

1.21 **Guarantee and Warranties**

1.21.1 This Trade, as a condition precedent to final payment, shall execute a guarantee to the Agency in writing warranting all apparatus furnished under this heading to remain in serviceable and perfect condition for a period of one (1) year from date of final acceptance of the work, unless specified otherwise. Any imperfections, as a whole, or in part, by reason of defective quality of work, defective materials, defective arrangement of the various parts, or materials damaged as a result of these defects or repairs, shall be made good to the satisfaction of the Consultant at this Trade's expense without undue delay.

1.21.2 Extended guarantees as outlined in various sections of this Specification shall be included as follows: Equipment Warranty Costs by Equipment Manufacturer; Labour Guarantee Costs by the Sprinkler Trade.

1.22 **Hangers and Supports for Fire-Suppression Piping and Equipment**

1.22.1 Provide hangers and supports that conform to the requirements of the applicable NFPA standards.

1.23 **Vibration and Seismic Controls for Fire-Suppression Piping and Equipment**

1.23.1 Provide isolation for pumps, compressors, piping, and all fire suppression equipment in general. All equipment shall be adequately isolated to maintain acceptable (NC) levels in occupied areas of the building.

1.23.2 Provide Seismic Restraint Systems (SRS) for a post-disaster building according to the Ontario Building Code, the National Building Code of Canada and its commentaries.
1. The SRS is to be designed by an Ontario P.Eng. with $1,000,000 professional insurance.

1.23.3 General

.1 Provide all hangers, isolators, bases, pads, and other devices specified, required, or detailed for the vibration isolation of all fire suppression equipment and piping.

.2 Provide seismic restraint system for fire suppression equipment and systems, both vibration isolated and statically supported.

.3 SRS to be fully integrated into, and compatible with:
   .1 Noise and vibration controls specified elsewhere in this Project Specification.
   .2 Structural, mechanical, electrical design of Project.
   .3 Systems equipment not required to be operational during and after seismic event.

.4 During seismic event, SRS to prevent systems and equipment from causing personal injury and from moving from normal position.

.5 All material Provided for vibration isolation or noise control shall be new and manufactured specifically for the purpose intended.

.6 The vibration isolation Supplier shall inspect and approve the installation of the vibration isolators and shall submit a report to the Agency that verifies that all of the isolation equipment has been properly installed.

.7 Any requests for change in this Specification or equipment selection must be submitted in writing for review and approval by the Consultant in time for a written addendum to this Specification. Consideration may not be given to subsequent substitution requests.

.8 Noise level criteria as per ASHRAE or as otherwise specified. Sound test reports will be Provided upon request.

1.23.4 Submittals – Drawings

.1 Supply to the vibration control manufacturer a copy of approved equipment Drawings of equipment to be isolated. These Drawings to show operating weights, motor positions and horsepower, support points and sizes.

.2 The vibration control manufacturer shall submit, for approval and the use of trades for proper co-ordination of their Work related to the Work of this section, Drawings of the isolation components being supplied.

.3 Submittals to include:
   .1 Separate Shop Drawings for each SRS and devices for each system, equipment.
   .2 Identification of location of devices.
   .3 Schedules of types of SRS equipment and devices.
   .4 Details of fasteners and attachments to structure, anchorage loadings, attachment methods.
.5 Installation procedures and instructions.
.4 Submit additional copy of Shop Drawings and Product data to Structural Engineer for review of connection points to building structure.

1.24 **Identification for Fire-Suppression Piping and Equipment**
1.24.1 Provide fire-suppression piping and equipment identification in accordance with the applicable NFPA Standards.

2. **PRODUCTS**

2.1 **Hangers and Supports for Fire-Suppression Piping and Equipment**
2.1.1 Horizontal Piping: For pipe sizes up to and including 50 mm (2 in.), use adjustable clevis Anvil Fig. 65. For pipe sizes that are 65 mm to 100 mm (2½ in. nominal and over) use Anvil Fig. 260. Use wedge-type concrete inserts Anvil Fig. 281 or Phillips steel shell and expansion plug concrete inserts in poured concrete slabs.

2.1.2 Vertical Piping: Vertical piping shall be supported at floor level with riser clamps Anvil Fig. 261. Supports shall be generally as above or of a type acceptable in accordance with the NFPA or authorities having jurisdiction.

2.2 **Vibration and Seismic Controls for Fire-Suppression Piping and Equipment**
2.2.1 Vibration, Isolation, and Supports
.1 All vibration and noise control equipment shall be Kinetics Noise Control – Vibron (or Agency approved equivalent), who will take single responsibility for proper isolation and silencing of all equipment, and piping.

.2 Isolation
.1 Type SL: Closed spring mounts with top and bottom housing separated with sponge neoprene stabilizers. Bottom housing to be bonded to a 13 mm (1/2 in.) thick ribbed neoprene noise pad.

.2 Type FDS: Open type spring mounts having extra iso - stiff springs with a minimum horizontal stiffness versus vertical stiffness (Kx/Ky) of 1.0.

.3 Type RD: Elastomer rubber mount with threaded insert and hold-down bolt holes.

.4 Type Vibropad: Waffle pads shall be 60 durometer neoprene, minimum of 10 mm (3/8 in.) thickness and selected for an operating load of 50 psi (345 kPa). Neoprene shall be used where the pads may be outside or in an area where oil may be present.

.5 Type VSV: Vibropad-steel-Vibropad pads shall be constructed of two layers of 10 mm (3/8 in.) thick type Vibropad waffle type neoprene pads, as specified above, bonded to 10-gauge steel plates. All holes to be sleeved and complete with an isolation rubber.
.3 Spring hangers shall be Kinetics Noise Control (or Agency approved equivalent) Type SH or SRH with completely colour coded stable springs. The SRH hanger shall be complete with neoprene isolation pad in series with the spring.

.4 All spring mounts shall be complete with levelling devices, neoprene sound pads and completely colour coded stable springs.

.5 Spring mounts shall be complete with neoprene grommets and allow for a 30 degree deflection of the rod to prevent hanger rod from shorting to the mount.

.6 All springs shall be selected to operate at no greater than 2/3 solid deflection. All hardware shall be zinc chromate plated.

.7 Application: see isolation schedule.

2.2.2 Seismic Restraint

.1 Seismic Restraint System:

.1 SRS to provide gentle and steady cushioning action and avoid high impact loads.

.2 SRS to restrain seismic forces in all directions.

.3 Fasteners and attachment points to resist the same load as the seismic restraints.

.4 Drilled or power driven anchors and fasteners are not permitted.

.5 SRS of piping systems to be compatible with:

.1 Expansion, anchoring and guiding requirements.

.2 Equipment vibration isolation and equipment SRS

.6 SRS equipment, equipment supports or mounts using cast iron, threaded pipe, or other brittle materials not permitted.

.7 Attachments to structure:

.1 Use high strength mechanical expansion anchors.

.2 Drilled or power driven anchors not permitted.

.8 Seismic control measures shall not interfere with the integrity of firestopping.

.2 SRS For Static Equipment, Systems

.1 Fire protection SRS to NFPA 13.

.3 SRS for Vibration Isolated Equipment

.1 Floor mounted equipment, systems - Use one of the following methods:

.1 Vibration isolators with built-in snubbers.

.2 Vibration isolators and separate snubbers.

.2 SRS to resist complete isolator unloading.

.3 SRS not to jeopardize noise and vibration isolation systems. Provide 6 - 9 mm (1/4 – 3/8 in.) clearance
between seismic restraint snubbers and equipment during normal operation of equipment and systems.

.4 Cushioning action to be gentle and steady by utilizing elastomeric material or other means in order to avoid high impact loads.

.5 Bracing methods:
  .1 Approved by Consultant.
  .2 Structural angles or channels.
  .3 Cable restraint system incorporating grommets, shackles and other hardware to ensure alignment of restraints and to avoid bending of cables at connection points. Incorporate neoprene into cable connections to reduce shock loads.

.4 Service Utilities Entrance Into Building
  .1 Provide flexibility to prevent breakage in the event of an earthquake.

.5 Application: see isolation schedule.

3. EXECUTION

3.1 Hangers and Supports for Fire-Suppression Piping and Equipment

3.1.1 Install hangers and supports in accordance with manufacturer's requirements.

3.1.2 Hang piping from beams, girders, purlins, long span joists or from angles supplied and installed by this Trade spanning between beams, joists or other supports or from inserts supplied and set in concrete floors by this Trade during construction.

3.1.3 Hangers shall be hung from structural steel members with appropriate hanger clamps. No welding to or burning, drilling or punching of structural steel members by this Trade, will be permitted under any circumstances.

3.2 Vibration and Seismic Controls for Fire-Suppression Piping and Equipment

3.2.1 Install vibration isolators in accordance with manufacturer's recommendations and generally as specified below.

3.2.2 Piping Support

  .1 All piping connected to isolated equipment shall be supported with SH springs as follows:
    .1 Up to 100 mm (4 in.) diameter: First 3 points of support
    .2 150 mm to 200 mm (6 in. to 8 in.) diameter: First 4 points of support
    .3 250 mm (10 in.) diameter & over: First 6 points of support

3.2.3 The first point of support shall have a static deflection of twice the deflection of the isolated equipment.
3.2.4 If it is not possible to install at least two spring hangers due to space restrictions, flexible metal or rubber hoses shall be used. Consultant’s approval is required of any such system prior to installation.

3.2.5 Care should be taken to ensure there is no transmission of vibration to walls and floors. These holes shall be sleeved at least 50 mm (2 in.) greater diameter than the pipe. After installation of the pipe, the periphery shall be packed with rock wool or fibreglass and non-hardening mastic compound used both sides. The mastic as well as water proofing acts as a sound barrier from machine room to occupied areas.

3.2.6 Have vibration isolator manufacturer determine mounting sizes. Install in accordance with manufacturer’s instructions.

3.2.7 Installed vibration isolation system for floor or ceiling supported equipment shall have a maximum lateral motion under equipment start-up or shut down conditions of 6 mm (1/4 in). Restrain excess motions by approved mountings.

3.2.8 Attachment points and fasteners shall be able to withstand the same maximum load that seismic restraint is to resist and in all directions.

3.2.9 Install SRS at least 25 mm (1 in.) from equipment, systems, services.

3.2.10 Allow for expansion and Contraction when selecting and applying isolation materials.

END OF SECTION
1. GENERAL

1.1 Related Sections
1.1.1 Section 21 05 00 – Common Work Results for Fire Suppression
1.1.2 Division 22 – Plumbing
1.1.3 Division 26 – Electrical

1.2 Scope of this Section: This specification section applies only to the 7750 Hurontario Site.

1.3 Reference Standards
1.3.1 Perform work to the following standards. Where standards are referenced by the OBC, the OBC referenced edition shall apply, where they are not referenced by the OBC the latest edition shall apply.
1.3.2 Provincial, building and fire regulations as approved by
.1 Ontario Building Code
.2 National Fire Protection Association Standards
.3 Local Fire Department
.4 CSA (for life safety), ULC, FM (for listed equipment)
.5 Canadian Electrical Code

1.3.3 Provide a fire hose and standpipe system.

2. PRODUCTS

2.1 Pipe and Fittings
2.1.1 All underground piping 65 mm (2½ in.) and over shall be ductile iron with tile-on joints.
2.1.2 All above ground piping and fittings shall be Schedule 40, screwed black pipe for sizes up to and including 50 mm (2 in.) and welded for 65 mm (2½ in.) and over. Schedule 80 pipe must be used for systems greater than 2.1 MPa (300 psi).
2.1.3 Victaulic grooved pipe (or Agency approved equivalent) and fittings suitable for above pressure are acceptable as follows:
  .1 Grooved Schedule 40 pipe, fittings, and valves may be used in lieu of traditional methods. If using the grooved method, all grooved products shall be of one manufacturer.
  .2 Grooved end valves/check valves shall be capable of 2.1 MPa (300 psi) bubble tight shut off. If using grooved end valves, the valves/check valves shall be of the same manufacturer as that of the grooved couplings and fittings. Standard of acceptance: VIC 300 BFV Style 715, 176 VIC check
  .3 If using the grooved method, rigid style couplings are to be used throughout the system. These couplings shall be of the offset bolt pad design and be capable of ANSI B31.1 and B31.1 hanging requirements. Standard of acceptance: Victaulic Style 07, Zero Flex
  .4 Where joining to sources of movement, vibration or noise, flexible couplings capable of 5.5 MPa (800 psi) shall be
used for the first three joints in/out of the source.
Standard of acceptance: Victaulic Style 77

2.2 **Supports**

2.2.1 Horizontal Piping:

.1 Up to and including 50 mm (2 in.), adjustable clevis Anvil Fig. 65.

.2 65 mm to 100 mm (2½ in. nominal and over), Anvil Fig. 260.

.3 In poured concrete slabs, wedge type concrete inserts Anvil Fig. 281 or Phillips Steel shell and expansion plug concrete inserts.

2.2.2 Vertical Piping:

.1 Supported at floor level with riser clamps Anvil Fig. 261.

.2 Supports shall be generally as above or of a type acceptable in accordance with the NFPA or authorities having jurisdiction.

2.3 **Fire Hose Cabinet Hose**

2.3.1 The hose shall be 30 m (100 ft) Wilco Peerless 100% synthetic fire hose complete with forged brass coupling.

2.3.2 All brass items shall be chrome plated.

2.3.3 Incoming pipe in cabinet shall have a chrome-plated escutcheon ring.

3. **EXECUTION**

3.1 **Fire Hose Cabinets**

3.1.1 Relocated fire hose cabinets shall be provided with new 30m (100ft) hoses.

3.2 **Hangers / Supports**

3.2.1 Hang piping from beams, girders, purlins, long span joists or from angles supplied and installed by this Trade spanning between beams, joists or other supports or from inserts supplied and set in concrete floors by this Trade during construction.

3.2.2 Branch lines only may be hung from hook end rods inserted into holes drilled in the sides of roof deck flutes.

3.2.3 Hangers shall be hung from structural steel members with appropriate hanger clamps. No welding to or burning, drilling or punching of structural steel members by this Trade, will be permitted under any circumstances.

**END OF SECTION**
1. **GENERAL**

1.1 **Work Included**

1.1.1 This Specification section applies to the fire protection scope of Work at the 180 Derry Road facility.

1.1.2 Work in this section includes, but is not necessarily limited to, providing all engineering, calculations, labor, materials, coordination, supervision, testing, permits and approvals required to design, install and obtain final acceptance of the automatic fire suppression system complete in all respects.

1.2 **Related Sections**

1.2.1 Division 22 Plumbing Requirements

1.2.2 Division 23 HVAC Requirements

1.2.3 Division 26 Electrical Requirements

1.3 **System Description**

1.3.1 The fire sprinkler system shall provide full and complete sprinkler coverage of all areas, and shall be compatible with the Contract Bid Documents (Drawings and Specifications) and avoid interference with Work of all other trades in the building.

1.3.2 Provide the fire suppression system in accordance with the applicable codes, standards and Agency requirements; whichever is more stringent shall prevail. Contractor design shall provide sprinkler spacing, pipe sizes and pipe locations as shown on fire suppression Bid Drawings, unless indicated otherwise on the Contract Bid Documents (Drawings and Specifications). All locations shown are approximate and shall be coordinated around the Work of all trades by the fire sprinkler Contractor.

1.3.3 All Drawings and calculations shall be submitted with a Professional Engineer’s stamp. Engineer to be a member in good standing of the Professional Engineers Association of Ontario and to have a minimum of three years’ experience in fire protection.

1.3.4 Successful Contractor to be a member in good standing of the Canadian Automatic Sprinkler Association (CASA).

1.3.5 The fire sprinkler Contractor shall coordinate piping locations with all other trades and around other trades as necessary. Additional sprinklers that may be required due to coordination shall be accounted for at time of Bid; failure of the Contractor to account for additional sprinklers will be at the cost of the fire sprinkler Contractor, the Agency shall not
be responsible for this cost or other costs associated with coordination.

1.3.6 Contractor to provide and install auxiliary drains at main piping where necessary.

1.3.7 The fire suppression system shall be complete with all ULc listed components and/or Factory Mutual approved equipment and material items. Install and test in full conformity with the requirements of all applicable codes, National Fire Protection Association (NFPA) standards, Ontario Building Code (O.B.C.), Ontario Fire Code, any local code enforcing agencies, Agency's insurance company, and Agency's reviewing Consultant.

1.3.8 Contractor shall coordinate carefully locations of all sprinklers (dry pendent, upright or otherwise) with regards to obstructions; beams/joist lights, conduit, and cooling/heating units that may obstruct the sprinkler discharge pattern from developing as per applicable codes and standards.

1.3.9 Sprinklers in finished ceilings shall be symmetrically spaced to provide proper coverage, and to avoid interference with lights, diffusers, grilles, or other ceiling mounted equipment. Sprinklers located in ceiling tiles shall be “quarter pointed.” The sprinkler layout shall conform to a typical pattern.

1.3.10 Contractors’ sprinkler Drawings and calculations must take into account and show the elevation loss from the flow test location to the flowing sprinklers. Backflow prevention and meter loss data shall be provided in the fire suppression documents. Acceptability of the backflow assembly must be approved by the Water Authority prior to installation. Actual pressure loss through backflow devices and/or water meters must be indicated in the hydraulic calculations. Sprinkler Contractor shall submit, with their calculations and shop Drawings, a manufacturer's flow chart indicating pressure loss through the device(s) at the calculated flows. Successful Contractor to perform flow test at the time of award of Contract.

1.3.11 Fire sprinkler design criteria hydraulic demands and hose allowances shall be in conformance with NFPA 13 as applicable, The Ontario Building Code. The safety factor for each calculation shall be a minimum of 5 psi (35 KPA).

1.3.12 Provide flushing and drainage per NFPA 13.

1.3.13 Test connection and combined test and drain connection components and installation shall be in conformance with NFPA 13.

1.3.14 Each riser/zone control assembly shall have the appropriate signage, including but not limited to system control valves,
drain valves, drum drip assemblies, and hose connections. Signage shall be of non-corrosive metallic material or a Lamacoid material affixed to each valve with chain.

1.3.15 Calculation information data plates shall be provided for each riser and each area calculated within that system, noted and labeled for each hydraulic calculation area. Each data plate shall have (as a minimum) project address, installing Contractors address and contact information, design density and design parameters, number of sprinklers calculated, k-factor, inside hose, outside hose, total system demand, and water flow data used at the time of system design.

1.3.16 All Work to be coordinated with the general Contractor and Agency. Any off hours Work that shall be required is to be included in at the time of tender.

2. PRODUCTS/MATERIALS

2.1 Materials

2.1.1 All materials used shall be ULc listed and/or Factory Mutual approved for fire protection use. Unless unavailable, ALL materials shall be domestically manufactured.

.1 Sprinklers:

.1 Fire Sprinklers shall be as shown on the Contract Bid Documents.

.2 Areas exposed to structure shall have upright sprinklers installed.

.3 Gypsum Wall Board (GWB) and ‘hard’ type ceilings shall have concealed pendent sprinklers installed.

.4 Lay-in Acoustical Ceiling Tile (ACT) type ceilings shall have concealed pendent sprinklers installed.

.5 All sprinklers located below 7’0 (2134mm) shall have listed sprinkler guards installed.

.6 All sprinklers susceptible to mechanical damage (including but not limited to gymnasiums, mechanical rooms, storage rooms, change rooms, etc) shall have listed sprinkler guards installed.

.2 Piping:

.1 All piping shall be new and conform to ASTM A135 or A795 guidelines, and/or FM approved for fire sprinkler use with a CRR value of 1.0 or greater.
.2 Grooved piping 1 ½” and larger shall be Schedule 10 piping utilizing grooved type fittings.

.3 Threaded piping 2” and smaller shall be Schedule 40 piping utilizing threaded fittings.

.4 Any piping used in air filled systems (pre-action) shall be galvanized.

.5 Any piping penetrating an exterior wall shall be galvanized.

.3 Fittings:

.1 All fittings 1 ½” and larger shall utilize grooved type fittings.

.2 All fittings 2” and smaller shall utilize threaded fittings.

.3 All dry/preaction systems shall have galvanized fittings.

.4 Any fittings exposed to the exterior shall have galvanized fittings.

.4 Piping Support:

.1 Hangers & hanger details shall be in conformance with NFPA and manufacturers recommendations and listings.

.2 All hangers and hanger components installed outside or in a corrosive environment shall be corrosive resistant.

.3 Seismic to be installed in accordance with The Ontario Building Code to the guidelines of NFPA13 and all manufactures listings. Cable or solid brace to be accepted.

.5 Valves:

.1 All system control valves shall be gear operating type butterfly valves and shall have built in tamper switches to be monitored by an alarm system. Wiring to be completed by Division 26.

.2 Pre-action valves shall have galvanized trim piping and fittings.

.1 *Trim shall be electric/electric pneumatic.

.2 *Electric detection system components (including pre-action panel and detectors) shall be designed and installed by the fire sprinkler Contractor. Detectors shall be smoke detection.
.3 *Wiring from the pre-action panel to the main building shall be wired by Division 26.

.4 *Inspectors test connections to be piped to an acceptable discharge location to accommodate full flow during a trip test as per NFPA13

.6 Miscellaneous

.1 Air compressor shall be tank mounted air cooled single stage pump in conformance with NFPA 13. Electrical requirements shall be Shall be coordinated with electrical division shall be hard wired, plug in type is not acceptable.

.2 Belt drive air compressor shall have a totally enclosed belt guard, louvered to allow for cooling. Front cover shall be easily removed for belt replacement.

.3 Compressor shall be capable of filling the system to operating pressure within the timelines outlined by NFPA 13

2.2 Material Submittals

2.2.1 Fire sprinkler Contractor shall submit material data sheets of all components. No components or material shall be ordered or delivered until the product data submittal has been reviewed/approved.

2.2.2 Submittals may be issued as hard copies delivered via courier, or a compiled PDF emailed.

2.2.3 If hard copies are submitted, no less than five copies shall be issued.

2.3 Close out Document Submittals

2.3.1 At substantial completion of the Fire Sprinkler scope of Work, three copies of the following shall be issued:

.1 Operations and Maintenance Manuals

.2 Copy of NFPA 25

.3 Hard Copy set of plans marked “As-Built” and dated

.4 CD with electronic PDF files of the items above

.5 CD with all “As-Built” CAD files

.6 Material and test certificates

.7 Engineers letter
3. **SPRINKLER SYSTEM DESIGN AND LAYOUT**

3.1 **Zones**

3.1.1 Fire sprinkler zones shall be as shown on the Contract Bid Documents.

3.1.2 Total zone areas shall be in conformance with NFPA 13.

3.2 **Drawing Data**

3.2.1 Sprinkler System Layout

   .1 Prepare detailed working Drawings of Fire Sprinkler systems containing information as outlined and defined by NFPA 13 under “Working Plans”

   .2 Plans and text to be clean, neat, complete and legible.

   .3 Sprinkler head legend shall have sprinkler head counts per system.

3.2.2 Design Data

   .1 Calculation of design data and calculation area to be clearly shown on the Sprinkler Layout Plans. Calculation area data and labels shall correspond to system calculation print outs.

   .2 Indicate system type and design type for each system.

3.2.3 Hydraulic Calculations

   .1 Hydraulic calculations shall be in conformance with applicable NFPA standards.

   .2 Any reductions or modifications to the standard areas per NFPA 13 shall be noted on the plans and noted on the calculation cover sheet.

   .3 A copy of the fire hydrant flow test shall be submitted with the set of hydraulic calculations.

3.2.4 Seismic Bracing

   .1 If required by OBC, and/or the structural Engineer, seismic calculations and bracing shall be in conformance with NFPA and manufacturers listing requirements.

   .2 All bracing components shall be by the same manufacturer.

3.2.5 Piping Support

   .1 Hangers & hanger details shall be in conformance with NFPA and manufacturers recommendations and listings.
.2 All hangers and hanger components installed outside or in a corrosive environment shall be corrosive resistant

.6 Fire rated penetrations

.1 Any fire sprinkler penetrating fire rated walls and floors shall utilize a listed fire stopping system/method equal to the rating of the wall and floor.

3.3 **Coordination**

3.3.1 Piping layout, sprinkler locations, component locations and pipe routing shall be completed as coordinated with other trades. Any conflicts or impacts shall be documented in writing and submitted to the General Contractor.

3.3.2 Failure to coordinate the system installation layout and communicate installation issues to the General Contractor shall burden the Sprinkler Contractor with providing solutions and associated costs.

3.3.3 Any required architectural features needed for pipe routing (bulkheads, chases, etc) shall be noted and detailed on the submittal plans

3.4 **Inspectors Test Connection**

3.4.1 Wet system inspectors test connection shall be at the riser assembly, with a listed test and drain installed within in the main drain line.

.1 Inspectors test connections for wet systems shall have the orifice of the smallest sprinkler installed on the system.

3.4.2 Dry/pre-action systems shall have inspectors tests installed in accordance with NFPA 13.

.1 Inspectors test connections for wet systems shall have the orifice of the smallest sprinkler installed on the system.

.2 Number of outlets shall be as outlined in NFPA.

3.5 **Drains**

3.5.1 Main riser drain(s) shall be sized to be in conformance with NFPA 13.

3.5.2 Piping passing through exterior walls and components exposed to the exterior shall be corrosion resistant.

3.5.3 Auxiliary drains shall be installed as required per NFPA 13 and be at an accessible level/elevation.
4. **SPRINKLER SYSTEM INSPECTION AND TESTING**

4.1 **Sprinkler System**

4.1.1 System shall be tested and inspected per NFPA 13.

4.1.2 All piping shall be inspected before concealed by framing, wall coverings, structure or architectural features.

4.1.3 Any/all piping or system components found to be in conflict with the plans and Specifications will be removed/replaced with acceptable materials at the Sprinkler Contractors expense.

4.1.4 Any equipment found to leak shall be immediately replaced and the system retested until there are no leaks in the system(s)

4.1.5 No Additives shall be permitted to be added to system, for stopping leaks or otherwise.

**END OF SECTION**
1. GENERAL

1.1 Related Sections
1.1.1 Division 01 – General Requirements
1.1.2 Section 22 07 00 – Plumbing Insulation
1.1.3 Section 22 10 00 – Plumbing Piping and Pumps
1.1.4 Section 22 40 00 – Plumbing Fixtures
1.1.5 Division 23 – HVAC
1.1.6 Division 26 – Electrical

1.2 General Notes
1.2.1 The Instructions to Bidders, the General Conditions of CCDC 2 - 2008, Supplementary Conditions of all sections of Division 1 are part of and apply to every division of this Specification.

1.3 Scope of Work
1.3.1 It is the intent of these Specifications to furnish and install a complete plumbing system as more thoroughly defined in each section of this Specification. All materials and equipment as hereinafter specified and/or shown on the Drawings will be furnished and installed in such a manner as to leave each of the systems complete and in satisfactory operating condition.

1.3.2 These Specifications are to be considered an integral part of the plans which accompany them. Neither the plans nor the Specifications shall be used alone. Any item or subject omitted from one but which is mentioned or reasonably implied in the other shall not relieve the Contractor of responsibility.

1.4 Inspection of Premises and Site
1.4.1 The Contractor shall visit the site and examine the existing conditions and make necessary allowances in the Bid Price for removal, relocation, re-routing, reconnection of existing mechanical and electrical equipment and wiring as may be necessary for the execution and completion of this Project. Extra charges for premium time labour shall be included in the Bid Price allowing for after hours, weekend and holiday labour requirements. No extras will be allowed for failure to properly evaluate conditions which affect the scope of the Work included in this Contract.

1.5 Sustainability
1.5.1 The Contractor is encouraged to work with Suppliers to identify additional sustainable practices relative to the delivery and packaging of supplied materials and equipment. The delivery of materials should be scheduled to minimize the energy consumption due to transportation. Identified sustainable practices with respect to packaging shall be reviewed with the Consultant prior to implementation.
1.5.2 The Contractor is encouraged to identify additional sustainable practices relative to the construction. The additional sustainable practices could include, but are not limited to, reduction in construction resource consumption and construction energy consumption. Identified sustainable practices that affect other Work shall be reviewed with the Contractor and the Consultant prior to implementation.

1.6 **Compliance and Co-Operation**

1.6.1 The Drawings upon which this Contract is based show the arrangement, general design and extent of the systems. These systems are suitably outlined on the Drawings with regard to sizes, locations, general arrangement and installation details. The mains and connections thereto are shown more or less in diagrammatic form except where in certain cases the Drawings may include details giving the exact location and arrangements required.

1.6.2 Where any parts of the system and/or pieces of equipment are located by dimensions on the Drawings, said dimensions shall be checked and verified in the field. The Contractor shall make, without additional charge or expense to the Agency, any necessary changes or additions to accommodate structural conditions or other equipment. The Consultant shall be notified immediately and his authority secured in writing for such revisions before proceeding with the Work.

1.6.3 The Contractor must exercise the utmost care and diligence in order that all Work shall be done in strict compliance with the full intent and meaning of the Drawings and these Specifications.

1.6.4 The Contractor shall be expected and required to confer and cooperate with the other trades in order to eliminate any unnecessary delays to any Work being done in the building. The Contractor will also be required to store materials neatly and out-of-the-way and to clean up all refuse caused by the Work daily.

1.6.5 The Contractor shall carefully study all Drawings, Specifications, and other instructions and shall at once report to the Consultant any errors, inconsistencies, or omissions discovered. In no case shall Work proceed in uncertainty.

1.6.6 As the Work progresses and before installing fixtures, other fittings and equipment which may interfere with the Work of others, the Contractor shall consult with the Consultant and obtain detail Drawings or instructions for the exact location of such equipment.

1.7 **Manufacturers Quotation Procedures**

1.7.1 Manufacturers shall submit a price for each different element which shall be supplied to this Project. Bulk or package prices will not be accepted. Full submission of components required with the Contractor’s First Construction Draw.
1.8 **Shop Drawings**

1.8.1 Submit for review, three complete sets of Shop Drawings and data sheets covering all items or equipment to be installed under the Contract. One copy will be retained by the Consultant. Shop Drawings shall show all relevant performance and installation information. The Drawings and data required shall generally be as outlined under each Section of the Specification, but shall not be restricted to the items listed. Submit copies of reviewed Shop Drawings to other trades as required for completion of their related Work.

1.8.2 Shop Drawings may be submitted electronically in Adobe Portable Document Format (.pdf). Electronically submitted Shop Drawings shall comply with all requirements for Shop Drawings noted herein including bearing the review mark. Electronically submitted Shop Drawings shall be returned electronically.

1.8.3 All submitted Shop Drawings must have been reviewed in detail by the Contractor and must bear the Contractor's stamp. Should the Drawings not have been reviewed and stamped, they will be returned immediately through the Contractor.

1.8.4 Show on each submittal the "Mark Number" used to designate each piece of equipment.

1.8.5 Clearly indicate manufacturer, model, performance data including pump curves and capacities, materials of construction, dimensions, shipping and operating (wet) weights, colours (or colour selection chart if choice available), and supplied options.

1.8.6 Clearly indicate any discrepancies between the specified and supplied equipment, particularly those that affect the performance of the equipment.

1.8.7 Show electrical characteristics of equipment.

1.8.8 Show service connection sizes and locations for equipment including electrical, water, waste, natural gas, compressed air, and hydraulic fluid. Include characteristics of supplied external services (i.e. voltage, temperatures, pressures, flow rates).

1.8.9 Provide wiring diagrams and control schematics when applicable.

1.8.10 Before the Project starts review the electrical Drawings to ensure the power provided meets the characteristics of the piece of equipment on the Shop Drawing. Should discrepancies occur, notify the Consultant immediately.

1.8.11 Provide control panel layout Drawings locating all gauges, switches and labels.

1.8.12 Show applicable standards such as CSA, ULC, FM, etc.

1.8.13 Show support points for all equipment including anchor bolt/hanger rod sizes, dead/live loads, etc. Indicate required service clearance around, above and below equipment for opening access doors, removal of internal components (filters, coils, shafts) etc.
1.8.14 Equipment will not be accepted on site until approval of Shop Drawings. Shop Drawings designated as "Reviewed as Modified" are conditionally approved such that the Contractor shall ensure equipment satisfies all Contract requirements. Delivery of equipment may proceed but final, corrected Shop Drawings must be submitted prior to completion of Contract.

1.8.15 Within ten working days of the award of the Contract, submit a list of all equipment for which delivery dates exceed six weeks.

1.8.16 Indicate the manufacturer's estimated time of delivery, expressed in weeks after receipt of approved Shop Drawings.

1.8.17 As more accurate delivery times become known during the course of the Contract, notify the Consultant where applicable.

1.8.18 Equipment with long delivery dates that are critical for the progress of the Work are to be followed closely by the Contractor. Submit these Shop Drawings as soon as possible, separating them from the bulk of all other equipment, and mark "Urgent" on the front page of the submission.

1.8.19 The Contractor shall retain a complete set of Shop Drawings for Testing Adjusting and Balancing.

1.8.20 All manufacturers and Suppliers shall provide parts lists and maintenance information for specific equipment on compact disc (CD), digital versatile disc (DVD) or other common storage standard compatible with BAS.

1.8.21 Manufacturers shall provide video files stored on DVD of Maintenance and Trouble Shooting instructions. See the Agency's Instructions below.

1.8.22 Refer to Section 01 33 00 - Submittal Procedures.

1.9 **Materials and Equipment Specified and Alternates**

1.9.1 This is a name type Specification and the following applies:

1. Material and equipment are specifically described and named in this Specification for the purpose of establishing a standard of materials and quality of Work and specific requirements to which the Contractor shall adhere.

2. The price submitted for this Contract shall be based on the use of materials and equipment as specified. If the Contractor wishes to quote on materials and equipment other than that specified, the Contractor shall refer to Section 01 25 00 – Substitution Procedures.

3. All of the materials required for the performance of the Work shall be new, the best of their respective kinds and a uniform pattern throughout the Work.

4. Any equipment substituted must not exceed space requirements allocated on the Drawings. Where equipment is substituted for that which is shown on the Drawings, the Contractor is to submit Shop Drawings showing revised layouts of equipment rooms, mechanical rooms, etc., for approval.

5. Specified equipment or equipment listed by Model Number is usually used as a base for design performance, physical arrangements, weights, shape, wiring, controls and starter
requirements, etc. If other equipment is proposed, it is a requirement that all pertaining factors listed above are checked by the Contractor, and allowance be made in the tender on a "Turn-key" basis. Furthermore, it is the Contractor's responsibility to co-ordinate all above items prior to roughing in. Should the Work be affected, the cost shall be borne by the Contractor.

1.10 **Equipment Manufacturer Shop Painting**

1.10.1 All equipment provided under this Specification shall be prime-coated in the manufacturer's facilities and finished according to the manufacturer's standard paint system or as noted in the applicable equipment section of this Specification. Equipment shall be primed and coated with flat grey enamel as a minimum.

1.11 **Equipment Supplied By Others**

1.11.1 The Contractor shall obtain from the Consultant approved Shop Drawings before roughing-in of services for any equipment supplied by others.

1.12 **Liability Insurance**

1.12.1 The Contractor must maintain such insurance as will fully protect both the Agency and the Contractor from any and all claims under the *Workplace Safety and Insurance Act*.

1.13 **Codes, Fees and Certificates**

1.13.1 All Work shall be executed and all materials shall conform to and be inspected in strict accordance with all the laws, rules, and regulations of the local and provincial Codes and all other authorities having jurisdiction.

1.13.2 The Contractor shall obtain all necessary permits and all notices, pay all fees in order that the Work hereinafter specified may be carried out and shall furnish any certificates necessary as evidence that the Work installed conforms to the laws and regulations of all authorities having jurisdiction before final certificates are issued.

1.13.3 All changes and alterations required by an authorized inspector of any authority having jurisdiction shall be carried out without charge or expense to the Agency.

1.13.4 All equipment supplied must have approval of NFPA, CSA, ULC, FM, Agency's Underwriter and any other authority having jurisdiction.

1.14 **Quality Of Work**

1.14.1 The Contractor must supply to this Project, certified mechanics and apprentices in accordance with current Ministry of Labour regulations. The Contractor shall provide installations and workmanship of a professional level of quality.
1.15 **Protection**
1.15.1 The Contractor shall protect finished and unfinished Work from damage due to carrying out the Work. The Contractor shall be responsible for the condition of all materials and equipment supplied under this Contract and shall provide all necessary protection for same. The Contractor shall be responsible for the protection and maintenance of the Work of this section until the building/Project has been completed and accepted.

1.15.2 At the end of each day, the Contractor shall seal the open ends of piping with 6 mil poly and maintain seal until Work continues. Remove seals prior to the continuation of the Work.

1.16 **Electrical Wiring**
1.16.1 The Contractor must review the Wiring for Mechanical Equipment Schedule on the electrical Drawings as well as individual sections of the mechanical Specification in order to determine the electrical requirements and responsibilities for the Work.

1.17 **Extras And Credits**
1.17.1 In the event of additional Work of any nature being required, the Contractor must state in writing the costs of such extras at the time required to do the Work, and unless any such extras are approved, they will not be allowed. In the event of omissions, a fair and reasonable adjustment will be made to the Contract price by negotiation with the Consultant. Such an adjustment to the Contract shall not in any sense be construed to render the Contract invalid. Any extras or credits submitted for approval shall be priced individually, and be accompanied by an itemized list of materials and corresponding price breakdown.

1.17.2 All quotations shall be based on the submitted hourly rates and the latest issue of MCAA pricing manual.

1.17.3 Material and equipment prices shall be trade price less the standard trade discount.

1.18 **Interference Drawings**
1.18.1 The Contractor shall prepare a complete set of interference Drawings for all critical locations to indicate conditions at crossovers and where space is limited. Field measurements shall be used to indicate accurate dimensions and configuration of all mechanical services in relation to structural and architectural members as well as electrical and sprinkler services. Coordination with other trades in the preparation of these Drawings is imperative.

1.18.2 These Drawings shall be submitted to the Consultant prior to installation according to the same procedure as for Shop Drawings.

1.18.3 Refer to Section 01 33 00 - Submittal Procedures.
1.19 **Excavation, Trenching And Backfilling**

1.19.1 The Contractor shall do all excavation, trenching and backfilling in connection with his Work. Excavations outside of the building shall be as required for the mechanical services. The bottoms of trenches shall be excavated so that pipes shall be supported on a solid bed of undisturbed earth. In trenches excavated too deep, sand backfill, power tamped to 95 percent Maximum Modified Dry Density (MMDD), shall be provided to bring the trench bottom to the required level.

1.19.2 All excavations shall be protected with timber sheeting, bracing or shoring, as required. In addition, provide adequate temporary cross-overs for pedestrian and vehicular traffic including guard rails, lamps, and flags, as directed. Remove all timber and protective devices before backfilling or when the necessity for protection ceases. The Contractor shall keep excavated areas free of water by providing pumps, hose, strainers, other apparatus, power, labour, and maintenance as required. The Contractor shall have all tanks and piping tested. The inspection will be by the Consultant or a representative and approved before backfilling.

1.19.3 Backfill the first 300 mm above pipes with clean sand compacted to 95 percent MMDD. The remaining backfill material shall be as outlined in Division 2 but carried out by the Contractor. Compaction shall conform to the requirements set out in Division 2. Provide compactions tests as directed by the Consultant.

1.19.4 Carefully backfill both sides of tanks and piping simultaneously to prevent movement or displacement.

1.20 **Concrete Bases, Curbs And Steel Supports**

1.20.1 The Contractor shall be responsible for supplying, locating and setting all anchor bolts required for mounting and anchoring mechanical equipment covered by this Contract. The Contractor shall supply accurate templates for each item of equipment requiring a concrete base.

1.20.2 The Contractor shall furnish all structural steel supports, platforms, braces, tie rods, etc., required to support or hang all piping and equipment installed under the mechanical Contract.

1.20.3 All floor mounted mechanical equipment such as pumps, tanks, etc., shall be mounted on 100 mm high concrete pads, unless specified otherwise.

1.21 **Sleeves, Inserts, And Chrome Plates**

1.21.1 The Contractor shall be responsible for supplying and setting of all sleeves, inserts, etc., on all piping.

1.21.2 Sleeves shall be flush with finished ceilings and wall faces and shall be sized large enough to allow for any lateral movement of piping due to expansion or contraction, pipe insulation, and sound packing. Floor sleeves into equipment rooms shall extend 100 mm above floor. All sleeves are to be made from schedule 40 steel pipe.
1.21.3 Where pipes pass through walls, floors and ceilings, the area between the pipe and sleeve shall be packed with 100 kg/m³ density fibreglass the full wall or floor depth. Minimum width of packing shall be 25 mm for piping with all joints sealed with caulking.

1.21.4 Where exposed, the packing and sleeve shall be covered completely with a chrome plated cast brass solid ring escutcheon plate with set screw.

1.21.5 Ensure that openings through fire separations do not exceed the maximum size wall openings, and maximum and minimum dimensions, indicated in ULC Guide No. 40U19 for service penetrations assemblies and fire stopping material.

1.21.6 Patch all openings around installations of this Division that pierce fire or smoke separations with an approved watertight smoke and fire stop sealant.

1.22 **Cutting And Patching**

1.22.1 The Contractor shall be responsible for all costs of cutting and patching of any building construction made necessary by the installation of the Work and/or due to lack of co-ordination in the new construction, except only in such instances as may be otherwise assigned by the Specifications or shown on the Drawings.

1.22.2 Under no circumstances shall any cutting or burning of the structural parts, including concrete slabs of the building be undertaken without the written authority of the Consultant.

1.22.3 All cutting and patching must be carried out by a worker experienced in that particular type of Work, but the costs of such Work shall be borne by the Contractor.

1.23 **Demolition In Existing Building**

1.23.1 The Contractor shall remove all equipment pertaining to the Work no longer required or being relocated, and cap or plug all connections no longer required. All equipment and fixtures not reused and all piping, fittings, etc., removed from the existing building shall become the property of the Contractor and shall be removed from the site. Material shall not be reused unless specifically noted on the Drawings.

1.24 **Hazardous Materials**

1.24.1 Certain equipment, piping and ductwork as well as building systems on this Project may have been manufactured using asbestos material.

1.24.2 The Contractor on this Project should be aware of this and notify the Consultant if any asbestos is to be disturbed during this Project.

1.24.3 The Agency will arrange to have such material removed from the premises and the area cleaned and made ready before any Work can commence in that area.

1.24.4 The cost for the removal of hazardous materials as related to the Work of the Contractor shall be the responsibility of the Agency.
1.25 **Existing Building Renovations**

1.25.1 The Contractor shall visit the site and include in the price all costs for removal revisions and resetting of piping, ducts, grilles, diffusers, and all mechanical items in general where ceilings, walls, floors, duct and pipe shafts, etc., are revised. Refer to architectural room finish schedules.

1.25.2 Perform all Work in the existing building indicated on the Drawings, specified herein, and as may be necessary to carry out the Work of this Contract.

1.25.3 Disconnect and cap all piping not reused at the mains so that all remaining piping is self-draining without dead pockets. All draining and filling of system required shall be a part of this Work.

1.25.4 Relocate and reconnect any piping, drains, vents, water lines, controls, or other Work pertaining to the Contractor presently concealed in walls, partitions, or ceiling spaces and which become exposed during the renovation Work so that these services are concealed in the renovated layout, and put back into operation.

1.25.5 All equipment, etc., to be reused shall be carefully removed and stored. Any piece of equipment or fitting, accessory, etc., which forms a part of the equipment to be reused which is lost or damaged shall be replaced with a new device, fitting, accessory, etc.

1.25.6 All existing equipment, fixtures, superfluous piping, etc., being removed shall become the property of the Contractor or Agency and be removed from site.

1.25.7 Make certain that all services affected by Work are cut off and are properly capped or diverted.

1.25.8 Do not make interruption of services to or within existing building without prior consultation with the Agency.

1.26 **Temporary And Trial Usage**

1.26.1 It is especially understood and agreed that the temporary and trial usage by the Agency of any mechanical device, machinery, apparatus, equipment or any other Work or materials, supplied under this Contract, before Date of Substantial Completion and written acceptance by the Consultant, is not to be construed as evidence of the acceptance of same by the Agency. It is further understood and agreed that the Agency shall have the privilege of such temporary and trial usage as soon as the Contractor shall claim that the said Work is completed and in accordance with the Drawings and Specifications for such reasonable length of time and as the Consultant shall deem to be sufficient for making a complete and thorough test of the same. No claims for damage shall be made by the Contractor for the injury to or breaking of any parts of such Work which may be so used whether caused by weakness or inaccuracy of structural parts; or by defective material or quality of Work of any kind whatsoever. All equipment used on a temporary basis must be brought back to new condition by the Manufacturer's service department and new full guarantee period to begin on date the building/Project is accepted by the Agency.
1.27 Adjusting And Start-Up

1.27.1 The Contractor shall provide acceptance tests to demonstrate that the equipment and systems actually meet the specified requirements. Tests may be conducted as soon as conditions permit. Make all changes, adjustments or replacements required as the preliminary tests may indicate prior to final tests.

1.27.2 The final balancing of the air systems and water systems and the testing of the sound levels shall be conducted by a company specializing in testing, adjusting and balancing (TAB). Notwithstanding the testing and balancing being performed by a specialist, the Contractor shall still bear full responsibility for the proper operation of all mechanical systems. The cost of the Work for the testing, adjusting and balancing by the TAB company shall be included in the Contract.

1.27.3 The Contractor is to operate all the equipment for a minimum period of five days after final acceptance date. Defects disclosed must be repaired and tests repeated until pronounced satisfactory. The Contractor is to lubricate all bearings; adjust and set all direct drives and 'V' belt drives and drivers for proper alignment and tension; calibrate and adjust all thermostats, thermometers, linkages and dampers; operate and test all motors and speed switches for correct wiring sequences; check all overload heaters in motor starters; replace and clean all strainers; fill all water systems and purge all air; clean the fan wheels, heating coils, fasten all loose and rattling pieces of equipment.

1.27.4 In testing, vary loads to illustrate start-up, sequence, normal shut down, and simulate emergency conditions for safety shut down with automatic and manual reset.

1.27.5 Final tests shall be conducted in the presence of the Consultant or a representative. The Contractor shall make up and forward the reports listed below. The Contractor shall give the Consultant advance notice in writing that the preliminary tests have been completed and that the Contractor is prepared to carry out final tests. During the final tests, the Contractor shall demonstrate to the satisfaction of the Consultant that all equipment is operating as intended without undue noise and vibration.

1.27.6 The Contractor is to provide the services of one job mechanic, ladders, tools and associated equipment to assist the Consultant's representative and the TAB company in carrying out final tests.

1.27.7 The Contractor shall obtain certificates of approval, acceptance, and compliance with rules and regulations for authorities having jurisdiction. The Work will not be considered complete until such certificates have been delivered to the Agency.

1.27.8 The Contractor shall be in charge of the plant during tests. The Contractor shall assume responsibility for damage in the event of injury to the personnel, building, and equipment, and shall bear all costs for liability, repairs, and restoration in this connection.

1.27.9 All air and water systems shall be tested, adjusted and balanced. Reports shall be submitted at the completion of the preliminary TAB phase and at the completion of the final TAB phase.
1.28  **Testing And Commissioning**
1.28.1 The Contractor shall witness all tests. The Consultant is to be notified when tests or commissioning is scheduled with adequate notice to attend.
1.28.2 The Contractor shall submit completed pre-commissioning forms to the Consultant for all commissioned equipment.

1.29  **Deficiencies**
1.29.1 All deficiencies as identified in Field Review Reports or Commissioning Reports shall be corrected by the Contractor in a timely manner after being made aware of said deficiencies. The Contractor shall subsequently inform the Consultant that deficiencies have been corrected in writing.

1.30  **Completion**
1.30.1 The Contractor shall keep the premises in a clean and orderly condition during construction. All waste and unusable materials shall be promptly removed from the site.
1.30.2 Upon completion of the Work, the Contractor shall go over the entire installation; clean and polish all fixtures, and equipment; remove all surplus materials and rubbish of every description, incident to the Work, leaving the installation neat and orderly and in completely satisfactory working conditions subject to the approval of the Consultant.

1.31  **Record Drawings**
1.31.1 During the progress of the Work, the Contractor shall keep on the site at all times, a complete and separate set of prints and shall note thereon clearly, neatly, accurately and promptly all mechanical changes, revisions and additions to the Work and deviations from the Contract Documents. Accurate locations, depth, size and type of underground utilities shall be included in these record Drawings so that on completion of the job, the Consultant will have a record of the exact location of all piping and equipment.
1.31.2 The final record Drawings shall be produced on a clean set of Drawings, shall be marked 'as built', signed and dated by the Contractor, and submitted to the Consultant at the completion of the Work. All Work on the Drawings must be neat and complete and carried out by an experienced draftsperson. After approval of the Consultant these Drawings will be submitted to the Agency.
1.31.3 After approval, record drawings shall be converted into CAD drawings into a standard AutoCAD file format, version to be compatible with the Agency’s requirements. Layers and general drawing formatting are to be consistent with the tender drawing AutoCAD formatting.
1.31.4 Refer to Sections 01 33 00 - Submittal Procedures and 01 78 39 - Project Record Documents.
1.32 Agency's Instructions
1.32.1 The Contractor shall supply to the Consultant (who will turn over to the Agency after review) three sets of operating and maintenance instructions. Each set of instructions is to be bound in a suitable three D-ring binder. The binder shall be no more than 75 percent full. An additional similar set shall be provided on DVD.
1.32.2 Each operating and maintenance manual shall contain parts list drawings for each mechanical component and each item of mechanical equipment.
1.32.3 The Contractor is to supply the services of a knowledgeable mechanic to thoroughly explain each mechanical system, its operation and its maintenance to the full satisfaction of the Consultant and the Agency's representative. Each system shall be started in its proper season in the presence of the Consultant and the Agency's representative.
1.32.4 At the discretion of the Agency a manufacturer's service representative shall provide direction for specialized equipment.
1.32.5 Refer to Sections 01 33 00 - Submittal Procedures and 01 78 39 - Project Record Documents.

1.33 Guarantee And Warranties
1.33.1 The Contractor, as a condition precedent to final payment, shall execute a guarantee to the Agency in writing warranting all apparatus furnished under this heading to remain in serviceable and perfect condition for a period of two years from date of final acceptance of the Work, unless specified otherwise. Any imperfections, as a whole, or in part, by reason of defective quality of Work, defective materials, defective arrangement of the various parts, or materials damaged as a result of these defects or repairs, shall be made good to the satisfaction of the Consultant at the Contractor's expense without undue delay.
1.33.2 Extended guarantees as outlined in various sections of this Specification shall be included as follows: Equipment Warranty Costs by Equipment Manufacturer; Labour Guarantee Costs by the Contractor.

1.34 Energy Efficiency
1.34.1 This Project is designed to meet specific resource use goals. Energy efficiency of equipment shall be as specified in the equipment schedules.
1.34.2 If equipment efficiency is not specified within these documents, provide equipment tested and certified to be in compliance with:
   .1 ASHRAE Standard 90.1 – 2010
   .2 Ontario Office of Energy Efficiency.

1.35 Expansion Fittings And Loops For Plumbing Piping
1.35.1 Provide detailed submittals for expansion fittings and loops for plumbing piping.
1.36 **General-Duty Valves For Plumbing Piping**

1.36.1 Valve materials shall conform to the requirements of ANSI, ASTM, ASME, and applicable MSS standards.

- Bronze shall be to ASTM B62 or B61 as applicable.
- Brass shall be to ASTM B283 C3770.
- Cast Iron shall be to ASTM A126 Class B.
- Valve markings shall conform to MSS-SP-25.
- End connections shall conform to ASME B16.

1.36.2 Valve testing and design shall conform to the requirements of applicable MSS standards.

- MSS-SP-67 – Butterfly Valves
- MSS-SP-70, -71, -85 – Cast Iron Gate, Globe & Check Valves
- MSS-SP-72 – American Valve
- MSS-SP-80 – Bronze Gate, Globe & Check Valves
- MSS-SP-110 – Ball Valves

1.36.3 All valves provided shall have a current and valid Canadian Registration Number for the Province of Ontario with the Technical Standards and Safety Authority (TSSA). Upon request, suppliers shall provide a copy of the statutory declaration for valves stamped, signed, and dated by TSSA as validation of the CRN registration.

1.36.4 Provide detailed submittals for general-duty valves for plumbing piping.

1.37 **Hangers And Supports For Plumbing Piping And Equipment**

1.37.1 Provide detailed submittals for hangers and supports for plumbing piping and equipment.

1.38 **Access Doors**

1.38.1 Provide access doors of a suitable size for easy servicing of all concealed mechanical equipment such as valves.

1.39 **Identification For Plumbing Piping And Equipment**

1.39.1 Provide labels and colour-coding for the positive identification of plumbing piping, and equipment.

1.39.2 Provide identification to the requirements of CAN/CGSB-24.3.

1.39.3 Colour coding shall be confirmed to match the Agency’s standard.

1.40 **Testing, Adjusting, And Balancing For Plumbing**

1.40.1 The testing, adjusting, and balancing services required of Divisions 22 and 23 of this Project shall be provided by one Company; the same firm shall cover both scopes of Work.

1.40.2 Provide Testing, Adjusting and Balancing (TAB) of all mechanical systems. This Work shall be performed by one of the approved TAB firms listed in Appendix 6.10. The Contractor shall co-operate with the TAB company to facilitate the Work of this section and provide mechanical tools, equipment, sheaves etc. as required. The TAB company shall review the design and proposed operating conditions of the systems, provide the specified number of site visits and reports, and shall provide the systems testing, adjusting and balancing as more fully detailed in this section of the Specification.
1.40.3 The Contractor shall provide all labour, tools, materials and equipment necessary to complete the Work of this Section using the information shown on the Drawings or reasonably inferable from same, and as described herein and including the testing, adjusting and balancing of the following systems.

.1 Domestic re-circulating water systems.

.1 Balancer shall adjust globe valves using ultra-sonic measurements to provide approximately equal flow to each re-circulation branch.

1.40.4 The Contractor shall carry a sufficient amount of money in his tender to cover the cost of providing additional devices at the direction of the TAB company as approved by the Consultant.

1.40.5 All devices shall be installed to facilitate the taking of measurements and balancing. All devices shall be accessible. If devices need to be relocated or have access provided to them, this Work shall be done by and at the cost of the Contractor.

1.40.6 Qualification

.1 The TAB company providing the building environmental testing, adjusting and balancing shall be an independent testing company with demonstrated expertise and reliability as listed in Appendix 6.10.

1.40.7 Responsibility

.1 The Contractor shall determine that the systems which have been installed within the scope of this Project are all connected and operating as outlined in the Specification and connected and operating as outlined in the Specification and as shown on the Drawings. The TAB company shall provide the initial testing, adjusting and balancing for all the systems indicated. This shall include all pumps to ensure that they are producing the correct flow and pressure within the horsepower rating as specified. The Contractor shall change any impellers, drives at no additional cost. Confirm with the TAB company before selection of these devices. Allowance shall be made so that these devices will be adequate for final balance.

1.40.8 Submittals

.1 Submit six copies of the final report showing the adjusted measured values of all systems. The report shall include all information detailed under the Execution section of this Specification (Section 22 05 00 – Common Work Results for Plumbing).

.2 The final report shall include design conditions, test and final conditions, temperatures and pressure readings.

.3 The reports shall be submitted through the Contractor to the Consultant.

1.40.9 Final System Check

.1 At the Consultant’s discretion, an independent company may be employed to perform a final system check. The cost of this check shall be paid out of a cash allowance.
1.41 **Facility Drainage**
   1.41.1 Provide detailed submittals for manholes and piping cleanouts.

2. **PRODUCTS**

2.1 **Expansion Fittings And Loops For Plumbing Piping**

2.1.1 In hot water lines, use Senior Flexonics (or Agency approved equivalent) expansion compensators Model HB, pressure external to the bellows, designed for maximum working pressure of 1.0 MPa.

2.1.2 Expansion joints 40 mm and smaller shall have solder ends. Expansion joints 50 mm and larger shall have flanged ends for easy removal.

2.1.3 Provide compatible Senior Flexonics (or Agency approved equivalent) guides on both sides of expansion joint. Provide anchors on all systems that require expansion compensation.

2.2 **General-Duty Valves For Plumbing Piping**

2.2.1 Valves shall be according to the following schedule.

2.2.2 Soldered bronze valves with sizes up to 50 mm. (Manufacturers as listed or Agency approved equivalent).

<table>
<thead>
<tr>
<th></th>
<th>Toyo</th>
<th>Kitz</th>
<th>Nibco</th>
<th>CWP Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ball valve</td>
<td>5043S</td>
<td>69AMLL</td>
<td>S5857066</td>
<td>600</td>
</tr>
<tr>
<td>(stainless</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>steel ball and</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>stem)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drain port, cap,</td>
<td>44</td>
<td>41</td>
<td>S-111</td>
<td>300</td>
</tr>
<tr>
<td>chain</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gate valve (RS)</td>
<td>281</td>
<td>12</td>
<td>S-211-B</td>
<td>200</td>
</tr>
<tr>
<td>Gate valve (NRS)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Globe valve</td>
<td>212A</td>
<td>23</td>
<td>S-413</td>
<td>200</td>
</tr>
</tbody>
</table>

2.2.3 Threaded bronze valves with sizes up to 50 mm. (Manufacturers as listed or Agency approved equivalent).

<table>
<thead>
<tr>
<th></th>
<th>Toyo</th>
<th>Kitz</th>
<th>Nibco</th>
<th>CWP Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ball valve</td>
<td>5041S</td>
<td>68AMLL</td>
<td>T5857066</td>
<td>600</td>
</tr>
<tr>
<td>(stainless</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>steel ball and</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>stem)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drain port, cap,</td>
<td>5046</td>
<td>68AC</td>
<td>T5857066HC</td>
<td>600</td>
</tr>
<tr>
<td>chain</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Gate valve (RS)</td>
<td>293</td>
<td>24</td>
<td>T-124</td>
<td>200</td>
</tr>
<tr>
<td>Gate valve (NRS)</td>
<td>280</td>
<td>40</td>
<td>T-113</td>
<td>200</td>
</tr>
<tr>
<td>Globe valve</td>
<td>211A</td>
<td>11</td>
<td>T-211-B</td>
<td>200</td>
</tr>
<tr>
<td>Check valve</td>
<td>236</td>
<td>22</td>
<td>T-413-B</td>
<td>200</td>
</tr>
</tbody>
</table>
2.2.4 Valves with sizes of 63 mm and larger. (Manufacturers as listed or Agency approved equivalent).

<table>
<thead>
<tr>
<th></th>
<th>Toyo</th>
<th>Kitz</th>
<th>Nibco</th>
<th>Victaulic</th>
<th>CWP Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butterfly valve</td>
<td>918BESL-2</td>
<td>6122EL</td>
<td>N200-L</td>
<td>608</td>
<td>200</td>
</tr>
<tr>
<td>Butterfly valve</td>
<td>918BESG-2</td>
<td>6122EG</td>
<td>N200-G</td>
<td></td>
<td>200</td>
</tr>
<tr>
<td>Gate valve</td>
<td>421A</td>
<td>72</td>
<td>F-617-0</td>
<td></td>
<td>200</td>
</tr>
<tr>
<td>Globe valve</td>
<td>400A</td>
<td>76</td>
<td>F-718-B</td>
<td></td>
<td>200</td>
</tr>
<tr>
<td>Check valve</td>
<td>435A</td>
<td>78</td>
<td>F-918-B</td>
<td></td>
<td>200</td>
</tr>
</tbody>
</table>

2.2.5 Ball valves may be used in lieu of Gate Valves for 50 mm and smaller shut-off services. American Valve 4000 may be used in lieu of cast iron gate valves 63 mm to 250 mm. Employ locking lever for sizes up to 150 mm and gear operator for sizes 200 mm and larger.

2.2.6 Ball valves shall be brass body, stainless steel ball and stem, full port, TFE seats, double O-ring design or Teflon packing, with locking lever handle and handle extension to suit thickness of associated piping insulation. Refer to insulation Specification Section 22 07 00 – Plumbing Insulation.

2.2.7 Wherever possible, all valves shall be of one manufacturer.

2.2.8 Provide valves with manufacturer’s name and pressure rating clearly marked on the body (per MSS-SP-25).

2.2.9 All exposed fixture stops shall be chrome plated.

2.2.10 All valves must be new material only and protected on site from conditions or environment that may affect performance.

2.2.11 Non-rising stem gate valves shall only be used when clearance does not permit using rising stem valves.

2.3 Hangers And Supports For Plumbing Piping And Equipment

2.3.1 For pipe sizes that are 50 mm nominal and under use Anvil No. 65 clevis type. For 63 mm nominal and over use Anvil No. 260 clevis type.

2.3.2 Provide suitable hanger rods and beam clamps or inserts. Provide plastic inserts over hangers or use copper hangers for copper piping. If copper plated steel hangers are used, the steel rod support must be isolated from the hanger.

2.3.3 Vertical lines are supported with Anvil Fig. 261 riser clamp.

2.3.4 Inserts for pipe hangers are to be Anvil or Universal I-beam clamps approved by Consultant.
2.4 **Access Doors**

2.4.1 Provide access doors, each complete with continuous concealed hinge, positive locking self-opening screwdriver lock.

1. Provide prime-coated access doors for general gypsum board and masonry applications.
2. Provide stainless steel, or aluminum access doors for tiled wall applications.
3. Provide drywall panel doors in gypsum board ceilings or walls featured in vestibules, foyers, corridors, public washrooms. Refer to architectural Drawings, including Reflected Ceiling Plans.
4. Provide ULC-listed, fire-rated access doors in fire-rated walls or ceilings. Rating shall suit point of installation. Refer to architectural Drawings for ceiling and wall assembly ratings.
5. Provide aluminum, or stainless steel, access doors and frames in wet areas such as showers and pools.

2.4.2 Access doors shall be a minimum of 200 x 200 mm.

2.4.3 Type, location and size of access door shall be referred to the Consultant for approval before installation.

2.4.4 Where equipment is installed above a ceiling with removable ceiling tile it is not necessary to provide an access door. However, the adjacent ceiling tile grid shall be marked as noted under identification for plumbing piping and equipment.

2.5 **Identification For Plumbing Piping And Equipment**

2.5.1 Refer to Part 1 of this Section for identification requirements associated with these products.

2.5.2 Provide Lamicoid equipment nameplates.

2.5.3 Provide snap-around plastic pipe markers for identification of all plumbing piping.

2.5.4 Provide 12 mm permanent adhesive coloured dots for identification of services above removable tile ceilings.

2.5.5 Wall-mounted directories and flow diagrams shall be framed behind Plexiglass safety glass.

2.6 **Facility Drainage Piping Cleanouts**

2.6.1 Provide cleanout model appropriate to the floor finish as follows:

<table>
<thead>
<tr>
<th>Floor Finish</th>
<th>Cleanout Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finished Floor</td>
<td>nickel bronze access cover and frame</td>
</tr>
<tr>
<td>VCT, Sheet Goods</td>
<td>Z nickel bronze recessed cover and frame</td>
</tr>
<tr>
<td>Unfinished, Heavy Traffic</td>
<td>extra heavy cast iron top</td>
</tr>
<tr>
<td>Ceramic or Porcelain Tile</td>
<td>square nickel bronze cover and frame</td>
</tr>
</tbody>
</table>

2.6.2 Cleanouts occurring in waterproof areas shall be supplied with Flashing Clamp Devices.
3. **EXECUTION**

3.1 **Expansion Fittings And Loops For Plumbing Piping**

3.1.1 Install expansion joints and compensators, flexible connections, pipe loops and offsets as indicated.

3.1.2 Support piping to prevent any stress or strain.

3.1.3 Install guides for expansion joints, to manufacturer's instructions. Install anchor pipe couplings to anchor piping.

3.1.4 Provide steel anchors welded to steel piping, clamped with non-ferrous fastenings to building structure or embedded in concrete pier. Co-ordinate with Consultant where fastenings are to be made.

3.1.5 Design axial traverse shall be 1.3 times expansion on temperature difference between -18 degrees C ambient and corresponding fluid temperature.

3.1.6 Anchor horizontal runs of brass and copper pipe to wall or floor construction. Co-ordinate locations with Consultant. Obtain approval for all anchor types.

3.1.7 Allow for expansion in vertical runs to compensate for temperature and building structural movements.

3.2 **General-Duty Valves For Plumbing Piping**

3.2.1 Valves shall be the same size as the pipe in which they are installed.

3.2.2 Provide shut-off valves at each piece of plumbing equipment and at each branch line take-off. Provide circuit balancing valves on branch take-offs where balancing is required.

3.2.3 Provide valves for all branches to washrooms so that one area can be isolated without shutting down the complete system.

3.3 **Hangers And Supports For Plumbing Piping And Equipment**

3.3.1 Hang piping from beams, girders, purlins, long span joists or from angles supplied and installed by the Contractor spanning between beams, joists or other supports or from inserts supplied and set in concrete floors by the Contractor during construction.

3.3.2 Branch lines only may be hung from hook end rods inserted into holes drilled in the sides of roof deck flutes.

3.3.3 Hangers shall be hung from structural steel members with appropriate hanger clamps. No welding to or burning, drilling or punching of structural steel members by the Contractor will be permitted under any circumstances.

3.4 **Access Doors**

3.4.1 Follow manufacturer's installation instructions.

3.5 **Identification For Plumbing Piping And Equipment**

3.5.1 Complete this Work in compliance with the manufacturer's recommendations.

3.5.2 After all equipment is installed and piping completed, the Contractor shall paint all exposed iron, steel Work, piping of every description installed by him (except for bronze nameplates). Two coats of suitable paint of colours listed shall be applied regardless
of whether the material comes on the site painted or not. All visible hangers and supports are to be painted black. A colour coding key shall be included permanently on framed plan and control diagrams.

3.5.3 All surfaces must be clean to SSPC-SP1 before painting and all painting must be carried out in accordance with the painting Specifications.

3.5.4 Identify each piece of equipment with 32-mm-high nameplates giving the name, service and system number as directed by the Consultant. Equipment requiring such identification shall include but not be limited to equipment such as pumps, converters, softeners, service water heaters, and tanks.

3.5.5 Identify each piping service, size, and direction of flow with plastic sleeves. Piping must be completely cleaned before sleeves are installed. Sleeves shall be applied at each horizontal or vertical change in direction, not more than 12 m apart in straight runs, so as to be readily seen, giving service and direction of flow. This applies to all piping throughout Project, exposed and concealed. Identify piping on each side of a wall through which it passes.

3.5.6 Upon completion of the Work the Contractor shall provide in connection with each valve installed under this Contract, a 30 mm diameter brass metal tag. Tags shall be attached to each valve with a key chain. Each tag shall bear an index number designating the valve.

3.5.7 Provide a neat computer printed directory giving the valve number and service of each valve and the location of the valve. After approval by the Consultant, one directory shall be provided for each mechanical room as well as a master directory. A duplicate set is to be provided for the Agency in the Operation and Maintenance Manual.

3.5.8 The Contractor shall supply flow and control diagrams of each system installed under his Contract. These are to include piping colour coding schedule.

3.5.9 After approval of the Consultant, both the valve tag schedule and the flow control diagram shall be enclosed under plexiglass, in neat, polished 460 mm x 600 mm (minimum) hardwood frames, provided with lugs or clips for wall mounting. The frame size shall be selected so that the diagram is legible.

3.5.10 All automatic controls, instruments, relays, etc., shall be tagged at location of installation on the job and keyed to a control schematic on which all instruments are to be numbered in sequence for the entire job. The schematic shall be framed under plexiglass and prepared for wall mounting.

3.5.11 Apply self-adhesive colour dots to the ceiling tile grid identifying service and maintenance items above the removable tile ceiling. Colours shall correspond to the colour schedule.

3.5.12 All surfaces shall be dry and clean prior to application of self-adhesive markers for a strong adhesion. Follow manufacturer’s application instructions.
3.5.13 The following is the recommended colour coding schedule as specified under the General Conditions. Final approval shall be obtained from the Consultant.

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Label</th>
<th>Strip Colour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot Water Supply</td>
<td>HWS</td>
<td>RED</td>
</tr>
<tr>
<td>Cold Water</td>
<td>CW</td>
<td>BLUE</td>
</tr>
<tr>
<td>Recirculation Line</td>
<td>HWR</td>
<td>PURPLE</td>
</tr>
</tbody>
</table>

3.6 **Testing, Adjusting, And Balancing For Plumbing**

3.6.1 The TAB company shall obtain Shop Drawings from the Contractor and review, amend and stamp and return to the Consultant one copy of all pertinent Shop Drawings. The TAB company shall point out to the Consultant in writing any deviations from the Specification. The TAB company shall also measure and make adjustments as necessary and direct the Contractor to make adjustments to the various systems to ensure that all the systems meet the design Specifications.

3.6.2 For the preliminary report test all pumps to determine flow quantities, total pressure, system pressure drop, motor HP load and current. Adjust the systems to ensure that they are operating within 10 percent of the specified values. Provide all necessary equipment to execute this Work.

3.6.3 The TAB company shall provide all necessary precision instruments, pressure gauges, manometers and thermometers, sound recording equipment, etc., for the execution of their Work. Accurate manufacturer's equipment performance characteristics shall be supplied by the Contractor to the TAB company for this Work.

3.6.4 Testing, Adjusting and Balancing Water Systems

.1 The TAB company shall test adjust, and balance all water systems indicated. System design conditions for testing and adjusting are preferred.

.2 Provision for pressure differential, flow and temperature measurements shall be made on inlet and outlet sides of all major equipment such as pumps and piping circuits. Appropriate readings shall be taken, to establish flow and capacities of individual units. All systems and system components shall then be balanced to suit design conditions.

.3 Include measurements in the report.

3.6.5 Adjustment Accuracy

.1 The maximum permissible deviation from design will be ± 5 percent for water flow and ± .5 degrees C in temperature unless otherwise specified.

3.6.6 Construction Inspection

.1 The TAB company shall visit the site during construction and co-ordinate the proper installation of all environmental systems adjusting components to comply with the Specification and Drawings and the testing requirements.
Inspection and progress reports shall be submitted to the Consultant within one week after each visit.

3.6.7 Automation
   .1 The TAB company shall make arrangements, through the Contractor for all necessary control adjustments to provide final and complete adjusted water systems in regard to flow and temperature.

3.6.8 Final Tests and Guarantee
   .1 The final test shall show and satisfy systems' operating conditions for year round operation. The TAB company shall guarantee all domestic water systems.
   .2 All complaints during this period in regards to water flow are the responsibility of the TAB company and shall be corrected by the same under this guarantee at no extra cost.

3.7 Facility Drainage Piping Cleanouts
   3.7.1 Cleanouts shall be provided in accordance with the OBC. Additional cleanouts beyond the OBC shall be provided if shown on plan. Install accessible cleanouts at traps.
   3.7.2 Unless serviceable from below floor, bring cleanouts up to finished floor or wall.

END OF SECTION
1. **GENERAL**

1.1 **Related Sections**
1.1.1 Section 22 05 00 – Common Work Results for Plumbing
1.1.2 Section 22 10 00 – Plumbing Piping and Pumps
1.1.3 Section 22 40 00 – Plumbing Fixtures
1.1.4 Division 23 – Heating, Ventilating, and Air Conditioning

1.2 **Qualifications**
1.2.1 This part of the Work shall be carried out by a qualified Contractor with an established reputation for this type of Work.

1.3 **Description of Systems**
1.3.1 The Work prescribed in this Section is intended to include all items of labour, materials, equipment specialties, and ancillary equipment, required to furnish and completely install in a first class condition, the plumbing insulation systems in strict accordance with the full intent and meaning of the Drawings and Specifications. This system shall include but not be limited to plumbing piping, plumbing equipment, and fixture traps.

1.4 **Submittals**
1.4.1 Submit technical data for all insulation.
1.4.2 Submit material samples as requested.

1.5 **Flame Spread Ratings And Smoke Development Classifications**
1.5.1 All materials and installations shall meet OBC required flame spread rating and smoke development classification when tested in accordance with ASTM E84 and/or CAN/ULC S102.

2. **PRODUCTS**

2.1 **Insulation For Pipe**
2.1.1 Provide pipe insulation with factory applied vapour retarding jacket and pressure sensitive lap sealing system. Jacket shall be ASJ SSL (All-Service Jacket with Self-Sealing Lap Closure System) high-density, white kraft bonded to an aluminum foil reinforced with fibre glass yarn.
2.1.2 Provide pressure-sensitive tape butt strips, using the same adhesive and a quick release paper strip to create a totally sealed and secure system.

2.2 **PVC Covering**
2.2.1 Provide jacketing and molded fitting covers and taped or glued joints. PVC material thickness shall be a minimum of 0.5 mm.

2.3 **Plumbing Fixture Supply And Waste Covering**
2.3.1 Provide PVC seamless thermal-insulating covers for plumbing fixture strainers, P-traps, continuous wastes, and supplies.
2.3.2 Covers shall incorporate an antimicrobial additive to inhibit bacterial growth.
2.4 **Metal Sheet Covering**
2.4.1 Provide 0.4 mm stucco-embossed aluminum sheet metal jacketing.

2.5 **Mastics, Coatings, Adhesives, Sealants**
2.5.1 Mastics, coatings, adhesives, and sealants shall be indicated for the specific individual use by the manufacturer.
2.5.2 Provide white durable water-based vinyl-acrylic weather-barrier breather mastic coating for thermal insulations for weatherproofing and mechanical protection of thermal insulations, indoors and outdoors, for tanks, fittings, vessels, equipment, and other irregularly-shaped objects. Provide reinforcing mesh as required by the manufacturer’s instructions for the application. VOC content 20 g/L less water and exempt solvents.
2.5.3 Provide high-performance water-based vapour retarder coating for low temperature interior and exterior applications. Permeability shall be less than 0.08 Perms at 1.4 mm thickness. Provide reinforcing mesh as required by the manufacturer’s instructions for the application. VOC content 36 g/L less water and exempt solvents.
2.5.4 Provide white combination coating and adhesive for finishing and adhering canvas and other lagging cloths over insulation. VOC content 48 g/L less water and exempt solvents.
2.5.5 Provide contact adhesive for use with elastomeric sheet insulation.

3. **EXECUTION**

3.1 **General**
3.1.1 Ensure that all pipes and fittings are dry and clean before applying covering.
3.1.2 Do not apply insulation until the items, including piping, to be covered have been tested against leakage.
3.1.3 Insulate all concealed piping.
3.1.4 Butt joints firmly together. Stagger joints in multiple layer construction.
3.1.5 Pipe insulation shall pass through walls or floors with continuous covering.
3.1.6 Protect insulation passing through floors, walls and similar barriers with a 1.2 mm thick sheet steel sleeve large enough to accommodate the full thickness of the insulation. The sleeve shall extend approximately 100 mm to each side and shall be secured properly to the barrier through which it passes.
3.1.7 Where pipes pass through existing floor and wall, insulation shall not be continuous: pipe shall be wrapped in a covering/tape and the hole shall be made as small as possible.
3.1.8 Tightly pack the annular space between the sleeve and the pipe covering for the full length of the sleeve. Use fibreglass or rockwool and finish flush at each end with aluminum colour caulking compound.

3.1.9 Protect insulation by means of 1.2 mm galvanized sheet steel shields where such insulation is supported by hangers, on rollers, or other type of supports. Insulation shall be continuous through the support. Use square hardwood blocking between pipe shield and pipe of same thickness as insulation for pipe 125 mm diameter and over. Install the saddle shield inside the jacket to prevent the shield from working loose due to vibration within the piping system.

3.1.10 Insulate all pipe elbows. Mitre insulation at pipe elbows 25 mm size and smaller and wrap joint with tape. Use fibreglass batt insulation wrapped and taped with foil tape for larger elbows.

3.1.11 Locate longitudinal seams so that they are concealed from view.

3.1.12 Apply all coverings in a neat standard of Work so that finished job is uniform and smooth in finish.

3.1.13 Apply fire retardant lagging coating to all canvas covered insulation.

3.1.14 Treat all insulation and finishes so that the maximum flame spread rating is 25 or lower and smoke index is 50 or lower.

3.2 **Pipe Insulation**

3.2.1 Apply insulation to piping at the thickness indicated in the following table:

<table>
<thead>
<tr>
<th>Service</th>
<th>Nominal Pipe Size in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>less than 25 mm</td>
</tr>
<tr>
<td>Domestic Hot and Water Recirculation Systems</td>
<td>25 mm</td>
</tr>
<tr>
<td>Domestic Cold Water, Storm and Sanitary Systems</td>
<td>25 mm</td>
</tr>
<tr>
<td>Column 1</td>
<td>2</td>
</tr>
</tbody>
</table>

3.2.2 Domestic Hot, Cold and Recirculating Water

.1 For straight run piping apply insulation to the pipe with side and end joints butted tightly.

.2 Insulate fittings with PVC preformed fittings or mitred segments made smooth with mastic coating. Coat each fitting with vapour retarder coating, reinforced with glass fabric extending 50 mm onto adjacent straight runs.

.3 Insulate hot and cold water supplies for barrier-free lavatories.
3.2.3 Sanitary Systems

.1 For all horizontal and vertical sanitary piping, apply insulation to pipe with all sides and end joints butted tightly. Seal off ends of insulation with vapour barrier mastic at each fitting and at 6-m intervals on continuous runs. Adhere the factory-applied vapour barrier lap smoothly and securely at the longitudinal laps. Adhere 75 mm wide butt strips smoothly and securely over all end joints.

.2 Insulate all fittings, flanges, etc., with flexible glass fibre inserts, or mitred segments of pipe insulation, oversized pipe insulation, or moulded fittings. Coat each fitting with vapour retarder coating, reinforced with glass fabric extending 50 mm onto adjacent straight runs.

.3 Insulate drain and trap for barrier-free lavatories.

3.3 Insulated Pipe Covering

3.3.1 Provide insulation covering for all piping and fitting insulation exposed within finished rooms, fan rooms, mechanical equipment rooms, duct and pipe shafts, pipe spaces and penthouses.

3.3.2 Secure PVC jacketing using adhesive on approximate 75 mm centres. Cover longitudinal and circumferential joints with jacket finishing tape.

3.3.3 No insulation covering shall be installed until the Consultant has inspected the insulation for type, adhesive and cracks.

3.3.4 For concealed piping neatly applied integral all service jacket shall constitute the finish.

3.3.5 Apply mastics, coatings, adhesives, and sealants in accordance with the manufacturer’s recommendations.

3.4 Outdoor Insulated Pipe Covering

3.4.1 All insulated piping located outdoors and in tunnels shall be covered with metal jacketing. Overlap all joints a minimum of 50 mm. Secure metal jacketing with 15 mm aluminum strapping on 300 mm centres and at the overlap. Longitudinal laps shall be positioned to shed water.

3.4.2 All insulated fittings located outdoors and in tunnels shall be covered with either:

3.4.3 Two 3 mm thick wet coats of weather-barrier breather mastic coating, reinforced with glass fabric, extending 50 mm onto the adjacent straight pipe insulation.

3.4.4 Pre-formed aluminum covers secured in place with aluminum strapping.

3.5 Roof or Exterior Wall Penetrations

3.5.1 All pipes penetrating the roof membrane or exterior wall shall be insulated below the roof or inside an exterior wall penetration for a distance of 1 m with a minimum insulation thickness of 25 mm.

END OF SECTION
1. **GENERAL**

1.1 **Related Sections**
- Section 22 05 00 – Common Work Results for Plumbing
- Section 22 07 00 – Plumbing Insulation
- Section 22 40 00 – Plumbing Fixtures
- Division 23 – Heating, Ventilating, and Air Conditioning
- Division 26 – Electrical

1.2 **Description of Systems**
- The Work prescribed in this section details the provision of all the fittings, piping, valves, fixtures, drains, traps, vents, and materials required to complete the plumbing and drainage system or specialty items as shown on the Drawings and as listed in the equipment schedule.
- Work includes drains, and cold or hot water for plumbing fixtures, and other equipment service water or drains.

1.3 **Quality Assurance**
- All materials and equipment must be CSA, and ULC approved.
- Copper water tubing shall conform to the requirements of ASTM B88-02.
- All materials, equipment and systems must comply with the latest Plumbing Code as amended by the local municipality.

1.4 **Submittals**
- Provide detailed Shop Drawings, maintenance data and operating instructions for the following:
  - valves
  - backflow preventers
  - floor drain primers
- Provide documentation concerning testing and verification of the operation of newly installed or re-located backflow preventers. This information is to be submitted in the operation and maintenance manual package. The documentation shall be made available upon request prior to issuing the operations and maintenance manuals.

2. **PRODUCTS**

2.1 **General**
- All equipment and piping must be new and in good condition, protected on site from conditions or environment which may affect performance and end use.
- All materials shall comply with code requirements. Do not use plastic piping where it has not been confirmed that the materials’ flame spread and smoke development classifications are acceptable.
2.2 **Sanitary Piping and Fittings**

2.2.1 Sanitary Drains Above Ground

.1 All drains up to and including 50 mm shall be type DWV copper. All drains 75 mm and over shall be type DWV copper or mechanical joint cast iron soil pipe. Urinal drains are type K copper.

2.2.2 Sanitary and Storm Drains Below Ground (Buried) Under Buildings

.1 Copper Type L up to and including 50 mm diameter. Urinal drains shall be Type K.

.2 Mechanical joint cast iron pipe, PVC-DWV or ABS for 30 mm to 75 mm diameter.

.3 Mechanical joint cast iron pipe, PVC-DWV (SDR-35) for 100 mm and for 150 mm.

.4 Extra heavy weight cast iron or PVC-DWV (SDR-35) for 200 mm and over.

2.2.3 Fittings

.1 Provide sweat DWV copper for DWV copper pipe.

.2 Provide cast iron fittings suitable for class of cast iron soil pipe.

.3 Provide double drainage fittings Y type only.

.4 Provide galvanized, flanged or screwed fittings for galvanized pipe.

.5 Provide PVC solvent-weld fittings and PVC mechanical-joint fittings for PVC pipe.

2.2.4 Connections

.1 Use Solder 95:5 tin-antimony for DWV copper.

.2 Use corrosion resistant nuts, bolts and gaskets for galvanized flanged.

.3 Use Teflon tape or dope for screwed fittings.

.4 Provide mechanical joint couplings that comply with ASTM C1540-02. Coupling compression gaskets shall be neoprene or butyl rubber to ASTM C564-97 and CAN 30B70-M88. Each coupling shall have four or more heavy-duty type 304 stainless steel bands.

.5 Provide SCAQMD Rule #1168 compliant Low-VOC PVC solvents for PVC pipe.

2.3 **Water Piping And Fittings**

2.3.1 Piping and fittings must be in compliance with the ASTM B88-83 Standard.

2.3.2 Piping

.1 For aboveground service use Type L hard copper tubing.

2.3.3 Fittings

.1 Use sweat wrought copper fittings, or cast brass, soldered fittings for Type L copper.

.2 Use Corporation fittings for Type K copper curb stop connections.

.3 Use ductile fittings complete with flanges or mechanical joint for ductile pipe.
.4 Dielectric fittings or flanges as manufactured to suit piping systems must be installed when dissimilar metals are in contact.

2.3.4 Connections
.1 Solder above-ground copper tubing connections up to 90 mm.
.2 Braze above-ground copper tubing connections over 100 mm and all underground copper connections.
.3 Solder: 100 percent waterpure; shall be 95 percent tin, 4 percent copper and 1 percent silver.
.4 Brazing alloy: Sil-Fos filler material.
.5 Unions 50 mm nominal and under shall be threaded using all bronze unions class 150, with 1 MPa rating, ground seat.
.6 Unions that are 63 mm nominal and over shall be flanged.
.7 Flanges, copper or cast, 860 kPa rating for services up to 700 kPa; class 250, 1.7 MPa rating for services 0.7 MPa to 1 MPa.

2.4 Backflow Preventers
2.4.1 Provide reduced pressure zone backflow preventers with ball valves, strainers and air gap for drain.

2.5 Trap Seal Primers
2.5.1 Primer valves shall automatically adjust to suit line pressure. Primer to have integral vacuum breaker.

2.6 Floor Drains
2.6.1 In finished areas without a waterproof membrane, use drain with a 125 mm diameter, nickel bronze 12 mm thick strainer. Provide nickel bronze circular adjustable strainer with surface clamp ring and grate where a surface membrane is specified.
2.6.2 Use drain with 125 mm diameter nickel bronze strainer and 230 x 90 mm oval funnel in non-waterproof membrane areas. Use nickel bronze with 127 mm diameter nickel bronze strainer and 230 mm x 90 mm nickel bronze oval funnel in waterproof membrane areas such as Mechanical Room.
2.6.3 Use drain with 125 mm diameter, polished nickel bronze top, circular adjustable hub funnel in non-waterproof membrane areas. Use drain with 125 mm diameter, polished nickel bronze top, circular adjustable hub funnel in waterproof membrane areas such as kitchens and finished areas.
2.6.4 In Mechanical Room, Unfinished and Heavy Duty Areas use drain with flange 200 mm diameter cast iron strainer and cast iron sediment bucket in non-waterproof and waterproof membrane areas.

2.7 Backwater Valves
2.7.1 Provide backwater valve complete with floor level cleanout for shallow rough-in where accepted by plumbing code.
3. **EXECUTION**

3.1 **General Piping Installation**

3.1.1 Install straight, parallel and close to walls and ceilings, with specified pitch. Use standard fittings for direction changes.

3.1.2 Install groups of piping parallel to each other, spaced to permit application of insulation, identification, and service access, on trapeze hangers.

3.1.3 Install eccentric reducers in horizontal piping to permit drainage and eliminate air pockets.

3.1.4 Where pipe sizes differ from connection sizes of equipment, install reducing fittings close to equipment. Reducing bushings are not permitted.

3.1.5 Brass and copper pipe and tubing shall be free from surface damage. Replace damaged pipe or tubing.

3.1.6 Clean ends of pipes or tubing and recesses of fittings to be brazed or soldered. Assemble joints without bending.

3.1.7 Lay copper tubing so that it is not in contact with dissimilar metal and will not be kinked or collapsed.

3.1.8 Ream ends of pipes and tubes before installation.

3.1.9 Use non-corrosive lubricant or Teflon tape applied to male thread.

3.1.10 Install swing or swivel joints to connect risers to mains. Use couplings in risers from one floor outlet to next.

3.1.11 Use dielectric fittings or flanges wherever dissimilar metals are joined.

3.1.12 Use couplings in risers from one floor outlet to next.

3.1.13 Install flanges or unions to permit removal of equipment without disturbing piping systems.

3.1.14 All hangers and rods shall be of a size and weight to safely support the pipe systems.

3.1.15 All hangers must be suitable for types of materials being supported to prevent electrolysis and abrasion.

3.1.16 Piping up to and including 50 mm shall be supported every 2.5 m. Piping 63 mm and over shall be supported every 3 m.

3.1.17 Cast iron soil pipe shall be supported every 1.5 m or between every two joints.

3.1.18 Vertical lines are to be supported at every floor level.

3.1.19 On hot water piping, allow for expansion on vertical risers.

3.1.20 Inserts for pipe hangers or other hangers are to be firmly secured to the forms before the concrete is poured. All inserts are to be correctly located by the Contractor. Universal I-beam clamps must be approved by the Engineer. Hang piping from structural steel with hangers as specified under the Product Section.

3.2 **Sanitary Drainage**

3.2.1 Install all drains and soil piping with required fittings of dimensions and in locations shown on the Drawings. Horizontal piping shall be pitched to an even grade of not less than 1:100 run throughout its entire length. All branch piping and drains from fixtures shall grade not less than 1:50 or as dictated by local plumbing inspection.
Drain connections to all fixtures and equipment shall be made gas and water tight.

3.2.2 Provide all sanitary piping to sewers where shown. The Contractor shall make all connections to the sanitary drains at locations shown on floor plans, and confirm these locations with the Site Services Contractor before any installation. Provide all adaptors as required to mate with the site service piping.

3.2.3 Where drains go through footings or building wall, provide opening 2 standard pipe sizes larger. Pack with insulation to allow for building movement.

3.2.4 Plug or cap pipe and fittings to keep out debris during construction.

3.2.5 Jointing of pipe shall be compatible with type of pipe used.

3.2.6 Outside storm shall be installed below frost line or a minimum of 1.3 m from top of pipe to finished grade. Outside sanitary is to be installed a minimum of 1.3 m from top of pipe to finished grade.

3.2.7 Provide brick or concrete supports at base of risers. Horizontal lines above main floor shall be supported by hangers from structural floor framing. Vertical lines shall be supported at each floor level. Turns shall be made with two 1/8 bends where space permits, elsewhere with Y fittings and 1/8 bends.

3.2.8 Use 1.5 m horizontal runouts, at base of stacks and through concrete footings or walls, of mechanical joint cast iron soil pipe up to 150 mm and extra heavy cast iron pipe over 150 mm diameter.

3.2.9 Run buried drains a minimum of 200 mm clear below the bottom of concrete slab.

3.3 **Water Piping**

3.3.1 Provide water piping where shown.

3.3.2 The Contractor shall provide water services where shown. The Contractor shall make connections to the water service at locations shown on floor plans and confirm locations with the Site Services Contractor before any installations. Water service piping shall be ductile iron cement lined, PVC Class 150 or material to mate with site service piping. Provide all adaptors as required for connection. If PVC piping it shall be complete with tracer wire.

3.3.3 All outside piping to be installed to a minimum depth of 1.8 m from top of pipe to finished grade.

3.3.4 Where piping changes direction, poured concrete thrust blocks with tie rods shall be provided. Where piping enters building the pipe shall be anchored to structure.

3.3.5 Provide washroom groups and branch take-offs from mains with isolating gate valves. Install stop valve in each fixture supply.

3.3.6 Provide hose bibb or sediment faucet for complete system drainage.
3.4 **Testing**

3.4.1 The Contractor shall test all Work in the presence of the Consultant or a representative at completion of roughing in and finally before the acceptance of the Work. The Contractor shall present local Plumbing Inspector’s certificate before final payment is made.

3.4.2 Generally, when roughing in is completed, a water test shall be made on all drains and vent piping and a pressure test shall be made on all water piping. When fixtures are completed, a smoke test shall be made on the complete installation.

3.5 **Connections for Equipment**

3.5.1 The Contractor shall provide a valve on the supply to any piece of equipment shown on the Drawing. The valves shall be of a type specified in the valve section of this Specification.

3.5.2 Provide drain valves with gasketed caps at low points.

3.5.3 Extend equipment drain piping to discharge into floor or hub drain.

3.5.4 Install drain piping from drain pan of air handling units, full size of outlet connection with trap seal equal to fan total pressure, unless otherwise instructed by Consultant.

3.6 **Backflow Preventers**

3.6.1 Protect entire water distribution system against contamination due to backflow from non-potable sources. Provide backflow preventers on each connection to equipment or fixtures. Provide written verification of proper operation. Include written verification of test results within Operational and Maintenance manuals. All domestic water make up connections to boilers, humidifiers, etc., shall be equipped with approved type backflow preventers of the same size as the make-up lines. Pipe drains to floor drains or provide indirect connection to the nearest sanitary line where not near a floor drain.

3.6.2 Where approved air gaps or vacuum breakers are shown or specified, backflow preventers are not required.

3.7 **Trap Seal Primers**

3.7.1 Install trap seal primer valves and distribution units in accordance with the manufacturer’s installation instructions, the plumbing code, and authorities having jurisdiction. Install a shut-off ball valve in the water supply to trap seal primers for maintenance.

3.7.2 Discretely locate trap seal primers within walls, accessible ceilings, or within mechanical rooms. Provide access doors.

3.7.3 Where electronic trap seal primers are installed, coordinate hard-wired 120 V power supply to unit with Division 26 – Electrical Work.

3.8 **Backwater Valves**

3.8.1 Install backwater valves with access to top for servicing.
3.9 **Floor Drains**

3.9.1 Install floor drains discharging into the drainage system as shown on the Drawing.

3.9.2 Install all floor drains with trap primers connected to a trap seal prime valve. Prime lines shall be positively sloped and piped to common headers or local trap seal prime valves and coordinated with the floor plan. All floor drain traps shall be vented.

3.9.3 Co-operate to establish floor drain levels.

**END OF SECTION**
1. **GENERAL**

1.1 **Related Sections**
   1.1.1 Section 22 05 00 – Common Work Results for Plumbing
   1.1.2 Section 22 07 00 – Plumbing Insulation

1.2 **Description of Systems**
   1.2.1 The work prescribed in this section details the provision of all the fixtures and additional materials required for the plumbing system.

1.3 **Quality Assurance**
   1.3.1 All materials and equipment must be CSA and ULC approved.
   1.3.2 All materials, equipment and systems must comply with the latest Ontario Building Code as amended by the local municipality.

1.4 **Submittals**
   1.4.1 Provide detailed Shop Drawings for the plumbing fixtures including supply, waste, hangers, and brass.

2. **PRODUCTS**

2.1 **General**
   2.1.1 All equipment and piping must be new and in good condition, protected on site from conditions or environment which may affect performance and end use.

2.2 **Fixtures**
   2.2.1 Provide all fixtures and fittings as shown on the Drawings as indicated in the plumbing fixture schedule.
   2.2.2 All fixtures shall be the best of their respective kinds, free from all defects. Any fixture which is, in the opinion of the Consultant, defective or damaged shall be removed and replaced by a fixture which is acceptable.
   2.2.3 The fixtures shall include all the trim, traps and wastes, water supplies, and flush valves usually classed as fittings and required to make the fixture unit complete. All fitting internals shall be brass unless specifically noted otherwise.
   2.2.4 All exposed metal parts of fixtures shall be brass with heavy chrome plating.
   2.2.5 Refer to the Plumbing Equipment Schedule for fixture and trim models.

2.3 **Sealant**
   2.3.1 Provide Dow Corning (or Agency approved equivalent). 786 Sanitary Silicone Sealant specifically designed for sanitary applications where mildew resistance is required. Colour shall be white.
2.4 **Plumbing Supply Fittings**

2.4.1 Provide plumbing supply fittings in accordance with ASME A112.18.1/CSA B125.1 or CSA B125.3 or equip plumbing supply fittings with a backflow preventer in accordance with the CSA B64 Series.

3. **EXECUTION**

3.1 **Fixtures**

3.1.1 Install all piping and fittings for plumbing fixtures as shown on the Drawings and as hereinafter specified, making all connections thereto. The Contractor shall review the architectural Drawings and include in his bid an amount to furnish any fixtures shown in addition to the fixtures shown on the plumbing Drawings.

3.1.2 Fixtures shall not be installed until directed by the Consultant. All roughing-in shall be accurately laid out, and no offsets will be accepted.

3.1.3 Provide chrome plated rigid or flexible supplies with stops, reducers and escutcheons to fixtures.

3.1.4 Provide supports, required to set fixtures level and square. Mount fixtures so that a mass of 90 kg will not loosen or distort mounting. Fasten fixtures on walls or partitions with 12 mm nominal carriage bolts passing through wall to 3 mm thick steel plates (recessed where required) on other side of wall unless chair carriers are specified.

3.1.5 Where future fixtures are shown on Drawings to be "roughed-in", plug or cap outlet branches for same, gas tight and water tight. Cap openings in walls with stainless steel cover plates, secured with knock-off head screws.

3.1.6 Install, complete in all respects, all trim required to make all fixture installation complete.

3.1.7 The Contractor shall advise the Supplier of the stainless steel sinks regarding the number of drillings required to suit the supply fittings provided.

3.1.8 Seal around all plumbing fixtures, such as tubs, sinks, lavatories, water closets and urinals.

3.2 **Water Connections**

3.2.1 Provide water services to all fixtures shown on the floor plan, including faucets, eyewash and shower combinations, and washer. Install as per manufacturer’s installation instruction.

3.3 **Special Drips and Drains**

3.3.1 The Contractor shall supply and install all drainage piping required for all fixtures shown on the floor plan including sinks, washer, mop sink, and floor drains. Install as per manufacturer’s installation instruction.

**END OF SECTION**
1. **GENERAL**

1.1 **Related Sections**

1.1.1 Division 01 – General Requirements
1.1.2 Section 23 07 00 – HVAC Insulation
1.1.3 Section 23 20 00 – HVAC Piping and Pumps
1.1.4 Section 23 30 00 – HVAC Air Distribution
1.1.5 Section 23 70 00 – Central HVAC Equipment
1.1.6 Section 23 80 00 – Decentralized HVAC Equipment
1.1.7 Division 26 – Electrical

1.2 **General Notes**

1.2.1 The Instructions to Bidders, the General Conditions of CCDC 2 - 2008, Supplementary Conditions of all sections of Division 1 are part of and apply to every division of this Specification.

1.3 **Scope of Work**

1.3.1 It is the intent of these Specifications to furnish and install a complete heating, ventilating, and air conditioning system as more thoroughly defined in each section of this Specification. All materials and equipment as hereinafter specified and/or shown on the Drawings will be furnished and installed in such a manner as to leave each of the systems complete and in satisfactory operating condition.

1.3.2 These Specifications are to be considered an integral part of the plans which accompany them. Neither the plans nor the Specifications shall be used alone. Any item or subject omitted from one but which is mentioned or reasonably implied in the other shall not relieve the Contractor of responsibility.

1.4 **Inspection of Premises and Site**

1.4.1 The Contractor shall visit the site and examine the existing conditions and make necessary allowances in their Bid Price for removal, relocation, re-routing, reconnection of existing mechanical and electrical equipment and wiring as may be necessary for the execution and completion of this Project. Extra charges for premium time labour shall be included in the Bid Price allowing for after hours, weekend and holiday labour requirements. No extras will be allowed for failure to properly evaluate conditions which affect the scope of the Work included in this Contract.
1.5 **Compliance and Co-Operation**

1.5.1 The Drawings upon which this Contract is based show the arrangement, general design and extent of the systems. These systems are suitably outlined on the Drawings with regard to sizes, locations, general arrangement and installation details. The mains and connections thereto are shown more or less in diagrammatic form except where in certain cases the Drawings may include details giving the exact location and arrangements required.

1.5.2 Where any parts of the system and/or pieces of equipment are located by dimensions on the Drawings, said dimensions shall be checked and verified in the field. The Contractor shall make, without additional charge or expense to the Agency, any necessary changes or additions to accommodate structural conditions or other equipment. The Consultant shall be notified immediately and authority secured in writing for such revisions before proceeding with the Work.

1.5.3 The Contractor must exercise the utmost care and diligence in order that all Work shall be done in strict compliance with the full intent and meaning of the Drawings and these Specifications.

1.5.4 The Contractor shall be expected and required to confer and cooperate with the other trades in order to eliminate any unnecessary delays to any Work being done in the building. He will also be required to store up materials neatly and out-of-the-way and to clean up all refuse caused by this Work daily.

1.5.5 The Contractor shall carefully study all Drawings, Specifications, and other instructions and shall at once report to the Consultant any errors, inconsistencies, or omissions discovered. In no case shall the Contractor proceed in uncertainty.

1.5.6 As the Work progresses and before installing fixtures, other fittings and equipment which may interfere with the Work of other Sections, the Contractor shall consult with the Consultant and obtain detail Drawings or instructions for the exact location of such equipment.

1.6 **Manufacturers Quotation Procedures**

1.6.1 Manufacturers shall submit a price for each different element which shall be supplied to this Project. Bulk or package prices will not be accepted. Full submission of components required with the Contractors First Construction Draw.

1.7 **Shop Drawings**

1.7.1 Submit for review, three complete sets of Shop Drawings and data sheets covering all items or equipment to be installed under the Contract. One copy will be retained by the Consultant. Shop Drawings shall show all relevant performance and installation information. The Drawings and data required shall generally be as outlined under each Section of the Specification, but shall not be restricted to the items listed. Submit copies of reviewed Shop
Drawings to other trades as required for completion of their related Work.

1.7.2 Shop Drawings may be submitted electronically in Adobe Portable Document Format (.pdf). Electronically submitted Shop Drawings shall comply with all requirements for Shop Drawings noted herein including bearing the review mark of the submitting Trade. Electronically submitted Shop Drawings shall be returned electronically.

1.7.3 All submitted Shop Drawings must have been reviewed in detail by the Contractor the submitting trade and must bear both stamps. Should the Drawings not have been reviewed and stamped, they will be returned to the Contractor.

1.7.4 Show on each submittal the "Mark Number" used to designate each piece of equipment.

1.7.5 Clearly indicate manufacturer, model, performance data including pump curves and capacities, materials of construction, dimensions, shipping and operating (wet) weights, colours (or colour selection chart if choice available), and supplied options.

1.7.6 Clearly indicate any discrepancies between the specified and supplied equipment, particularly those that affect the performance of the equipment.

1.7.7 Show electrical characteristics of equipment.

1.7.8 Show service connection sizes and locations for equipment including electrical, water, waste, natural gas, compressed air, and hydraulic fluid. Include characteristics of supplied external services (i.e. voltage, temperatures, pressures, flow rates).

1.7.9 Provide wiring diagrams and control schematics when applicable.

1.7.10 Before the Project starts review the electrical Drawings to ensure the power provided meets the characteristics of the piece of equipment on the Shop Drawing. Should discrepancies occur, notify the Consultant immediately.

1.7.11 Provide control panel layout Drawings locating all gauges, switches and labels.

1.7.12 Show applicable standards such as CSA, ULC, FM, etc.

1.7.13 Show support points for all equipment including anchor bolt/hanger rod sizes, dead/live loads, etc. Indicate required service clearance around, above and below equipment for opening access doors, removal of internal components (filters, coils, shafts) etc.

1.7.14 Equipment will not be accepted on site until approval of Shop Drawings. Shop Drawings designated as "Reviewed as Modified" are conditionally approved such that The Contractor shall ensure equipment satisfies all Contract requirements. Delivery of equipment may proceed but final, corrected Shop Drawings must be submitted prior to completion of Contract.

1.7.15 Within ten working days of the award of the Contract, submit a list of all equipment for which delivery dates exceed six weeks.

1.7.16 Indicate the manufacturer's estimated time of delivery, expressed in weeks after receipt of approved Shop Drawings.
1.7.17 As more accurate delivery times become known during the course of the Contract, notify the Consultant.

1.7.18 Equipment with long delivery dates that are critical for the progress of the Work are to be followed closely by The Contractor. Submit these Shop Drawings as soon as possible, separating them from the bulk of all other equipment, and mark "Urgent" on the front page of the submission.

1.7.19 The Contractor shall retain a complete set of Shop Drawings for the Testing Adjusting and Balancing Trade.

1.7.20 All manufacturers and Suppliers shall provide parts lists and maintenance information for specific equipment on compact disc (CD), digital versatile disc (DVD) or other common storage standard compatible with BAS.

1.7.21 Manufacturers shall provide video files stored on DVD of Maintenance and Trouble Shooting instructions. See Agency's Instructions below.

1.7.22 Refer to Section 01 33 00 - Submittal Procedures.

1.8 **Materials and Equipment Specified and Alternates**

1.8.1 The following applies to this specification:

.1 Where material and equipment are specifically described and named in this Specification for the purpose of establishing a minimum standard of materials and quality of Work and specific requirements to which the Contractor shall adhere.

.2 The price submitted for this Contract shall be based on the use of materials and equipment as specified. If the Contractor wishes to quote on materials and equipment other than that specified, the Contractor shall refer to Section 01 25 00 – Substitution Procedures.

.3 All of the materials required for the performance of the Work shall be new, the best of their respective kinds and a uniform pattern throughout the Work.

.4 Any equipment substituted must not exceed space requirements allocated on the Drawings. Where equipment is substituted for that which is shown on the Drawings, The Contractor is to submit Shop Drawings showing revised layouts of equipment rooms, mechanical rooms, etc., for approval.

.5 Specified equipment or equipment listed by Model Number is usually used as a base for design performance, physical arrangements, weights, shape, wiring, controls and starter requirements, etc. If other equipment is proposed, it is a requirement that all pertaining factors listed above are checked by the Contractor, and allowance be made in the Tender on a "Turn-key" basis. Furthermore, it is the Contractor's responsibility to co-ordinate all above items prior to roughing in, in conjunction with other trades. Should the Work be affected, the cost shall be borne by the Contractor.
1.9 **Equipment Manufacturer Shop Painting**

1.9.1 All equipment provided under this Specification shall be prime-coated in the manufacturer's facilities and finished according to the manufacturer's standard paint system or as noted in the applicable equipment section of this Specification. Equipment shall be primed and coated with flat grey enamel as a minimum.

1.10 **Equipment Supplied by others**

1.10.1 The Contractor shall obtain from the Consultant approved Shop Drawings before roughing-in of services for any equipment.

1.11 **Liability Insurance**

1.11.1 The Contractor must maintain such insurance as will fully protect both the Agency and the Contractor from any and all claims under the Workplace Safety and Insurance Act.

1.12 **Codes, Fees and Certificates**

1.12.1 All Work shall be executed and all materials shall conform to and be inspected in strict accordance with all the laws, rules, and regulations of the local and provincial codes and all other authorities having jurisdiction.

1.12.2 The Contractor shall obtain all necessary permits and all notices, pay all fees in order that the Work hereinafter specified may be carried out and shall furnish any certificates necessary as evidence that the Work installed conforms to the laws and regulations of all authorities having jurisdiction before final certificates are issued.

1.12.3 All changes and alterations required by an authorized inspector of any authority having jurisdiction shall be carried out without charge or expense to the Agency.

1.12.4 All equipment supplied must have approval of NFPA, CSA, ULC, FM, Agency's Underwriter and any other authority having jurisdiction.

1.13 **Quality Of Work**

1.13.1 The Contractor must supply to this Project, Certified Mechanics and Apprentices in accordance with current Ministry of Labour regulations. The Contractor shall provide installations and workmanship of a professional level of quality.

1.14 **Protection**

1.14.1 The Contractor shall protect finished and unfinished Work from damage due to carrying out Work. The Contractor shall be responsible for the condition of all materials and equipment supplied under this Contract and shall provide all necessary protection for same. The Contractor shall be responsible for the protection and maintenance of the Work of this section until the building/Project has been completed and accepted.

1.14.2 At the end of each day, the Contractor shall seal the open ends of piping and ductwork with 6 mil poly and maintain seal until Work continues. Remove seals prior to the continuation of the Work.
1.15 **Electrical Wiring**
1.15.1 The Contractor must review the Wiring for Mechanical Equipment Schedule on the electrical Drawings as well as individual sections of the mechanical Specification in order to determine the electrical requirements and responsibilities.

1.16 **Extras and Credits**
1.16.1 In the event of additional Work of any nature being required, The Contractor must state in writing the costs of such extras at the time it is required to do the Work, and unless any such extras are approved, they will not be allowed. In the event of omissions, a fair and reasonable adjustment will be made to the Contract price by negotiation with the Consultant. Such an adjustment to the Contract shall not in any sense be construed to render the Contract invalid. Any extras or credits submitted for approval shall be priced individually, and be accompanied by an itemized list of materials and corresponding price breakdown.

1.16.2 All quotations shall be based on the submitted hourly rates and the latest issue of MCAA pricing manual.

1.17 **Interference Drawings**
1.17.1 The Contractor shall prepare a complete set of interference Drawings for all critical locations to indicate conditions at crossovers and where space is limited. Field measurements shall be used to indicate accurate dimensions and configuration of all mechanical services in relation to Structural and Architectural members as well as Electrical and Sprinkler services. Coordination with other trades in the preparation of these Drawings is imperative.

1.17.2 These Drawings shall be submitted to the Consultant prior to installation according to the same procedure as for Shop Drawings.

1.17.3 Refer to Section 01 33 00 - Submittal Procedures.

1.18 **Sleeves, Inserts, and Chrome Plates**
1.18.1 The Contractor shall be responsible for supplying and setting of all sleeves, inserts, etc., on all piping and ductwork.

1.18.2 Sleeves shall be flush with finished ceilings and wall faces and shall be sized large enough to allow for any lateral movement of piping or ductwork due to expansion or contraction, pipe and duct insulation, and sound packing. Floor sleeves into equipment rooms shall extend 100 mm above floor. All sleeves are to be made from schedule 40 steel pipe.

1.18.3 Where ducts and pipes pass through walls, floors and ceilings, the area between the pipe or duct and sleeves shall be packed with 100 kg/m³ density fibreglass the full wall or floor depth. Minimum width of packing shall be 25 mm for piping and 50 mm for ductwork with all joints sealed with caulking.
1.18.4 Where exposed, the packing and sleeve shall be covered completely with an approved sheet metal and angle collar for ductwork, and chrome plated cast brass solid ring escutcheon plate with set screw for piping.

1.18.5 Ensure that openings through fire separations do not exceed the maximum size wall openings, and maximum and minimum dimensions, indicated in ULC Guide No. 40U19 for service penetrations assemblies and fire stopping material.

1.18.6 Patch all openings around installations of this Division that pierce fire or smoke separations with an approved watertight smoke and fire stop sealant.

1.19 Cutting and Patching

1.19.1 The Contractor shall be responsible for all costs of cutting and patching of any building construction made necessary by the installation of this Work and/or due to lack of co-ordination in the new construction.

1.19.2 Under no circumstances shall any cutting or burning of the structural parts, including concrete slabs of the building be undertaken without the written authority of the Consultant.

1.19.3 All cutting and patching must be carried out by a worker experienced in that particular type of Work, but the costs of such Work shall be borne by the Contractor.

1.20 Demolition in Existing Building

1.20.1 All structural demolition Work of floors, walls, roof, ceilings, including costs, in the existing building will be carried out by the Contractor. All making good of the existing structure, walls, ceilings, floors, roof, and the finishing surfaces including costs, will be carried by the Contractor.

1.20.2 Contractor shall remove all equipment pertaining to the Work of the Contractor no longer required or being relocated, and cap or plug all connections no longer required. All equipment and fixtures not reused and all piping, fittings, ductwork, etc., removed from the existing building shall become the property of the Contractor and shall be removed from the site. Material shall not be reused unless specifically noted on the Drawings.

1.21 Hazardous Materials

1.21.1 Certain equipment, piping and ductwork as well as building systems on this Project may have been manufactured using asbestos material.

1.21.2 The Contractor shall be aware of this and notify the Consultant if any asbestos is to be disturbed during this Project.

1.21.3 The Agency will arrange to have such material removed from the premises and the area cleaned and made ready before the Contractor commences Work in that area.

1.21.4 The cost for the removal of hazardous materials as related to the Work of the Contractor shall be the responsibility of the Agency.
1.22 **Existing Building Renovations**

1.22.1 The Contractor shall visit the site and include in the price all costs for removal revisions and resetting of piping, ducts, grilles, diffusers, and all mechanical items in general where ceilings, walls, floors, duct and pipe shafts, etc., are revised. Refer to room finish schedules.

1.22.2 Perform all Work in the existing building indicated on the Drawings, specified herein, and as may be necessary to carry out the Work of this Contract.

1.22.3 Disconnect and cap all piping not reused at the mains so that all remaining piping is self-draining without dead pockets. All draining and filling of system required shall be a part of this Work.

1.22.4 Relocate and reconnect any piping, drains, vents, water lines, heating lines, controls, and piping, ductwork or other material presently concealed in walls, partitions, or ceiling spaces and which become exposed during the renovation Work so that these services are concealed in the renovated layout, and put back into operation.

1.22.5 All equipment, etc., to be reused shall be carefully removed and stored. Any piece of equipment or fitting, accessory, etc., which forms a part of the equipment to be reused which is lost or damaged shall be replaced with a new device, fitting, accessory, etc.

1.22.6 The existing building roof will be stripped and new 100 mm insulation installed. Contractor shall provide removal and resetting of all existing roof mounted fans, vents, roof drains, etc., complete in all respects.

1.22.7 All existing equipment, fixtures, superfluous piping, etc., being removed shall become the property of the Contractor and be removed from site.

1.22.8 Make certain that all services affected by Work are cut off and are properly capped or diverted.

1.22.9 Do not make interruption of services to or within existing building without prior consultation with the Agency.

1.23 **Temporary and Trial Usage**

1.23.1 It is especially understood and agreed that the temporary and trial usage by the Agency of any mechanical device, machinery, apparatus, equipment or any other Work or materials, supplied under this Contract, before Date of Substantial Completion and written acceptance by the Consultant, is not to be construed as evidence of the acceptance of same by the Agency. It is further understood and agreed that the Agency shall have the privilege of such temporary and trial usage as soon as the Contractor shall claim that the said Work is completed and in accordance with the Drawings and Specifications for such reasonable length of time and as the Consultant shall deem to be sufficient for making a complete and thorough test of the same. No claims for damage shall be made by the Contractor for the injury to or breaking of any parts of such Work which may be so used whether caused by
weakness or inaccuracy of structural parts; or by defective material or quality of Work of any kind whatsoever. All equipment used on a temporary basis must be brought back to new condition by the Manufacturer's service department and new full guarantee period to begin on date the building/Project is accepted by the Agency.

1.24 **Adjusting and Start-up**

1.24.1 The Contractor shall provide acceptance tests to demonstrate that the equipment and systems actually meet the specified requirements. Tests may be conducted as soon as conditions permit. Make all changes, adjustments or replacements required as the preliminary tests may indicate prior to final tests.

1.24.2 The final balancing of the air systems and water systems and the testing of the sound levels shall be conducted by a company specializing in testing, adjusting and balancing (TAB). Notwithstanding the testing and balancing being performed by a specialist, the Contractor shall still bear full responsibility for the proper operation of all mechanical systems. The cost of the Work for the testing, adjusting and balancing by the TAB company shall be included in the Contract price.

1.24.3 The Contractor is to operate all the equipment for a minimum period of five days after final acceptance date. Defects disclosed must be repaired and tests repeated until pronounced satisfactory. The Contractor is to lubricate all bearings; adjust and set all direct drives and "V" belt drives and drivers for proper alignment and tension; calibrate and adjust all thermostats, thermometers, linkages and dampers; operate and test all motors and speed switches for correct wiring sequences; check all overload heaters in motor starters; replace and clean all strainers; fill all water systems and purge all air; clean the fan wheels, heating coils, fasten all loose and rattling pieces of equipment.

1.24.4 In testing, vary loads to illustrate start-up, sequence, normal shut down, and simulate emergency conditions for safety shut down with automatic and manual reset.

1.24.5 Final tests shall be conducted in the presence of the Consultant or a representative. The Contractor shall make up and forward the reports listed below. The Contractor shall give the Consultant advance notice in writing that the preliminary tests have been completed and that the Contractor is prepared to carry out final tests. During the final tests, The Contractor shall demonstrate to the satisfaction of the Consultant that all equipment is operating as intended without undue noise and vibration.

1.24.6 The Contractor is to provide the services of one job mechanic, ladders, tools, and associated equipment to assist the Consultant's representative and the TAB company in carrying out final tests.

1.24.7 The Contractor shall obtain certificates of approval, acceptance, and compliance with rules and regulations for authorities having jurisdiction. The Work will not be considered complete until such certificates have been delivered to the Agency.
1.24.8 The Contractor shall be in charge of the plant during tests. He shall assume responsibility for damage in the event of injury to the personnel, building, and equipment, and shall bear all costs for liability, repairs, and restoration in this connection.

1.24.9 All air and water systems shall be tested, adjusted and balanced. Reports shall be submitted at the completion of the preliminary TAB phase and at the completion of the final TAB phase.

1.25 **Testing and Commissioning**

1.25.1 The Contractor shall witness all tests. The Consultant is to be notified when tests or commissioning is scheduled with adequate notice to attend.

1.25.2 The Contractor shall submit completed pre-commissioning forms to the Consultant for all commissioned equipment.

1.25.3 Provide all material and labour required to assist in the Commissioning process.

1.26 **Deficiencies**

1.26.1 All deficiencies as identified in Field Review Reports or Commissioning Reports shall be corrected by the Contractor in a timely manner after being made aware of said deficiencies. The Contractor shall subsequently inform the Consultant that deficiencies have been corrected in writing.

1.27 **Completion**

1.27.1 The Contractor shall keep the premises in a clean and orderly condition during construction. All waste and unusable materials shall be promptly removed from the site.

1.27.2 Upon completion of this Work, the Contractor shall go over the entire installation; clean and polish all fixtures, and equipment; remove all surplus materials and rubbish of every description, incident to this Work, leaving the installation neat and orderly and in completely satisfactory working conditions subject to the approval of the Consultant.

1.28 **Record Drawings**

1.28.1 During the progress of the Work, the Contractor shall keep on the site at all times, a complete and separate set of prints and shall note thereon clearly, neatly, accurately and promptly all Mechanical changes, revisions and additions to the Work and deviations from the Contract Documents. Accurate locations, depth, size and type of underground utilities shall be included in these record Drawings so that on completion of the job, the Consultant will have a record of the exact location of all piping, ductwork and equipment.

1.28.2 The final record Drawings shall be produced on a clean set of Drawings and submitted to the Consultant at the completion of the Work. All Work on the Drawings must be neat and complete and carried out by an experienced draftsperson. After approval of the Consultant these Drawings will be submitted to the Agency.
1.28.3 After approval, record Drawings shall be converted into CAD Drawings into a standard AutoCAD file format, version to be compatible with Agency’s requirements. Layers and general Drawing formatting are to be consistent with the Tender Drawing AutoCAD formatting.

1.28.4 Refer to Sections 01 33 00 - Submittal Procedures and 01 78 39 - Project Record Documents.

1.29 **Agency’s Instructions**

1.29.1 The Contractor shall supply to the Consultant (who will turn over to the Agency after review) three sets of operating and maintenance instructions. Each set of instructions is to be bound in a suitable three D-ring binder. The binder shall be no more than 75% full. An additional similar set shall be provided on DVD.

1.29.2 Each operating and maintenance manual shall contain parts list Drawings for each mechanical component and each item of mechanical equipment.

1.29.3 The Contractor is to supply the services of a knowledgeable mechanic to thoroughly explain each mechanical system, its operation and its maintenance to the full satisfaction of the Consultant and Agency's representative. Each system shall be started in its proper season in the presence of the Consultant and the Agency's representative.

1.29.4 At the discretion of the Agency, a manufacturer’s service representative shall provide direction for specialized equipment.

1.29.5 Refer to Sections 01 33 00 - Submittal Procedures and 01 78 39 - Project Record Documents.

1.30 **Guarantee and Warranties**

1.30.1 The Contractor, as a condition precedent to final payment, shall execute a guarantee to the Agency in writing warranting all apparatus furnished under this heading to remain in serviceable and perfect condition for a period of two years from date of final acceptance of this Work, unless specified otherwise. Any imperfections, as a whole, or in part, by reason of defective quality of Work, defective materials, defective arrangement of the various parts, or materials damaged as a result of these defects or repairs, shall be made good to the satisfaction of the Consultant at the Contractor’s expense without undue delay.

1.30.2 Extended guarantees as outlined in various sections of this Specification shall be included as follows: Equipment Warranty Costs by Equipment Manufacturer; Labour Guarantee Costs by the Contractor.

1.31 **Common Motor Requirements for HVAC Equipment**

1.31.1 Provide motors for mechanical equipment as specified.

1.31.2 If delivery of specified motor will delay delivery or installation of any equipment, install an acceptable motor for temporary use. Final acceptance of equipment will not occur until specified motor is installed.
1.31.3 All motors up to and including 373 W shall be 120 V single-phase, motor speed as indicated, continuous duty, built-in overload protection, with resilient mount.

1.31.4 Larger motors shall be three-phase, continuous duty operation, electric induction motors, squirrel cage, EEMAC/NEMA T-frame Class B, 4-pole, ball bearing, maximum temperature rise 40°C, or as noted on the Wiring for Mechanical Equipment Schedule shown on the Electrical Drawings. Motors must be approved under the Electrical Safety Code.

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<tr>
<th>Nominal System Voltage</th>
<th>Specific Motor Voltage</th>
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1.31.5 Premium Efficiency Motors

1. The minimum nominal full-load AC motor efficiencies shall not be less than the requirements of either Natural Resources Canada’s Energy Efficiency Regulations or clause 4.10 of CAN/CSA C390. All AC motors provided on this Project must be premium efficiency motors that exceed the above minimum requirements. Motor efficiencies shall be nominal full-load motor efficiency as determined with CAN/CSA C390 “Energy Efficiency Test Methods for Three-Phase Induction Motors.” Motors shall bear nameplates that list the nominal full-load motor efficiency.

1.31.6 AC motors that are powered through variable frequency drives shall be inverter duty rated.

1.31.7 Motors shall be open drip-proof (ODP) unless specified otherwise or unless mounted in a direct air stream. Totally enclosed fan cooled (TEFC) or totally enclosed air over (TEAO) motors shall be used in such cases.

1.31.8 Motors shall be manufactured by: Baldor, Brook Crompton, GE Energy, Leeson, TECO-Westinghouse, Toshiba, U.S. Electrical, WEG, or Agency approved equivalent.

1.31.9 Review motor characteristics to the power being provided per the electrical Drawings. Should discrepancies occur, notify the Consultant immediately.

1.32 Expansion Fittings and Loops for HVAC Piping

1.32.1 Provide detailed submittals for expansion fittings and loops for HVAC piping.

1.33 Hangers and Supports for HVAC Piping and Equipment

1.33.1 Provide detailed submittals for hangers and supports for HVAC piping and equipment.

1.34 Vibration and Seismic Controls for HVAC Piping and Equipment

1.34.1 Provide isolation for air distribution and ventilation equipment and systems, including fans, ductwork, piping, and all mechanical
equipment in general. All equipment shall be adequately isolated to maintain acceptable Noise Criteria (NC) levels in occupied areas of the building.

1.34.2 Provide Seismic Restraint Systems (SRS) for a post-disaster building according to the Ontario Building Code, the National Building Code of Canada and its commentaries. All SRS must meet the requirements of all other codes with jurisdiction for the installed material and equipment.

1.34.3 The SRS is to be designed by an Ontario P.Eng. with $1,000,000 professional insurance.

1.34.4 General

.1 Provide all hangers, isolators, bases, pads, and other devices specified, required, or detailed for the vibration isolation of all mechanical equipment, piping and ductwork.

.2 Provide seismic restraint system for mechanical equipment and systems, both vibration-isolated and statically-supported.

.3 SRS to be fully integrated into, and compatible with:

.1 Noise and vibration controls specified elsewhere in this Project Specification.

.2 Structural, mechanical, electrical design of Project.

.3 Systems equipment not required to be operational during and after seismic event.

.4 During seismic event, SRS to prevent systems and equipment from causing personal injury and from moving from normal position.

.5 All material provided for vibration isolation or noise control shall be new and manufactured specifically for the purpose intended.

.6 The vibration isolation Supplier shall inspect and approve the installation of the vibration isolators and shall submit a report to the Agency which verifies that all of the isolation equipment has been properly installed.

.7 Any requests for change in this Specification, ductwork layout or Mechanical equipment selection must be submitted in writing for review and approval by the Consultant in time for a written addendum to this Specification. Consideration may not be given to subsequent substitution requests.

.8 Noise level criteria as per ASHRAE or as otherwise specified. Sound test reports will be provided upon request.

1.34.5 Submittals – Drawings

.1 Supply to the vibration control manufacturer a copy of approved equipment Drawings of equipment to be isolated. These Drawings to show belt centres, operating weights, motor positions and horsepower, support points and sizes.
The vibration control manufacturer shall submit, for approval and the use of the Contractor for proper co-ordination of their Work related to the Work of this section, Drawings of the isolation components being supplied.

Submittals to include:

1. Separate Shop Drawings for each SRS and devices for each system, equipment.
2. Identification of location of devices.
3. Schedules of types of SRS equipment and devices.
4. Details of fasteners and attachments to structure, anchorage loadings, attachment methods.
5. Installation procedures and instructions.
6. Shop drawing submittal package must be sealed by an engineer.

Submit additional copy of Shop Drawings and product data to Structural Engineer for review of connection points to building structure.

### Access Doors
1.35.1 Provide access doors of a suitable size for easy servicing of all concealed mechanical equipment such as valves, air flow dampers, fire dampers.

1.35.2 Provide access doors within mechanical systems such as ductwork and plenums. Refer to applicable Specification section.

### Identification for HVAC Piping, Ductwork and Equipment
1.36.1 Provide labels and colour-coding for the positive identification of HVAC piping, ductwork, and equipment.

1.36.2 Provide identification to the requirements of CAN/CGSB-24.3.

1.36.3 Colour coding shall be confirmed to match the Agency’s standard.

### Testing, Adjusting, and Balancing for HVAC
1.37.1 The testing, adjusting, and balancing services required of Divisions 22 and 23 of this Project shall be provided by Air Audit.

1.37.2 Provide Testing Adjusting and Balancing (TAB) of all mechanical systems. This Work shall be performed by Air Audit. The Contractor shall co-operate with the TAB company to facilitate the Work of this section and provide mechanical tools, equipment, sheaves etc. as required. The TAB company shall review the design and proposed operating conditions of the systems, provide the specified number of site visits and reports, and shall provide the systems testing, adjusting and balancing as more fully detailed in this section of the Specification.

1.37.3 The Contractor shall provide all labour, tools, materials and equipment necessary to complete the Work of this Section using the information shown on the Drawings or reasonably inferable from same, and as described herein and including the testing, adjusting and balancing of the following systems.

1. All supply, return and exhaust air systems.
2. All hot water heating systems.
1.37.4 A preliminary test, adjust and balance and a final test, adjust and balance complete with reports for both shall be required.

1.37.5 The Contractor shall carry a sufficient amount of money in the Tender to cover the cost of providing additional devices at the direction of the TAB company as approved by the Consultant.

1.37.6 All devices shall be installed to facilitate the taking of measurements and balancing. All devices shall be accessible. If devices need to be relocated or have access provided to them, this Work shall be done by and at the cost of the Contractor.

1.37.7 Responsibility

.1 The Contractor shall determine that the systems which he has installed within the scope of this Project are all connected and operating as outlined in the Specification and connected and operating as outlined in the Specification and as shown on the Drawings. Provide adjusting and balancing for all the systems indicated. This shall include all fans and pumps to ensure that they are producing the correct flow and pressure within the horsepower rating as specified. The Contractor shall change any sheaves, pulleys, impellers, drives, drivers, etc., at no additional cost. Confirm with the TAB company before selection of these devices. Allowance shall be made so that these devices will be adequate for final balance. Immediately upon completion of the preliminary adjustment and balancing the TAB company shall submit a "Preliminary Testing, Adjusting and Balancing Report".

.2 During this phase of the Work the Contractor shall check that flow is occurring throughout all parts of every system being tested, adjusted and balanced and that no part of any system is subject to damage due to erratic, high or low flow conditions.

.3 The (TAB) Trades shall measure and make adjustments as necessary and direct the Contractor to make adjustments such as the addition of valves, dampers, etc., to the various systems to ensure that all the systems meet the design Specifications.

.4 Air and water balancing shall occur in multiple phases to accommodate the scope of work. Refer to architectural drawings for phasing drawings.

1.37.8 Submittals

.1 Submit four copies of the Preliminary Testing, Adjusting and Balancing report showing the adjusted measured values of the fans, pumps, etc., along with the specified data and the Manufacturer’s Equipment data.

.2 Submit six (6) copies of the Final Report showing the adjusted measured values of all systems. The report shall include all information detailed under the Execution section of this Specification (Section 23 05 00 – Common Work Results for HVAC).
.3 The final report shall include design conditions, test and final conditions, temperatures and pressure readings. Equipment shall be fully identified including:
- Equipment Number
- Manufacturer
- Type and Model
- Fan Wheel/Impeller Size
- Volume Ratings
- Suction/Inlet Pressure
- Discharge/Pressure Outlet
- RPM
- BHP
- Motor hp
- Voltage
- Manufacturer's test curves.

.4 The reports shall be submitted through the Contractor to the Consultant.

1.37.9 Drawing Review
.1 The TAB company shall review the Drawings after the award of the Contract and recommend in writing, additional devices, if necessary, to complete the testing, adjusting and balancing of all systems. The Contractor shall provide these devices. The cost of these devices shall be considered extra to the Contract. The Contractor shall coordinate the installation of these devices.

1.37.10 Final System Check
.1 At the Consultant's discretion, employ the services of an independent company to perform a final system check. The cost of this check shall be extra to the Contract price.

2. PRODUCTS

2.1 Hangers and Supports for HVAC Piping and Equipment

2.1.1 Horizontal Piping:
.1 Up to and including 50 mm, provide adjustable clevis type equal to Anvil Fig. 65.
.2 For 65 mm to 100 mm inclusive, provide Anvil Fig. 260.
.3 For 150 mm and over, provide Anvil Fig. 181 adjustable pipe roll hangers.
.4 For groups of pipes running at the same level use steel channel supports with Anvil fig. 271 and 274 pipe roll stands. (See detail Drawing.)
.5 In poured concrete slabs, provide wedge type concrete inserts such as Anvil Fig. 281 or Phillips steel shell and expansion plug concrete inserts.
.6 Provide Anvil Fig. 163 to 165 protection saddles for all piping supported on rollers.

2.1.2 Vertical Piping
.1 Vertical piping shall be supported at floor level with riser clamps equal to Anvil International Fig. 261.
2.2 Vibration and Seismic Controls for HVAC Piping and Equipment

2.2.1 Vibration, Isolation, and Supports

.1 All vibration and noise control equipment shall be Kinetics Noise Control - Vibron, (or Agency approved equivalent) who will take single responsibility for proper isolation and silencing of all equipment, piping, and ductwork.

.2 Isolation

.1 Type SL: Closed spring mounts with top and bottom housing separated with sponge neoprene stabilizers. Bottom housing to be bonded to a 13 mm thick ribbed neoprene noise pad.

.2 Type FDS: Open type spring mounts having extra iso-stiff springs with a minimum horizontal stiffness versus vertical stiffness (Kx/Ky) of 1.0.

.3 Type FLS: Free standing restrained mounts with heavy rigid steel base frame, built-in limit stops and removable spacer plates. Springs shall be iso-stiff with a minimum horizontal to vertical stiffness (Kx/Ky) of 1.0. The clearance around the bolt holes must be a minimum 13 mm such that a ± 3° rotational misalignment may be tolerated.

.4 Type HSR: Limit restraint isolator suitable for horizontal installation to limit horizontal movement of isolated equipment.

.5 Type RD: Elastomer rubber mount with threaded insert and hold-down bolt holes.

.6 Type Vibropad: Waffle pads shall be 60 durometer neoprene, minimum of 10 mm thickness and selected for an operating load of 345 kPa. Neoprene shall be used where the pads may be outside or in an area where oil may be present.

.7 Type VSV: Vibropad-steel-Vibropad pads shall be constructed of two layers of 10 mm thick type Vibropad waffle type neoprene pads, as specified above, bonded to 10 ga steel plates. All holes to be sleeved and complete with an isolation rubber.

.8 Type KIP: Kinetic or Agency approved equivalent pre-compressed moulded fiberglass pads shall be coated with a flexible moisture impervious elastomeric membrane. Glass fibres, produced by the multiple flame attenuation process shall have a diameter not exceeding 3 mm.

.3 Spring hangers shall be Kinetics Noise Control (or Agency approved equivalent) Type SH or SRH or Agency approved equivalent with completely colour coded stable springs. The SRH hanger shall be complete with neoprene isolation pad in series with the spring.
.4 All spring mounts shall be complete with levelling devices, neoprene sound pads and completely colour coded stable springs.

.5 Spring mounts shall be complete with neoprene grommets and allow for a 30° deflection of the rod to prevent hanger rod from shorting to the mount.

.6 All springs shall be selected to operate at no greater than 2/3 solid deflection. All hardware shall be zinc chromate plated.

.7 Provide single or twin-sphere neoprene flexible pipe connectors. Neoprene/rubber connectors shall not be used when water temperatures are within 10°C of manufacturer’s published high-temperature limit.

2.2.2 Seismic Restraint

.1 Seismic Restraint System:

.1 SRS to provide gentle and steady cushioning action and avoid high impact loads.

.2 SRS to restrain seismic forces in all directions.

.3 Fasteners and attachment points to resist same load as seismic restraints.

.4 Drilled or power driven anchors and fasteners are not permitted.

.5 SRS of piping systems to be compatible with: Expansion, anchoring and guiding requirements. Equipment vibration isolation and equipment SRS.

.6 SRS equipment, equipment supports or mounts utilizing cast iron, threaded pipe, or other brittle materials not permitted.

.7 Attachments to structure: Use high strength mechanical expansion anchors. Drilled or power driven anchors not permitted.

.8 Seismic control measures shall not interfere with the integrity of firestopping.

.9 Seismic controls shall meet the requirements of CSA B149.1.

.2 SRS For Static Equipment, Systems

.1 Suspended equipment, systems: Use one or a combination of the following methods: Install tight to structure Cross-brace in all directions. Brace back to structure. Slack cable restraint system.

.2 SRS to prevent sway in horizontal plane, “rocking” in vertical plane, and buckling in axial direction.

.3 All piping systems with hangers longer than 300 mm are to be braced at each hanger.

.4 All SRS are to be compatible with requirements for anchoring and guiding of piping systems.

.5 Not required for single pipe less than 63 mm, except gas piping down to 25 mm and mechanical room piping down to 32 mm.
.3 Protect mounting systems exposed to weather and other corrosive environments with factory corrosion resistant coatings. Hot dip galvanized metal parts of mountings (except springs and hardware). Cadmium plate and neoprene coat springs. Cadmium plate nuts and bolts.

2.3 **Access Doors**

2.3.1 Provide access doors for accessing mechanical equipment and services concealed within ceilings or walls. Each access door shall be complete with continuous concealed hinge, positive locking self-opening screwdriver lock.

.1 Provide prime-coated access doors for general gypsum board and masonry applications.

.2 Provide stainless steel, or aluminum access doors for tiled wall applications.

.3 Provide drywall panel doors in gypsum board ceilings or walls featured in vestibules, foyers, corridors, public washrooms. Refer to architectural Drawings, including Reflected Ceiling Plans.

.4 Provide ULC-listed, fire-rated access doors in fire-rated walls or ceilings. Rating shall suit point of installation. Refer to architectural Drawings for ceiling and wall assembly ratings.

.5 Provide aluminum, or stainless steel, access doors and frames in wet areas such as showers and pools.

2.3.2 Access doors shall be a minimum of 200 x 200 mm.

2.3.3 Type, location and size of access door shall be referred to the Consultant for approval before installation.

2.3.4 Where equipment is installed above a ceiling with removable ceiling tile it is not necessary to provide an access door. However, the adjacent ceiling tile grid shall be marked as noted under identification for HVAC piping and equipment.

2.4 **Identification for HVAC Piping and Equipment**

2.4.1 Refer to Part 1 of this Section for identification requirements associated with these products.

2.4.2 Provide Lamicoid equipment nameplates.

2.4.3 Provide snap-around plastic pipe markers for identification of all HVAC piping.

2.4.4 Provide Self-Adhesive Markers for identification of all HVAC ductwork.

2.4.5 Provide 12 mm permanent adhesive coloured dots for identification of services above removable tile ceilings.

2.4.6 Wall-mounted directories and flow diagrams shall be framed behind Plexiglas safety glass.

3. **EXECUTION**

3.1 **Expansion Fittings and Loops for HVAC Piping**

3.1.1 Branch piping shall be protected against thermal expansion damage in the main by providing three elbow swing connections
on branch connections and pipe loops on straight runs. Provide guides.
3.1.2 Normally branch take-offs from the main shall be from the bottom for hot water systems.
3.1.3 All expansion joints shall be aligned with suitable guide, installed on each side of expansion joint to manufacturer's recommendations.
3.1.4 Mains and long runs of branch steam and condensate piping shall be protected from damage due to thermal expansion by the installation of pipe loops where required.
3.1.5 No cold springing of pipe loops shall be allowed.
3.1.6 Install expansion joints in all mains where necessary if loops cannot be installed.
3.1.7 The Contractor shall provide all necessary bracing, steel modifications and anchors to ensure a functional installation.

3.2 Hangers and Supports for HVAC Piping and Equipment
3.2.1 Horizontal
.1 Support spacing for piping 32 mm and less shall be installed at least every 2.5 m. Pipes over 32 mm shall be supported every 3 m.
.2 All hangers and rods to be of a size and weight to safely support the pipe system for which they are intended.
.3 Pipe roll hangers shall be large enough to accommodate a piece of 2 mm galvanized sheet metal approximately 150 mm long, placed between the hanger and the pipe covering.
.4 Hangers installed under un-insulated copper or brass pipes, shall be plastic coated.
.5 The first three hangers adjacent to motor driven equipment shall include spring isolation to absorb vibration generated by the equipment.
3.2.2 Vertical
.1 Riser clamps shall be welded to the pipe in such a manner as to act as an anchor and to allow for pipe expansion from this point.
.2 In multi-storey buildings, provide spring type hangers on top of riser and provide a pipe guide at each floor level. Anchor at a midpoint determined by expansion requirements and spring hanger behaviour.
.3 In multi-storey buildings where ample horizontal pipe runs are connected to risers to allow for expansion, riser may be anchored halfway up and guided at each floor level.
3.2.3 Rooftop
.1 Provide adequate support for all rooftop piping and equipment. Install roof top supports in accordance with the manufacturer's recommendations.

3.3 Vibration and Seismic Controls for HVAC Piping and Equipment
3.3.1 Install vibration isolators in accordance with manufacturer's recommendations and generally as specified below.
3.3.2 Piping Support
   .1 All piping connected to isolated equipment shall be supported with SH springs as follows: Up to 100 mm diameter: First three points of support 150 mm to 200 mm diameter: First four points of support 250 mm diameter and over: First six points of support
   .2 The first point of support shall have a static deflection of twice the deflection of the isolated equipment.

3.3.3 If it is not possible to install at least two spring hangers due to space restrictions, flexible metal or rubber hoses shall be used. Consultant's approval is required of any such system prior to installation.

3.3.4 Care must be taken to ensure no piping transmits vibration to the walls and floors through which they pass. These holes shall be sleeved at least 50 mm greater diameter than the pipe. After installation of the pipe, the periphery shall be packed with rock wool or fibreglass and non-hardening mastic compound used both sides. The mastic as well as water proofing acts as a sound barrier from machine room to occupied areas.

3.3.5 Seismic controls shall meet the requirements of CSA B149.1.

3.3.6 Any piping supported on an upper floor equipment room floor shall be supported on Type CM mounts to give 25 mm static deflection.

3.3.7 It shall be the responsibility of the vibration isolation manufacturer to design the riser isolation to allow for any expansion and contraction.

3.3.8 Care must be taken to ensure no ducts transmit vibration to the walls and floors through which they pass. A minimum clearance of 25 mm shall be allowed around the entire perimeter of the penetration. The clearance shall be packed with rockwool or fibreglass and mastic sealed on both sides.

3.3.9 Paint all hardware with zinc chromate. For applications subject to outdoor or high humidity conditions, neoprene coat springs, and paint mounts with two coats of rust resisting paint. Use neoprene instead of rubber when pads may be affected by outside weather conditions or oil contamination.

3.3.10 Have vibration isolator manufacturer determine mounting sizes. Install in accordance with manufacturer's instructions.

3.3.11 Attachment points and fasteners shall be able to withstand the same maximum load that seismic restraint is to resist and in all directions.

3.3.12 Install SRS at least 25 mm from equipment, systems, and services.

3.3.13 Allow for expansion and contraction when selecting and applying isolation materials.

3.4 Access Doors
3.4.1 Follow manufacturer's installation instructions.

3.5 Identification for HVAC Piping and Equipment
3.5.1 Complete this Work in compliance with the manufacturer's recommendations.
3.5.2 After all equipment is installed and piping completed, the Contractor shall paint all exposed iron, steel, Work, piping and ductwork of every description installed as part of this Work (except for bronze nameplates). Two coats of suitable paint of colours listed shall be applied regardless of whether the material comes on the site painted or not. All visible hangers and supports are to be painted black. A colour coding key shall be included permanently on framed plan and control diagrams.

3.5.3 All surfaces must be clean to SSPC-SP1 before painting and all painting must be carried out in accordance with the painting Specifications.

3.5.4 Identify each piece of equipment with 32-mm-high nameplates giving the name, service and system number as directed by the Consultant. Equipment requiring such identification shall include but not be limited to equipment such as pumps, fans, compressors, converters, tanks, boilers and ventilating apparatus.

3.5.5 Identify each piping service, size, and direction of flow with plastic sleeves. Piping must be completely cleaned before sleeves are installed. Sleeves shall be applied at each horizontal or vertical change in direction, not more than 12 m apart in straight runs, so as to be readily seen, giving service and direction of flow. This applies to all piping throughout Project, exposed and concealed. Identify piping on each side of a wall through which it passes.

3.5.6 Identify each air duct service and direction of flow with self-adhesive markers. Duct covering surface must be completely cleaned before markers are installed. Markings shall be applied at each horizontal or vertical change in direction, not more than 12 m apart in straight runs, so as to be readily seen, giving service and direction of flow. This applies to all ductwork throughout Project, exposed and concealed. Identify ductwork on each side of a wall through which it passes.

3.5.7 Upon completion of the Work the Contractor shall provide in connection with each valve installed under this Contract, a 30 mm diameter brass metal tag. Tags shall be attached to each valve with a key chain. Each tag shall bear an index number designating the valve.

3.5.8 Provide a neat computer printed directory giving the valve number and service of each valve and the location of the valve. After approval by the Consultant, one directory shall be provided for each mechanical room as well as a master directory. A duplicate set is to be provided for the Agency in the Operation and Maintenance Manual.

3.5.9 The Contractor shall supply flow and control diagrams of each system installed under this Contract. These are to include piping colour coding schedule.

3.5.10 After approval of the Consultant, both the valve tag schedule and the flow control diagram shall be enclosed under Plexiglas, in neat, polished 460 mm x 600 mm (minimum) hardwood frames, provided with lugs or clips for wall mounting. The frame size shall be selected so that the diagram is legible.
3.5.11 All automatic controls, instruments, relays, etc., shall be tagged at location of installation on the job and keyed to a control schematic on which all instruments are to be numbered in sequence for the entire job. (The schematic shall be framed under Plexiglas and prepared for wall mounting).

3.5.12 Apply self-adhesive colour dots to the ceiling tile grid identifying service and maintenance items above the removable tile ceiling. Colours shall correspond to the colour schedule.

3.5.13 All surfaces shall be dry and clean prior to application of self-adhesive markers for a strong adhesion. Follow manufacturer’s application instructions.

3.5.14 The following is the recommended colour coding schedule as specified under the General Conditions. Final approval shall be obtained from the Consultant.

<table>
<thead>
<tr>
<th>Stripe Colour</th>
<th>Label</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment Light Blue</td>
<td>-</td>
</tr>
<tr>
<td>Heating Hot Water Supply Orange HHWS</td>
<td></td>
</tr>
<tr>
<td>Heating Hot Water Return Orange HHWR</td>
<td></td>
</tr>
<tr>
<td>Refrigeration Hot Gas Line Purple REFS</td>
<td></td>
</tr>
<tr>
<td>Refrigeration Liquid Line Purple REFR</td>
<td></td>
</tr>
<tr>
<td>Heating Hot Glycol Supply Green HHGS</td>
<td></td>
</tr>
<tr>
<td>Heating Hot Glycol Return Green HHGR</td>
<td></td>
</tr>
<tr>
<td>Natural Gas Yellow -</td>
<td></td>
</tr>
</tbody>
</table>

3.6 Testing, Adjusting, and Balancing for HVAC

3.6.1 The TAB company shall obtain Shop Drawings from the Contractor and review, amend and stamp and return to the Consultant one copy of all pertinent Shop Drawings. He shall point out to the Consultant in writing any deviations from the Specification. He shall also measure and make adjustments as necessary and direct the Contractor to make adjustments to the various systems to ensure that all the systems meet the design Specifications.

3.6.2 For the preliminary report test all fans, pumps, etc., to determine flow quantities, total pressure, system pressure drop, motor H.P. load, etc. Adjust the systems to ensure that they are operating within 10% of the specified values. Provide all necessary equipment to execute this Work.

3.6.3 The TAB company shall provide all necessary precision instruments, pressure gauges, manometers and thermometers, sound recording equipment, etc., for the execution of their Work. Accurate manufacturer’s equipment performance characteristics shall be supplied by the Contractor to the TAB company for this Work.

3.6.4 Testing, Adjust, and Balancing Air Systems

.1 The TAB company shall completely test, measure and adjust the air systems to deliver the stated air quantities shown on the Drawings and described in the Specifications. Provide in the report all readings taken of
velocity grids, actual motor load, fan static, fan RPM and each outlet final air volume for all supply and return and exhaust fan systems. All outlets shall be numbered and keyed to a sketch submitted with the report. Suitable belts and sheaves shall be provided by the Contractor.

.2 The system shall operate at the lowest possible static pressure. The adjustment shall include an allowance for dirty filter pressure drop. The air systems shall be tested and adjusted for temperature and relative humidity. Dry and wet bulb readings and/or adjustments shall be taken across the air handling equipment and room terminals.

.3 Variable volume systems shall be made to simulate conditions at outside design air temperatures and building interior design loads. Air volume ratings on variable volume terminals shall meet design loads. Air handling loads are based on design peak demand loads.

3.6.5 Testing, Adjusting and Balancing Water Systems

.1 The TAB company shall test adjust, and balance all water systems indicated. System design conditions for testing and adjusting are preferred. If outdoor temperatures which should be as low as possible for heating systems and as high as possible for cooling systems do not meet design conditions, correction factors shall be used as required.

.2 Provision for pressure differential, flow and temperature measurements shall be made on inlet and outlet sides of all major equipment such as converters, pumps, piping circuits, coils, control and pressure regulating valves, etc. Appropriate readings shall be taken, to establish flow and capacities of individual units. All systems and system components shall then be balanced to suit design conditions. If higher system flow conditions exist, the excess flow capacity may be proportioned providing the system noise level is not objectionable.

.3 Where air systems supply into space and combine with the heating and/or cooling system to maintain space conditions, simultaneous readings on the heating and/or cooling and air systems shall be taken. Heating systems should be tested and balanced when no interior and/or solar gain is available and cooling systems should be tested and balanced when no exterior heat loss exists. If these conditions are not possible, the necessary corrections shall be applied.

.4 Include measurements in the report.

3.6.6 Duct Pressure Testing

.1 The TAB company shall pressure test all medium pressure supply ductwork from air handler to terminal VAV units and welded ductwork.

.2 The air leakage tests shall be based on a measurement of air leakage at constant static pressure. The tests shall not
be on the maintenance of constant static pressure against
time.

.3  Test pressure shall be 1250 Pa or 1½ times design
pressure. This pressure shall be gradually increased from
ambient so duct pressure never exceeds duct classification
pressure.

.4  The allowable leakage rate shall be less than 5% of design
flow rate, proportioned to the area of ductwork being
tested.

.5  All corrections required to meet allowable leakage rates
and correct any audible air leakage shall be performed by
the Contractor.

.6  A final pressure test meeting all requirements shall be
performed and documented.

.7  The Contractor shall provide the required wiring from
blower motor to temporary power service of the building.

.8  All tests to be carried out to the Consultant's direction.

3.6.7  Adjustment Accuracy

.1  The maximum permissible deviation from design will be ±
5% for water and/or air flow, ± .5°C in temperature and
±2% in relative humidity unless otherwise specified.

3.6.8  Noise Level Testing and Recording

.1  The TAB company shall test every room served by the air
and/or water distribution systems and record the noise
level in all frequency bands and provide a “NC” equivalent
reading when the building is not yet occupied. Include all
measurements in this report.

3.6.9  Construction Inspection

.1  The TAB company shall visit the site during construction
and co-ordinate with all Subtrades for the proper
installation of all environmental systems adjusting
components to comply with the Specification and Drawings
and the testing requirements. Inspection and progress
reports shall be submitted to the Consultant within one
week after each visit.

3.6.10  Automatic Temperature Control and Vibration and Sound Control

.1  The TAB company shall make arrangements, through the
Contractor with the Temperature Control Trade and the
Vibration and Sound Trade for all necessary control
adjustments to provide final and complete adjusted air and
water systems in regard to flow temperature, relative
humidity, sound and vibration requirements.

3.6.11  Final Tests and Guarantee

.1  The final test shall show and satisfy systems' operating
conditions for year round operation. The TAB company
shall guarantee all air and water systems for one complete
heating season and one complete cooling season for flow.
.2 All complaints during this period with regard to air and water flow are the responsibility of the TAB company and shall be corrected by the same under this guarantee at no extra cost.

END OF SECTION
1. **GENERAL**

1.1 **Related Sections**
1.1.1 Division 22 – Plumbing
1.1.2 Section 23 05 00 – Common Work Results for HVAC
1.1.3 Section 23 20 00 – HVAC Piping and Pumps
1.1.4 Section 23 30 00 – HVAC Air Distribution
1.1.5 Section 23 70 00 – Central HVAC Equipment
1.1.6 Section 23 80 00 – Decentralized HVAC Equipment

1.2 **Qualifications**
1.2.1 This part of the Work shall be carried out by a qualified worker with an established reputation for this type of Work.

1.3 **Description of Systems**
1.3.1 The Work prescribed in this Section is intended to include all items of labour, materials, equipment specialties, and ancillary equipment, required to furnish and completely install in a first-class condition, the HVAC insulation systems in strict accordance with the full intent and meaning of the Drawings and Specifications. This system shall include but not be limited to the following:

- 1. Heating piping, equipment, and ductwork;
- 2. Ventilating ductwork and equipment;
- 3. Air Conditioning piping, ductwork, and equipment; and

1.4 **Submittals**
1.4.1 Submit technical data for all insulation.
1.4.2 Submit material samples as requested.

1.5 **Flame Spread Ratings And Smoke Development Classifications**
1.5.1 All materials and installations shall meet OBC required flame spread rating and smoke development classification when tested in accordance with ASTM E84 and/or CAN/ULC S102.

2. **PRODUCTS**

2.1 **Insulation For Pipe**
2.1.1 Provide pipe insulation with factory applied vapour retarding jacket and pressure sensitive lap sealing system. Jacket shall be ASJ SSL (All-Service Jacket with Self-Sealing Lap Closure System) high-density, white kraft bonded to an aluminum foil reinforced with fibre glass yarn. Performance shall be $k = 0.033$ W/m°C or lower.
2.1.2 Provide pressure-sensitive tape butt strips, using the same adhesive and a quick release paper strip to create a totally sealed and secure system.

2.2 **Elastomeric Insulation for Pipe**
2.2.1 Provide closed-cell elastomeric thermal pipe insulation.
2.3 **Rigid Insulation Board**

2.3.1 Provide 50 kg/m³ density resin-bonded thermo-set glass fibre rigid insulation board with a Type FSK vapour retarding facing. Thickness and service shall be as specified under Execution. Performance shall be at least RSI-28.7/m.

2.4 **Flexible Insulation Wrap**

2.4.1 Provide fibre glass duct wrap insulation with a Type FSK vapour retarding facing. Performance as labelled shall be $k = .036 \text{W/m} \cdot \text{°C}$ or lower.

2.5 **Acoustic Insulation Board**

2.5.1 Provide rigid fibre glass liner board with acrylic surface treatment for rectangular ducts. Thickness and service shall be as specified under Execution.

2.5.2 Provide high-density fibreglass board with acrylic surface treatment for round ducts.

2.5.3 The duct liner shall not support microbial growth.

2.6 **Canvas Covering**

2.6.1 Provide 200 g/m² close woven, canvas.

2.7 **PVC Covering**

2.7.1 Provide PVC jacketing and molded fitting covers and taped or glued joints. PVC material thickness shall be a minimum of 0.5 mm.

2.8 **Mastics, Coatings, Adhesives, Sealants**

2.8.1 Mastics, coatings, adhesives, and sealants shall be indicated for the specific individual use by the manufacturer.

2.8.2 Provide white durable water-based vinyl-acrylic weather-barrier breather mastic coating for thermal insulations for weatherproofing and mechanical protection of thermal insulations, indoors and outdoors, for tanks, fittings, vessels, equipment, and other irregularly-shaped objects. Provide reinforcing mesh as required by the manufacturer’s instructions for the application. VOC content 20 g/L less water and exempt solvents.

2.8.3 Provide Childers (or Agency approved equivalent) Chil-Perm CP-35 WB high-performance water-based vapour retarder coating for low temperature interior and exterior applications. Permeability shall be less than .08 Perms at 1.4 mm thickness. Provide Chil-Glas #10 reinforcing mesh as required by the manufacturer’s instructions for the application. VOC content 36 g/L less water and exempt solvents.

2.8.4 Provide Childers (or Agency approved equivalent) Chil-Seal CP-50A white combination coating and adhesive for finishing and adhering canvas and other lagging cloths over insulation. VOC content 48 g/L less water and exempt solvents.

2.8.5 Provide Armaflex (or Agency approved equivalent) 520 or 520 BLV contact adhesive for use with elastomeric sheet insulation.
3. **EXECUTION**

3.1 **General**

3.1.1 Ensure that all pipes, fittings, and ductwork are dry and clean before applying covering.

3.1.2 Do not apply insulation until the items to be covered, including piping and ductwork, have been tested against leakage.

3.1.3 Insulate all concealed piping.

3.1.4 Butt joints firmly together. Stagger joints in multiple layer construction.

3.1.5 Pipe and duct insulation shall pass through walls or floors with continuous covering.

3.1.6 Protect insulation passing through floors, walls and similar barriers with a 1.2 mm thick sheet steel sleeve large enough to accommodate the full thickness of the insulation. The sleeve shall extend approximately 100 mm to each side and shall be secured properly to the barrier through which it passes.

3.1.7 Where pipes and ducts pass through existing walls or floor, insulation shall be removed in order to minimize the cutting in existing walls or floors. If the opening is existing, insulation shall be provided where possible. Pipes shall be covered/taped where no insulation is provided.

3.1.8 Tightly pack the annular space between the sleeve and the pipe covering for the full length of the sleeve. Use fibreglass or rockwool and finish flush at each end with aluminum colour caulking compound.

3.1.9 Protect insulation by means of 1.2 mm galvanized sheet steel shields where such insulation is supported by hangers, on rollers, or other type of supports. Use square hardwood blocking between pipe shield and pipe of same thickness as insulation for pipe 125-mm-diameter and over. Install the saddle shield inside the jacket to prevent the shield from working loose due to vibration within the piping system.

3.1.10 Insulate all pipe elbows. Mitre insulation at pipe elbows 25 mm size and smaller and wrap joint with tape. Use fibreglass batt insulation wrapped and taped with foil tape for larger elbows. Use superwool insulation wrapped and taped with foil tape for high temperature applications.

3.1.11 Locate longitudinal seams so that they are concealed from view.

3.1.12 Apply all coverings in a neat standard of Work so that finished job is uniform and smooth in finish.

3.1.13 Apply fire retardant lagging coating to all canvas covered insulation.

3.1.14 Treat all insulation and finishes so that the maximum flame spread rating is 25 or lower and smoke index is 50 or lower.
3.2 **Piping Service**

3.2.1 Apply insulation to piping at the thickness indicated in the following table:

<table>
<thead>
<tr>
<th>Service</th>
<th>Nominal Pipe Size in mm</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>less than 25 mm</td>
</tr>
<tr>
<td>Heating Systems, Water</td>
<td>40 mm</td>
</tr>
<tr>
<td>Glycol Systems, Chilled Water</td>
<td></td>
</tr>
</tbody>
</table>

3.2.2 Heating Hot Water, Glycol Systems, Chilled Water

.1 For straight run piping apply insulation to the pipe with side and end joints butted tightly. Apply pipe insulation with an integral (AP-T) Pressure Sensitive Lap Sealing System. Secure jacketing using necessary fastenings on approximate 75 mm centres. Cover longitudinal and circumferential joints with jacket finishing tape.

.2 Insulate fittings with PVC preformed fittings or mitred segments made smooth with mastic coating. Coat each fitting with vapour retarder coating, reinforced with glass fabric extending 50 mm onto adjacent straight runs.

3.3 **Insulated Pipe Covering**

3.3.1 Provide insulation covering for all piping and fitting insulation exposed within finished rooms, fan rooms, mechanical equipment rooms, duct and pipe shafts, pipe spaces and penthouses.

3.3.2 Secure PVC jacketing using adhesive on approximate 75 mm centres. Cover longitudinal and circumferential joints with jacket finishing tape.

3.3.3 Provide elastomeric sheet finish on elastomeric pipe insulation. Provide elastomeric sheet finish on elastomeric sheet insulation. Elastomeric finish shall be appropriate for exterior use where applicable.

3.3.4 No insulation covering shall be installed until the Consultant has inspected the insulation for type, adhesive and cracks.

3.3.5 For concealed piping neatly applied integral all service jacket shall constitute the finish.

3.3.6 Apply mastics, coatings, adhesives, and sealants in accordance with the manufacturer’s recommendations.

3.4 **Outdoor Insulated Pipe Covering**

3.4.1 All insulated piping located outdoors and in tunnels shall be covered with metal jacketing. Overlap all joints a minimum of 50 mm. Secure metal jacketing with 15 mm aluminum strapping on 300 mm centres and at the overlap. Longitudinal laps shall be positioned to shed water.
3.4.2 All insulated fittings located outdoors and in tunnels shall be covered with either:
.1 Two 3 mm thick wet coats of weather-barrier breather mastic coating, reinforced with glass fabric, extending 50 mm onto the adjacent straight pipe insulation.
.2 Pre-formed aluminum covers secured in place with aluminum strapping.

3.5 Duct Thermal Insulation
3.5.1 Cover all rectangular outside air intakes, exhaust air ducts with 100 mm thick rigid insulation board. Cover all rectangular ducts that are exposed to outside air or exterior to the building enclosure with 100 mm thick rigid insulation board.
3.5.2 Cover all supply and return air ducts in unconditioned (non-cooled) spaces with 40 mm thick rigid insulation board. These spaces include spaces such as return air plenums, shafts, mechanical rooms, electrical rooms, and penthouses.
3.5.3 Insulation shall be cut to fit between standing seams and stiffeners and shall be secured to ductwork by impaling over mechanical fasteners at the rate of one per 0.18 m². All joints shall be tightly butted. Tape all joints and cover all pin penetrations with 75 mm RFFRK tape to provide a complete vapour barrier envelope.
3.5.4 Where internal sound insulation is shown or specified, reduce the amount of thermal insulation by 25 mm.
3.5.5 All visible ductwork shall be insulated using rigid insulation. Concealed ductwork may use duct wrap.

3.6 Insulated Duct Covering
3.6.1 Provide insulation covering for all duct insulation exposed within finished rooms, fan rooms, mechanical equipment rooms, duct and pipe shafts, pipe spaces and penthouses.
3.6.2 Size and apply canvas finish covering with combination coating and adhesive for finishing and adhering canvas and other lagging cloths over insulation. Provide an additional coat for covering finish.
3.6.3 Neatly apply self-adhesive laminate covering sheet.
3.6.4 No insulation covering shall be installed until the Consultant has inspected the insulation for type, adhesive and cracks.
3.6.5 Apply mastics, coatings, adhesives, and sealants in accordance with the manufacturer’s recommendations.

3.7 Intake and Exhaust Plenums
3.7.1 Cover all intake and exhaust plenums with 100 mm thick rigid insulation board.
3.7.2 Apply the insulation in two layers installed so that the joints and seams are overlapping.
3.7.3 Insulation shall be cut to fit between standing seams and stiffeners and shall be secured to ductwork by impaling over mechanical fasteners at the rate of one per 0.18 m². All joints shall be tightly butted. Tape all joints and cover all pin penetrations with 75 mm RFFRK tape to provide a complete vapour barrier envelope.
3.7.4 Cover all intake and exhaust plenum insulation with a canvas finish as described under insulated duct covering.

3.8 **Acoustic Duct Insulation**

3.8.1 All ductwork shown to require acoustic insulation on the mechanical plans shall be insulated with 25 mm thick material or as noted otherwise on plans. Duct sizes shown on plans are actual inside dimensions of the insulation.

3.8.2 All portions of duct designated to receive duct liner shall be completely covered with liner. Transverse joints shall be neatly butted and there shall be no interruptions or gaps. The liner surface designed to be exposed shall face the air stream. Duct liner shall be adhered to the sheet metal with 100% coverage of adhesive, and all exposed leading edges and all transverse joints coated with adhesive. The liner shall be additionally secured with welded mechanical fasteners which shall compress the duct liner sufficiently to hold it firmly in place.

3.8.3 All rigid duct liner shall be cut to assure tight, overlapped corner joints. The top pieces shall be supported by the side pieces.

3.8.4 For horizontal duct runs where the velocity is less than 10 m/s, and the duct width or height exceeds 500 mm, acoustic insulation shall be additionally secured with welded mechanical fasteners. Fasteners shall be applied within 75 mm of the upstream transverse edge and they shall be spaced on a grid with a maximum spacing of 400 mm between fastener centrelines. Fasteners shall be applied within a maximum distance of 400 mm from longitudinal joints.

3.8.5 For vertical duct runs where the velocity is less than 20 m/s and a duct dimension exceeds 300 mm, acoustic insulation shall be additionally secured with mechanical fasteners. Fasteners shall be applied within 75 mm of the upstream transverse edge and they shall be spaced on a grid with a maximum spacing of 400 mm between fastener centrelines. Fasteners shall be applied within a maximum distance of 400 mm from longitudinal joints.

3.9 **Roof or Exterior Wall Penetrations**

3.9.1 All pipes penetrating the roof membrane or exterior wall shall be insulated below the roof or inside an exterior wall penetration for a distance of 1 m with a minimum insulation thickness of 25 mm.

3.9.2 All ducts penetrating the roof membrane or exterior wall shall have the additional requirement to be insulated per Ductwork Insulation Sections for exterior duct up to the related air handler unit or 0.1 m beyond the thermally-broken damper frame.

END OF SECTION
1. **GENERAL**

1.1 **Related Sections**
- 1.1.1 Division 22 – Plumbing
- 1.1.2 Section 23 05 00 – Common Work Results for HVAC
- 1.1.3 Section 23 07 00 – HVAC Insulation
- 1.1.4 Section 23 70 00 – Central HVAC Equipment
- 1.1.5 Section 23 80 00 – Decentralized HVAC Equipment

1.2 **Description Of Systems**
- 1.2.1 Provide modifications to the existing gas piping system to provide a complete installation.

1.3 **Reference Standards**
- 1.3.1 CAN/CSA-B149.1, Natural Gas and Propane Installation Code
- 1.3.2 Technical Standards and Safety Act, 2000 and amendments
- 1.3.3 Ontario Building Code
- 1.3.4 Local by-laws and authorities having jurisdiction.

1.4 **Qualifications**
- 1.4.1 Use qualified and licensed welders. Furnish welder's qualifications upon request.

1.5 **Approvals**
- 1.5.1 All approvals shall be obtained before any installation proceeds.

1.6 **Pipe**
- 1.6.1 Provide ASTM A53 grade B, schedule 40 Electric-Resistance-Welded black steel pipe, true and round for 50 mm (2 in.) and over. Provide ASTM A53 Continuous-Welded black steel pipe for sizes under 50 mm (2 in).
- 1.6.2 Buried gas piping shall be yellow jacket steel pipe or plastic pipe.

1.7 **Fittings**
- 1.7.1 Piping 50 mm (2 in.) and less: fittings shall be Class 300 malleable iron, unions shall be Class 150 malleable iron, dart pattern. Joints shall be screwed type.
- 1.7.2 Piping 63 mm (2½ in.) and over: Fittings shall be steel for butt welding to ANSI Standard. Weld-o-let fittings for branch connections are acceptable. Welding neck flanges shall be for Class 150 minimum. Joints shall be welded.

1.8 **Valves**
- 1.8.1 Use CSA approved gas isolation valves with lever handles.

1.9 **Pressure Reducing Valves And Reliefs**
- 1.9.1 Use regulators and relief valves and vents as detailed on the drawings or in drawing details. Verify size, model and capacity, with equipment manufacturer.
2. **EXECUTION**

2.1 **Gas Piping, Joints, And Valves**
   2.1.1 Weld, list, and tag all concealed piping and piping in return air plenums, ceiling spaces and on roof.
   2.1.2 Test all piping with 350 kPa (50 psi) air pressure or 1½ times maximum working pressure whichever is greater. Air test shall be maintained for a period of 12 hours without loss of pressure.
   2.1.3 Joints shall be checked with soap and water solution during air test to ascertain any leaks.
   2.1.4 All buried piping shall be tested before backfilling.

2.2 **Pipe Support**
   2.2.1 Provide adequate support for all fuel system piping. Install rooftop supports in accordance with the manufacturer’s recommendations.

2.3 **Painting**
   2.3.1 All gas piping, including piping in concealed spaces shall be identified with yellow paint or other acceptable means as described in the gas code.

2.4 **Relief Valves And Vents**
   2.4.1 Pipe all relief valves and gas vents to the exterior of the building as detailed on the drawings, as specified or as required by code.

2.5 **Minimum Pipe Size**
   2.5.1 Minimum gas pipe size shall be in compliance with the Gas Code.

2.6 **EQUIPMENT CONNECTIONS**
   2.6.1 Make connections to all gas fired equipment complete with coupling and isolating gas valves.

END OF SECTION
1. **GENERAL**

1.1 **Related Sections**
   1.1.1 Division 22 – Plumbing
   1.1.2 Section 23 05 00 – Common Work Results for HVAC
   1.1.3 Section 23 07 00 – HVAC Insulation
   1.1.4 Section 23 30 00 – HVAC Air Distribution
   1.1.5 Section 23 70 00 – Central HVAC Equipment
   1.1.6 Section 23 80 00 – Decentralized HVAC Equipment
   1.1.7 Division 26 – Electrical

1.2 **Description of Systems**
   1.2.1 Provide complete fluid heat transfer systems including piping, fittings, valves, traps, strainers, and ancillaries as shown on the Drawings and as further detailed in the Specifications.

1.3 **Qualifications**
   1.3.1 Use qualified welders licensed by the TSSA.

1.4 **Quality Assurance**
   1.4.1 All materials and equipment must be CSA, and ULC approved.
   1.4.2 Where applicable, products shall carry a valid CRN (Canadian Registration Number) issued by the TSSA. The Contractor shall verify the CRN prior to installation.
   1.4.3 Valve materials shall conform to the requirements of ANSI, ASTM, ASME, and applicable MSS standards.
      - Bronze shall be to ASTM B62 or B61 as applicable.
      - Brass shall be to ASTM B283 C3770.
      - Cast iron shall be to ASTM A126, Class B.
      - Forge steel shall be to ASTM A105N.
      - Cast steel shall be to ASTM A216WCB.
      - Valve markings shall conform to MSS-SP-25.
      - End connections shall conform to ASME B16.
   1.4.4 All materials, equipment and systems must comply with the latest Ontario Building Code as amended by the local municipality.

1.5 **Submittals**
   1.5.1 Provide shop Drawings, maintenance manuals and operating instructions for the following:
      - valves
      - strainers
      - thermometers
      - pressure gauges
      - expansion tanks
      - air eliminators
      - pumps
2. **PRODUCTS**

2.1 **Hydronic Piping, Fittings and Specialty Items**

2.1.1 **Pipe**

1. Provide ASTM A53 grade B, schedule 40 Electric-Resistance-Welded black steel pipe, true and round for 50 mm and over. Provide ASTM A53 Continuous-Welded black steel pipe for sizes under 50 mm.

2. Type "L" hard copper tubing.

2.1.2 **Fittings**

1. All screwed fittings up to and including 50 mm shall be of best quality 1.0 MPa malleable iron. Unions shall be malleable iron, dart pattern.

2. Provide flanged or welded fittings for piping over 50 mm.

3. Tube turn elbows, tees and reducers shall be used for all changes in direction in pipe 63 mm and over. Flanges shall be 1.0 MPa steel weldneck or slip-on type with 2 mm thick Cranite or Agency approved equivalent gaskets.

4. Sweat wrought copper or cast brass soldered fittings for Type "L" copper piping.

5. Dielectric fittings or flanges must be installed to suit piping systems.

6. Provide a "Pete's Plug" as required to facilitate instrument insertion where shown on the mechanical Drawings.

2.1.3 **Connections**

1. Nuts and bolts shall be carbon steel square head machine bolts and heavy hex head nuts.

2. For screwed piping connections, use dope or Teflon tape.

3. Gaskets shall be 2 mm thick Cranite or Agency approved equivalent gaskets.

4. Where copper piping is used, joints shall be 95-5 hard solder for sizes up to and including 90 mm. Sil-Fos shall be used for sizes 90 mm and over.

5. Flexible hose connections shall be suitable for fittings.

6. Plugs and caps shall be iron body, brass plug and washers, soldered or screwed ends to suit piping. Air test connections to insure integrity.

2.1.4 **Hydronic System Strainers**

1. Strainers shall be cast iron, semi-steel or bronze "Y" type.

2. The screen will be stainless steel or Monel with 1 mm perforations.

3. Provide drain valves with hose connection, complete with cap and chain, for strainers in fluid lines that are over 40 mm.
2.1.5 Hydronic System Air Vents
   .1 Provide automatic air eliminators/air and gas vents suitable for 10 bar g at 110 degrees C. The air vent shall be complete with check valve and lockshield ball valve. The body and cap shall be cast DZR brass alloy. The check ball shall be stainless steel and the isolation ball shall be hard corrosion resistant DZR alloy. Provide lockshield keys for operating the valve.
   .2 Manual vents shall be Crane No. 4 (or Agency approved equivalent), screwdriver operated.

2.1.6 Hydronic System Air Eliminators
   .1 All air eliminators shall be line sized.
   .2 The Vortex air separator shall be designed and constructed in accordance with Section VIII, Div. 1 of the ASME Boiler and Pressure Vessel Code.
   .3 The unit shall be fitted with an NPT vent connection (for connection to a compression tank or an air vent). An additional NPT tapping shall be provided on the bottom of the air separator to facilitate blow-down.
   .4 The unit will operate for an input flow rate value based on the design, a working pressure of 860 kPa and a working temperature of 93 degrees C.
   .5 Supply size 2, 2.5, and 3 models with a cast iron body and NPT system connections. Supply size 4, 5, and 6 models with a cast iron body and ANSI flanges. Supply size 8 to 24 models with a fabricated steel body and carbon steel ANSI flanges.

2.2 Valves
2.2.1 Valves shall be ‘industrial class’ and equivalent to the following schedules.

2.2.2 Hydronic services
   .1 Bronze valves: 50 mm and smaller Class 125
      (Manufacturers listed below or Agency approved equivalent)

<table>
<thead>
<tr>
<th></th>
<th>Toyo</th>
<th>Kitz</th>
<th>Nibco</th>
<th>Steam Rating</th>
<th>CWP Rating</th>
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<tbody>
<tr>
<td>Gate Valve</td>
<td>293</td>
<td>24</td>
<td>T-111</td>
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<td>200</td>
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<td>Globe Valve</td>
<td>220</td>
<td>3</td>
<td>T-211-B</td>
<td>125</td>
<td>200</td>
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<td>Check Valve</td>
<td>236</td>
<td>22</td>
<td>T-413</td>
<td>125</td>
<td>200</td>
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<tr>
<td>Ball Valve</td>
<td>5043S-LH</td>
<td>69AMLL</td>
<td>T-585-70-66</td>
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<td>600</td>
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</tbody>
</table>

   .2 Bronze valves: 50 mm and smaller Class 150
      (Manufacturers listed below or Agency approved equivalent)
### Major Renovation Project at Two Peel Regional Police Commercial Sites

<table>
<thead>
<tr>
<th>Type</th>
<th>Model</th>
<th>Manufacturer</th>
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<th>CWP Rating</th>
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<td>Toyo</td>
<td>T-134</td>
<td>150 300</td>
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<td>Globe Valve</td>
<td>221A</td>
<td>Kitz</td>
<td>T-235-Y</td>
<td>150 300</td>
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<tr>
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<td>238</td>
<td>Nibco</td>
<td>T-433-B</td>
<td>150 300</td>
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<tr>
<td>Ball Valve (Stainless)</td>
<td>5043S-LH</td>
<td>Toyo</td>
<td>T-585-70-66</td>
<td>150 600</td>
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.3 Bronze valves: 50 mm and smaller Class 300 (Manufacturers listed below or Agency approved equivalent)

<table>
<thead>
<tr>
<th>Type</th>
<th>Model</th>
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<tr>
<td>Gate Valve</td>
<td>318A</td>
<td>Toyo</td>
<td>T-174SS</td>
<td>300 1000</td>
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<tr>
<td>Globe Valve</td>
<td>335</td>
<td>Kitz</td>
<td>T-276-AP</td>
<td>300 1000</td>
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<td>Check Valve</td>
<td>360</td>
<td>Nibco</td>
<td>T-473-B</td>
<td>300 1000</td>
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.4 Class 125 cast iron valves: 63 mm and larger (Manufacturers listed below or Agency approved equivalent)

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<th>Model</th>
<th>Manufacturer</th>
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<th>CWP Rating</th>
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</thead>
<tbody>
<tr>
<td>Gate Valve</td>
<td>421A</td>
<td>Toyo</td>
<td>F-617</td>
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<td>Kitz</td>
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<td>435A</td>
<td>Nibco</td>
<td>F-918-B</td>
<td>125 200</td>
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<td>Butterfly Valve</td>
<td>918BESL-2</td>
<td>American Valve</td>
<td>N-200-L</td>
<td>Not for steam 200</td>
</tr>
<tr>
<td>Butterfly Valve</td>
<td>918BESG-2</td>
<td></td>
<td>N-200-G</td>
<td>Not for steam 200</td>
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<tr>
<td>Flanged Ball Valve</td>
<td>4000</td>
<td></td>
<td></td>
<td>125 200</td>
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### 5 Class 150 cast steel valves: 63 mm and larger
(Manufacturers listed below or Agency approved equivalent)

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<td>101-RF-AA08-H</td>
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<td>Globe Valve</td>
<td>150SCJS</td>
<td>201-RF-EA08-H</td>
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<td>285</td>
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<td>Check Valve</td>
<td>150SCOS</td>
<td>301-RF-EA08-X</td>
<td>150</td>
<td>285</td>
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### 6 Class 300 cast steel valves: 63 mm and larger
(Manufacturers listed below or Agency approved equivalent)

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<td>300SCLS</td>
<td>103-RF-AA08-H</td>
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<td>740</td>
</tr>
<tr>
<td>Globe Valve</td>
<td>300SCJS</td>
<td>203-RF-EA08-H</td>
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<td>740</td>
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<tr>
<td>Check Valve</td>
<td>300SCOS</td>
<td>303-RF-EA08-X</td>
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<td>740</td>
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### 7 Class 600 cast steel valves: 63 mm and larger
(Manufacturers listed below or Agency approved equivalent)

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<tbody>
<tr>
<td>Gate Valve</td>
<td>600SCLS</td>
<td>106-RF-AA08-H</td>
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<tr>
<td>Globe Valve</td>
<td>600SCJS</td>
<td>206-RF-AA08-H</td>
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<td>Check Valve</td>
<td>600SCOS</td>
<td>306-RF-AA08-H</td>
<td>600</td>
<td>1480</td>
</tr>
</tbody>
</table>

### 8 Ball valves may be used in lieu of gate valves 50 mm and smaller for shut off service only.

### 9 Provide valve handle extensions for all ball valves to suit thickness of associated pipe insulation.

### 10 Drain valves shall be Kitz 69AC or Agency approved equivalent. Valves shall have integral threaded hose connection with end cap.

2.2.3 Wherever possible, all valves shall be from one manufacturer, for example; all cast steel valves, all bronze and iron valves.

2.2.4 All valves must be new material only and protected on site from conditions or environment which may affect performance.
2.3 **Circuit Balancing Valves**

2.3.1 Provide Tour and Andersson (or Agency approved equivalent) 786 (soldered), 787 (threaded), 788 (flanged), 799 Koil-Kit Circuit Balancing Valves or Agency approved equivalent with provision for connecting a portable differential pressure meter. Each meter connection shall have a positive shut-off valve.

2.3.2 The valves shall be globe design with positive shut off and drain capability.

2.3.3 The 786 (STA-S), 787 (STA-D) model shall have four (4) 360 degrees adjustment turns of handwheel for maximum Vernier-type setting with "Hidden Memory" feature to program the valve with precision Tamper-Proof Balancing Setting.

2.3.4 The 788 (STA-F), 789 (STA-G) model shall have eight, twelve or sixteen 360 degrees adjustment turns of handwheel for maximum Vernier-type setting with "Hidden Memory" feature to program the valve with precision Tamper-Proof Balancing System.

2.4 **Thermometers**

2.4.1 Provide adjustable stem thermometers size 230 mm complete with unbreakable glass, dual scale, separable socket and well. The temperature indicating liquid shall contrast with the background scale.

2.5 **Pressure Gauges**

2.5.1 Provide Series Quality Series liquid-filled gauges with suitable pressure ranges and dual scale for all applications where the measured fluid is liquid. Provide Winters 100 Series gauges with suitable pressure ranges and dual scale for use in steam applications only. Gauges shall be with solid front and blow out back complying with ANSI B40.1.

2.5.2 Gauges shall be 100 mm diameter.

2.5.3 Provide ball valve to isolate each gauge from the piping system.

2.5.4 Gauges shall be CRN registered.

3. **EXECUTION**

3.1 **Hydronic Piping, Fittings, And Specialty Items**

3.1.1 Connect water equipment as per manufacturer's installation literature and as instructed.

3.1.2 Provide flexible, vibration and expansion connections at equipment as specified or as noted on the mechanical Drawings.

3.1.3 Slope water piping and drain at low points.

3.1.4 Ends of piping to be reamed, filed and all burrs removed from the interior.

3.1.5 Prepare pipe for screwed joints by providing full cut threads. Screwed joints to be made iron to iron or with a filler of graphite and oil or Teflon tape.

3.1.6 Where pipe sizes differ from connection sizes of equipment, install reducing fittings close to equipment. Reducing bushings are not permitted.
3.1.7 Use reducing fittings, instead of bushings, wherever reduction in piping occurs.

3.1.8 Branch connections may be welded into main pipe runs. Openings cut for welded connections shall not permit the entry of welding metals and slag into the pipes. No branch tee shall be larger than 50 percent of the main pipe diameter.

3.1.9 Connections of any approved type shall not project inside the pipe or header.

3.1.10 All piping joints 63 mm and over shall be electric arc welded by certified welders.

3.1.11 Install dielectric fittings or flanges where all dissimilar metals and pipes are joined.

3.1.12 Pipes must be concealed in all areas unless otherwise noted. Under no circumstances shall any piping be installed in concealed spaces in outside walls. The final location of the piping must be approved by Consultant before proceeding with the installation.

3.1.13 Provide adequate space for installation of insulation. Access shall be provided to strainers, valves, air vents, drains, cleanouts, unions, expansion joints, flexible connections and trap assemblies.

3.1.14 Hydronic System Air Vents

.1 Locate vents at all high points of fluid and water system. Air vents located within concealed locations shall have drain lines to prevent damage to finished ceilings.

.2 Wall fin loops, convectors, forced-flow heaters and other heating units shall be vented with a coin air valve extended through the cabinet cover, locked in place with a lock nut on each side of the cabinet or located behind access panels using a length of copper tubing.

.3 All vents and vacuum breakers must be accessible.

.4 All automatic air vents shall be provided with a ball valve to facilitate removal of the vent without draining the heating system.

.5 On closed systems and equipment low points provide 19 mm NPS drain valves and hose nipples with gasketed brass caps on retention chains. Provide at high points on lines and on equipment connections, collecting chambers and high capacity float operated automatic air vents.

.6 Where high points consist of piping 100 mm and larger, an air chamber shall be installed.

3.2 **Hydronic System Hydrostatic Testing**

3.2.1 All hydronic heat transfer systems shall be hydrostatically tested.

3.3 **Valves**

3.3.1 Install valves with stems upright or horizontal unless approval has been granted stating otherwise.

3.3.2 Install globe or angle valve with solid plug for throttling service, control devices or meter bypass.
3.3.3 All valves shall be of one manufacturer and have the manufacturer's name and pressure rating clearly marked on the outside of the body.

3.3.4 Valves shall be line-size; that is, they shall be the same size as the pipe in which they are installed. Exception: circuit balancing valves and control valves sizes shall be calculated and selected as outlined within their respective Specification sections.

3.3.5 Provide floor stands for gate, globe or angle valves complete with indicators where indicated.

3.3.6 Valves located more than 2 m from the floor are to be provided with chain operated drives.

3.3.7 Extend chains to approximately 1.5 m above the floor and secure in order to clear walking aisles are occupied areas.

3.3.8 Provide isolation valves and unions around all control valves to permit local maintenance isolation, control valve removal and replacement.

3.4 Circuit Balancing Valves

3.4.1 Circuit balancing valves shall be installed on the return side of all radiation units, convectors, forced-flow units, unit heaters and radiant panels, as well as all other heating units.

3.4.2 Circuit balancing valve sizes shall be selected based on flow. See detail Drawings for valve sizing chart.

3.4.3 Valves shall be located in a straight run of pipe at least: ten pipe diameters downstream of a pump, five pipe diameters downstream of an elbow, and two pipe diameters upstream of an elbow or other fitting. Valves shall be installed in accordance with the manufacturer’s latest installation instructions.

3.4.4 Install valves so that pressure connections, pressure shut-off valves, main valve adjustment, and tamper proof memory set screw are all easily accessible and adjustable.

3.5 Thermometers

3.5.1 Locate thermometers so that they can be easily read from the floor and installed for removal or replacement without shutting down the system.

3.5.2 In general, thermometers are required on outlet side of mixing valves, heat exchange equipment supplies and returns.

3.5.3 Provide standard range to suit purpose.

3.5.4 Thermowells shall be provided for all thermometers.

3.6 Pressure Gauges

3.6.1 Provide pressure gauges where shown on the mechanical Drawings and in the following locations:
Suction and discharge sides of each hydronic system pump piped to one common gauge per pump.
Hydronic coil supply and return piping.

3.6.2 Each gauge shall have a ball valve to isolate it from the piping system. Each gauge shall be located so that it can be easily read from the floor.
3.7 Protection of Water-Filled Equipment and Piping

3.7.1 The Contractor shall drain all water from the system, coils and equipment during weather conditions below 4 degrees C. He shall also fill all coils with an alcohol solution to withstand temperatures down to -23 degrees C. Before leaving the project, the Contractor must instruct the Owner to drain all water coils in winter and add alcohol as stated above. The Contractor is responsible for all equipment until taken over by the Owner and shall replace any coils which may be damaged due to freezing or other reason.

3.8 Draining the System

3.8.1 The hot water system shall be thoroughly drained after all of the piping has been completed and re-filled with new water, and chemically treated from existing heating system. Before system is turned over to the owner, all strainers must be thoroughly cleaned and reinstalled.

3.8.2 Provide 15 mm drain ball valves on all low points of system for drainage purposes. Drain valves shall be complete with hose end connection, cap and chain.

3.8.3 All equipment must be capable of being drained without draining the entire system. Control valves shall be included in the draining isolated sections for equipment that they serve.

END OF SECTION
1. **GENERAL**

1.1 **Related Sections**
1.1.1 Section 23 05 00 – Common Work Results for HVAC
1.1.2 Section 23 07 00 – HVAC Insulation
1.1.3 Section 23 70 00 – Central HVAC Equipment
1.1.4 Section 23 80 00 – Decentralized HVAC Equipment
1.1.5 Division 26 – Electrical

1.2 **Description**
1.2.1 Air distribution and ventilation equipment and systems, including ductwork, fans, duct accessories (such as dampers), air diffusers, and air treatment equipment as described herein.

1.3 **Quality Assurance**
1.3.1 Galvanized steel ductwork material to ASTM A653 / A653M-03 or ASTM A792 / A792M-03.
1.3.2 Stainless steel type 304 material to ASTM A480 / A480M-06b.
1.3.3 Ducts in accordance with ASHRAE.
1.3.4 Duct fabrication including fittings as recommended by SMACNA.
1.3.5 Joints in accordance with ASHRAE for galvanized ductwork. Joints to be continuous inert gas welded for stainless steel and aluminum ductwork.
1.3.6 Hanger configuration to SMACNA details.
1.3.7 Flexible ductwork with requirements of UL "Standards for Safety, Air Ducts", UL-181 Class 1 and NFPA 90A.
1.3.8 Conform to the requirements of local by-laws, Ministry of Labour Regulations and all other authorities having jurisdiction.
1.3.9 Silencers shall be tested in full accordance with ASTM E-447-13.

1.4 **Submittals**
1.4.1 Provide Shop Drawings, maintenance data and operating instructions for the following equipment:
- GRD (grilles, registers, and diffusers)
- Fire dampers
- VAV Boxes
- Bypass Boxes
- Silencers

1.5 **Manufactured Items**
1.5.1 Grilles, registers, and diffusers shall be the product of one manufacturer for generic type; that is: grilles and registers by one, diffusers by one or same.
1.5.2 Medium and high pressure spiral duct, fittings and specials shall be factory fabricated.
1.5.3 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to Codes and standards in force.
1.6 **Duct Pressure Testing**

1.6.1 The Contractor shall refer to Section 23 05 00 – Common Work Results for HVAC for instructions covering pressure testing of supply air ductwork.

1.6.2 The Contractor shall co-operate with the TAB company and shall prepare all ducts for testing with sealed blank off plates and connections for the blower and the flow meter.

2. **PRODUCTS**

2.1 **Low Pressure Duct Materials**

2.1.1 Ductwork shall be constructed to withstand 1½ times the working static pressure with a leakage rate of 5 percent maximum and designed to operate at 750 Pa maximum pressure.

2.1.2 Fabricate ducts from smooth finish prime grade, new, open hearth, soft steel sheet, galvanized, conforming to manufacturer's standard gauges as specified herein.

2.1.3 Gauges and Reinforcing of Sheet Metal Ductwork

<table>
<thead>
<tr>
<th>Largest Dimension</th>
<th>Galvanized Steel Thickness mm</th>
<th>Aluminum B&amp;S Thickness mm</th>
<th>B&amp;S Recommended Construction Transverse Joints &amp; Bracing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Duct</td>
<td>Slip</td>
<td>Duct</td>
</tr>
<tr>
<td>Up to 300 mm</td>
<td>0.6</td>
<td>0.6</td>
<td>0.89</td>
</tr>
<tr>
<td>310 to 610 mm</td>
<td>0.71</td>
<td>0.71</td>
<td>0.89</td>
</tr>
<tr>
<td>620 to 760 mm</td>
<td>0.71</td>
<td>0.71</td>
<td>0.89</td>
</tr>
<tr>
<td>770 to 1540 mm</td>
<td>0.89</td>
<td>0.89</td>
<td>1.04</td>
</tr>
<tr>
<td>1550 to 1800 mm</td>
<td>1.04</td>
<td>1.04</td>
<td>1.35</td>
</tr>
<tr>
<td>1810 to 2290 mm</td>
<td>1.04</td>
<td>1.04</td>
<td>1.35</td>
</tr>
<tr>
<td>2300 mm and up</td>
<td>1.35</td>
<td>1.04</td>
<td>1.65</td>
</tr>
</tbody>
</table>

* 38 x 38 x 3 mm angle reinforcing located mid-way between joints around entire duct or joints made on 610 mm centres.
2.1.4 Acoustical Liner
   .1 Ducts are to be increased in size by thickness of insulation to maintain inside dimensions as per indicated duct sizes.

2.2 Sealed Ductwork
   2.2.1 Sealants used on duct systems shall have a flame spread rating of not more than 25 and a smoke developed classification of not more than 50, or as per latest building code requirements. Sealant shall be ULC approved as manufactured by Transcontinental or equal.

2.3 Variable Flow System Ductwork
   2.3.1 All supply air ductwork used in conjunction with variable flow damper systems or Variable Air Volume Systems (VAV) shall be treated as medium pressure ductwork (750 Pa positive pressure) to comply with SMACNA standards. All joints shall be sealed and taped with approved sealant for a leakage rate as required during duct pressure testing.

2.4 Fire Dampers
   2.4.1 Fire dampers shall be constructed to the applicable standards listed in the Quality Assurance section in Part 1 of this document. They shall be ULC listed and labelled for 1½ hour fire rating.
   2.4.2 Provide multi-blade ‘Fire Dampers for Dynamic Systems’, suitable for application in HVAC systems with velocities to 10 m/s. Maximum pressure shall be 1 kPa. Dynamic Fire Dampers shall be operated by a stainless steel closure spring and latch.
   2.4.3 Fire dampers shall be galvanized steel channel frame curtain type galvanized steel interlocking blades, minimum 22 gauge galvanized steel enclosure, and 70°C fusible link standard. Fusible links for 100°C, or 140°C shall be provided if indicated on Drawing as such.
   2.4.4 Fire damper configuration shall be low resistance type B with blades located outside of the air stream for rectangular ductwork, and type CR for round and type CO for oval ductwork.
   2.4.5 Fire damper assemblies shall have factory installed sleeves.

2.5 VAV Air Terminals With/Without Reheat Coils
   2.5.1 Factory-assembled, externally powered, variable air volume control terminal. Unit shall be complete with a damper assembly, flow sensor, externally mounted volume controller, collars for duct connection and all required features. Control box shall be clearly marked with an identification label that lists such information as

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** 38 x 38 x 3 mm angle reinforcing located midway between joints around entire duct, plus 10 mm threaded rod stay bracing at 610 mm centres or joints made on 610 mm centres plus stays.**
nominal cfm, maximum and minimum airflow limits, coil type and coil hand, where applicable

2.5.2 Unit Cabinet:
.1 Constructed of 0.8 mm galvanized steel with round or rectangular inlet collar and rectangular discharge with slip and drive connection. All primary air inlet collars shall accommodate standard flex duct sizes

.2 Unit casing shall be lined with 13 mm thick, 0.6 kilograms dual density fiberglass insulation that meets UL 181 and NFPA 90A. Insulation shall be attached to the unit casing by adhesive and weld pins.

2.5.3 The control air damper assembly shall be constructed of heavy gauge galvanized steel with solid shaft rotating in self-lubricating and wear resistant bearings. Damper shaft shall be marked on the end to indicate damper position. Damper blade shall incorporate a flexible gasket for tight airflow shutoff and operate over a full 90°.

2.5.4 Units shall have pressure-independent communicating controls, capable of maintaining required airflow set points +/-5% of the unit’s capacity at any inlet pressure up to 6-in. wg. The controllers shall be capable of resetting between factory or field-set maximum and minimum set points to satisfy the room thermostat demand.

2.5.5 Refer to division 25 for further description of controls requirements.

2.5.6 Where reheat coils are shown, they shall be mounted in a minimum 1.0 mm Galvanized steel casing with slip and drive discharge connections, and factory mounted on the base unit as shown on the equipment Drawings. Coils shall have:
.1 Aluminum fins (1.2 m/cm) bonded to the copper tubes by mechanical expansion.

.2 Number of coil rows and circuits shall be selected to provide performance as required by the plans.

.3 Up to 4 rows as shown on equipment Drawings or designed on the equipment schedule. Right or left-hand fittings with sweat connection sizes as indicated on equipment Drawings.

2.5.7 For capacity see Schedules on Drawings.

2.6 Access Duct Doors

2.6.1 Provide duct doors for low-pressure sheet metal duct up to 750 Pa static pressure. Doors shall be 24 gauge galvanized steel, double panel, and insulated along with gasketing between the door, frame, and duct. Frame shall be 24 gauge galvanized steel with 16 mm notched knock-over tabs. Insulation shall be 50 mm fibreglass batt compressed to 25 mm.

2.6.2 Provide duct doors for sheet metal duct up to 2.0 kPa static pressure. Door shall be rated for leakage no greater than 10 L/s per m² at 2.0 kPa. Doors shall be 24 gauge galvanized steel, double panel, and insulated along with gasketing between the door, frame, and duct. Frame shall be 24 gauge galvanized steel with 16 mm notched knock-over tabs. Insulation shall be 50 mm fibreglass batt compressed to 25 mm.
2.6.3 For un-insulated low-pressure sheet metal duct up to 750 Pa static pressure, ductwork access panels may be fabricated from 20 gauge galvanized steel, hinged to 20 gauge galvanized mounting frame complete with 16 mm notched knock-over tabs and gasketing between the door, frame, and duct.

2.6.4 Hinges shall be continuous aluminum piano hinge.

2.6.5 Gaskets shall be 3 mm thick by 15 mm wide closed cell neoprene gasketing between the door and frame and also between the frame and duct.

2.6.6 Latches shall be self-tightening, hand operated cam latch.

2.6.7 Duct door material shall match the duct material. Substitute aluminum or stainless steel in the above-specified doors as required.

2.6.8 Access doors shall be a minimum of 200 x 200 mm.

2.7 **Access Plenum Doors**

2.7.1 Provide walk-through access doors for access to plenums, 760 mm by 1500 mm in stainless steel. Access door shall be complete with insulation, a continuous stainless steel piano hinge, and three compression ‘L’ handles.

2.8 **Test Ports**

2.8.1 Test ports to be Air Power Equipment Co. (or Agency approved equivalent). Use Dial 1000 for flat ducts and Dial 2000 for round ducts.

2.9 **Flexible Connectors**

2.9.1 Provide pre-assembled flexible duct connections as manufactured of .66 mm steel and fabric having a density of 8 g/m² and a tensile strength of not less than 2 x 1.8 kN. "Grip-Lok" connectors shall band 75 mm metal to 150 mm fabric to 75 mm metal.

2.10 **Flexible Duct Runouts**

2.10.1 The duct shall be made of perforated dead soft aluminum and manufactured in a manner to produce a triple lock mechanical joint. The core will be factory wrapped with fibreglass insulation and covered by a flame-retardant polyethylene vapour barrier, rated at a maximum of 500 Pa and -250 Pa (negative pressure) and a maximum velocity of 20 m/s.

2.10.2 The duct shall be listed by Underwriters' Laboratories Canada as a Class 1 Air Duct Connector and complying with NFPA Standards 90A and 90B. The duct must be approved by the Consultant, CSA and the Ontario Fire Marshal's Office.

2.10.3 Provide galvanized iron, rounded edged, hose clamps. Hangers shall be plastic coated iron bands.

2.11 **Louvres**

2.11.1 Louvres shall be Stationary Louver 152 mm deep extruded aluminum construction, minimum thickness 3.2 mm complete with aluminum bird screen, aluminum sub-sill and standard baked
enamel finish of colour selected by the Architect from the manufacturer extended range of colours.

2.11.2 Louvres shall have a pressure drop no greater than 25 Pa at 2.0 m/s exhaust and 2.5 m/s intake average face velocity.

2.11.3 Acoustical Louvres shall be 150 mm deep, aluminium construction, complete with bird-screen and standard baked enamel finish of colour selected by the Architect from the manufacturer extended range of colours.

2.11.4 Acoustical louvres shall provide the following attenuation (dB/Hz): 6/63; 7/125; 8/250; 8/500; 15/1000; 16/2000; 14/4000; 14/8000.

2.11.5 Acoustical louvres shall provide a pressure drop no greater than 25 Pa at 1.25 m/s and no greater than 100 Pa at 2.5 m/s average face velocity.

2.11.6 Sizes of louvres are shown on Drawings. Frames shall suit building construction.

2.12 **Grilles, Registers, and Diffusers**

2.12.1 Provide all grilles, registers, and diffusers complete with accessories as detailed on the Drawings.

2.12.2 For T-Bar lay-in ceilings the grilles, registers, and diffusers shall lay into T-Bar system and no flange shall extend beyond flange of T-Bar.

2.12.3 Check architectural details; verify size of units and flanging requirements prior to ordering any units.

2.12.4 Where diffusers are supplied individually with splitter take-off, an equalizing grid is required. All other diffusers require equalizing grids and combination balancing take-off units.

2.12.5 On aluminum ductwork systems, aluminum diffusers, grilles, registers, fasteners and dampers shall be used.

2.12.6 The Contractor is cautioned that before ordering of any units architectural details should be checked for verification of size of unit and flanging arrangement required.

2.13 **Silencers**

2.13.1 General Requirements:

.1 Silencers shall be of the size, configuration, capacity and acoustic performance as scheduled on the drawings. All silencers shall be factory fabricated and supplied by the same manufacturer.

.2 Transitions on inlet and outlet will not be accepted. Silencers shall fit the ducting system they are installed in without requiring duct fittings/transitions. Silencer inlet and outlet must match duct dimensions. See contract documents for silencer configuration. Non-basis of design suppliers must submit details of internal geometry of silencers to be supplied.

.3 Silencer inlet and outlet connection dimensions must be equal to the duct sizes shown on the drawings. Duct transitions at silencers are not permitted unless shown on the contract drawings.
.4 Silencers shall be constructed in accordance with ASHRAE and SMACNA standards for the pressure and velocity classification specified for the air distribution system in which it is installed. Material gauges noted in other sections are minimums. Material gauges shall be increased as required for the system pressure and velocity classification. The silencers shall not fail structurally when subjected to a differential air pressure of 8 inches water gauge.

.5 All casing seams and joints shall be lock-formed and sealed or stitch welded and sealed except as noted in Section G below, to provide leakage-resistant construction. Airtight construction shall be achieved by use of a duct-sealing compound supplied and installed by the contractor at the jobsite.

.6 All perforated steel shall be adequately stiffened to insure flatness and form.

.7 Fire-Performance Characteristics: Silencer assemblies, sealants, and acoustical spacer, shall have flame-spread index not exceeding 25 and smoke-developed index not exceeding 50 when tested according to ASTM E 84, NFPA 255 or UL 723.


2.13.3 Principal Sound-Absorbing Mechanism:

.1 Dissipative silencers:

.1 Models RD: type with acoustic media. Media shall be of acoustic quality, shot-free glass fiber insulation with long, resilient fibers bonded with a thermosetting resin. Glass fiber density and compression shall be as required to insure conformance with laboratory test data. Glass fiber shall be packed with a minimum of 15% compression during silencer assembly. Media shall be resilient such that it will not crumble or break, and conform to irregular surfaces. Media shall not cause or accelerate corrosion of aluminum or steel. Mineral wool will not be permitted as a substitute for glass fiber.

2.13.4 HTL Casings: Where indicated on the silencer schedule, silencers shall have high transmission loss (HTL) walls externally applied and completely sealed to the silencer casing by the silencer manufacturer to assure quality controlled transmission loss. The HTL walls shall consist of media, airspace, mass and outer protective metal skin, as required, to obtain the specified room noise criteria. Standard acoustical panels will not be accepted as HTL walls. If requested by the Engineer, break-out noise
calculations for each air handling and fan system shall be provided with the silencer submittal to insure compliance with the room noise criteria. Break-out noise calculations shall be based on the sound power levels of the specified equipment.

3. **EXECUTION**

3.1 **General Duct Installation**

3.1.1 The Contractor shall furnish all labour and incidental materials and perform all the operations for the installation of the ventilating systems as shown on the Drawings or as specified.

3.1.2 All ducts shall be located in co-operation with the Work to clear lights, pipes, plumbing, etc. In cases where cross beams, pipes, etc., must pass through ducts, air foils must be installed.

3.1.3 In general, all ducts shall be constructed so that they may be dismantled and cleaned. All visible internal portions of duct outlets behind grilles and registers shall be painted dull black.

3.2 **General Ductwork Construction**

3.2.1 Duct up to 600 mm in either dimension shall have reinforcing ribs, spaced not more than 2400 mm apart.

3.2.2 Ducts over 600 mm in either dimension shall have reinforcing ribs, spaced not more than 1200 mm apart. Ducts shall have supplemental stiffening as required to prevent drumming and provide a structurally sound assembly.

3.2.3 All sides of ducts over 450 mm in either dimension, except those to which rigid board type insulation is to be applied, shall have all sides cross-broken, except area of the duct where outlets are to be installed.

3.3 **Change In Shape or Dimension**

3.3.1 Slope requirements for transformations that either increase or decrease duct area to a minimum of 1:7.

3.3.2 The angle of transformation at connections to heaters or other equipment shall not exceed 30 degrees from a line parallel to the airflow on the approaching side of the equipment, and 45 degrees on the leaving side of the equipment. The angle of approach may be increased to meet space conditions when the transformation section is provided with vanes.

3.4 **Changes in Direction**

3.4.1 In general, changes in direction and in shape shall be kept to the minimum, permitted only by distribution requirements and building conditions. Turns shall be made with elbows as conditions necessitate in the following order of preference on all supply, return and exhaust ductwork.

1. Un-vaned elbow, throat radius full-width of duct and full heel radius.
2. Un-vaned elbow, throat radius ¾-width of duct and full heel radius.
Square elbow with double thickness turning vanes spaced at 40 mm centres up to 600 m duct and 80 mm centres over 600 mm. Duct turning vanes are acceptable.

3.5 **Obstruction and Restrictions**

3.5.1 Where possible, avoid locating any pipe, electrical conduit, structural member, or other obstructions inside the duct. Particular care should be taken to avoid obstruction in elbows and tees as the air pressure drop is much greater than in straight ducts. When obstructions cannot be avoided, the following rules shall apply.

3.5.2 In straight duct, any pipe or other round obstructions more than 100 mm in diameter shall be encased in an easement. In small ducts, all pipe or round obstructions shall be covered with an easement if it blocks more than 20 percent of the duct area.

3.5.3 Any flat or irregular shape, the width of which exceeds 75 mm or 10 percent of the duct area shall be encased in an easement. Hangers or stays through the duct shall be caulked tight and installed parallel to air flow.

3.5.4 When an obstruction equals or exceeds 20 percent of the duct area, the duct shall either be transformed, or split into two sections so the original duct area is maintained. When the duct is transformed to accommodate an obstruction, the angle of transformation approaching the decreasing area section shall not exceed 1 in 4 and the slope of the increasing section shall not exceed 1 in 7.

3.5.5 An obstruction which restricts only a corner of the duct shall be treated by transforming the ducts provided the reduction does not exceed 20 percent of the original area. The slope of the decreasing section shall not exceed 1 in 4 and the slope of the increasing section shall not exceed 1 in 7.

3.6 **Holes in Ducts**

3.6.1 Provide in duct systems, holes required for the installation of pipes, hangers, conduits, etc. where these are permitted to pass through ducts as only approved and authorized on site by the Consultant. Holes are to be cut to the diameter and in locations as approved. After pipe has been installed, hole shall be caulked to close any space left between edge of hole and pipe surface.

3.7 **Seams**

3.7.1 Sections shall be assembled with Pittsburgh lock or grooved longitudinal seams, fully closed for tightness and appearance.

3.8 **Joints and Reinforcement**

3.8.1 Duct sections shall be jointed by flat or standing S-cleats which shall conform to following general requirements.

3.8.2 Ducts up to 450 mm in width shall have flat S-cleats on top and bottom and drive cleats on sides.

3.8.3 Ducts over 450 mm width shall have standing S-cleats on top and bottom and drive cleats on sides.
3.8.4 Where length of drive cleat exceeds 600 mm, a standing S-cleat or standing T-cleat shall be used and corners taped for tightness.

3.9 **Supporting of Ducts**

3.9.1 All ducts shall be adequately supported. For ducts up to 450 mm in width, hangers shall be placed on not more than 2400 mm centres; ducts 483 mm and above in width on not more than 1200 mm centres. Hangers shall be placed plumb and present a neat appearance.

3.9.2 Hangers on ducts up to 900 mm in width shall be constructed from galvanized band iron 32 mm x 3 mm. On ducts greater than 900 mm in width, hangers shall be constructed from galvanized iron angles not less than 32 mm x 32 mm x 3 mm. Hangers shall extend down the sides of the ducts to bottom of duct with angle bent around bottom for support. Fasten to duct with sheet metal screws on sides and bottom. Hangers on ducts to be of same material as ductwork.

3.9.3 Hanger bands shall extend the full depth of duct with bottom of hanger being toed-in under duct. Hangers shall be attached to the duct using not less than three rivets or sheet metal screws.

3.9.4 On reinforced concrete, all hangers for ductwork shall then be fastened to the concrete by Ram-Set studs or expansion shields and lag bolts.

3.9.5 Ducts cannot be supported from the furring or ceiling construction.

3.9.6 The use of perforated band iron for supporting of ducts will not be permitted unless the Contractor receives prior approval by the Consultant.

3.10 **Sealed Ductwork**

3.10.1 Sealants used on duct systems shall have a flame spread rating of not more than 25 and a smoke development classification of not more than 50 or as per latest Building Code requirements. As manufactured by Transcontinental or an Agency approved, multi-purpose sealant, ULC-approved, equivalent.

3.11 **Watertight Duct**

3.11.1 Provide watertight ductwork at minimum 1.0 mm or as required to suit larger duct sizes for show exhaust and fresh air intake.

3.11.2 Form bottom of duct without longitudinal seams. Weld joints of bottom sheets and sides. Weld transverse joints and caulk.

3.11.3 Slope horizontal branch ductwork down towards hood served. Slope header ducts down toward risers.

3.11.4 All ductwork, grilles, fasteners, etc. handling wet air exhaust from showers, washrooms, etc. shall be aluminum from grille to a point 3 m downstream.

3.12 **Special Bracket**

3.12.1 Where the method of support specified above is not applicable, vertical risers and other duct runs shall, in general, be supported by substantial angle brackets designed to meet field conditions.
3.13 Reinforcing of Sheet Metal – General
3.13.1 All ductwork 300 mm and over in either dimension to be cross broken except those to which internal rigid board insulation is applied. Where drive cleat is used top and bottom corners to be caulked before cleat is turned over to make duct air tight.
3.13.2 All other joints to be caulked at all corners before and after joint is made to make duct completely air tight.
3.13.3 All standing S-cleats referred to are to be machine made for purposes of extra reinforcing.
3.13.4 All longitudinal seams are to be Pittsburgh lock seam hammered over and made air tight.
3.13.5 Where a duct falls into a certain maximum duct size classification the entire duct, sides to and bottom, is to be of the gauge specified.
3.13.6 Sheet metal screws to be used on sides of ducts where standing S-cleat is used or reinforcing angle on 300 mm centres or minimum two screws per side.

3.14 Baffles
3.14.1 Baffles shall be installed in all mixing chambers to prevent stratification and as required.

3.15 Test Holes in Ductwork
3.15.1 Where necessary to provide opening in the ductwork for the insertion of the Pitot tube, there shall be provided at each of these locations a metal cap to close this hole. Test holes and caps are to be located in 150 mm grids as required by the TAB company.

3.16 Sheet Metal Installation
3.16.1 All necessary allowances and provisions shall be made in the installation of the ducts for the structural conditions of the building, and other Work and ducts shall be transformed or divided as may be required. Wherever this is necessary, the required area shall be maintained. All of these changes, however, must be approved and installed as directed at the site, or as approved on shop or erection Drawings.
3.16.2 During installation, the open ends of ducts shall be protected to prevent debris and dirt from entering. The Contractor shall install this Work in accordance with the overall approved progress schedule and in co-operation with all other Work so there will be no delay to the Work.

3.17 Ducts at Masonry
3.17.1 Where ducts are shown connecting to or terminating at masonry openings, and/or along the edges of all plenums at floors, walls, or ceilings, provide a continuous 38 mm x 38 mm x 6 mm galvanized angle iron which shall be bolted to the construction and made air tight to same by applying approved caulking compound on the angle before they are drawn down tight. The sheet metal at these locations shall be bolted to the continuous angle iron.
3.18 **Ducts Through Floor**

3.18.1 Where vertical ducts pass through floor openings, supporting angles shall be rigidly attached to ducts and to the structure. Angles shall be of approved size to support the ductwork. The supporting angles for any duct whose dimension is not greater than 900 mm in any one dimension shall be not less than 32 mm x 32 mm x 3 mm and placed on at least two sides of the duct.

3.18.2 The supporting angles for any duct whose dimensions is greater than 900 mm in any one dimension shall be not less than 38 mm x 38 mm x 5 mm. Where ducts are installed in large shafts, these ducts shall be provided with angles not less than 50 mm x 50 mm x 6 mm and sound packing as specified to general conditions and seal entire sleeve areas to Consultant's approval.

3.19 **Access Duct Doors**

3.19.1 Install duct doors to access fire or other dampers, for service and inspection, and for cleanouts where required on specialty systems.

3.20 **Access Plenum Doors**

3.20.1 Install plenum doors to access plenums.

3.21 **Weather Louvres**

3.21.1 Install louvres weatherproof, of sizes shown on the Drawings.

3.22 **Flexible Fan Connections**

3.22.1 Install Duro Dyne Grip-Lock Durolon duct connectors (or Agency approved equivalent) to suit system pressure between ductwork and all fan equipment on both sides to isolate all fan equipment.

3.23 **Flexible Duct Runouts**

3.23.1 Provide flexible hose run-outs where shown on plans

3.23.2 The tube must maintain an even diameter when fixed. The ends of the spiral tube and seamed ducts are to be fitted with a coupling to provide smooth surfaces for the fitting of the flexible tube, and this shall be made air tight with an approved sealing compound, the material surface having been previously cleaned with thinners. Provide a rigid elbow at each diffuser for a 90 degree turn.

3.23.3 Sizes shall be as shown on the Drawings, or if not shown, the neck size of the diffuser. Minimum length of run-outs shall be 600 mm; maximum length shall be 2 m. All flexible run-outs to diffusers shall be installed level taut.

3.23.4 Provide sealing of joints complete with galvanized iron hose clamps with sealer and tape. Hangers shall be plastic coated iron bands or plastic hangers.

3.24 **Fans**

3.24.1 Install exhaust fans where indicated.

3.24.2 Make all duct connections to fans with flexible connectors.

3.24.3 Level units while fans are in operation and align ductwork providing clearance in proportion to flexible duct connector length
ensuring that misalignment of ductwork when fan is not in operation does not strain or damage the connector.

3.25 **Fan Fire Protection**
3.25.1 Install fire stats to manufacturer's recommendation for all fans shown on plans, noted in Specification or as outlined in wiring for mechanical equipment schedule of electrical plans.

3.26 **Location of Outlets**
3.26.1 The position of all outlets shown on the Drawings are approximate only and the Contractor shall check the location of all outlets with the Consultant and make such adjustments in position as are necessary to conform with architectural features acoustic tile pattern, etc. and the outlets required by other Work without extra charge. Ceiling outlets and their assemblies must be constructed so that they fit the spacing and construction of the removable acoustic ceiling.

3.27 **Grilles, Registers, and Diffusers**
3.27.1 Install all grilles, registers, and diffusers as detailed on the Drawings and in strict compliance with manufacturer's recommendations.

3.28 **Outside Openings**
3.28.1 Provide all necessary ductwork and plenums for intakes and exhausts and patch around same to make a weather-tight job. Co-operate on exact location of these openings, ducts, and louvres serving the air systems. Supply and install 14 gauge louvre blank-offs for blanking off any unused portion of louvres.

3.29 **Noise Level Requirements**
3.29.1 The Testing and Balancing company shall measure the sound level in each room.

3.30 **Fire Dampers**
3.30.1 Install dampers at locations indicated on the Drawings and in accordance with manufacturer's UL approved installation instructions.
3.30.2 Generally where any duct or any outlet passes through any required fire wall or fire rated ceiling the duct shall be provided with the Fire Marshall's approved automatic fire dampers built into the wall complete with approved break away joints. Dampers must be supported from the structure and not from the ducts or grilles.
3.30.3 In addition, install in all systems where ducts service two or more stories, at each floor level Fire Marshall approved dampers, leaf dampers, fitted with fusible links of a Fire Marshall approved temperature rating to close air tight on linkage failure. Provide access to dampers for linkage replacement.
3.30.4 Install dampers square and free from racking with blades running horizontally.
3.30.5 Do not compress or stretch damper frame into duct or opening.
3.30.6 Handle damper using sleeve or frame. Do not lift damper using blades or jackshaft.

3.30.7 Install bracing for multiple section assemblies to support assembly weight and to hold against system pressure. Install bracing as needed.

3.30.8 The complete fire damper installation is to meet approval of all authorities having jurisdiction. All fire damper locations must be shown on Record Drawings.

3.31 **VAV/Bypass Air Terminals**

3.31.1 Install boxes and reheat coils as indicated on floor plans complete with all ductwork and transition as required.

3.31.2 Where the boxes are mounted flush to the underside of the floor slab, they shall have rubber isolation pads installed between the slab and the mounted lugs. All boxes must be supported from structure not ceiling system.

3.31.3 Easy access shall be provided to the internal mechanical constant pressure regulator. The interior of the box shall be acoustically insulated.

3.31.4 Provide control wiring for the standalone controller as required.

3.31.5 For VAV terminal boxes that are to be controlled by Division 25, coordinate with controls trade on requirements.

3.32 **Sleeves**

3.32.1 Where the branch take off goes through the floor or wall construction, there shall be placed around the take off, a sleeve which shall be large enough in diameter that the air conduit with insulation can expand and contract without restriction.

3.32.2 All openings for duct shall be thoroughly sealed with caulking where the high velocity risers pass through. The Contractor shall pack insulation around the duct to eliminate circulation stack effect of the air as specified under General Conditions.

3.33 **Silencers**

3.33.1 Install silencer according to manufacturer’s written installation instructions.

**END OF SECTION**
1. **GENERAL**

1.1 **Related Sections**
1.1.1 Section 22 05 00 – Common Work Results for Plumbing
1.1.2 Section 22 07 00 – Plumbing Insulation
1.1.3 Section 23 70 00 – Central HVAC Equipment
1.1.4 Division 26 – Electrical

1.2 **Description of Systems**
1.2.1 Provide prefabricated stacks and venting systems for the following equipment:
   – Air Handling Equipment

1.3 **Reference standards**
1.3.1 CAN/CSA-B149.1, Natural Gas and Propane Installation Code
1.3.2 CSA-B139ON, Ontario Installation Code for Oil-Burning Equipment
1.3.3 ULC-S636, Standard for Type BH Gas Venting Systems
1.3.4 CAN/ULC-S605, Standard for Gas Vents
1.3.5 Technical Standards and Safety Act, 2000; O.Reg. 213/01 Fuel Oil
1.3.6 NFPA 211, Standard for Chimneys, Fireplaces, Vents, and Solid Burning Fuel Appliances

1.4 **Submittals**
1.4.1 Provide shop drawings for prefabricated stacks and venting systems.

2. **PRODUCTS**

2.1 **Prefabricated Stacks/vents, High Temperature**
2.1.1 Provide double wall, Type BH gas venting system suitable for Category I, II, III, IV gas-fired appliances having a rated operating flue temperature of 290°C. The system shall preclude the need for in-the-field cutting.
2.1.2 Inner conduit material shall be AL29-4C superferritic stainless steel to Test and List ULC-S636.
2.1.3 Outer jacket shall be 430 stainless steel.
2.1.4 Prefabricated venting shall be complete with a 15-year product warranty.
2.1.5 As applicable, the vents or stacks shall include a draft hood connector, roof- or wall-thimble, tall cone flashing, starter "T" complete with cleanout, firestop spacers, adjustable roof flashing, storm collar, and/or bird proof belmont top.
2.1.6 Materials shall be ULC-approved for gas-fired units on the project and must comply with all applicable codes and authorities having jurisdiction.
3. **EXECUTION**

3.1 **Breeching, Prefabricated Stacks, and Venting Systems**

3.1.1 Install all breeching, stacks, and vents in accordance with manufacturers’ installation instructions and all applicable codes. Connect to gas-fired appliances’ outlets. Seal all breeching, stack, and vents as required.

3.1.2 Provide all modular straight sections, fittings, supports, guides, expansion joints, guy sections, guy tensioners, roof thimbles, roof flashings, storm collars, and stack cap terminations as required to provide a complete system.

3.1.3 The vertical stack termination shall be no less than 610 mm above any portion of the building within 3 m of the stack penetration. Vent heights shall satisfy all code requirements.

3.1.4 Roof penetrations shall be suitable for the specified roof construction and shall comply with the manufacturers’ installation instructions.

END OF SECTION
1. **GENERAL**

1.1 **Related Sections**

1.1.1 Section 23 05 00 – Common Work Results for HVAC
1.1.2 Section 23 07 00 – HVAC Insulation
1.1.3 Section 23 20 00 – HVAC Piping and Pumps
1.1.4 Section 23 30 00 – HVAC Air Distribution
1.1.5 Division 26 – Electrical

1.2 **Description**

1.2.1 The Work of this Section shall include the furnishing of all labour, materials, equipment, and services required for the complete installation, testing and operation of the equipment as indicated on the Drawings, or hereinafter specified.

1.3 **Reference Standards**

1.3.1 *Technical Standards and Safety Act, 2000 and amendments*
1.3.2 CSA-B52-05 Mechanical Refrigeration Code
1.3.4 Canadian Pressure Vessels Regulations (CRN)
1.3.5 AHRI, ASME and ASHRAE Standards specified for ratings and performance tests.
1.3.6 CSA, ULC and governing electrical Codes
1.3.7 Requirements of local and provincial authorities

1.4 **Quality Assurance**

1.4.1 Use welders qualified and licensed by the TSSA.
1.4.2 Provide authorized equipment inspection prior to shipment and submit one copy of inspection report to the Consultant.
1.4.3 The refrigeration manufacturer shall be regularly engaged in production of the specified equipment.
1.4.4 The manufacturer shall also be one who issues catalogue information with correction factors where published ratings are based on parameters different from those specified.
1.4.5 Factory leak test air-cooled condenser and evaporator coils in accordance with above referenced agencies.

1.5 **Maintenance Data**

1.5.1 Provide maintenance data for incorporation in operation and maintenance manuals. Include exploded views of components.

1.6 **Delivery and Storage**

1.6.1 Ship equipment factory dehydrated and sealed with a full charge of refrigerant and lubricating oil.
1.6.2 Store equipment in protected area.
1.7 **Performance Criteria**

1.7.1 The following are to be used as selection criteria and are to be as specified: Air flow rates, external static pressures, water flow rates. The following are to be equalled or bettered: Coil face velocities, filter face velocities, casing leakage rates, fluid flow rates, fluid pressure drops, and brake horsepower.

1.8 **Certification**

1.8.1 Coils shall be certified in accordance with AHRI Standard 410 and bear the AHRI label. Coils exceeding the scope of the manufacturer’s certification and/or the range of AHRI’s standard rating conditions will be considered provided the manufacturer is a current member of the AHRI Forced Circulation Air-Cooling and Air-Heating Coils certification programs and that the coils have been rated in accordance with AHRI Standard 410.

1.9 **Warranty**

1.9.1 Replace all refrigerant lost from system(s) due to leaks for an additional one year after normal one-year warranty period.

1.9.2 Warrant refrigeration compressors and compressor motors with five years non-pro-rated for material and labour. Material shall be by equipment manufacturer and labour shall be by The Contractor.

1.10 **Shop Drawings**

1.10.1 Submit Shop Drawings for the following:

1. Custom air-handling units
2. ERV’s
3. Condensing Units
4. DX Air-cooled condensing units
5. Exhaust Fans

2. **PRODUCTS**

2.1 **Exhaust Fans**

2.1.1 Provide factory assembled exhaust fan in accordance with the exhaust fan schedule.

2.1.2 All units shall be made available for inspection by the Agency at the Agency’s request.

2.1.3 The exhaust fan shall allow manual override.

2.1.4 Contractor of this trade is responsible to provide all auxiliary equipment and devices that allow the exhaust fan to operate as intended.
2.2 **ERV-1:**

2.2.1 Configuration: Fabricate as detailed on Drawings.

2.2.2 Performance: Conform to AHRI 430. See schedules on prints.

2.2.3 Acoustics: Sound power levels (dB) for the unit shall not exceed the specified levels shown on the unit schedule. The manufacturer shall provide the necessary sound treatment to meet these levels if required.

2.2.4 Unit Construction

.1 Fabricate unit with heavy gauge channel posts and panels secured with mechanical fasteners. All panels, access doors, and ship sections shall be sealed with permanently applied bulb-type gasket. Shipped loose gasketing is not allowed.

.2 Panels and access doors shall be constructed as a 2-inch nominal thick; thermal broke double wall assembly, injected with foam insulation with an R-value of not less than R-13.

.1 The inner liner shall be constructed of G90 galvanized steel.

.2 The outer panel shall be constructed of G90 galvanized steel.

.3 The floor plate shall be constructed as specified for the inner liner.

.4 Unit will be furnished with solid inner liners.

.3 Panel deflection shall not exceed L/240 ratio at 125% of design static pressure, maximum 5 inches of positive or 6 inches of negative static pressure. Deflection shall be measured at the panel midpoint.

.4 The casing leakage rate shall not exceed 0.50 cfm per square foot of casing surface area at design static pressure up to a maximum of +5" w.c. in positive pressure sections and -6" w.c. in negative pressure sections (.0025 m³/s per square meter of cabinet area at 1.24 kPa static pressure)

.5 Module to module field assembly shall be accomplished with an overlapping, full perimeter internal splice joint that is sealed with bulb type gasketing on both mating modules to minimize on-site labor and meet indoor air quality standards.

.6 Access doors shall be flush mounted to cabinetry, with minimum of two six-inch-long stainless steel piano-type hinges, latch and full size handle assembly. Access doors shall swing outward for unit sections under negative pressure. Access doors on positive pressure sections, shall have a secondary latch to relieve pressure and prevent injury upon access.

.7 A 4-inch formed G60 galvanized steel base rail shall be provided by the unit manufacturer for structural rigidity and condensate trapping. The base rail shall be constructed with 12-gauge nominal for unit sizes.
2.2.5 Fan Assemblies
.1 Acceptable fan assembly shall be a double width, double inlet, class II, belt-drive type housed forward curved fan dynamically balanced as an assembly, as shown in schedule. Maximum fan RPM shall be below first critical fan speed. Fan assemblies shall be dynamically balanced by the manufacturer on all three planes and at all bearing supports. Copper lubrication lines shall be provided and extend from the bearings and attached with grease fittings to the fan base assembly near access door. If not supplied at the factory, Contractor shall mount copper lube lines in the field. Fan and motor shall be mounted internally on a steel base. Provide access to motor, drive, and bearings through hinged access door.
.2 Fan and motor shall be mounted internally on a steel base. Factory-mount motor on slide base that can be slid out the side of the unit if removal is required. Provide access to motor, drive, and bearings through hinged access door. Fan and motor assembly shall be mounted on rubber-in-shear vibration type isolators inside cabinetry.

2.2.6 Bearings, Shafts, and Drives
.1 Bearings: Basic load rating computed in accordance with AFBMA - ANSI Standards. The bearings shall be designed for service with an L-50 life of 200,000 hours and shall be a heavy-duty pillow block, self-aligning, grease-lubricated ball or spherical roller bearing type.
.2 Shafts shall be solid, hot rolled steel, ground and polished, keyed to shaft, and protectively coated with lubricating oil. Hollow shafts are not acceptable.
.3 V-Belt drives shall be cast iron or steel sheaves, dynamically balanced, bored to fit shafts and keyed. Fixed sheaves, matched belts, and drive rated based on motor horsepower. Minimum of 2 belts shall be provided on all fans with 10 HP motors and above. Standard drive service factor minimum shall be 1.1 S.F. for 1/4 HP – 7.5 HP, 1.3 S.F. for 10 HP and larger, calculated based on fan brake horsepower.

2.2.7 Electrical
.1 Fan motors shall be manufacturer provided and installed, Open Drip Proof, premium efficiency (meets or exceeds EPAct requirements), 1750 RPM, single speed, 230V / 60HZ / 3P. Complete electrical characteristics for each fan motor shall be as shown in schedule.
.2 The air handler(s) shall be ETL and ETL-Canada listed by Intertek Testing Services, Inc. Units shall conform to bi-national standard ANSI/UL Standard 1995/CSA Standard C22.2 No. 236.
.3 Wiring Termination: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclosed terminal lugs in terminal box sized to NFPA 70.
4. Manufacturer shall provide ASHRAE 90.1 Energy Efficiency equation details for individual equipment to assist Building Engineer for calculating system compliance.

5. Installing Contractor shall provide GFI receptacle within 25 feet of unit to satisfy National Electrical Code requirements.

6. Supply one 575V/60Hz/3Ph power connection for fan motors and electrical preheat coil.

2.2.8 Cooling and Heating Coils

1. Certification: Acceptable water cooling, water heating, steam, and refrigerant coils shall be certified in accordance with AHRI Standard 410 and bear the AHRI label. Coils exceeding the scope of the manufacturer’s certification and/or the range of AHRI’s standard rating conditions will be considered provided the manufacturer is a current member of the AHRI Forced Circulation Air-Cooling and Air-Heating Coils certification programs and that the coils have been rated in accordance with AHRI Standard 410. Manufacturer must be ISO 9002 certified.

2. Water heating coil shall be provided. Provide access to coil(s) for service and cleaning. Enclose coil headers and return bends fully within unit casing. Unit shall be provided with coil connections that extend a minimum of 5” beyond unit casing for ease of installation. Drain and vent connections shall be provided exterior to unit casing. Coil connections must be factory sealed with grommets on interior and exterior panel liners to minimize air leakage and condensation inside panel assembly. If not factory packaged, Contractor must supply all coil connection grommets and sleeves. Coils shall be removable through side and/or top panels of unit without the need to remove and disassemble the entire section from the unit.

1. Headers shall consist of seamless copper tubing to assure compatibility with primary surface. Headers to have intruded tube holes to provide maximum brazing surface for tube to header joint, strength, and inherent flexibility. Header diameter should vary with fluid flow requirements.

2. Fins shall have a minimum thickness of 0.0075-inch aluminum plate construction. Fins shall have full drawn collars to provide a continuous surface cover over the entire tube for maximum heat transfer. Tubes shall be mechanically expanded into the fins to provide a continuous primary to secondary compression bond over the entire finned length for maximum heat transfer rates. Bare copper tubes shall not be visible between fins.

3. Coil tubes shall be 5/8-inch OD seamless copper, 0.020-inch nominal tube wall thickness, expanded into fins, brazed at joints.
.4 Coil connections shall be carbon steel, threaded connection. Connection size to be determined by manufacturer based upon the most efficient coil circuiting. Vent and drain fittings shall be furnished on the connections, exterior to the air handler. Vent connections provided at the highest point to assure proper venting. Drain connections shall be provided at the lowest point to ensure complete drainage and prevent freeze-up.

.5 Coil shall be furnished as an uncased galvanized steel to allow for thermal movement and slide into a pitched track for fluid drainage.

.3 Direct expansion refrigerant cooling coil shall be provided. Provide access to coil(s) for service and cleaning. Enclose coil headers and return bends fully within unit casing. Unit shall be provided with coil connections that extend a minimum of 3” beyond unit casing for ease of installation. Coil connections must be factory sealed with grommets on interior and exterior panel liners to minimize air leakage and condensation inside panel assembly. If not factory packaged, Contractor must supply all coil connection grommets and sleeves. Coils shall be removable through side and/or top panels of unit without the need to remove and disassemble the entire section from the unit.

.1 Sweat type copper suction headers shall be provided.

.2 Fins shall have a minimum thickness of 0.0075-inch aluminum plate construction. Fins shall have full drawn collars to provide a continuous surface cover over the entire tube for maximum heat transfer. Tubes shall be mechanically expanded into the fins to provide a continuous primary to secondary compression bond over the entire finned length for maximum heat transfer rates. Bare copper tubes shall not be visible between fins.

.3 Coil tubes shall be 5/8-inch OD seamless copper, 0.020 inch nominal tube wall thickness, expanded into fins on 1 1/2-inch centers, brazed at joints.

.4 Sweat type copper suction connections located at the bottom of the suction headers for gravity oil drainage. Coils shall be uniformly circuited in a counterflow manner for either single circuit, row, face, interlaced, or interlaced face split capacity reduction as shown on unit schedule. Pressure type liquid distributors used. Coils shall be tested with 315 pounds air pressure under warm water, and suitable for 250 psig working pressure.

.5 Coil casing shall be a formed channel frame of galvanized steel.

2.2.9 Filters
.1 Furnish flat panel filter sections with 2-inch pleated MERV 8 filter. Provide side loading and removal of filters.

.2 Furnish flat filter in mixing box section with 2-inch pleated MERV 8 filter. Provide side loading and removal of filters.

.3 Filter media shall be UL 900 listed, Class I or Class II.

2.2.10 Preheat: Provide preheat to provide frost control for the ERV wheel.

2.2.11 Safeties and Limits

.1 A low temperature limit is hardwired to shut down the unit (supply and exhaust fans), close the dampers (fresh and exhaust air) and open the heating valve when the sensed temperature drops below 2 Deg C. A 5-minute time delay is provided on start-up to bypass the limit and allow time for the heating system to come under control. Once the timer has expired the unit will trip if it detects an air temperature of less than 2 Deg C. Once tripped the limit must be reset manually. Provide a reset button on the control panel. Protection will work when the fan is in either ‘hand’ or ‘auto’.

.2 The dampers are hardwired to their respective starters. Dampers must prove open (end switch) for their fan to run. Damper interlock will also work if the fan is run in ‘hand’.

.3 Supply air temperature control is disabled until fan run status is received.

.4 Simultaneous heating and cooling are not permitted.

.5 When the heating plant is seasonally disabled the heating valve will go to its relaxed (fully open) state (if applicable).

2.2.12 Controls:

.1 A controller shall be supplied with the ERV to provide standalone controls as further described in Division 25.

2.3 Condenser Unit

2.3.1 Condensing unit base is formed 10 gauge galvanized steel, type G90.

2.3.2 Condenser Fan Section on condensing units are provided with deep punched fan orifice 1” high for minimum noise and maximum fan efficiency.

2.3.3 Condensing Unit Casings for up to 22 horse power are heavy gauge pre-painted (white) with punched louvers. Casings are hinged for full access to all components.

2.3.4 Coils are manufactured using seamless deoxidized heavy wall smooth copper tubes, mechanically expanded in self spaced full collared aluminium corrugated plate fins for permanent bond and maximum heat transfer. Connections and bends are brazed with high temperature brazing alloy. Coils are factory leak tested at 400 psig and purged using dry air (-40deg F dew point). All condenser coils are provided with a sub cooling circuit.

2.3.5 Fan Guards and Motor Mounts for condensing unit models are spot welded wire construction with baked on powder epoxy coating.
2.3.6 Fans blades are aluminium blade 20” diameter, 4 blade 1075 rpm, statically and dynamically balanced, riveted to steel hub.

2.3.7 Fan Motors for are 2-speed electrically commutated type, thermally protected, suitable for outdoor condenser duty.

2.3.8 Compressors are rigid mount hermetic Scroll refrigeration duty, suction cooled, thermally protected, with mineral oil for HCFC applications or polyol-ester oil for HFC applications. Compressors shall be provided with digital compressor superheat controller. Ridgid compressor sound enclosures shall be factory supplied. Compressors shall have a 5-year parts-only warranty.

2.3.9 Control Panel are formed 16 gauge galvanized steel type G90 with hinged access door. Low ambient thermostat shall be provided to prevent operation when the ambient temperature drops below an adjustable set point. Control panel must be mounted indoors in a NEMA1 cabinet by controls contractor. Any enclosures are by others.

2.3.10 Wiring to condensing unit via single point power connection. Internal wiring for fan motors, compressors and controls are wired using flexible metallic conduit with outdoor duty wire.

2.3.11 Electrical Controls are complete with control transformer compressor contactors and fan contactors, compressor time delay, adjustable LP switch and fixed high-pressure control, complete with flexible hoses and a pump down service switch. All units are wired for continuous pump down cycle.

2.3.12 Electronic expansion valves (EEVs) shall be supplied and installed by the mechanical contractor along with all refrigeration piping between condensing units and coils. EEVs MUST be compatible with the condensing unit digital controller otherwise the system will not work.

2.4 Air Handling Unit

2.4.1 General

.1 Air handling units must be seismically restrained as described under 23 05 00

.2 The air handling units must be designed to support the weight of the condensing units CU-2, CU-3, CU-4, CU-5 that are to be mounted on top of the unit. Refer to mechanical schedules on Drawings.

.3 The air handling unit supplier shall provide all required mounting brackets/devices required to achieve the above.

.4 Included in the air handling unit supply is a factory manufactured structural platform constructed from a minimum C6x8.2 lb./sq.ft. channel structural steel perimeter base, with 2x2x1/4 intermediate structural steel channel and angle iron supports.

.1 Platform shall accommodate the factory mounting of condensing units to serve the DX coils in the air handling unit tunnels, AND the VRF condensing units that are servicing an elevator machine room.

All condensing units shall be factory mounted to the
platform in the air handling unit factory and shipped to site in one piece along with the platform.

2. Platform shall ship to site separately from the air handling unit for field mounting of the platform on top of the unit in the field. Once installed, the condensing units serving air handling unit DX coils shall have power connected to single point power feeds in the field by the electrical contractor.

2.4.2 Quality Assurance:

1. Fans shall conform to AMCA bulletins regarding testing and construction. Airfoil fans shall bear the AMCA certified rating seal for airflow and sound.

2. Coils shall be ARI certified.

3. Filter media shall be ULC listed.

4. Unit shall be factory CSA approved.

2.4.3 Unit Construction

1. Walls and roofs shall be constructed of 16-gauge galvanized steel 2" thick acoustic thermal panels. The inner liner shall be 22-gauge solid galvanized steel. Insulation shall be 2" thick 4.0 lb. density mineral fiber. Provide neoprene liner to seal insulation in sections with perforated panels. All permanently joined flanged panel surfaces shall be sealed with an individual strip of 1/8" X 3/8" tape sealer. Wall seams shall be turned inward to provide a clean flush exterior finish. All panel seams shall be sealed during assembly to produce an airtight unit.

2. Unit shall have roof panels broken outward to provide a lapped joint watertight seal. Outdoor roofs shall be sloped a minimum of 5/8" away from the access side.

3. Screws and other similar fastening devices shall not penetrate the roof deck or the top of standing seems.

2.4.4 Insulation

1. All insulation used in air handling unit walls, roof and base shall have a Flame spread rating of less than 25 and a Smoke Developed rating of less than 50 per ASTM E84 and UL 723 and Can/ULC S102-M88.

2. Insulation shall meet NFPA 90A and 90B.

2.4.5 Structural Base Construction

1. Units shall be constructed from a minimum C6x8.2 lb./sq.ft. channel structural steel perimeter base, with 2x2x1/4 intermediate structural steel channel and angle iron supports. Perimeter structural steel base shall be designed to directly support the weight of the walls. Intermediate structural steel and angle iron shall support the weight of all internal components (i.e. fans, coils, enthalpy wheels, etc.). Maximum base deflection shall be ¼ inch on unsupported spans of 12 ft. Structural steel base shall be designed so that it can be point loaded or set on an unlevel surface and shimmed by the Contractor within 12-foot spans without deflecting more than ¼ inch.
The structural steel base shall be either I-beam construction or C-channel (not box channel) so that the base will shed all water. Base shall be provided with lifting lugs, minimum four (4) per shipping split. Formed metal bases formed from sheet metal will not be acceptable. Base shall prevent wall panel joints from separating during lifting, transportation and rigging.

.2 Lifting lugs shall be located and engineered to properly support the loads within. Manufacturers shall provide a load point calculation along with detailed lifting lug information as part of the Shop Drawing package.

.3 A 0.12" thick aluminum checker plate floor shall be installed on the base. Floor seams shall be continuously welded providing a completely flat unit floor. Standing seems will not be accepted in any section. A 1-1/2" perimeter collar shall be provided to ensure the unit is internally watertight. The collar shall be alternately screwed down and tack welded to the unit base on one (1) foot centers. Caulk joint to be watertight.

.4 The base shall be insulated with 3" thick, 1-1/2 lb. density fibreglass insulation and sheeted with a 22-gauge galvanized steel liner. The base liner shall be broken, tack welded and sealed for rigidity and vapour barrier integrity.

2.4.6 Access Doors

.1 Access door construction and width shall match the rest of the unit casing. Corners shall be welded for rigidity. Spot welding of corner seems will not be accepted. 4.0 lb. density insulation shall be sandwiched between the outer and inner skins. A 10" x 10" double pane tempered glass window shall be provided in each door.

.2 Provide Two chrome plated “Ventlok” Model #310 high pressure latches operable from either side of the door. Hinges shall be continuous piano type stainless steel. Door openings shall be fully gasketed with continuous 1/2" closed cell hollow round black gasket with a metal encapsulated reinforced backing that mechanically fastens to the door opening perimeter. Door frames shall be framed from 16-gauge galvanized steel with the outside of the door flush to the unit. Minimum door width shall be as shown on the plans but in no case shall an access door be less than 18". Door height shall be the maximum permitted by the height of the unit up to 72".

.3 Doors shall open against positive pressure.

2.4.7 Fans

.1 All fans shall be tested in accordance with AMCA Standards 210-70 and 310 Test Codes for Air Moving Devices. Backward inclined fans shall bear the AMCA sticker for both air and sound performance.

.2 Fan Wheels and Shafts: Provide air foil blades on all fans wheels. Provide forward curved blades where scheduled.
Provide solid shafts keyed to the fan wheel. Coat fan shaft with rust inhibitor. Hollow shafts will not be acceptable.

.3 Fan bearings shall be self aligning pillow block, grease lubricated, extra heavy-duty anti-friction ball or spherical roller type selected for an L10 life of 200,000 hours at design operating conditions. Bearings are to be mounted on the integral fan scroll bracing.

.4 Fan and motor shall be mounted on an all welded, structural steel, prime coated and internal isolation base. The outlet of the fan shall be separated from the unit casing by means of a factory installed flexible connection. The internally mounted motor shall be provided on a slide rail base to allow proper adjustment of belt tension.

.5 Provide an OSHA approved fully enclosed metal belt guard having side of galvanized steel and expanded metal face. Belt guard shall be sized to allow either sheave to be increased by two sizes.

.6 Provide fixed pitch sheaves rated at 150% of motor nameplate H.P. Allow for one (1) drive change for air balancing purposes (parts only, labour by air balancer).

.7 On air handling units with variable speed drives, mount the VSD on the unit. Factory wire between the VSD and fan motors. Ensure all casing penetrations are sealed to be airtight. Provide a terminal block within the VSD for field termination of line side wiring.

.8 Provide plenum fan inlets on the fan wall and air outlets from the casing with a smooth bellmouth fitting with radius to match casing thickness, and free of protruding structural members and flanges.

.9 Plenum fan assembly must have an enclosed safety screen as per OSHA Standards.

.10 Provide fan evases on all blow thru scrolled fans.

2.4.8 Motors

.1 Motors shall be designed for severe duty in accordance with IEEE 841 standards and shall meet NEMA MG1 Part 31. Motors shall be operable at 575 Volts, 60 Hz, 3-phase.

.2 Motor enclosure shall be totally enclosed fan cooled and rated to IP55. A non-metallic cooling fan shall be provided. Frame, end bells and fan cowl shall be manufactured of heavy duty cast iron. The end plates shall be sealed to the frame joints. Enclosure shall be epoxy coated and rated for ASTM B117-90 96-hour salt spray test.

.3 Motor windings shall have class F insulation with class B temperature rise ratings. Windings shall be 200C inverter spike resistant wire. Motor windings shall withstand 2000V transients. Motor service factor shall be 1.15 on sine wave power and 1.0 on VFD power.

.4 Bearings shall be re-greasable without disassembly and provide for the elimination of purged grease. Bearing life
shall be a minimum of L10 at 50000 hours. Bearing seals shall be Inpro or equivalent.

.5 Motors shall be balanced to less than 0.08 inches per second (filter out) and the vibration test data shall be shipped with the motor.

.6 Nameplates shall be stainless steel and contain both NEMA data and bearing data.

.7 Motors used with variable frequency drives shall be provided with a brush system to electrically ground the shaft and discharge any induced voltage on the motor shaft, with a direct path to ground.

.8 Motor shall be provided with a 3 year warranty.

.9 Acceptable motor manufacturers are Reliance-Baldor, US Motors, and TECO-Westinghouse (or Agency approved equivalent).

2.4.9 Airflow Measuring Probes

.1 Provide on each fan, air flow measuring probes.

.2 Each airflow probe shall contain multiple, averaged velocity pressure taps located symmetrically around the throat of the fan inlet and a single static pressure tap located on the fan housing. The entire airflow monitoring probe must be located outside the inlet throat as to not obstruct airflow.

.3 The probes shall be capable of producing steady, non-pulsating signal of the velocity pressure, independent of the upstream static pressure without adversely affecting the performance of the fan. The sensing probes shall be accurate ±3% of actual fan airflow. The fan inlet sensing rings shall be FreeFlo Sensing Ring as manufactured by Haakon Industries Ltd or Air Monitor Voluprobe (or Agency approved equivalent).

2.4.10 Airflow Display

.1 Provide on indicated fans a method of displaying digitally, in real time, the fans current air flow.

.2 The display shall be capable of showing the airflow of four (4) independent fans simultaneously.

.3 For interaction with a controller, the display shall output one (1) 0-10VDC signal for each fan being monitored.

.4 The output signal shall be accurate to ±0.5% of Natural Span, including non-linearity, hysteresis and non-repeatability.

.5 The display must be watertight allowing for use in outdoor locations. If the display is not watertight it shall be enclosed in a weatherproof housing.

2.4.11 Vibration Isolation

.1 An integral all weld steel vibration isolation base shall be provided for the fan and motor.

.2 Provide open spring mounts with iso stiff springs, sound deadening pads and leveling bolts.

.3 Horizontal stiffness shall be equal to vertical stiffness.

.4 Spring deflection shall be 2".
.5 Isolators shall have earthquake restraints. Restraint detail shall be certified by a professional engineer.

2.4.12 Coils

.1 Coils shall be fully enclosed within casing and mounted on angle frames manufactured to allow coils to be individually removed. Cooling coil racks shall be 12 Ga. 304 stainless steel. Heating coils shall be mounted on galvanized angle racks.

.2 Removable coil access panels shall be provided to remove coils through casing wall. Coil covers shall be double wall construction with all exposed edges of insulation covered with sheet metal including holes through the cover for coil header stub outs. Coils shall be individually removable towards the access side.

.3 All drain pans shall be double wall continuously welded 304 stainless steel. Intermediate drain pans shall be interconnected with stainless steel 1" down pipes. Condensate drain shall be a minimum 1-1/4" diameter stainless steel tube extending 1" out from unit for solder connection to trap. Drain pans shall be sloped within unit and fully drainable.

.4 Coils shall be certified in accordance with ARI Standard 410.

.5 Construction:

.3 Tubes: Horizontal, copper.

.4 Fins: Aluminum mechanically bonded to tubes.

.5 Headers: Seamless copper with vent and drain connections.

.6 Casing: 16-gauge, stainless steel channels with 16-gauge center and end supports.

.7 Connections: Same end, counterflow, with vent, drain, supply and return stubs extended to outside of unit casing with grommets for airtight casing. Roof mounted units shall have the centre of the bottom coil connections located 10" off the unit floor.

.6 All refrigerant coils shall be designed to conform to ANSI – B 9.1 Safety Code for Mechanical Refrigeration. All DX coils shall contain a holding charge of dry nitrogen when shipped from the factory.

2.4.13 Prefilters

.1 Prefilters shall be 2"-50mm Farr 30/30, medium efficiency, pleated, disposable type (or Agency approved equivalent). The filter shall be listed by Underwriters Laboratories as Class 2.

.2 Prefilters shall be installed in a prefabricated channel rack.

.3 Prefilters shall be lift out from upstream access section.
2.4.14 Final Filters

.1 Final filters shall be high performance, Farr Riga-Flo deep pleated 12" long cartridge disposable type (or Agency approved equivalent). Each filter shall consist of glass fibre media, media support grid, contour stabilizer and enclosing frame.

.2 Final filter media shall be of high density microfine glass fibers laminated to a non-woven synthetic backing to form a lofted filter blanket. The filter media shall have an average efficiency of 90-95% on the ASHRAE Test Standard 52. The filter shall be listed by Underwriters Laboratories as Class 2.

.3 Holding frames shall be factory fabricated of 16-gauge galvanized steel and shall be equipped with gaskets and 2 heavy duty positive sealing fasteners. Each fastener shall be capable of withstanding 25 lb. pressure without deflection. They will be capable of being attached or removed without the use of tools.

.4 Final filters shall be lift out from upstream access section.

2.4.15 Drains

.1 Provide 1 1/4" capped floor drain connections on the side of the unit for complete drainability of the base pan for all sections if unit has washdown line.

2.4.16 Lights

.1 Marine lights with protective cast metal cage and glass globes complete with duplex receptacles shall be installed on the wall across from the access doors. One (1) switch with an indicator light shall be installed on the exterior of the unit. Factory wire from switch to all lights in EMT conduit with liquid tight connections. At all split sections, provide a one foot long piece of flexible conduit, with the extra wire spooled, for reconnection on site by the installing Contractor. Electrical power shall be 120V/1/60.

2.4.17 Filter Gauges

.1 Provide Dwyer 2000 magnehelic gauges (or Agency approved equivalent).

.2 Magnehelic gauges shall be accurate to +/- 2% of full range.

.3 Provide sensing probes and shut off valves for each gauge.

.4 Provide one gauge, flush mounted into the casing for each filter bank.

2.4.18 Hoods

.1 Fresh air and exhaust air hoods shall be provided complete with 1/2" x 1/2" birdscreen and finished to match the unit. A rain gutter shall be provided on all edges of the hood. Outside air hoods shall be sized for maximum inlet velocity of 600 FPM.
2.4.19 Aluminum Airfoil Dampers

.1 Aluminum airfoil frames and blades shall be a minimum of 12-gauge extruded aluminum. Blades to be 6" wide single air foil design.

.2 Frames shall be extruded aluminum channel with grooved inserts for vinyl seals. Standard frames 2" x 4" x 5/8" on linkage side, 1" x 4" x 1" on the other sides.

.3 Pivot rods shall be 7/16" hexagon extruded aluminum interlocking into blade section. Bearings to be double sealed type with a Celcon inner bearing on a rod within a Polycarbonate outer bearing inserted into frame so that the outer bearing cannot rotate.

.4 Bearing shall be designed so that there are no metal-to-metal or metal-to-bearing riding surfaces. Interconnecting linkage shall have a separate Celcon bearing to eliminate friction in linkage.

.5 Blade linkage hardware is to be installed in frame out of airstream. All hardware to be on non-corrosive reinforced material or cadmium plated steel.

.6 Damper seals shall be designed for minimum air leakage by means of overlapping seals.

.7 **OA and EA dampers:** Internal hollows shall be insulated with 7/8" thick polyurethane foam with R factor of 5.0 per inch. Blades shall be 100% thermally broken. Frame shall be insulated with polystyrene, R factor of 5.0 per inch.

.8 Dampers shall be sized to permit full recirculation or 100% free-cooling operation.

.9 Damper blades shall be maximum 40" long per section.

.10 Dampers greater than 2 sections wide shall be provided with a jackshaft.

.11 Acceptable OA and EA dampers are: T.A. Morrison "TAMCO series 9000" (or Agency approved equivalent).

.12 All other dampers will be acceptable as: T.A. Morrison "TAMCO series 1000" (or Agency approved equivalent).

2.4.20 Test Ports

.1 Provide 1" diameter test ports for unit air stream testing in each plenum section between each component within the AHU. Test ports shall have a tube that extends between the inside and outside of the unit and a screwed cap on the exterior to allow access. The test ports shall have been flanged on the exterior to allow air seal and shall be flanged on the interior to cover the penetration of the casing.

2.4.21 Heat Wheel

.1 Ion exchange wheels shall be manufactured by SG America. All wheels shall be certified in accordance with AHRI 1060. Wheels which are not AHRI certified will not be accepted.

.2 Ion exchange resin desiccant technology shall be used to transfer latent energy via osmotic transfer of water
molecules. Silica gels and other desiccant coatings which rely on capillary adsorption will not be accepted due to the increased potential for odor transfer.

.3 Energy recovery wheels shall be manufactured of corrugated aluminum treated for corrosion resistance and shall include a high water vapor capacity ion desiccant with low co-adsorption characteristics to adsorb and transfer humidity in the vapor phase while avoiding adsorption and transfer of typical ambient none water vapor molecules. Paper or synthetic wheels will not be accepted.

.4 The aluminum element and desiccant shall be treated with an EPA registered bacteriostatic agent capable of inhibiting growth or reproduction of bacteria on the wheel. Wheels shall be capable of cleaning by soft brush, vacuum-cleaner, low-pressure compressed air or a water wash.

.5 Wheel surfaces shall be smooth to provide consistent seal gap between the wheel face and the cassette seal ring for the multi-pass seal.

.6 Wheels of more than 60 inches in diameter shall be of segmented construction with the wound element cut into pie shapes which are bolted together to form the wheel.

2.4.22 Gas Heating Section

.1 Where shown on plans, furnish and install a Gas-fired Section. Furnaces shall have a minimum thermal efficiency of 80%. The module shall employ tubular heat exchangers with a draft inducer assembly to provide for positive venting of flue gases.

.2 Tubular heat exchanger shall be constructed of 16-gauge, minimum, type 304 stainless tubes, 2 1/4” diameter having a minimum tube wall thickness of .049” and shall be produced to ASTM A249 construction standards for heat exchanger application. Tubes shall employ integral formed-dimple restrictors to eliminate noise associated with expansion and Contraction of internal baffles during heating cycles, and to provide for unobstructed drainage of condensate that occurs in the tubes during cooling operation. Drainage shall be configured so that burners and burner surfaces are not exposed to condensate during cooling system operation.

.3 The furnace shall have a modulating 10:1 control system. On a call for heat, the modulating control shall control the firing rate between 10% and 100% of rated capacity. Stepped modulation is not acceptable.

.4 All burners shall include an ignition control, roll out switch and air proving switch. Additionally, on full modulation models a fan relay, delay timer and high fire gas valve control relay shall be included. Burners shall accept either 0 to 10vDC or 4 to 20ma input signals (signal provided by
others). Two independent and adjustable (when compared to the analog input signal) SPDT relays shall be provided for fan and valve control.

.5 Burner shall be complete with exhaust stack piped up above unit roof to prevent entrainment and supported off the unit.

2.4.23 Electrical

.1 Factory wire and test all air handling units. Have units approved by CSA or ETLC.

.2 Supply one @ 575 V/60 Hz/3 Ph power connection for motors and other large electrical devices and one @ 120 V/208V/60 Hz/1 Ph power connection for lights, controls, heaters, etc.

.3 Provide necessary circuit breakers and/or fuses for each type of electric device.

.4 A bonding wire shall be provided between the motor loads and the electrical panel. Use of the air handling unit casing for a bond will not be accepted.

.5 Label and number code all wiring and electrical devices in accordance with the unit electrical diagram. Mount the devices in a control panel inside the unit’s service enclosure or on the outside. Ensure the control panel meets the CSA or Canadian Electrical Code (CEC) standard for the specific installation.

.6 Provide a system of motor control including all necessary terminal blocks, motor contactors, motor overload protection, grounding lugs, auxiliary contactors and terminals for the connection of external control devices or relays. Individually fuse all fan and branch circuits.

.7 Wire from the motors to the motor control in accordance with the local electrical code and contained by EMT conduit with liquid tight connections. Seal the casing penetrations in a manner that eliminates air leaks. At all split sections, provide a 1-foot long piece of flexible conduit, with the extra wire spooled, for reconnection on site by the installing Contractor.

.8 External disconnects shall be provided in a NEMA 4 enclosure for superior water protection. Disconnects must be interlocked with the electrical panels for added personnel safety.

.9 Unit manufacturer to provide an empty run of ¾” EMT conduit through all unit sections to permit field control wiring of all control components and sensors. All control wiring shall penetrate the air handling unit casing through a single factory provided opening in the controls enclosure. Empty junction boxes shall be provided in each section for field wiring by installing controls Contractor.

2.4.24 Finish

.1 Unit shall be finished painted with two components, etch bond primer and finish painted with alkyd enamel, color as
selected by Owner. All uncoated steel shall be painted with grey enamel. All metal surfaces shall be pre-painted with vinyl wash primer to ensure paint bonds to metal. Outdoor unit shall be finish coated with polyurethane paint. Paint for outdoor units shall be tested to ASTM B117 for 5000hr salt spray endurance.

2.4.25 Air Leakage Testing

.1 Unit manufacturer shall factory pressure test each air handling unit to ensure the leakage rate of the casing does not exceed 0.5% of the unit airflow at 1.5 times the rated total static pressure for 4" thick casing units (1.0% of unit airflow at 1.5 times the rated total static pressure for 2" thick casing units). (Leakage test shall be performed with VFD and humidifier panels installed).

.2 Test shall be conducted in accordance with SMACNA duct construction manual. A calibrated orifice shall be used to measure leakage airflow.

.3 An officer of the air handling unit company shall certify test results. Forward copies of certified test results to the consultant. (The consultant shall witness the pressure test on the first two units. Provide for all transportation for the consultant and owner to the factory).

.4 "Side by side" units shall have each duct or side tested independently.

2.4.26 Controls

.1 Controls shall be field supplied and installed by others. Refer to Division 25 for further details.

.2 Heat recover wheel shall be provided with VFD and controller to reduce speed for defrost cycle.

.3 Provide independent control actuators for each outdoor air damper, mixing air damper, supply air damper, and exhaust air damper.

.4 Provide pressure sensor downstream of return air fan ahead of heat recovery wheel.

3. EXECUTION

3.1 Inspection

3.1.1 Upon delivery, inspect components for damage or gas loss and report to Consultant in writing. Wait for written instruction.

3.2 Exhaust Fan

3.2.1 Install equipment and all auxiliary devices as per manufacturer’s instruction.

3.3 ERV

3.3.1 Install in accordance with manufacturer’s Installation and Maintenance instructions.
3.3.2 Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test-run under observation.

3.4 **Condenser**
3.4.1 Install in strict accordance with manufacturer’s requirements, Shop Drawings, and Contract documents
3.4.2 Adjust and level unit in alignment on supports.
3.4.3 Coordinate electrical installation with electrical Contractor.
3.4.4 Coordinate controls with control Contractor.
3.4.5 Install proper charge of refrigerant and oil by mechanical Contractor
3.4.6 Provide testing and starting of machine and instruct the Agency in its proper operation and maintenance.
3.4.7 High pressure switch is factory installed to be wired in series with the airflow proving switch by the controls contractor on site.

3.5 **Air Handling Unit**
3.5.1 Provide components furnished as per manufacturer’s literature.
3.5.2 Provide certified wiring schematics to the electrical division for the equipment and controls.
3.5.3 Provide all necessary control wiring as recommended by the manufacturer.
3.5.4 Provide condensate traps in accordance with manufacturers recommendations.
3.5.5 Insulate all piping and equipment mounted inside the corridor.
3.5.6 Ensure all mounting and fastening is compliant with seismic requirements for post-disaster building as specified further in 23 05 00 – Common Work Results for HVAC.

END OF SECTION
1. **GENERAL**

1.1 **Related Sections**
   - 1.1.1 Section 23 05 00 – Common Work Results for HVAC
   - 1.1.2 Section 23 07 00 – HVAC Insulation
   - 1.1.3 Section 23 20 00 – HVAC Piping and Pumps
   - 1.1.4 Section 23 30 00 – HVAC Air Distribution
   - 1.1.5 Division 26 – Electrical

1.2 **Description**
   - 1.2.1 The Work of this Section shall include the furnishing of all labour, materials, equipment, and services required for the complete installation, testing and operation of the equipment as indicated on the Drawings, or hereinafter specified.
   - 1.2.2 Provide decentralized HVAC equipment including:
     - Fin tube radiation
     - Fan Coils

1.3 **Reference Standards**
   - 1.3.1 Conform to:
     - CSA B52 Mechanical Refrigeration Code.
     - Canadian Pressure Vessels Regulations (CRN)
     - Requirements of Local and Provincial Authorities.
     - CSA, ULC and governing electrical codes.
     - AHRI, ASME and ASHRAE Standards specified for ratings and performance tests.

1.4 **Qualifications**
   - 1.4.1 Use qualified welders licensed by the TSSA.

1.5 **Source Quality Control**
   - 1.5.1 Factory leak test coils in accordance with above referenced agencies.

1.6 **Maintenance Data**
   - 1.6.1 Provide maintenance data for incorporation in operation and maintenance manuals. Include exploded views of components.

1.7 **Submittals**
   - 1.7.1 Provide Shop Drawings, maintenance manuals, and operating instructions for the following:
     - 1 Fin tube radiation

2. **PRODUCTS**

2.1 **Fin Tube Radiation**
   - 2.1.1 All radiation capacities are based on radiator length as specified on the Drawings. Refer to radiator schedules on Drawings.
2.1.2 Provide fin tube radiation units as specified in the radiator schedule.

2.1.3 All units shall be made available for inspection by the Agency at the Agency’s request.

2.1.4 Contractor of this trade is responsible to provide all auxiliary equipment and devices that allow the exhaust fan to operate as intended.

2.1.5 Refer to division 25 for further description of controls requirements.

2.2 **Split-system air-conditioners**

2.2.1 Provide split-system ductless air conditioning systems with Variable Compressor Speed Inverter Technology (VCSI). The outdoor unit shall be pre charged with R410A refrigerant. The system shall include a wall mounted evaporator section with wired control and a horizontal discharge, and a single phase outdoor unit. System efficiency shall meet or exceed 13.0 SEER. Provide all required starters and accessories.

2.2.2 The outdoor unit shall be pre charged for 100 ft of refrigerant tubing. Helium holding charge shall be provided in the evaporator.

2.2.3 Indoor Unit

.1 The indoor unit shall be factory assembled, wired and tested. Contained within the unit shall be all factory wiring and internal piping, control circuit board and fan motor. The unit in conjunction with the remote controller shall have a self-diagnostic function, 3 minute time delay mechanism, an auto restart function, and a test run switch. Indoor will be charged with helium before shipment from the factory.

.2 The casing shall be ABS plastic.

.3 The evaporator fan shall have three high performance, double inlet, forward curve sirocco fans driven by a single motor. The fans shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings. A motorized vane shall close the outlet port when operation is stopped. It shall also automatically direct air flow in a horizontal and downward direction for uniform air distribution. The indoor fan shall consist of four (4) speeds, Low, M1, M2, Hi. There shall be a choice of horizontal and downward airflow pattern. Four directions of airflow can be selected by remote control 100% downward flow, 80% downward flow (plus 20% horizontal airflow), 60% downward airflow (plus 40% horizontal airflow) and 100% horizontal airflow.

.4 Return air shall be filtered by means of an easily removable washable filter.

.5 The evaporator coil shall be of nonferrous construction with aluminum pre coated fins on copper tubing. The multi angled heat exchanger will have a modified fin shape that reduces air resistance for a smoother, quieter airflow. In addition, the remote controlled vane shall significantly decrease downward air resistance for lower noise levels.
All tube joints shall be brazed with phoscopper or silver alloy. The coils shall be pressure tested at the factory. A condensate pan and drain shall be provided under the coil.

.6 The unit electrical power shall be 208/230 V, 1 phase, 60 Hz. The system shall be capable of satisfactory operation within voltage limits of 198 V to 253 V. The unit provides optional, individual as well as shared power supply between indoor and outdoor units.

.7 This unit shall have a wired controller to perform input functions necessary to operate the system. The wire controller shall have multi language, a large DOT liquid crystal display and a weekly timer with eight pattern settings per day. The controller shall consist of an On Off switch, Cool/Dry Fan selector, Thermostat setting, Timer Mode, High Low fan speed, Auto Vane selector, Test Run switching and Check Mode switching. The controller shall have a built in temperature sensor. Temperature changes shall be by 1°F increments with a range of 67 – 87°F. Temperature displayed in both °F and °C. The control system shall consist of two (2) microprocessors interconnected by a single non polar two wire cable.

.8 Normal operation of the remote controller provides individual system control in which one remote controller and one indoor unit are installed in different rooms. The controller shall have the capability of controlling up to a maximum of sixteen systems at a maximum developed control cable distance of 1,500 feet.

.9 The unit will have interfaces for the building automation system for: 1) unit alarm, 2) unit enable/disable.

.10 Manufacturer shall provide 2 conductor non polar 22 AWG stranded wire for connection to remote controller.

.11 The system shall include self-diagnostics including total hours of compressor run time. Diagnostics codes for indoor and outdoor unit shall be displayed on wired remote panel. Controller shall display operating conditions such as pipe temperatures (i.e. liquid, discharge, indoor and outdoor), compressor operating conditions, including (running current, frequency, input voltage, on/off status and operating time), LEV opening pulses, sub cooling and discharge super heat.

.12 The microprocessor located in the indoor unit shall have the capability of monitoring return air temperature and indoor coil temperature, receiving and processing commands from the wired controller, providing emergency operation and controlling the outdoor unit. The control voltage from the controller to the indoor unit shall be 12 V DC. The control signal between the indoor and outdoor unit shall be pulse signal 24 V DC. The system shall be capable of automatic restart when power is restored after power interruption.
.13 The microprocessor within the wall mounted remote controller shall provide automatic cooling, display set point and room temperature. Control system shall control the continued operation of the air sweep louvers, as well as provide on/off and system/mode function switching. The controller shall have the capability to provide sequential starting with up to fifty seconds delay. Two remote controllers can be used to control one unit.

2.2.4 Condensing/Outdoor Unit

.1 The condensing unit must be suitable for installation in a return air plenum as shown on the Drawings. The condensing unit is referred to as “outdoor unit” in the following sections however it must be suitable for indoor use in the return air plenum.

.2 The outdoor unit shall be compatible with the indoor unit. The indoor units must be of the same capacity as the outdoor unit. The outdoor unit shall be equipped with a control board that interfaces with the indoor unit to perform all functions necessary for operation. The outdoor unit shall contain Variable Compressor Speed Inverter Technology. The outdoor unit shall be completely factory assembled. The outdoor unit shall be complete with the ultra-low Ambient Kit, capable of operating at -40°F ambient temperature. Provide wind baffles on all unit louvers. The outdoor unit must have the ability to operate with a maximum height difference of 100 ft and have a maximum refrigerant tubing length of 150 ft between indoor and outdoor units without the need for line size changes, traps or additional oil. Each unit must be test run at the factory.

.3 The casing shall be constructed from galvanized steel plate and have a Munsell 3Y 7.8/1.1 (ivory) colour finish. The fan grille shall be of ABS plastic.

.4 The unit shall be furnished with one A/C fan. The motor bearings shall be permanently lubricated. The fan motor shall be of aerodynamic design for quiet operation. The fan shall be mounted in front of the coil, pulling air across it from the rear and dispensing it through the front.

.5 The L shaped condenser coil shall be of copper tubing with flat aluminum fins to reduce debris build up. The coil shall be protected with an integral metal guard. Refrigerant flow from the condenser shall be controlled by means of linear expansion valve (LEV) metering orifice. The LEV shall be control by a microprocessor controlled step motor.

.6 The compressor shall be a rotary compressor with Mitsubishi’s Variable Compressor Speed Inverter Technology (VSCI). The compressor shall be driven by inverter circuit to control compressor speed. The compressor speed shall match the room load to significantly increase the efficiency of the system which results in vast energy savings. During the off cycle,
minimal amount of current shall be intermittently applied to
the compressor motor, to maintain enough heat to prevent
liquid from accumulating in the compressor. The outdoor
unit shall have an accumulator and high pressure safety
switch.

2.2.5 The unit electrical power shall be 208/230 V, 1 phase, 60 Hz. The
unit shall be capable of satisfactory operation within voltage limits
of 198 V to 253 V. The outdoor unit shall be controlled by the
microprocessor located in the indoor unit. The control signal
between the indoor unit and the outdoor unit shall be pulse signal
24 V DC. The unit shall have pulse amplitude modulation circuit,
this shall enable the unit to use 98% of input power supply.

2.2.6 The outdoor unit shall be provided with the manufacturer’s wall
mounting brackets.

2.2.7 Refer to equipment schedules for models and capacities.

2.3 Condensate Pumps for Split System Air Conditioners

2.3.1 Provide condensate pumps for split system A/C units as shown on
the Drawings and schedules. Pump kits shall be specifically
designed for pumping condensate.

2.4 Fan Coil Units

2.4.1 Provide factory assembled, horizontal blow-thru ducted fan coil
unit. Unit shall be complete with water coils, fans, motors, drain
pan and all required wiring, piping, controls and special features.
Unit shall be constructed of galvanized steel with removable
panels for access to internal components. Units have 13 mm glass
fiber insulation, filter track with one-in. Throwaway filter, one-in
supply collar, and 64 mm return air collar on rear of unit for duct
connection and drain pan.

2.4.2 Fans: Direct-driven, double-width fan wheels shall have forward-
curved blades and be statically and dynamically balanced with
scrolls and fans constructed of galvanized steel. Fans shall have
ECM motors.

2.4.3 Coils: Unit shall be equipped with a 4-row coil for installation a 2-
pipe system. Coils shall have 13 mm copper tubes, aluminum fins
bonded to the tubes by mechanical expansion and have a working
pressure of 1725 kPa. Each coil shall have a manual air vent and
sweat connection for copper tubes.

2.4.4 Controls and Safeties: Unit shall be finished with a 3-speed, 4-
position fan switch on a wall plate for field mounting. The fan
motors shall be equipped with integral, automatic reset thermal
overload motor protection.

2.4.5 Electrical Requirements: Standard unit shall operate on 115V, 1
phase, 60 Hz electric power, and all exposed wiring shall be in a
flexible conduit.

2.4.6 Units shall be UL approved. All units shall be CSA approved. Each
coil shall be factory tested for leakage at 2.4 MPa air pressure
with coil submerged in water.

2.4.7 Insulation and adhesive shall meet NFPA-90A requirements for
flame spread and smoke generation. All equipment wiring shall
comply with NEC requirements. The 42DF model shall be tested and certified in accordance with AHRI Standard 440.

2.4.8 Refer to Schedules for model and capacity.
2.4.9 Refer to Division 25 for further description of control requirements.

3. **EXECUTION**

3.1 **Inspection**

3.1.1 Upon delivery, inspect components for damage or gas loss and report to Consultant in writing. Wait for written instruction.

3.2 **Radiation**

3.2.1 Locate units or equipment upon arrival. Level and make secure.
3.2.2 Install according to piping layout. Provide for pipe movement during normal operation.
3.2.3 Maintain proper clearance around equipment to permit performance of service maintenance. Check final location with Consultant if different from that indicated prior to installation. Should deviations beyond allowable clearances arise, request and follow Consultant's directive.
3.2.4 Check that all openings for appurtenances and operating weight conform to Shop Drawings. If accessories, ancillaries, are received knocked down, check assembly with Consultant.
3.2.5 Refer to manufacturer's installation Drawings. Check electrical service Work with characteristics stamped on unit.
3.2.6 Connect water equipment as per manufacturer's installation recommendations.
3.2.7 Install all heating units in locations shown on plans complete with radiator valve, balancing valve, etc., and/or as detailed on plans and Specifications.
3.2.8 The Contractor is to exercise special care to see that the vents and valves are located immediately behind the access door.
3.2.9 Radiation Valves
   .1 Automatic control valves shall be installed on the supply side of all fin tube radiators.
   .2 Circuit balancing valves shall be installed on the return side of all fin tube radiators.

3.3 **Cooling Coil Drain Lines**

3.3.1 Provide insulated drainage piping from all cooling coil drain pans to nearest floor drain.

3.4 **Split System Air Conditioning Systems**

3.4.1 Provide refrigerant piping, hydronic piping, controls, water and/or drain connections.
3.4.2 Install fan units where indicated.
3.4.3 Make all duct connections to fans with flexible connectors.
3.4.4 Level units while fans are in operation and align ductwork providing clearance in proportion to flexible duct connector length ensuring the misalignment of ductwork when fan is not in operation does not strain or damage the connector.
3.4.5 Note requirements for vibration isolation as specified and referenced in Section 23 05 00 – Common Work Results for HVAC and Drawings and as specified with equipment.

3.4.6 Install condensing units where shown on Drawings and to manufacturer's recommendations. Note requirements for support as specified and referenced in Section 23 05 00 - Common Work Results for HVAC and Drawings and as specified with equipment.

3.4.7 Install condensate pump and pipe to nearest drain in an accessible location.

3.4.8 Extend liquid, suction and hot gas lines from evaporator to units and make all necessary connections.

3.4.9 All starters, wiring from disconnect for indoor unit, weatherproof disconnect for condensers, to units, relays, pilot lights, interlocking of equipment, control wiring, to be by this Trade unless shown otherwise on Electrical Drawings or Specifications. Ensure units are interlocked so that condenser cannot operate when the indoor unit fan is not in operation.

3.5 Fan coil units
3.5.1 Install equipment in accordance with manufacturer’s installation instructions. Install units plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances.

3.5.2 Connect supply and return ducts to units with flexible duct connections. Provide transitions to exactly match unit duct connection size.

3.5.3 Connect equipment condensate drain to nearest indirect waste connection, or as indicated.

3.6 Controls:
3.6.1 All equipment described in this Specification shall be provided with standalone controls. Refer to Division 25 for further details.

END OF SECTION
1. **GENERAL**

1.1 **Related Sections**

1.1.1 Division 01 – General Requirements
1.1.2 Division 21 – Fire Suppression
1.1.3 Division 22 – Plumbing
1.1.4 Division 23 – Heating, Ventilating, and Air-Conditioning
1.1.5 Section 25 10 00 – Integrated Automation Network Equipment
1.1.6 Section 25 30 00 – Integrated Automation Instrumentation and Terminal Devices
1.1.7 Section 26 05 19 – Wire and Cable
1.1.8 Section 26 05 33 – Raceway and Boxes for Electrical Systems
1.1.9 Section 27 05 28 – Pathways for Communications Systems
1.1.10 Division 28 – Electronic Safety and Security

1.2 **General Notes**

1.2.1 The Instructions to Bidders, the General Conditions of CCDC 2 - 2008, Supplementary Conditions of all Sections of Division 1 are part of and apply to every division of this Specification.

1.3 **Scope of Work**

1.3.1 It is the intent of these Specifications to furnish and install two complete integrated automation systems

.1 For renovation Work at 180 Derry Road as more thoroughly defined in each Section of this Specification. It is the intent that the new building automation system shall operate independently of the existing BAS but shall interface with the existing Metasys network.

.2 For renovation Work at 7750 Hurontario shall operate as standalone or connected to the existing Metasys system as further described in this Division.

1.3.2 All materials and equipment as hereinafter specified and/or shown on the Drawings will be furnished and installed in such a manner as to leave each of the systems complete and in satisfactory operating condition.

1.3.3 These Specifications are to be considered an integral part of the plans which accompany them. Neither the plans nor the Specifications shall be used alone. Any item or subject omitted from one but which is mentioned or reasonably implied in the other shall not relieve the Contractor of responsibility.

1.4 **Inspection of Premises and Site**

1.4.1 Visit the site and examine the existing conditions and make necessary allowances in their Bid Price for removal, relocation, re-routing, reconnection of existing controls equipment and wiring as may be necessary for the execution and completion of this Project. Extra charges for premium time labour shall be included in the Bid Price allowing for after hours, weekend and holiday labour requirements. No extras will be allowed for failure to
properly evaluate conditions which affect the scope of the Work included in this Contract.

1.5 **Compliance and Co-Operation**

1.5.1 The Drawings upon which this Contract is based show the arrangement, general design and extent of the systems. These systems are suitably outlined on the Drawings with regard to sizes, locations, general arrangement and installation details. The mains and connections thereto are shown more or less in diagrammatic form except where in certain cases the Drawings may include details giving the exact location and arrangements required.

1.5.2 Where any parts of the system and/or pieces of equipment are located by dimensions on the Drawings, said dimensions shall be checked and verified in the field. The Contractor shall make, without additional charge or expense to the Agency, any necessary changes or additions to accommodate structural conditions or other equipment. The Consultant shall be notified immediately and authority secured in writing for such revisions before proceeding with the work.

1.5.3 The Contractor must exercise the utmost care and diligence in order that all Work shall be done in strict compliance with the full intent and meaning of the Drawings and these Specifications.

1.5.4 The Contractor shall be expected and required to confer and co-operate with the other Work in order to eliminate any unnecessary delays to any Work being done in the building. The Contractor will also be required to store up materials neatly and out-of-the-way and to clean up all refuse caused by the Work daily.

1.5.5 The Contractor shall carefully study all Drawings, Specifications, and other instructions and shall at once report to the Consultant any errors, inconsistencies, or omissions discovered. In no case shall Work proceed in uncertainty.

1.5.6 As the Work progresses and before installing fixtures, other fittings and equipment which may interfere with the Work of other Sections, the Contractor shall consult with the Consultant and obtain detail Drawings or instructions for the exact location of such equipment.

1.6 **Submittals and Shop Drawings**

1.6.1 Submit for review, three (3) complete sets of Shop Drawings and data sheets covering all items or equipment to be installed under the Contract. One copy will be retained by the Consultant. Shop Drawings shall show all relevant performance and installation information. The Drawings and data required shall generally be as outlined under each Section of the Specification, but shall not be restricted to the items listed.

1.6.2 Shop Drawings may be submitted electronically in Adobe Portable Document Format (.pdf). Electronically submitted Shop Drawings shall comply with all requirements for Shop Drawings noted herein including bearing the review mark of the Contractor. Electronically submitted Shop Drawings shall be returned electronically.
1.6.3 Clearly indicate any discrepancies between the specified and supplied equipment, particularly those that affect the performance of the equipment.

1.6.4 Equipment will not be accepted on site until approval of Shop Drawings. Shop Drawings designated as "Reviewed as Modified" are conditionally approved such that The Contractor shall ensure equipment satisfies all Contract requirements. Delivery of equipment may proceed but final, corrected Shop Drawings must be submitted prior to completion of Contract.

1.6.5 Within ten working days of the award of the Contract, submit a list of all equipment for which delivery dates exceed six (6) weeks.

1.6.6 Shop Drawings: Meet requirements of Section 01 33 00 - Submittal Procedures. In addition, Contractor shall Provide Shop Drawings or other submittals on all hardware, software, and installation to be provided. No Work may begin on any segment of this Project until submittals have been successfully reviewed for conformity with the design intent. Provide Drawings as AutoCAD 2004 (or newer) compatible files on optical disk (file format: .dwg, .dxf, or comparable) with 11 x 17 prints of each Drawing. When manufacturer’s cut sheets apply to a Product series rather than a specific Product, the data specifically applicable to the Project shall be highlighted or clearly indicated by other means. Each submitted piece of literature and Drawings shall clearly reference the Specification and/or Drawing that the submittal is to cover. General catalogues shall not be accepted as cut sheets to fulfill submittal requirements. Submittals shall include:

.1 A complete bill of materials of equipment to be used indicating quantity, manufacturer, model number, and other relevant technical data.

.2 Manufacturer’s description and technical data, such as performance curves, Product Specification sheets, and installation/maintenance instructions for the items listed in other Sections of Division 25.

.3 Wiring diagrams and layouts for each control panel. Show all termination numbers.

.4 Schematic diagrams for all field sensors and controllers. Provide floor plans of all sensor locations and control hardware.

.5 Schematic diagrams for all control, communication, and power wiring. Provide a schematic Drawing of the central system installation. Label all cables and ports with computer manufacturers’ model numbers and functions. Show all interface wiring to the control system.

.6 Riser diagrams of wiring between central control unit and all control panels.

.7 A list of the color graphic screens to be provided. For each screen, Provide a conceptual layout of pictures and data and show or explain which other screens can be directly accessed.
.8 Quantities of items submitted shall be reviewed but are the responsibility of the Contractor.

.9 A description of the proposed process along with all report formats and checklists to be used in “Control System Demonstration and Acceptance.”

1.6.7 Schedules:
.1 Within one month of Contract award, Provide a schedule of the Work indicating the following:
   .1 Intended sequence of Work items.
   .2 Start dates of individual Work items.
   .3 Duration of individual Work items.
   .4 Planned delivery dates for major material and equipment and expected lead times.
   .5 Milestones indicating possible restraints on Work by other situations.

.2 Provide monthly written status reports indicating Work completed, revisions to expected delivery dates, etc. An updated Project schedule shall be included.

1.6.8 Project Record Documents: Refer to 01 78 39 - Project Record Documents. Upon completion of installation, submit record (as-built) documents. The documents shall be submitted for approval prior to final completion and shall include:

.1 Project Record Drawings. As-built versions of the submittal Shop Drawings provided as AutoCAD 2004 (or newer) compatible files on optical media and as 11 x 17 prints.

.2 Testing and Commissioning Reports and Checklists. Completed versions of reports, checklists, and trend logs used to meet requirements of “Control System Demonstration and Acceptance.”

.3 Certification of control air tubing pressure test.

.4 Operation and Maintenance (O & M) Manual.

.5 As-built versions of submittal Product data.

.6 Names, addresses, and 24-hour telephone numbers of installing Contractors and service representatives for equipment and control systems.

.7 Operator’s manual with procedures for operating control systems: logging on and off, handling alarms, producing point reports, trending data, overriding computer control, and changing setpoints and variables.

.8 Programming manual or set of manuals with description of programming language and syntax, of statements for algorithms and calculations used, of point database creation and modification, of program creation and modification, and of editor use.

.9 Engineering, installation, and maintenance manual or set of manuals that explains how to design and install new points, panels, and other hardware; how to perform preventive maintenance and calibration; how to debug hardware problems; and how to repair or replace hardware.
.10 Documentation of all programs created using custom programming language including setpoints, tuning parameters, and object database.

.11 Graphic files, programs, and database on magnetic or optical media.

.12 List of recommended spare parts with part numbers and Suppliers.

.13 Complete original-issue documentation, installation, and maintenance information for furnished third-party hardware including computer equipment and sensors.

.14 Complete original-issue copies of furnished software, including operating systems, custom programming language, operator workstation software, and graphics software.

.15 Licenses, guarantees, and warranty documents for equipment and systems.

.16 The Contractor shall Provide a written guarantee from the manufacturer that the technology being provided will be supported for a minimum of ten years following completion of the Project.

.17 Recommended preventive maintenance procedures for system components, including schedule of tasks such as inspection, cleaning, and calibration; time between tasks; and task descriptions.

1.7 **Materials and Equipment Specified and Alternates**

1.7.1 This is a name type Specification and the following applies:

.1 Material and equipment are specifically described and named in this Specification for the purpose of establishing a standard of materials and quality of Work and specific requirements to which Work shall adhere.

.2 The price submitted for this Contract shall be based on the use of materials and equipment as specified. If The Contractor wishes to quote on materials and equipment other than that specified, the Contractor may select from the Approved Manufacturer's List. the Contractor may use this equipment in the base bid but must submit the name of the manufacturer with the bid. Otherwise only the specified manufacturer's equipment will be accepted.

.3 All of the materials required for the performance of the Work shall be new, the best of their respective kinds and a uniform pattern throughout the work.

.4 Any equipment substituted must not exceed space requirements allocated on the Drawings. Where equipment is substituted for that which is shown on the Drawings, The Contractor is to submit Shop Drawings showing revised layouts of equipment rooms, mechanical rooms, etc., for approval.

.5 Specified equipment or equipment listed by Model Number is usually used as a base for design performance, physical arrangements, weights, shape, wiring, controls and starter
requirements, etc. If other equipment is proposed, it is a requirement that all pertaining factors listed above are checked by The Contractor, and allowance be made in the tender on a "Turn-key" basis. Furthermore, it is The Contractor's responsibility to co-ordinate all above items prior to roughing in. Should any other Work be affected, the cost shall be borne by the Contractor.

1.8 Liability Insurance
  1.8.1 The Contractor must maintain such insurance as will fully protect both the Agency and the Contractor from any and all claims under the Workplace Safety and Insurance Act.

1.9 Codes, Fees and Certificates
  1.9.1 All Work shall be executed and all materials shall conform to and be inspected in strict accordance with all the laws, rules, and regulations of the local and provincial codes and all other authorities having jurisdiction.
  1.9.2 The Contractor shall obtain all necessary permits and all Notices, pay all fees in order that the Work hereinafter specified may be carried out and shall furnish any certificates necessary as evidence that the Work installed conforms with the laws and regulations of all authorities having jurisdiction before final certificates are issued.
  1.9.3 All changes and alterations required by an authorized inspector of any authority having jurisdiction shall be carried out without charge or expense to the Agency.
  1.9.4 All equipment supplied must have approval of NFPA, CSA, ULC, FM, Agency's Underwriter and any other authority having jurisdiction.

1.10 Quality of Work
  1.10.1 The Contractor must supply to this Project, Certified Mechanics and Apprentices in accordance with current Ministry of Labour regulations. The Contractor shall Provide installations and workmanship of a professional level of quality.
  1.10.2 The Work shall be performed by skilled technicians under the direction of an experienced Project manager, all of whom shall be properly trained and qualified for this work.

1.11 Electrical Wiring
  1.11.1 The Contractor must review the Wiring for Mechanical Equipment Schedule on the electrical Drawings as well as individual Sections of the mechanical Specification in order to determine the electrical requirements and responsibilities.

1.12 Extras and Credits
  1.12.1 In the event of additional Work of any nature being required, The Contractor must state in writing the costs of such extras at the time required to do the work, and unless any such extras are approved, they will not be allowed. In the event of omissions, a fair
and reasonable adjustment will be made to the Contract price by negotiation with the Consultant. Such an adjustment to the Contract shall not in any sense be construed to render the Contract invalid. Any extras or credits submitted for approval shall be priced individually, and be accompanied by an itemized list of materials and corresponding price breakdown.

1.12.2 All quotations shall be based on the submitted hourly rates and the latest issue of MCAA pricing manual.

1.13 **Fire or Smoke Separation Penetrations**

1.13.1 Patch all openings around installations of this Division that pierce fire or smoke separations with an approved watertight smoke and fire stop sealant.

1.14 **Existing Building Renovations**

1.14.1 Perform all Work in the existing building indicated on the Drawings, specified herein, and as may be necessary to carry out the Work of this Contract.

1.14.2 All equipment, etc., to be reused shall be carefully removed and stored. Any piece of equipment or fitting, accessory, etc., which forms a part of the equipment to be reused which is lost or damaged shall be replaced with a new device, fitting, accessory, etc.

1.14.3 Make certain that all services affected by Work are cut off and are properly capped or diverted.

1.14.4 Do not make interruption of services to or within existing building without prior consultation with Agency.

1.15 **Temporary and Trial Usage**

1.15.1 It is especially understood and agreed that the temporary and trial usage by the Agency of any mechanical device, machinery, apparatus, equipment or any other Work or materials, supplied under this Contract, before Date of Substantial Completion and written acceptance by the Consultant, is not to be construed as evidence of the acceptance of same by the Agency. It is further understood and agreed that the Agency shall have the privilege of such temporary and trial usage as soon as The Contractor shall claim that the said Work is completed and in accordance with the Drawings and Specifications for such reasonable length of time and as the Consultant shall deem to be sufficient for making a complete and thorough test of the same. No claims for damage shall be made by The Contractor for the injury to or breaking of any parts of such Work which may be so used whether caused by weakness or inaccuracy of structural parts; or by defective material or quality of Work of any kind whatsoever. All equipment used on a temporary basis must be brought back to new condition by the Manufacturer's service department and new full guarantee period to begin on date the building/Project is accepted by the Agency.
1.16 **Adjusting and Start-Up**

1.16.1 The Contractor shall provide acceptance tests to demonstrate that the equipment and systems actually meet the specified requirements. Tests may be conducted as soon as conditions permit. Make all changes, adjustments or replacements required as the preliminary tests may indicate prior to final tests.

1.16.2 In testing, vary loads to illustrate start-up, sequence, normal shut down, and simulate emergency conditions for safety shut down with automatic and manual reset.

1.16.3 Final tests shall be conducted in the presence of the Consultant or a representative. The Contractor shall make up and forward the reports listed below. The Contractor shall give the Consultant advance Notice in Writing that the preliminary tests have been completed and that the Contractor is prepared to carry out final tests. During the final tests, The Contractor shall demonstrate to the satisfaction of the Consultant that all equipment is operating as intended.

1.16.4 The Contractor shall obtain certificates of approval, acceptance, and compliance with rules and regulations for authorities having jurisdiction. The Work will not be considered complete until such certificates have been delivered to the Agency.

1.16.5 The Contractor shall be in charge of the plant during tests. He shall assume responsibility for damage in the event of injury to the personnel, building, and equipment, and shall bear all costs for liability, repairs, and restoration in this connection.

1.17 **Testing and Commissioning**

1.17.1 The Contractor shall witness all tests performed. The Consultant is to be notified when tests or commissioning is scheduled with adequate notice to attend.

1.17.2 The Contractor shall submit completed pre-commissioning forms to the Consultant for all commissioned equipment.

1.18 **Deficiencies**

1.18.1 All deficiencies as identified in Field Review Reports or Commissioning Reports shall be corrected by the Contractor in a timely manner after being made aware of said deficiencies. The Contractor shall subsequently inform the Consultant that deficiencies have been corrected in writing.

1.19 **Completion**

1.19.1 The Contractor shall keep the premises in a clean and orderly condition during construction. All waste and unusable materials shall be promptly removed from the site.

1.19.2 Upon completion of the work, the Contractor shall go over the entire installation; clean and polish all fixtures, and equipment; remove all surplus materials and rubbish of every description, incident to this work, leaving the installation neat and orderly and in completely satisfactory working conditions subject to the approval of the Consultant.
1.20 **Record Drawings**

1.20.1 The final record Drawings shall be produced on a clean set of Drawings and submitted to the Consultant at the completion of the work. All Work on the Drawings must be neat and complete and carried out by an experienced drafts Person. After approval of the Consultant these Drawings will be submitted to the Agency.

1.20.2 Refer to Sections 01 33 00 - Submittal Procedures and 01 78 39 - Project Record Documents.

1.21 **Agency's Instructions**

1.21.1 The Contractor shall supply to the Consultant (who will turn over to the Agency after review) three (3) sets of operating and maintenance instructions. Each set of instructions is to be bound in a suitable three D-ring binder. The binder shall be no more than 75% full. An additional similar set shall be provided on DVD or USB.

1.21.2 Each operating and maintenance manual shall contain parts list Drawings for each mechanical component and each item of mechanical equipment.

1.21.3 The Contractor is to supply the services of a knowledgeable technician to thoroughly explain the integrated control system operation and its maintenance to the full satisfaction of the Consultant and Agency's representative. Each system shall be started in its proper season in the presence of the Consultant and the Agency's representative.

1.21.4 The instructions to the Agency, as described above, shall also be video recorded in common Digital Versatile Disc format (optical media) by the Contractor and the completed DVD or USB submitted to the Consultant for approval.

1.21.5 The video shall be prepared after verbal instruction is given so that any of the Agency's special concerns and needs is incorporated in the video version.

1.21.6 Instructions on DVD or USB shall be properly edited and narrated with each section being adequately titled. Instructions should be specific to this installation but video can be combined with supportive visual information from other sources.

1.21.7 Refer to Sections 01 33 00 - Submittal Procedures and 01 78 39 - Project Record Documents.

1.22 **Warranty**

1.22.1 The Contractor, as a condition precedent to final payment, shall execute a guarantee to the Agency in writing warranting all apparatus furnished under this heading to remain in serviceable and perfect condition for a period of one (1) year from date of final acceptance of the Work, unless specified otherwise. Any imperfections, as a whole, or in part, by reason of defective quality of work, defective materials, defective arrangement of the various parts, or materials damaged as a result of these defects or repairs, shall be made good to the satisfaction of the Consultant at The Contractor's expense without undue delay.
1.22.2 Extended guarantees as outlined in various Sections of this Specification shall be included as follows: Equipment Warranty Costs by Equipment Manufacturer; Labour Guarantee Costs by the Contractor.

1.22.3 Equipment, material and software shall be unconditionally guaranteed for a period of one year form the date of substantial completion.

1.22.4 Provide warranty service at no cost to the Agency for the guarantee period, this shall include, but not limited to the following:

- Emergency repair service on regular working hour basis during warranty.
- Replacing defective parts and components as required.
- Servicing by factory trained and employed service representatives of system manufacturer.
- System software support.
- Provide updates to operator workstation software, Project-specific software, graphic software, database software, and firmware that resolve Contractor-identified software deficiencies at no charge during warranty period. If available, Agency can purchase in-warranty service agreement to receive upgrades for functional enhancements associated with above-mentioned items. Do not install updates or upgrades without Agency’s written authorization.

1.23 **Control Wiring**

1.23.1 Wire components of the integrated automation system in accordance with the requirements of Divisions 26 and 27. Include wiring between control components and electrical circuits of fans, pumps, and any other equipment or apparatus as indicated in this Section. Provide necessary transformers, relays etc. to accomplish specified control functions.

1.23.2 Provide wiring and associated pathways for circuits up to 24 Volts. Coordinate with Divisions 26 and 27 for wiring of circuits greater than 24 V.

1.23.3 Submit samples of each type of wire and cable for confirmation of acceptable wire and cable jacket colour selection. Refer to identification requirements specified and/or referenced within this Section of the Specifications.

1.24 **Access Doors**

1.24.1 Supply to the Contractor for installation, access doors of a suitable size for easy servicing of all concealed integrated automation equipment.

1.25 **Identification for Integrated Automation**

1.25.1 All automation equipment, including but not limited to: stand-alone control units, instruments, and relays, shall be tagged at location of installation on the job and keyed to a control schematic on which all instruments are to be numbered in sequence for the entire job. (The schematic shall be framed under Plexiglas and prepared for wall mounting). A standard logical, rigorous, and
comprehensive naming and identification system will be employed. Provide a rational relationship between the naming and identification system and its related equipment numbering system. Review any diversions from the facility’s equipment number system with the Consultant. Provide a complete list of all automation equipment using this same comprehensive identification system for reference within the operation and maintenance manual.

1.26 **Training**
1.26.1 Training shall be provided to the Agency’s designated representative. Training will cover the complete operation of the Building Automation System, and the software procedures to allow the representative to add, modify or create points, DDC loops or energy management programs.

1.27 **Acceptance Procedures**
1.27.1 Upon completion of the system the control Contractor will request, in writing, to the Engineer and Agency that the acceptance procedure can commence.
1.27.2 The procedure is conducted with the Engineer and Agency present. The procedure shall consist of:
1.27.3 A list of all points connected to the system detailed in the input/output summary shall be printed. Also, lists of all programs, sub-routines and DDC loops used in the system shall be printed.
1.27.4 Each commandable point shall be commanded and the results documented.
1.27.5 Each program sub-routine shall be demonstrated as functioning.
1.27.6 Each DDC loop shall be demonstrated as functioning and stable.
1.27.7 A report including the results of these tests shall be submitted.
1.27.8 Should this procedure and associated documentation prove satisfactory then the system will be accepted by the Agency.

2. **PRODUCTS**

2.1 **Access Doors**
2.1.1 Provide access doors, each complete with continuous concealed hinge, positive locking self-opening screwdriver lock.

1. Provide prime-coated access doors for general gypsum board and masonry applications.
2. Provide stainless steel, or aluminum access doors for tiled wall applications.
3. Provide drywall panel doors in gypsum board ceilings or walls featured in vestibules, foyers, corridors, public washrooms. Refer to architectural Drawings, including Reflected Ceiling Plans.
4. Provide ULC-listed, fire-rated access doors in fire-rated walls or ceilings. Rating shall suit point of installation. Refer to architectural Drawings for ceiling and wall assembly ratings.

2.1.2 Access doors shall be a minimum of 200 x 200 mm (8 x 8 in).
2.1.3 Type, location and size of access door shall be referred to the Consultant for approval before installation.

2.1.4 Where equipment is installed above furred ceiling with removable ceiling tile it is not necessary to provide an access door. However, ceiling tiles shall be marked with coloured Merit S-10 paper fasteners. Colours to match colour schedule.

2.2 **Identification for Integrated Automation**

2.2.1 Refer to Part 1 and Part 3 of this Section for identification requirements associated with these Products.

2.2.2 Provide brown wire and cable jacket colour for identification of integrated automation network and instrumentation wire and cable materials throughout the facility. Refer to Section 26 05 53 - Identification for Electrical Systems for complete facility wire and cable colour coding requirements.

2.2.3 Provide Lamicoid equipment nameplates.

2.2.4 Provide 12 mm (½ in.) permanent adhesive coloured dots for identification of services above removable tile ceilings.

3. **EXECUTION**

3.1 **Control Wiring**

3.1.1 Provide all necessary conduit, fittings and wire to provide a complete control system described in this Specification. Control wiring shall be coded and identified and installed in conduit to the standard of Division 27 and run parallel or at right angles to structure.

3.1.2 Safety control loops such as freeze and fire stats shall be hard wired into the associated system magnetic starter. The primary function shall not be performed by software in this case.

3.1.3 Provide all transformers and power supplies for the required controls. Co-ordinate with the electrical Contractor for power supplies. Power supplies for control systems shall have separate labeled circuit breakers and shall not be used for any other purposes.

3.1.4 All controls shall be powered from circuits dedicated to the control circuit. Application specific controllers may be powered from the same circuit as the equipment they are controlling, as long as that equipment is powered from a dedicated power source.

3.1.5 Class 2 wiring and power wiring shall not share the same conduit.

3.1.6 Verify integrity and provide complete testing of all wiring to ensure continuity and freedom from shorts and grounds. All equipment, installation, and wiring shall comply with acceptable industry Specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

3.1.7 Penetrations through and mounting holes in the building exteriors shall be made watertight. Holes in concrete, brick, steel and wood walls shall be drilled or core drilled with proper equipment; conduits installed through openings shall be sealed with materials which are compatible with existing materials. Openings in
fire/smoke partitions shall be sealed with materials which meet the requirements of NFPA 70, Firestopping.

3.1.8 The installation shall provide clear space for control-system maintenance by maintaining access space between coils, access space to mixed-air plenums, and other access space required to calibrate, remove, repair, or replace control-system devices. The control-system installation shall not interfere with the clearance requirements for mechanical and electrical system maintenance.

3.1.9 All controllers and control power supplies shall be located in plant rooms and in dedicated control cabinets, except for those serving terminal boxes and ceiling mounted equipment which shall be located in a manner which facilitates service and maintenance.

3.1.10 All panel enclosures shall contain a Drawing showing the panel layout and connected points list.

3.2 **Access Doors**
3.2.1 Follow manufacturer's installation instructions.

3.3 **Identification for Integrated Automation**
3.3.1 All wiring and cabling, including that within factory-fabricated panels, shall be labelled at each end within 50 mm (2 in.) of termination with the DDC address or termination number.

3.3.2 All pneumatic tubing shall be labelled at each end within 50 mm (2 in.) of termination with a descriptive identifier.

3.3.3 Permanently label or code each point of field terminal strips to show the instrument or item served.

3.3.4 Identify control panels with minimum 10 mm (½ in.) letters on laminated plastic nameplates.

3.3.5 Identify all other control components with permanent labels. All plug-in components shall be labelled such that removal of the component does not remove the label.

3.3.6 Identify room sensors relating to terminal box or valves with nameplates.

3.3.7 Apply self-adhesive colour dots to the ceiling tile grid identifying service and maintenance items above the removable tile ceiling. Colours shall correspond to the service.

3.3.8 All surfaces shall be dry and clean prior to application of self-adhesive markers for a strong adhesion. Follow manufacturer's application instructions.

3.3.9 Manufacturers' nameplates and UL or CSA labels are to be visible and legible after equipment is installed.

3.3.10 Identifiers shall match record documents.

3.4 **Training**
3.4.1 Provide a minimum of four on-site or classroom training sessions, three days each, throughout the Contract period for personnel designated by the Agency.

3.4.2 Provide two additional training sessions at 6 and 12 months following building’s turnover. Each session shall be three days in length and must be coordinated with the building Agency.
3.4.3 Train the designated staff of Agency's representative and Agency to enable them to do the following:

.1 Operators:
  .1 Proficiently operate the system
  .2 Understand control system architecture and configuration
  .3 Understand DDC system components
  .4 Understand system operation, including DDC system control and optimizing routines (algorithms)
  .5 Operate the workstation and peripherals
  .6 Log on and off the system
  .7 Access graphics, point reports, and logs
  .8 Adjust and change system set points, time schedules, and holiday schedules
  .9 Recognize malfunctions of the system by observation of the printed copy and graphical visual signals
  .10 Understand system Drawings and Operation and Maintenance manual
  .11 Understand the job layout and location of control components
  .12 Access data from DDC controllers and ASCs
  .13 Operate portable operator’s terminals

.2 Advanced Operators:
  .1 Make and change graphics on the workstation
  .2 Create, delete, and modify alarms, including annunciation and routing of these
  .3 Create, delete, and modify point trend logs and graph or print these both on an ad-hoc basis and at user-definable time intervals
  .4 Create, delete, and modify reports
  .5 Add, remove, and modify system’s physical points
  .6 Create, modify, and delete programming
  .7 Add panels when required
  .8 Add operator interface stations
  .9 Create, delete, and modify system displays, both graphical and others
  .10 Perform DDC system field checkout procedures
  .11 Perform DDC controller unit operation and maintenance procedures
  .12 Perform workstation and peripheral operation and maintenance procedures
  .13 Perform DDC system diagnostic procedures
  .14 Configure hardware including PC boards, switches, communication, and I/O points
  .15 Maintain, calibrate, troubleshoot, diagnose, and repair hardware
  .16 Adjust, calibrate, and replace system components

.3 System Managers/Administrators:
  .1 Maintain software and prepare backups
3.4.4 These objectives will be divided into three logical groupings. Participants may attend one or more of these, depending on level of knowledge required.

1. Day-to-day Operators: parts 1-13
2. Advanced Operators: parts 1-29
3. System Managers/Administrators: parts 1-13 and 30-32

3.4.5 Provide course outline and materials in accordance with the “Submittals” article in Part 1 of this Specification. The instructor(s) shall provide one copy of training material per student.

3.4.6 The instructor(s) shall be factory-trained instructors experienced in presenting this material.

3.4.7 Classroom training shall be done using a network of working controllers representative of the installed hardware.

3.4.8 During each training session formal minutes shall be taken documenting instructors, attendees and subjects discussed. No informal discussions or trouble shooting will be counted against training time.

3.5 Integration and Testing

3.5.1 The controls Contractor shall connect, test and commission all the Products, software and network bindings to verify they are working to meet the controls sequence as specified for this Project.

3.5.2 The Contractor shall coordinate with and assist the testing adjusting and balancing company to provide accurate balancing.

3.6 Control System Checkout and Testing

3.6.1 Start-up Testing: All testing listed in this article shall be performed by the Contractor and shall make up part of the necessary verification of an operating control system. This testing shall be completed before the Agency’s representative is notified of the system demonstration.

1. The Contractor shall furnish all labour and test apparatus required to calibrate and prepare for service of all instruments, controls, and accessory equipment furnished under this Specification.

2. Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.

3. Enable the control systems and verify calibration of all input devices individually. Perform calibration procedures according to manufacturers’ recommendations.

4. Verify that all binary output devices (relays, solenoid valves, two-position actuators and control valves, magnetic starters, etc.) operate properly and that the normal positions are correct.

5. Verify that all analog output devices (I/Ps, actuators, etc.) are functional, that start and span are correct, and that
direction and normal positions are correct. The Contractor shall check all control valves and automatic dampers to ensure proper action and closure. The Contractor shall make any necessary adjustments to valve stem and damper blade travel.

.6 Verify that the system operation adheres to the sequences of operation. Simulate and observe all modes of operation by overriding and varying inputs and schedules. Tune all DDC loops and optimum start/stop routines.

.7 Alarms and Interlocks:

.1 Check each alarm separately by including an appropriate signal at a value that will trip the alarm.

.2 Interlocks shall be tripped using field contacts to check the logic, as well as to ensure that the fail-safe condition for all actuators is in the proper direction.

.3 Interlock actions shall be tested by simulating alarm conditions to check the initiating value of the variable and interlock action.

3.7 Control System Demonstration

3.7.1 Prior to acceptance, the control system shall undergo a series of performance tests to verify operation and compliance with this Specification. These tests shall occur after the Contractor has completed the installation, started up the system, and performed tests.

3.7.2 The tests described in this Section are to be performed in addition to the tests that the Contractor performs as a necessary part of the installation, start-up, and debugging process and as specified in the “Control System Checkout and Testing” article in Part 3 of this Specification. The engineer will be present to observe and review these tests. The engineer shall be notified at least 10 days in advance of the start of the testing procedures.

3.7.3 The demonstration process shall follow that approved in Part 1, “Submittals.” The approved checklists and forms shall be completed for all systems as part of the demonstration.

3.7.4 The Contractor shall Provide at least two persons equipped with two-way communication and shall demonstrate actual field operation of each control and sensing point for all modes of operation including day, night, occupied, unoccupied, fire/smoke alarm, seasonal changeover, and power failure modes. The purpose is to demonstrate the calibration, response, and action of every point and system. Any test equipment required to prove the proper operation shall be provided by and operated by the Contractor.

3.7.5 As each control input and output is checked, a log shall be completed showing the date, technician’s initials, and any corrective action taken or needed.

3.7.6 Demonstrate compliance with Section 25 10 00 – Integrated Automation Network Equipment, Part 1, “System Performance.”
3.7.7 Demonstrate compliance with sequences of operation through all modes of operation.

3.7.8 Demonstrate complete operation of operator interface.

3.7.9 Additionally, the following items shall be demonstrated:

1. DDC loop response. The Contractor shall supply trend data output in a graphical form showing the step response of each DDC loop. The test shall show the loop’s response to a change in set point, which represents a change of actuator position of at least 25% of its full range. The sampling rate of the trend shall be from 10 seconds to 3 minutes, depending on the speed of the loop. The trend data shall show for each sample the set point, actuator position, and controlled variable values. Any loop that yields unreasonably under-damped or over-damped control shall require further tuning by the Contractor.

2. Demand limiting. The Contractor shall supply a trend data output showing the action of the demand limiting algorithm. The data shall document the action on a minute-by-minute basis over at least a 30-minute period. Included in the trend shall be building kW, demand limiting set point, and the status of sheddable equipment outputs.

3. Optimum start/stop. The Contractor shall supply a trend data output showing the capability of the algorithm. The change-of-value or change-of-state trends shall include the output status of all optimally started and stopped equipment, as well as temperature sensor inputs of affected areas.

4. Interface to the building fire alarm system.

5. Operational logs for each system that indicate all set points, operating points, valve positions, mode, and equipment status shall be submitted to the architect/engineer. These logs shall cover three 48-hour periods and have a sample frequency of not more than 10 minutes. The logs shall be provided in both printed and disk formats.

3.7.10 Any tests that fail to demonstrate the operation of the system shall be repeated at a later date. The Contractor shall be responsible for any necessary repairs or revisions to the hardware or software to successfully complete all tests.

3.8 Control System Acceptance

3.8.1 All tests described in this Specification shall have been performed to the satisfaction of both the engineer and Agency prior to the acceptance of the control system as meeting the requirements of completion. Any tests that cannot be performed due to circumstances beyond the control of the Contractor may be exempt from the completion requirements if stated as such in writing by the engineer. Such tests shall then be performed as part of the warranty.
3.8.2 The system shall not be accepted until all forms and checklists completed as part of the demonstration are submitted and approved as required in Part 1, “Submittals”.

END OF SECTION
1. **GENERAL**

1.1 **Metasys Points Schedule**

1.1.1 System: Communications Room Air Handling Unit (180 Derry Road)

<table>
<thead>
<tr>
<th>Label</th>
<th>Description</th>
<th>Type</th>
<th>Sensor/Device</th>
<th>Eng.Units</th>
<th>Software</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>AHn_SF</td>
<td>Supply Fan start-stop</td>
<td>DO</td>
<td>VSD interface</td>
<td>On/Off</td>
<td></td>
<td>N=1,2</td>
</tr>
<tr>
<td>AHn_SF~V</td>
<td>Supply Fan speed</td>
<td>AO</td>
<td>VSD interface</td>
<td>%</td>
<td></td>
<td>N=1,2</td>
</tr>
<tr>
<td>AHn_SF~S</td>
<td>Supply Fan Status</td>
<td>DI</td>
<td>VSD interface</td>
<td>On/Off</td>
<td></td>
<td>N=1,2</td>
</tr>
<tr>
<td>AHn_SF~A</td>
<td>Supply Fan Alarm</td>
<td>DI</td>
<td>VSD interface</td>
<td>On/Off</td>
<td></td>
<td>N=1,2</td>
</tr>
<tr>
<td>AHn_RF~SS</td>
<td>Return Fan start-stop</td>
<td>DO</td>
<td>relay</td>
<td>On/Off</td>
<td></td>
<td>N=1,2</td>
</tr>
<tr>
<td>AHn_RF~S</td>
<td>Return Fan Status</td>
<td>DI</td>
<td>current switch</td>
<td>On/Off</td>
<td></td>
<td>N=1,2</td>
</tr>
<tr>
<td>AH_DP</td>
<td>Duct Pressure</td>
<td>AI</td>
<td>Duct pressure sensor</td>
<td>kPa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AHn_RAT</td>
<td>Return Air Temperature</td>
<td>AI</td>
<td>duct temp. sensor</td>
<td>°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AHn_MAD</td>
<td>Mixed Air Dampers</td>
<td>AO</td>
<td>OA, RA, EA mtr-dampers</td>
<td>% OA</td>
<td>N=1,2</td>
<td></td>
</tr>
<tr>
<td>AHn_MAT</td>
<td>Mixed Air Temperature</td>
<td>AI</td>
<td>average. Temp. sensor</td>
<td>°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AHn_GH</td>
<td>Gas-fired Heating</td>
<td>AO</td>
<td>% heat</td>
<td></td>
<td></td>
<td>N=1,2</td>
</tr>
<tr>
<td>AH_CC</td>
<td>Cooling Coil</td>
<td>AO</td>
<td>Modulating</td>
<td>% cool</td>
<td>12,14,15</td>
<td>N=1,2</td>
</tr>
<tr>
<td>AHnERV</td>
<td>Energy Recovery Wheel</td>
<td>AO</td>
<td>Wheel Speed</td>
<td>RPM</td>
<td></td>
<td>N=1,2</td>
</tr>
<tr>
<td>AH_SAT</td>
<td>Supply Air Temperature</td>
<td>AI</td>
<td>duct temp. sensor</td>
<td>°C</td>
<td>11,14</td>
<td></td>
</tr>
<tr>
<td>AH_RAH</td>
<td>Return Air Humidity</td>
<td>AI</td>
<td>duct humidity sensor</td>
<td>% RH</td>
<td>11,12,14</td>
<td></td>
</tr>
<tr>
<td>AH_SAH</td>
<td>Supply Air Humidity</td>
<td>AI</td>
<td>duct humidity sensor</td>
<td>% RH</td>
<td>111415</td>
<td></td>
</tr>
<tr>
<td>AH_ZAT</td>
<td>Zone Air Temperature</td>
<td>AI</td>
<td>space temp. sensor</td>
<td>°C</td>
<td>11,14</td>
<td>One per zone</td>
</tr>
</tbody>
</table>
### 1.1.2 System: Leak Detection

<table>
<thead>
<tr>
<th>Label</th>
<th>Description</th>
<th>Type</th>
<th>Sensor/Device</th>
<th>Eng.Units</th>
<th>Software</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LDn_H2O</td>
<td>Leak Detection</td>
<td>DI</td>
<td>H2O Sensor</td>
<td>On/Off</td>
<td></td>
<td>N=1,2</td>
</tr>
</tbody>
</table>

### 1.1.3 System: Garage Exhaust & Makeup Air

<table>
<thead>
<tr>
<th>Label</th>
<th>Description</th>
<th>Type</th>
<th>Sensor/Device</th>
<th>Eng.Units</th>
<th>Software</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MUA</td>
<td>Existing control points to remain</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MUA_SF~S</td>
<td>Supply Fan Speed</td>
<td>AO</td>
<td>VFD interface</td>
<td>Hz</td>
<td>N=1,2</td>
<td></td>
</tr>
<tr>
<td>MUA_DPn</td>
<td>Makeup Air Damper Positions</td>
<td>AO</td>
<td>Motorized damper</td>
<td>% open</td>
<td>N=1,2</td>
<td></td>
</tr>
<tr>
<td>EFn_SS</td>
<td>Exhaust Fan start-stop</td>
<td>DO</td>
<td>EF ECM interface</td>
<td>On/Off</td>
<td>N=1,2</td>
<td></td>
</tr>
<tr>
<td>EFn_FS</td>
<td>Exhaust Fan speed</td>
<td>AO</td>
<td>EF ECM interface</td>
<td>%</td>
<td>N=1,2</td>
<td></td>
</tr>
<tr>
<td>EFn_F~S</td>
<td>Exhaust Fan Status</td>
<td>DI</td>
<td>Current Sensor</td>
<td>On/Off</td>
<td>N=1,2</td>
<td></td>
</tr>
<tr>
<td>EFn_ED</td>
<td>Exhaust Damper Position</td>
<td>AO</td>
<td>Motorized damper</td>
<td>% open</td>
<td>N=1,2</td>
<td></td>
</tr>
<tr>
<td>GDn_NOx</td>
<td>Gas Detection, NOx</td>
<td>AI</td>
<td>NOx sensor</td>
<td>PPM</td>
<td>N=1,2</td>
<td></td>
</tr>
<tr>
<td>GDn_CO</td>
<td>Gas Detection, CO</td>
<td>AI</td>
<td>CO sensor</td>
<td>PPM</td>
<td>N=1,2</td>
<td></td>
</tr>
</tbody>
</table>

### 1.2 Standalone Controller Points Schedule

#### 1.2.1 VAV with or without reheat

<table>
<thead>
<tr>
<th>Perimeter Heating</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Label</th>
<th>Description</th>
<th>Type</th>
<th>Sensor/Device</th>
<th>Eng.Units</th>
<th>Software</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>VAVn_ZAT</td>
<td>Zone Air Temperature</td>
<td>AI</td>
<td>space temp. sensor</td>
<td>°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VAVn_BP</td>
<td>VAV Box Position</td>
<td>AO</td>
<td>VAV Box</td>
<td>% open</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VAVn_RH</td>
<td>VAV Reheat Valve (if applicable)</td>
<td>AO</td>
<td>Control valve</td>
<td>% open</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 1.2.2 System: Perimeter Heating

<table>
<thead>
<tr>
<th>Label</th>
<th>Description</th>
<th>Type</th>
<th>Sensor/Device</th>
<th>Eng.Units</th>
<th>Software</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHn_ZAT</td>
<td>Zone Air Temperature</td>
<td>AI</td>
<td>space temp. sensor</td>
<td>°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PHn_PHV</td>
<td>Perimeter Heating Valve</td>
<td>AO</td>
<td>control valve</td>
<td>% heat</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 1.2.3 System: Fan Coils

<table>
<thead>
<tr>
<th>Description</th>
<th>Type</th>
<th>Sensor/Device</th>
<th>Eng.Units</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooling coil valve</td>
<td>AO</td>
<td>Valve actuator</td>
<td>%cool</td>
<td></td>
</tr>
<tr>
<td>Heating coil valve</td>
<td>AO</td>
<td>Valve actuator</td>
<td>%heat</td>
<td></td>
</tr>
<tr>
<td>Supply air temperature</td>
<td>AI</td>
<td>Thermistor</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>Supply Fan</td>
<td>AO</td>
<td></td>
<td>0-10V</td>
<td>EC motor</td>
</tr>
<tr>
<td>Supply Fan status</td>
<td>DI</td>
<td>Current sensor</td>
<td>On/off</td>
<td></td>
</tr>
</tbody>
</table>

### 1.2.4 System: Unit Heaters

<table>
<thead>
<tr>
<th>Label</th>
<th>Description</th>
<th>Type</th>
<th>Sensor/Device</th>
<th>Eng.Units</th>
<th>Software</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>UHn_ZAT</td>
<td>Zone Air Temperature</td>
<td>AI</td>
<td>space temp. sensor</td>
<td>°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UHn_F</td>
<td>Unit Heater Fan on-off</td>
<td>DO</td>
<td>Unit heater</td>
<td>ON/OFF</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 1.2.5 System: ERV-1

<table>
<thead>
<tr>
<th>Label</th>
<th>Description</th>
<th>Type</th>
<th>Sensor/Device</th>
<th>Eng.Units</th>
<th>Software</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERV1_OAT</td>
<td>Outdoor/Intake Air Temperature</td>
<td>AI</td>
<td>duct temp. sensor</td>
<td>°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERV1_SF</td>
<td>Supply Fan On/Off</td>
<td>DO</td>
<td>Relay</td>
<td>On/off</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERV1_SF~S</td>
<td>Supply Fan Status</td>
<td>DI</td>
<td>Current sensor</td>
<td>On/off</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERV1_EF</td>
<td>Exhaust Fan On/Off</td>
<td>DO</td>
<td>Relay</td>
<td>On/off</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERV1_EF~S</td>
<td>Exhaust Fan Status</td>
<td>DI</td>
<td>Current sensor</td>
<td>On/off</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERV1_C</td>
<td>Cooling</td>
<td>DO</td>
<td>Relay</td>
<td>Enable/Disable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Label</td>
<td>Description</td>
<td>Type</td>
<td>Sensor/Device</td>
<td>Eng.Units</td>
<td>Software</td>
<td>Notes</td>
</tr>
<tr>
<td>----------</td>
<td>------------------------------------</td>
<td>------</td>
<td>---------------</td>
<td>-----------</td>
<td>----------</td>
<td>----------------</td>
</tr>
<tr>
<td>ERV1_SAT</td>
<td>Supply Air Temperature</td>
<td>AI</td>
<td>Duct temp sensor</td>
<td>°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERV1_FS</td>
<td>Freezestat status</td>
<td>DI</td>
<td>Freezestat OK/alarm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERV1_HWT</td>
<td>Heat wheel leaving air temperature</td>
<td>AI</td>
<td>Duct temp sensor</td>
<td>°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERV1_RAT</td>
<td>Return Air Temperature</td>
<td>AI</td>
<td>Duct temp sensor</td>
<td>°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERV1_PH</td>
<td>Preheat On/Off</td>
<td>DO</td>
<td>relay</td>
<td>On/off</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERV1_PHT</td>
<td>Preheat Leaving air Temperature</td>
<td>AI</td>
<td>Duct temp sensor</td>
<td>°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERV1_HV</td>
<td>Heating valve Position</td>
<td>AO</td>
<td>Control valve</td>
<td>% open</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERV1_HW~E</td>
<td>Heat wheel enable/disable</td>
<td>DO</td>
<td>relay</td>
<td>Enable/Disable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ERV1_HWT</td>
<td>Heat wheel leaving air temperature</td>
<td>AI</td>
<td>Duct temp sensor</td>
<td>°C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
1. **GENERAL**

1.1 **Related Sections**

1.1.1 Division 22 – Plumbing
1.1.2 Division 23 – Heating, Ventilating, and Air-Conditioning
1.1.3 Section 25 05 00 – Common Work Results for Integrated Automation
1.1.4 Section 25 30 00 – Integrated Automation Instrumentation and Terminal Devices
1.1.5 Division 26 – Electrical
1.1.6 Division 27 – Communications
1.1.7 Division 28 – Electronic Safety and Security

1.2 **Scope of Work**

1.2.1 The Work description shall be as follows:

- .1 Preparation of control Shop Drawings for review.
- .2 Provide control components and set-up tools.
- .3 Provide a network of Direct Digital Control panels.
- .4 Provide Operator's interface equipment.
- .5 Complete the wiring of the controls system.
- .6 Confirm the sequences of operation and graphics standards.
- .7 Program the sequences of operation.
- .8 Provide dynamic graphics interface.
- .9 Calibrate and commission the installed controls system.
- .10 Provide maintenance manuals and as-built Drawings.
- .11 Provide training of Agency's operators.
- .12 Provide a one year warranty on all components.
- .13 Provide one year of maintenance.

1.3 **Ownership of Proprietary Material**

1.3.1 Project-specific software and documentation shall become Agency's property. This includes, but is not limited to:
- Graphics
- Record Drawings
- Database
- Application programming code
- Documentation

1.4 **System Performance**

1.4.1 The system shall meet or better the following performance parameters:

- .1 Graphic Display. The system shall display a graphic with 20 dynamic points with all current data within 10 seconds.
- .2 Graphic Refresh. The system shall update a graphic with 20 dynamic points with all current data within 8 seconds and shall automatically refresh every 15 seconds.
.3 Object Command. Devices shall react to command of a binary object within 2 seconds. Devices shall begin reacting to command of an analog object within 2 seconds.

.4 Object Scan. Data used or displayed at a controller or workstation shall have been current within the previous 6 seconds.

.5 Alarm Response Time. An object that goes into alarm shall be annunciated at the workstation within 45 seconds.

.6 Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 5 seconds. Select execution times consistent with the mechanical process under control.

.7 Performance. Programmable controllers shall be able to completely execute DDC PID control loops at a frequency adjustable down to once per second. Select execution times consistent with the mechanical process under control.

.8 Multiple Alarm Annunciation. Each workstation on the network shall receive alarms within 5 seconds of other workstations.

.9 Configuration and Tuning Screens. Any special screens used for configuring, calibrating, or tuning points, PID loops, and similar control logic shall refresh every 5 seconds.

.10 Reporting Accuracy. System shall report values with minimum end-to-end accuracy listed in Table 1.

.11 Control Stability and Accuracy. Control loops shall maintain measured variable at setpoint within tolerances listed in Table 2.

### 1.4.2 Table 1: Reporting Accuracy

<table>
<thead>
<tr>
<th>Measured Variable</th>
<th>Reported Accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space Temperature</td>
<td>±0.5°C (±1°F)</td>
</tr>
<tr>
<td>Ducted Air</td>
<td>±0.5°C (±1°F)</td>
</tr>
<tr>
<td>Outside Air</td>
<td>±1.0°C (±2°F)</td>
</tr>
<tr>
<td>Dew Point</td>
<td>±1.5°C (±3°F)</td>
</tr>
<tr>
<td>Water Temperature</td>
<td>±0.5°C (±1°F)</td>
</tr>
<tr>
<td>Delta-T</td>
<td>±0.15°C (±0.25°F)</td>
</tr>
<tr>
<td>Relative Humidity</td>
<td>±5% RH</td>
</tr>
<tr>
<td>Water Flow</td>
<td>±2% of full scale</td>
</tr>
<tr>
<td>Airflow (terminal)</td>
<td>±10% of full scale (see Note 1)</td>
</tr>
<tr>
<td>Airflow (measuring stations)</td>
<td>±5% of full scale</td>
</tr>
<tr>
<td>Airflow (pressurized spaces)</td>
<td>±3% of full scale</td>
</tr>
<tr>
<td>Air Pressure (ducts)</td>
<td>±25 Pa (±0.1 in. w.g.)</td>
</tr>
</tbody>
</table>
### Measured Variable | Reported Accuracy
--- | ---
Air Pressure (space) | ±3 Pa (±0.01 in. w.g.)
Water Pressure | ±2% of full scale (see Note 2)
Electrical (A, V, W, Power Factor) | ±1% of reading (see Note 3)
Carbon Monoxide (CO) | ±5% of reading
Carbon Dioxide (CO₂) | ±50 ppm

**Note 1:** Accuracy applies to 10%–100% of scale  
**Note 2:** For both absolute and differential pressure  
**Note 3:** Not including utility-supplied meters

#### 1.4.3 Table 2: Control Stability and Accuracy

<table>
<thead>
<tr>
<th>Controlled Variable</th>
<th>Control Accuracy</th>
<th>Range of Medium</th>
</tr>
</thead>
</table>
| Air Pressure        | ±50 Pa (±0.2 in. w.g.)  
|                     | ±3 Pa (±0.01 in. w.g.) | 0–1.5 kPa (0–6 in. w.g.)  
|                     |                           | -25 to 25 Pa (-0.1 to 0.1 in. w.g.) |
| Airflow             | ±10% of full scale   |
| Space Temperature   | ±1.0ºC (±2.0ºF)       |
| Duct Temperature    | ±1.5ºC (±3ºF)         |
| Humidity            | ±5% RH               |
| Fluid Pressure      | ±10 kPa (±1.5 psi)    
|                     | ±250 Pa (±1.0 in. w.g.) | 0–1 MPa (1–150 psi)  
|                     |                           | 0–12.5 kPa (0–50 in. w.g.) differential |

#### 1.5 Submittals

1.5.1 Submit Shop Drawings: Manufacturer’s description and technical data, such as performance curves, Product Specification sheets, and installation/maintenance instructions for the items listed below and other relevant items not listed below:

.1 Direct Digital Control System Hardware:
   .1 A complete bill of materials of equipment to be used indicating quantity, manufacturer, model number, and other relevant technical data.
   .2 Manufacturer’s description and technical data, such as performance curves, Product Specification sheets, and installation/maintenance instructions for the items listed below and other relevant items not listed below:
   (a) Direct Digital Controller (controller panels)
   (b) Operator Interface Equipment
(c)  Wiring

.3  Wiring diagrams and layouts for each control panel. Show all termination numbers.

.4  Schematic diagrams for all field sensors and controllers. Provide floor plans of all sensor locations and control hardware.

.2  Controlled Systems

.1  Riser diagrams showing control network layout, communication protocol, and wire types.

.2  A schematic diagram of each controlled system. The schematics shall have all control points labelled with point names shown or listed. The schematics shall graphically show the location of all control elements in the system.

.3  A schematic wiring diagram for each controlled system. Each schematic shall have all elements labelled. Where a control element is the same as that shown on the control system schematic, it shall be labelled with the same name. All terminals shall be labelled.

.4  An instrumentation list for each controlled system. Each element of the controlled system shall be listed in table format. The table shall show element name, type of device, manufacturer, model number, and Product data sheet number.

.5  A mounting, wiring, and routing plan-view Drawing. The Drawing shall be done in the same scale as the HVAC plans. The design shall take into account HVAC, electrical, and other systems’ design and elevation requirements.

.6  A complete description of the operation of the control system, including sequences of operation. The description shall include and reference a schematic diagram of the controlled system.

.7  A point list for each system controller including both inputs and outputs (I/O), point number, the controlled device associated with the I/O point, and the location of the I/O device. Software flag points, alarm points, etc.

.3  Quantities of items submitted shall be reviewed but are the responsibility of the Contractor.

.4  A BACnet Protocol Implementation Conformance Statement (PICS) for each type of controller and operator interface included in the submittal.
2. **PRODUCTS**

2.1 **Materials**

2.1.1 Use new Products that the manufacturer is currently manufacturing and that have been installed in a minimum of 25 installations. Do not use this installation as a Product test site unless explicitly approved in writing by Agency or Agency's representative. Spare parts shall be available for at least ten years after completion of this Contract.

2.2 **Nameplates**

2.2.1 Control panels shall be Provided with Lamicoid Nameplates, clearly identifying the equipment and the zone in which it is controlling. Refer to Section 25 05 00 – Common Work Results for Integrated Automation.

3. **EXECUTION**

3.1 **Control Strategies**

3.1.1 The control strategy for each control loop shall be performed by software within the SCU the points are connected to.

3.1.2 Globally shared objects such as outdoor air temperature shall be available at each SCU as a shared value over the network.

3.1.3 The controls Contractor shall allow for programming each point in the points list summary allowing for programming sequences of operation, alarm points, trend logs, totalizers and energy management routines. The control points summary is a minimum requirement for the Project. Additional points necessary to Provide a functional BAS system as specified shall be Provided at no extra cost to the Agency.

3.1.4 The Contractor shall work with the Consultant to implement the sequences of operation for all controlled equipment before coding them.

3.2 **Controllers**

3.2.1 Provide a separate controller for each AHU or other HVAC system. A DDC controller may control more than one system provided that all points associated with the system are assigned to the same DDC controller. Points used for control loop reset, such as outside air or space temperature, are exempt from this requirement.

3.2.2 Building Controllers and Custom Application Controllers shall be selected to Provide a minimum of 15% spare I/O point capacity for each point type found at each location. If input points are not universal, 15% of each type is required. If outputs are not universal, 15% of each type is required. A minimum of one spare is required for each type of point used.

1 Future use of spare capacity shall require providing the field device, field wiring, point database definition, and custom software. No additional controller boards or point
modules shall be required to implement use of these spare points.

3.3 Programming

3.3.1 Provide sufficient internal memory for the specified sequences of operation and trend logging. There shall be a minimum of 25% of available memory free for future use.

3.3.2 Point Naming: System point names shall be modular in design, allowing easy operator interface without the use of a written point index. Use the following naming convention: AA.BBB.CCDDE where

.1 AA is used to designate the location of the point within the building, such as mechanical room, wing, or level, or the building itself in a multi-building environment,

.2 BBB is used to designate the mechanical system with which the point is associated (e.g., A01, HTG, CLG, LTG),

.3 CC represents the equipment or material referenced (e.g., SF for supply fan, RW for return water, EA for exhaust air, ZN for zone),

.4 D or DD may be used for clarification or for identification if more than one CC exists (e.g., SF10, ZNB),

.5 E represents the action or state of the equipment or medium (e.g., T for temperature, H for humidity, C for control, S for status, D for damper control, I for current).

3.3.3 Software Programming

.1 Provide programming for the system and adhere to the sequences of operation Provided. All other system programming necessary for the operation of the system, but not specified in this document, also shall be Provided by the Contractor. Imbed into the control program sufficient comment statements to clearly describe each section of the program. The comment statements shall reflect the language used in the sequences of operation. Use the appropriate technique based on the following programming types:

.1 Text-based:
   (a) Must Provide actions for all possible situations
   (b) Must be modular and structured
   (c) Must be commented

.2 Graphic-based:
   (a) Must Provide actions for all possible situations
   (b) Must be documented

.3 Parameter-based:
   (a) Must Provide actions for all possible situations
   (b) Must be documented
3.3.4 Operator Interface

.1 Standard graphics—Provide graphics for all mechanical systems and floor plans of the building. This includes each chilled water system, hot water system, chiller, boiler, air handler, and all terminal equipment. Point information on the graphic displays shall dynamically update. Show on each graphic all input and output points for the system. Also show relevant calculated points such as set points.

.2 Show terminal equipment information on a “graphic” summary table. Provide dynamic information for each point shown.

.3 The Contractor shall provide all the labor necessary to install, initialize, start up, and troubleshoot all operator interface software and its functions as described in this Section. This includes any operating system software, the operator interface database, and any third-party software installation and integration required for successful operation of the operator interface.

3.4 Start-Up and Checkout Procedures

3.4.1 Start up, check out, and test all hardware and software and verify communication between all components.

.1 Verify that all control wiring is properly connected and free of all shorts and ground faults. Verify that terminations are tight.

.2 Verify that all analog and binary input/output points read properly.

.3 Verify alarms and interlocks.

.4 Verify operation of the integrated system.

END OF SECTION
1. **GENERAL**

1.1 **Related Sections**

1.1.1 Division 22 – Plumbing
1.1.2 Division 23 – Heating, Ventilating, and Air-Conditioning
1.1.3 Section 25 05 00 – Common Work Results for Integrated Automation
1.1.4 Section 25 10 00 – Integrated Automation Network Equipment
1.1.5 Division 26 – Electrical
1.1.6 Division 27 – Communications
1.1.7 Division 28 – Electronic Safety and Security

1.2 **Scope of Work**

1.2.1 Provide new instrumentation and terminal devices as required to complete the Building Automation System (BAS) utilizing Direct Digital Control (DDC) to serve the mechanical and electrical systems as described on the drawings and these specifications.

1.2.2 Supply all labour, tools, services, hardware, software, wiring, field devices, installation, documentation and training required to complete controls and instrumentation work in accordance with this Section of the Specification and the drawings.

1.2.3 The following controls shall be provided by this section for installation by others:

- .1 wells for temperature sensors,
- .2 control dampers (except for those supplied with packaged equipment),
- .3 control valves, and
- .4 flow sensors.

1.2.4 Wire components of the integrated automation system in accordance with the requirements of Divisions 26 and 27. Include wiring between control components and electrical circuits of fans, pumps, and any other equipment or apparatus as indicated in this Section. Provide necessary transformers, relays etc. to accomplish specified control functions.

1.2.5 The temperature control systems for terminal units, reheat, cabinet heating, and unit heating, not specifically identified to be DDC, shall be stand-alone electric/electronic. All other control systems shall be direct digital control (DDC) through the stand-alone control units and shall utilize electronic sensing as specified. Actuators may be pneumatic only if specified as such in this Section.

1.2.6 The work shall be performed by skilled technicians under the direction of an experienced project manager, all of whom shall be properly trained and qualified for this work.

1.2.7 The contractor shall provide a written guarantee from the manufacturer that the technology being provided will be supported for a minimum of ten years following completion of the project.
1.2.8 The BAS system shall use open or standard protocols to create an open system by using standard communication speeds, standard data formatting and by adapting the full range of the open protocol.

1.3 **Submittals**

1.3.1 Submit shop drawings for the following:

.1 All automatic temperature and humidity control components.

.2 Technical specification data sheets of each system component.

1.4 **Warranty**

1.4.1 Equipment, material and software shall be unconditionally warranted for a period of one year from the date of substantial completion.

1.4.2 Provide warranty service at no cost to the Agency for the guarantee period, this shall include, but not limited to the following:

.1 Emergency repair service on regular working hour basis during warranty.

.2 Replacing defective parts and components as required.

.3 Servicing by factory trained and employed service representatives of system manufacturer.

2. **PRODUCTS**

2.1 **Electric Actuators**

2.1.1 The actuator shall have mechanical or electronic stall protection to prevent damage to the actuator throughout the rotation of the actuator.

2.1.2 Where shown, for power-failure/safety applications, an internal mechanical, spring-return mechanism shall be built into the actuator housing. Alternatively, an uninterruptible power supply (UPS) may be provided.

2.1.3 Proportional actuators shall accept a 0 to 10 VDC or 0 to 20 mA control signal and provide a 2 to 10 VDC or 4 to 20 mA operating range.

2.1.4 All 24 VAC/VDC actuators shall operate on Class 2 wiring.

2.1.5 All non-spring-return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring-return actuators with more than 7 N·m (60 in-lb) torque capacity shall have a manual crank for this purpose.

2.2 **Control Valve Operators**

2.2.1 All characteristics of control valve operators shall be suitable for the required operations.

2.2.2 Control valves shall have electric non-overloading actuators.
2.2.3 Modulating valves shall be controlled by a 4 to 20 mA or 0 to 10 V DC signal. An exception may be made for tri-state actuators if provided with an extra analog position feedback signal to an analog input in the control panel.

2.2.4 Actuators shall have brushless DC motor technology with electronic overload protection or digital rotation sensing circuitry to prevent actuator damage throughout the entire range of actuation.

2.3 **Control Damper Actuators**

2.3.1 Electronic actuators shall have ISO 9001 quality certification and be UL listed under standard 873, CSA C22.2 No. 24 and have CE certification.

2.3.2 Electronic actuators used on valves or dampers shall be designed to directly couple and mount to a stem, shaft or ISO style-mounting pad. Actuator mounting clamps shall be a V-bolt with a toothed V-clamp creating a cold weld, positive grip effect. Single point, bolt, or single screw actuator type fastening techniques or direct-coupled actuators requiring field assembly of the universal clamp is not acceptable.

2.3.3 Actuators shall be fully modulating/proportional, or two-position as required and be factory or field selectable. Actuators shall have visual position indicators and shall operate in sequence with other devices if required.

2.3.4 Actuators shall have an operating range of -30°C to 50°C (-20°F to 120°F).

2.3.5 Proportional actuators shall accept a 0 to 10 VDC or 4 to 20 mA (with a load resistor) operating range.

2.3.6 Actuators shall be capable of operating on 24, 120 or 230 VAC, or 24VDC and Class 2 wiring as dictated by the application. Power consumption shall not exceed 10 VA for AC, including 120 VAC actuators, and 8 watts per actuator for DC applications.

2.3.7 NEMA-2 rated actuators shall be provided with a one-metre (three-foot) (minimum), pre-wired, electrical cable. Actuators requiring removal of the actuator cover for access to wiring terminals, exposing electronic, printed circuit boards to damage, are unacceptable.

2.3.8 Actuators shall have brushless DC motor technology with electronic overload protection or digital rotation sensing circuitry to prevent actuator damage throughout the entire rotation. End switches to deactivate the actuator at the end of rotation or magnetic clutches are not acceptable.

2.3.9 For power-failure/safety applications, an internal mechanical spring return mechanism shall be built into the actuator housing. Spring return actuators shall be capable of CW or CCW mounting orientation. Spring return models with torques greater than 7 N×m (60 in-lb) will be capable of mounting on shafts up to 27 mm (1.05 in.) in diameter and have a metal, manual override crank.
2.3.10 Actuators using "on-board" chemical storage systems, capacitors, or other "on-board" non-mechanical forms of fail-safe operation are unacceptable. Upon loss of control signal, a proportional actuator shall fail open or closed based on the minimum control signal. Upon loss of power, a non-spring return actuator shall maintain the last position.

2.3.11 Damper operators shall be selected to operate maximum damper loads of 6.0 N×m/m² (5.0 in×lb/ft²) of damper face area. Actuators shall be directly coupled the damper drive shafts - no linkages or jack shafts shall be used.

2.3.12 Multiple sections of a damper shall be actuated by individual damper actuators controlled by the same signal so they work in unison. No jack shafts or other means shall be used to couple more than one section of damper to a damper actuator.

2.4 Control Damper Status Switches
2.4.1 Damper status switches shall be a lever operated, activated by damper blade movement and mounted securely on damper frame.
2.4.2 Damper status switches, where specified, shall be part of shaft mounted damper actuators.
2.4.3 Damper switch shall have contact rating of 5 A at 120V AC and be CSA approved.
2.4.4 Positive Positioning Relays: All pneumatic actuators which are sequenced shall be provided with positive positioning relays.

2.5 Relays
2.5.1 Control relay contacts shall have utilization category and ratings selected for the application, with a minimum of two sets of contacts enclosed in a dust proof enclosure. Each set of contacts shall incorporate a normally open (NO), normally closed (NC) and common contact.
2.5.2 Control relays shall be UL listed plug-in type with dust cover and LED “energized” indicator. Contact rating, configuration, and coil voltage shall be suitable for application.
2.5.3 Relays shall be rated for a minimum life of one million operations. Operating time shall be 20 milliseconds or less. Relays shall be equipped with coil transient suppression devices to limit transients to 150% of rated coil voltage.
2.5.4 Time delay relays shall be UL listed solid-state plug-in type with adjustable time delay. Delay shall be adjustable ±200% (minimum) from set point shown on plans. Contact rating, configuration, and coil voltage shall be suitable for application. Provide NEMA 1 enclosure when not installed in local control panel.

2.6 VAV Terminal Unit Controls
2.6.1 Provide electric DDC controls to connect with the multi-point pitot-tube air flow sensor and single blade damper provided with the VAV terminal boxes. Actuators shall be non-overloading electric units directly connected to the damper shaft. Controllers shall be dedicated to each box with all inputs and outputs directly
connected. The controller shall sequence the VAV box reheat coil, radiation and fan as required. The room temperature sensor shall provide a connection means to directly program the connected box controller.

2.7 **Pressure-Electric (PE) Switches.**

2.7.1 Shall be metal or neoprene diaphragm actuated, operating pressure rated 0-175 kPa (0-25 psig), with calibrated scale setpoint range of 14-125 kPa (2-18 psig) minimum, UL listed.

2.7.2 Provide one- or two-stage switch action SPDT, DPST, or DPDT, as required by application. Electrically rated for pilot duty service (125 VA minimum) and/or for motor control.

2.7.3 Shall be open type (panel-mounted) or enclosed type for remote installation. Enclosed type shall be NEMA 1 unless otherwise specified.

2.7.4 Shall have a permanent indicating gauge on each pneumatic signal line to PE switches.

2.7.5 The pressure switch shall be CSA approved.

2.8 **Output Devices as Application Specific Devices**

2.8.1 Output Devices that receive commands as network variables with data formatted with SNVTs are considered to be application specific devices.

2.8.2 These devices shall meet the requirements specified for application specific devices.

2.9 **Sensors and Sensor/Transmitters**

2.9.1 Each controller shall be directly connected to point devices as specified by the input/output summary. Sensor wire for each analog input shall be at least 20 AWG twisted cable. Refer to Division 27 for specification of other type of wire required. Plenum rated cable from device to controller shall be used if any part of the wire run passes through a return air plenum.

2.9.2 It is the intent of the Agency to purchase industry standard analog input devices. For all analog sensors that are an integral part of a control loop, the control contractor shall demonstrate that the sensor supplied can be purchased by the Agency from two other manufacturers.

2.9.3 **Binary Temperature Devices**

2.9.3.1 Low-voltage space thermostat shall be 24 V, bimetal-operated, mercury-switch type, with either adjustable or fixed anticipation heater, concealed setpoint adjustment, 13°C to 30°C (55°F to 85°F) set point range, 1°C (2°F) maximum differential, and vented ABS plastic cover.

2.9.3.2 Line-voltage space thermostat shall be bimetal-actuated, open contact type, or bellows-actuated, enclosed, snap-switch type or equivalent solid-state type, with heat anticipator, UL listed for electrical rating, concealed setpoint adjustment, 13°C to 30°C (55°F to 85°F) setpoint
range, 1°C (2°F) maximum differential, and vented ABS plastic cover.

.3 Low-limit thermostats. Low-limit airstream thermostats shall be UL listed, vapor pressure type, with an element of 6 m (20 ft) minimum length. Element shall respond to the lowest temperature sensed by any 300 mm (1 ft) section. The low-limit thermostat shall be manual reset only.

2.9.4 Temperature sensors.

.1 All temperature sensors shall be 1000 Ω platinum, resistance temperature detector (pRTD) type; 10 kΩ thermistor or 1800 Ω thermistor at 25°C (77°F). The accuracy of the sensor shall be ± 0.3°C (0.5°F) over a range of 0°C (32°F) to 110°C (230°F). No transmitters shall be used with temperature sensors.

.2 All duct probe air temperature sensors shall have a minimum probe length of 450 mm (18 in.). All mixed air temperature sensors shall have a 7.5 m (24 ft) copper averaging tube with 9 sensor elements.

.3 All space temperature sensors shall be provided with vented protective covers, mounted 1200 mm (47 in.) from floor level. Coordinate with the Electrical Trade when installing in areas where switches are required. Verify mounting height and exact location of all t-stats with the Consultant in writing before proceeding with installation.

.4 Immersion sensors shall be provided with a separable stainless steel well. Pressure rating of well is to be consistent with the system pressure in which it is to be installed. The well must withstand the flow velocities in the pipe.

.5 Outdoor air temperature sensors shall be mounted in a weather proof enclosure with solar shielding. The accuracy of the sensors shall be ± 0.3°C (0.5°F) over a range -30°C (-20°F) to 50°C (120°F).

.6 Space sensors shall be equipped with set point adjustment, override switch, display, and communication port.

.7 Provide matched temperature sensors for differential temperature measurement.

2.9.5 Space Sensors

.1 Space sensors shall incorporate a temperature sensor and a temperature indicating device.

.2 Space sensors shall have an analog output to be used for set point adjustment.

.3 Space sensors shall have a momentary push button to trigger a binary output to be used for requesting an override of the system occupancy.
2.9.6 Humidity Sensors

.1 Duct and room sensors shall have a sensing range from 5% to 90% RH with an operating temperature range of 0°C to 60°C (32°F to 140°F).

.2 Duct sensors shall be provided with a sampling chamber.

.3 Outdoor air humidity sensors shall have a sensing range of 20% to 95% RH. They shall be suitable for ambient conditions of -40°C to 75°C (-40°F to 170°F).

.4 Humidity sensor’s drift shall not exceed 1% of full scale per year.

.5 Each sensor shall be provided with an industry standard two-wire, 4 to 20 mA transmitter, mounted at the sensor. The transmitter and sensing element shall have a combined accuracy of ± 3% RH over the humidity range.

.6 Duct mounted sensors shall be mounted halfway across the duct. Room mounted sensors shall be provided with vented covers.

2.9.7 Water Detectors

.1 Water detectors shall use gold-plated sensing probes to detect the presence of water or other conductive liquid.

.2 The detector shall include normally open and normally closed (form C) relay contacts rated at 5A @ 120 VAC/30 VDC for connection to a monitoring system, or direct control of another device.

.3 The mounting legs will allow a sensing height adjustment from 0" to 1/2". The WD100 is designed to signal an alarm if one or more of three conditions are met: water is detected, power is lost to the unit, or if there is an internal failure.

.4 Where noted in the schedules, the detector shall include a conductivity cable for increased coverage.

2.9.8 Gas Detection

.1 Provide Hazardous Gas Detection Equipment as follows:

.1 System

.1 Provide Standalone Controller to achieve the required detection and sequences.

.2 Programmable alarm time delays & minimum fan run times

.3 LCD display of gas, concentration and alarm status

.4 LED alarm indication (Fault, Low, Mid, High)

.5 Audible alarm rated 90 dB @ 10 feet

.6 Acknowledge / silence button

.7 Completely field programmable

.8 Digital pushbutton selection of calibration gas concentration

.9 CSA/UL and CE certifications

.10 PDC-BACNET module.
2. Sensor / Transmitters

.1 Carbon Monoxide Gas Sensor / Transmitter
   .1 4-20 mA analog output
   .2 Rugged PVC housing
   .3 Electrochemical CO sensor
   .4 Factory calibrated to CO gas, range 0 - 100 PPM.

.2 NOx Gas Sensor / Transmitter
   .1 4-20 mA analog output
   .2 Rugged PVC housing
   .3 Electrochemical NO sensor
   .4 Factory calibrated to NO gas, range 0 – 100 PPM.

.3 Strobe and Siren
   .1 Provide strobe and siren in each garage.
   .2 Strobes shall be red in colour
   .3 Sirens shall provide minimum 105 dB

2.9.9 Differential Pressure Sensors

.1 Differential pressure sensors shall be provided for liquid or air differential pressure applications. The differential pressure range shall be selected to match the application. Select materials suitable for the measured variable, i.e.: water or air, and to withstand a minimum of four times the normal pressure.

.2 Each sensor shall be provided with an industry standard two-wire, 4 to 20 mA transmitter, mounted at the sensor. The transmitter and sensor shall have a combined accuracy and repeatability of 0.5% of the differential pressure range.

.3 Calibrated span: not greater than twice the static pressure at maximum flow.

2.9.10 Pressure transducers.

.1 Transducer shall have linear output signal. Zero and span shall be field adjustable.

.2 Transducer sensing elements shall withstand continuous operating conditions of positive or negative pressure 50% greater than calibrated span without damage.

.3 Water pressure transducer shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Transducer shall be complete with 4 to 20 mA output, required mounting brackets, and block and bleed valves.

.4 Water differential pressure transducer shall have stainless steel diaphragm construction, proof pressure of 1 MPa (150 psi) minimum. Over-range limit (differential pressure) and maximum static pressure shall be 2 MPa (300 psi).
Transducer shall be complete with 4 to 20 mA output, required mounting brackets, and five-valve manifold.

2.9.11 Differential Pressure Switches

.1 Differential pressure type switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum), NEMA 1 enclosure, with scale range and differential suitable for intended application or as shown.

.2 The differential pressure range of the switch shall be selected to suit the applications. Factory manufactured pressure tips from the same manufacturer shall be used to measure static pressure.

.3 The switches shall have adjustable setpoint.

.4 The switch shall have SPDT contacts rated at 5 amperes 120V AC and be CSA approved.

.5 The switch shall be mounted with diaphragms in a vertical plane.

2.9.12 Freeze-stats

.1 Freeze-stats shall be complete with 7.3 m (24 ft) of capillary. Wire freezestats to shut down respective fan or fans and alarm at the BAS should temperature over any 300 mm (12 in.) of capillary length drop below 2°C (36°F). Freezestats shall have manual reset.

.2 Provide 3.3 metres (1 foot) of capillary for every square metre (foot) of coil face area. Wire multiple freeze-stats so any one will shut down the fans.

.3 The capillary tube shall run horizontally across the coil face and vertically along the frame. Secure the capillary so there is no sagging or diagonal runs. Horizontal runs shall be 300 mm (12 in.) or less apart.

.4 Locate freeze-stats after preheat coils and before cooling coils in air systems utilizing outside air.

2.9.13 Duct Smoke Detectors

.1 Duct smoke detectors and interlocks to shut down associated fans shall be provided and connected to the building fire alarm system under Division 28.

.2 Shall conform to the requirements of UL 268A.

.3 Shall have perforated sampling tubes.

.4 Shall be rated for air velocities that include air flows between 2.5 and 20 m/s (500 and 4000 feet per minute).

.5 Shall have a minimum of two independent sets of contacts, one normally open (NO) and one normally closed (NC). The NC contact shall be rated for a 120 VAC starter circuit.

.6 Upon detecting smoke in the duct, the NO contact shall close, the NC contact shall open, and both sets of contacts shall remain in this state until reset.

.7 Shall be capable of local manual reset or remote reset via dry contacts.
2.9.14 Flow switches
.1 Flow-proving switches shall be either paddle or differential pressure type, as shown.
.2 Paddle type switches (water service only) shall be UL listed, SPDT snap-acting with pilot duty rating (125 VA minimum) and shall have adjustable sensitivity with NEMA 1 enclosure unless otherwise specified.
.3 Differential pressure type switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum), NEMA 1 enclosure, with scale range and differential suitable for intended application or as specified.

2.9.15 Water Flow Sensors
.1 Water flows shall be measured using annubars. They shall be constructed of 316 stainless steel and provided with a 25 mm (1 in.) carbon steel fitting. The annubar shall be of diamond shaped design having a low pressure drop and a no clog feature.
.2 The annubar shall be fitted with a differential pressure transmitter which provides an output of 4 to 20mA proportional to flow. Select the annubar to suit the pipe and flow conditions. The accuracy shall be ± 1% of range with turndown ratio of 4 to 1.

2.9.16 Current Switch
.1 Provide solid-state current switches with LED status indicators and adjustable set point of the proper range for motorized equipment status points as specified.
.2 The switch shall be selected to suit motor current ratings and the threshold value shall be field adjusted to indicate a properly loaded motor. If a belt or coupling fails the current switch shall indicate an “off” status.

2.9.17 Current Transducer/Transmitter
.1 Provide current transducers with range specified on point schedule.
.2 Current transducers shall measure line current and produce a proportional two-wire, 4 to 20 mA or 0 to 10 VDC signal.
.3 Current transducers shall measure line current within ± 2% of full scale and produce a proportional two-wire, 4 to 20 mA or 0 to 10 VDC signal. An integral power supply shall be provided for the analogue output signal if required. The device shall have a means for calibration.

2.9.18 Current transformers.
.1 AC current transformers shall be UL/CSA Recognized and completely encased (except for terminals) in approved plastic material.
.2 Transformers shall be available in various current ratios and shall be selected for ±1% accuracy at 5 A full-scale output.
.3 Transformers shall be fixed-core or split-core type for installation on new or existing wiring, respectively.

2.9.19 Voltage Transducers
.1 Voltage transducers shall accept an AC voltage input and have an accuracy of ±0.25% of full scale.
.2 An integral power supply shall be provided if required for the analog output signal. The device shall have a means for calibration. Line side fuses for transducer protection shall be provided.

2.9.20 Voltage transformers.
.1 AC voltage transformers shall be UL/CSA Recognized, 600 VAC rated, complete with built-in fuse protection.
.2 Transformers shall be suitable for ambient temperatures of 4°C to 55°C (40°F to 130°F) and shall provide ±0.5% accuracy at 24 VAC and a 5 VA load.
.3 Windings (except for terminals) shall be completely enclosed with metal or plastic material.

2.9.21 Watt Transducers
.1 A watt transducer shall be provided for each chiller. The transducer will provide input signals into the SCU which will provide kW and kWh readings.
.2 Current and potential transformers shall be used to provide input signals to the watt transducers.

2.9.22 Override timers.
.1 Override timers shall be spring-wound line voltage, UL Listed, with contact rating and configuration as required by application. Provide 0- to-6-hour calibrated dial unless otherwise specified. Timer shall be suitable for flush mounting on control panel face and located on local control panels or where shown.

2.10 Transmitters
2.10.1 The electrical output of a transmitter shall be 0 to 10 VDC, 4 to 20 mA or 0 to 20 mA for analog variables and binary contacts for status variables.

2.10.2 The resolution of a transmitter may not exceed the following:
.1 0.01 V per increment for 0-10 VDC transmitters.
.2 0.02 mA per increment for 4-12 or 0-20 mA transmitters.
.3 The process variable change that corresponds to the transmitter resolution is the smallest reportable change that can be processed.

2.10.3 Transmitters that connect directly to the FT 10A field bus are considered to be application specific devices.

2.10.4 Current transmitters.
.1 AC current transmitters shall be the self-powered, combination split-core current transformer type with built-in rectifier and high-gain servo amplifier with 4 to 20 mA two-wire output. Unit ranges shall be 10 A, 20 A, 50 A, 100 A, 150 A, and 200 A full scale, with internal zero and span...
adjustment and ±1% full-scale accuracy at 500 Ω maximum burden.

.2 Transmitter shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA Recognized.

.3 Unit shall be split-core type for clamp-on installation on existing wiring.

2.10.5 Voltage transmitters.

.1 AC voltage transmitters shall be self-powered single-loop (two-wire) type, 4 to 20 mA output with zero and span adjustment.

.2 Ranges shall include 100 to 130 VAC, 200 to 250 VAC, 250 to 330 VAC, and 400 to 600 VAC full-scale, adjustable, with ±1% full-scale accuracy with 500 Ω maximum burden.

.3 Transmitters shall be UL/CSA Recognized at 600 VAC rating and meet or exceed ANSI/ISA S50.1 requirements.

2.11 Control Valves

2.11.1 General

.1 Valves shall have stainless steel stems and stuffing boxes with extended necks to clear the piping insulation. Valve bodies shall meet ANSI/ASME B16.34 or ANSI/ASME B16.15 pressure and temperature class ratings based on the design operating temperature and 150% of the system design operating pressure.

.2 Unless otherwise specified or shown, valve leakage shall meet ANSI/FCI 70 2 Class IV leakage rating (0.01% of valve Kv). Unless otherwise specified or shown, valves shall have globe style bodies.

.3 Unless otherwise specified the following applies:

.1 Bodies for valves 40 mm (1.5 in.) and smaller shall be brass or bronze, with threaded or union ends.

.2 Bodies for 50-mm (2-in.) valves shall have threaded ends.

.3 Bodies for valves 50 to 75 mm (2 to 3 in.) shall be of brass, bronze, or iron.

.4 Bodies for valves 63 mm (2.5 in.) and larger shall be provided with flanged end connections.

.5 For modulating applications, the valve coefficient shall be within 100 to 125% of valve coefficient shown.

.6 For two position applications, where the two positions are full open and full closed, the valve coefficient shall be the largest available for the valve size.

.7 Valve and actuator combinations shall be normally open or normally closed as shown.

.4 All characteristics of control valves shall be suitable for the required operations.
The pressure drop across all modulating control valves shall be between 10 and 25 kPa (1.5 and 4 psi) unless specified otherwise.

The minimum stabilized control valve authority shall be 0.25.

2.11.2 Ball Valves
1. Balls shall be stainless steel.
2. All valves shall have stainless steel stems and spring loaded Teflon cone packing.
3. Valves shall have blow-out proof stems.
4. In steam and high temperature hot water applications, the valve to actuator linkage shall provide a thermal break.

2.11.3 Two-way Valves
1. Two way modulating valves used for liquids shall have an equal percentage characteristic.
2. Two way modulating valves used for steam shall have a linear characteristic.
3. Two-position control valves shall be line size.

2.11.4 Duct Coil and Terminal Unit Coil Valves
1. Control valves with either flare type or solder type ends shall be provided for duct or terminal unit coils.
2. Flare nuts shall be provided for each flare type end valve.

2.11.5 Valves for Chilled Water, Condenser Water and Glycol Service
1. Valve internal trim shall be Type 316 stainless steel.
2. Valves 100 mm (4 in.) and larger shall be butterfly valves.

2.11.6 Valves for Hot Water
1. Valves for hot water service between 100°C and 120°C (210°F and 250°F) shall have internal trim (including seats, seat rings, modulating plugs, and springs) of Type 316 stainless steel.
2. Internal trim for valves controlling water below 100°C (210°F) shall be brass, bronze, or Type 316 stainless steel.
3. Non-metallic valve parts shall be suitable for a minimum continuous operating temperature of 120°C or 30°C (250°F or 50°F) above the system design temperature, whichever is higher.
4. Valves 100 mm (4 in.) and larger shall be butterfly valves.

2.12 Control Dampers
2.12.1 Exhaust air or intake dampers shall be thermally insulated units. Return air dampers shall be airfoil dampers.

2.12.2 Unless otherwise indicated, automatic control dampers shall be as follows: Outdoor and/or return air mixing dampers and face and bypass (F&BP) dampers shall be parallel blade, arranged to direct airstreams toward each other. Other modulating dampers shall be the opposed blade type. Two-position shutoff dampers may be parallel or opposed blade type with blade and side seals.

2.12.3 Extruded aluminum damper frames shall not be less than 2.0 mm (0.080 in.) thickness, 100 mm (4 in.) deep and insulated dampers
shall be insulated with Styrofoam on three sides if installed in duct and on four sides if flanged to duct.

2.12.4 Blades to be extruded aluminum. Insulated dampers shall be internally insulated with expanded polyurethane foam and shall be thermally broken. Complete blade shall have an insulating factor of RSI-0.40 (R-2.3) as per certified tests.

2.12.5 Blade gaskets shall be of extruded EPDM. Frame seals shall be of extruded TPE. Gaskets to be secured in an integral slot within the aluminum extrusions.

2.12.6 Bearings are to be composed of an inner bearing fixed to a 11 mm (7/16 in.) aluminum hexagon blade pin, rotating within a polycarbonate outer bearing inserted in the frame.

2.12.7 Linkage hardware shall be installed in the frame side and be constructed of aluminum and corrosion-resistant, zinc-plated steel, complete with cup-point trunnion screws for slip-proof grip.

2.12.8 Dampers to be designed for operation in temperatures ranging between -40°C and 100°C (-40°F and 212°F).

2.12.9 Leakage shall not exceed 25 L/s/m² against a 1 kPa (4.9 cfm/ft² against 4 in. w.c.) differential static pressure at -40°C (-40°F).

2.12.10 Pressure drop of a fully open 1200 x 1200 mm (48 in. x 48 in.) damper shall not exceed 7.0 Pa at 5.0 m/s (0.03 in. w.c. at 1000 fpm).

2.13 **Local Control Panels**

2.13.1 All indoor control cabinets shall be fully enclosed NEMA 1 construction with (hinged door) key-lock latch and removable subpanels. A single key shall be common to all field panels and subpanels.

2.13.2 Cabinets shall be wall mounted or free standing and shall be located as co-ordinated in writing with the Agency and Consultant.

2.13.3 Interconnections between internal and face-mounted devices shall be prewired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections shall be UL listed for 600 volt service, individually identified per control/interlock drawings, with adequate clearance for field wiring. Control terminations for field connection shall be individually identified per control drawings.

2.13.4 Provide ON/OFF power switch with overcurrent protection for control power sources to each local panel.

2.14 **Nameplates**

2.14.1 Duct and pipe mounted sensors and control panels shall be provided with Lamicoid Nameplates, clearly identifying the equipment and the zone in which it is controlling.

3. **EXECUTION**

3.1 **Sensors, Transmitters, and Terminal Devices**

3.1.1 Install sensors in accordance with the manufacturer's recommendations.
3.1.2 Mount sensors rigidly and adequately for the environment within which the sensor operates.

3.1.3 Room temperature sensors shall be installed on concealed junction boxes properly supported by the wall framing.

3.1.4 All wires attached to sensors shall be air sealed in their raceways or in the wall to stop air transmitted from other areas affecting sensor readings.

3.1.5 Sensors used in mixing plenums and hot and cold decks shall be of the averaging type. Averaging sensors shall be installed in a serpentine manner vertically across the duct. Each bend shall be supported with a capillary clip.

3.1.6 Low-limit sensors used in mixing plenums shall be installed in a serpentine manner horizontally across duct. Each bend shall be supported with a capillary clip. Provide 3 m of sensing element for each 1 m² (1 ft of sensing element for each 1 ft²) of coil area.

3.1.7 All pipe-mounted temperature sensors shall be installed in wells. Install all liquid temperature sensors with heat-conducting fluid in thermal wells.

3.1.8 Install outdoor air temperature sensors on north wall, complete with sun shield at designated location.

3.1.9 Differential air static pressure.

.1 Supply Duct Static Pressure: Pipe the high-pressure tap to the duct using a pitot tube. Pipe the low-pressure port to a tee in the high-pressure tap tubing of the corresponding building static pressure sensor (if applicable) or to the location of the duct high-pressure tap and leave open to the plenum.

.2 Return Duct Static Pressure: Pipe the high-pressure tap to the duct using a pitot tube. Pipe the low-pressure port to a tee in the low-pressure tap tubing of the corresponding building static pressure sensor.

.3 Building Static Pressure: Pipe the low-pressure port of the pressure sensor to the static pressure port located on the outside of the building through a high-volume accumulator. Pipe the high-pressure port to a location behind a thermostat cover.

.4 The piping to the pressure ports on all pressure transducers shall contain a capped test port located adjacent to the transducer.

.5 All pressure transducers, other than those controlling VAV boxes, shall be located in field device panels, not on the equipment monitored or on ductwork. Mount transducers in a location accessible for service without use of ladders or special equipment.

.6 All air and water differential pressure sensors shall have gauge tees mounted adjacent to the taps. Water gauges shall also have shutoff valves installed before the tee.
3.2 **Remote Sensor Location**

3.2.1 Sensors that are used in variable flow systems shall be located within the distribution system and not at the distribution source. Thus, the sensors will measure the effects of changes within the system. Control of the source (example: fans, pumps) output (speed) shall be effected through the local controller. The remote sensor shall be hard-wired back to the source’s controller. The Control Trade will provide this extended wiring. The remote sensor shall not be connected to a second controller located closer to the site of the measurement. The stability of the variable flow system control shall not depend on network communication between controllers.

3.3 **Flow Switch Installation**

3.3.1 Use correct paddle for pipe diameter.
3.3.2 Adjust flow switch in accordance with manufacturer’s instructions.

3.4 **Actuators**

3.4.1 Mount and link control damper actuators according to manufacturer’s instructions.

.1 To compress seals when spring-return actuators are used on normally closed dampers, power actuator to approximately 5° open position, manually close the damper, and then tighten the linkage.

.2 Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.

.3 Provide all mounting hardware and linkages for actuator installation.

3.4.2 Electric/Electronic

.1 Dampers: Actuators shall be direct-mounted on damper shaft or jackshaft unless shown as a linkage installation. For low-leakage dampers with seals, the actuator shall be mounted with a minimum 5° available for tightening the damper seals. Actuators shall be mounted following manufacturer’s recommendations.

.2 Valves: Actuators shall be connected to valves with adapters approved by the actuator manufacturer. Actuators and adapters shall be mounted following the actuator manufacturer’s recommendations.

3.4.3 **Gas Detection:**

.1 Sensor ranges shall be at least 10% of low level alarm and double the high level alarm.

.2 CO Gas Sensor / Transmitter

.1 High Level Alarm at 50 ppm.
.2 Low Level Alarm at 25 ppm.
.3 Mount at 1500 mm A.F.F.
.3 NO Gas Sensor / Transmitter
.1 High Level Alarm at 2 ppm.
.2 Low level alarm at 1 ppm.
.3 Mount at 1500 mm A.F.F

END OF SECTION
1. **GENERAL**

   1.1 Related Sections
      1.1.1 Division 21 – Fire Suppression
      1.1.2 Division 22 – Plumbing
      1.1.3 Division 23 – Heating, Ventilating, and Air-Conditioning
      1.1.4 Section 25 05 00 – General Requirements For Controls Trades
      1.1.5 Section 25 06 00 – Schedules for Integrated Automation
      1.1.6 Section 25 10 00 – Integrated Automation Network Equipment
      1.1.7 Section 25 30 00 – Integrated Automation Instrumentation and Terminal Devices
      1.1.8 Division 26 – Electrical
      1.1.9 Division 27 – Communications
      1.1.10 Division 28 – Electronic Safety and Security

2. **CONTROLS SEQUENCE OF OPERATIONS**

   2.1 The Contractor shall provide and install all the control items to provide the following controls. Refer to Wiring for Mechanical Equipment Schedule on the electrical plans and execution Sections of the Specifications.

   2.2 **Metasys Control System:** The following systems shall be integrated into the existing Johnson Controls Metasys System:

      2.2.1 Air Handling Unit Controls for Communications department (180 Derry Road):
         .1 Air handling units serving Communications department at 180 Derry Road shall operate as duty-standby. Lead AHU shall alternate on a weekly basis. (user adjustable)
         .2 The occupancy mode (Occupied or Unoccupied) shall be determined through a user-adjustable, graphical, seven-day schedule with holiday schedule. However, this system is intended to be in occupied mode 24h/day, 7 days/week.
         .3 Whenever the supply and return fans are de-energized, as sensed by the VFD status contact, the outside and exhaust air dampers shall be closed and the return air damper shall be open, the cooling and cooling valves shall be closed or positioned as described below.
         .4 Occupied Mode
            .1 The supply fan shall be energized. The air handling unit supply fan speed shall modulate to the speed by duct pressure setpoint determined by the balancing company that provides the required air flow to the space. The supply fan speed shall not drop below 30% (adjustable) to assure adequate fan motor cooling.
.2 Whenever the supply fan is energized, the return fan shall be energized. The return fan speed shall modulate to maintain the space pressure setpoint (adjustable) as determined by the balancing company.

3. Outdoor and mixed air dampers
   1. When airflow measuring station is measuring above setpoint, and mixed air damper is fully open, outdoor air damper shall begin to close until setpoint is reached.
   2. If outdoor damper is not fully open and airflow measuring station is measuring below setpoint, the outdoor air damper shall modulate open until setpoint is reached.
   3. If outdoor air damper is fully open and below setpoint, then the mixed air damper shall modulate closed until setpoint is reached.
   4. If mixed air damper is not fully open and airflow measuring station reads above setpoint, then modulate the mixed air damper open until setpoint is reached.
   5. Outdoor air damper and mixed air damper shall modulation one at a time. While one is modulating, the other shall be fully open.

.4 There shall be separate heating and cooling space temperature setpoints with a 2.5°C deadband between the heating and cooling.

.5 The burner, mixed air damper, and cooling coil shall modulate in sequence to maintain supply air temperature setpoint. Maintain a 2.5°C deadband between heating and economizer cooling.

.6 Economizer cooling is enabled whenever the outside air-dry bulb is less than the return air dry bulb. When the outside air dry bulb is greater than the return air dry bulb, economizer cooling is disabled. When economizer cooling is enabled, mixed air damper will modulate to maintain space temperature setpoint. There shall be a mixed air low limit function to modulate the mixed air dampers closed to prevent the mixed air temperature from dropping below the mixed air low limit setpoint of 12.7°C (adjustable).
Defrost Cycle: Unit controller shall slow heat recovery wheel as required for defrost cycle.

VAV Boxes shall be controlled as follows:

1. When the zone temperature is between the occupied heating and cooling setpoints the primary air damper will be at the minimum CFM and there will be no mechanical heating.

2. On a rise in zone temperature above the cooling setpoint, the primary air damper will increase the CFM and there will be no mechanical heating.

3. On a drop in zone temperature below the heating setpoint, the electric reheat will modulate and the damper is controlled to provide a minimum CFM.

4. If the zone temperature remains below the heating setpoint with the reheat coil valve fully open, the VAV damper shall slowly open until setpoint is reached.

Unoccupied Mode

1. Unoccupied Setback: When the lowest space temperature drops below the unoccupied heating space temperature setpoint, the supply and return fans shall energize, the outside and exhaust dampers shall remain closed and return damper open. The heating coil valves shall modulate to maintain supply air temperature setpoint of 85°F (adjustable) until the lowest space temperature is above the unoccupied setpoint. The supply and return fan speed shall be controlled as described in the occupied mode.

2. Start up sequence: Supply fan is energized to maintain duct pressure setpoint. Return fan energizes and modulated to maintain space pressure setpoint. Outdoor air damper to start in fully open position. If airflow measuring station is below setpoint, mixed air damper to modulate closed until outdoor air flow setpoint is reached. If airflow measuring station is measuring above setpoint, modulate outdoor air damper closed until setpoint is reached.

3. Morning Warm-up: The optimum start program shall start the unit at the latest possible time to reach the desired occupied space temperature setpoint at occupancy time. If the average space temperature is below the occupied space temperature setpoint, the unit shall be energized to maintain the desired space temperature setpoint.
temperature setpoint, the supply and return fans shall energize, the outside and exhaust dampers shall remain closed and return damper open. The gas fired furnace shall modulate to maintain supply air temperature setpoint of 85°F (adjustable) until the average space temperature equals the occupied space temperature setpoint. When the occupied space temperature setpoint is reached, the unit shall operate in the Occupied Mode. Morning warm-up shall occur only once in a day.

.4 Morning Pre-cooling: If the month is between May and October (adjustable), the outside air temperature is below 55°F (adjustable) and the space temperature exceeds Pre-Cool Space Temperature setpoint, Morning Pre-cooling may begin. The unit shall start in the pre-cool mode as determined by an optimum start program at the latest possible time to have the space at the occupied setpoint at occupancy time. The economizer cooling mode shall modulate the outside air and return air dampers to provide 55°F (adjustable) supply air. The heating and cooling valves shall be closed. The outside air return and exhaust air dampers shall modulate to provide 55°F (adjustable) supply air until the space temperature falls below the pre-cooling space temperature setpoint. Heating shall be disabled. If the space reaches the pre-cooling setpoint before occupancy, the system shuts off. If occupancy occurs before the space reaches the pre-cooling setpoint, the system switches to occupied mode. Morning Pre-cooling shall occur only once in a day.

.5 VAV Boxes shall be controlled as follows:

.1 When the zone temperature is between the unoccupied heating and cooling setpoints, the primary air damper will be at the minimum CFM and there will be no mechanical heating.

.2 On a rise in zone temperature above the cooling setpoint, the primary air damper will increase the CFM and there will be no mechanical heating.

.3 On a drop-in zone temperature below the heating setpoint, the reheat coil will modulate and the damper is controlled to provide a minimum CFM. If the zone temperature remains below the heating setpoint with the reheat coil
valve fully open, the VAV damper shall slowly open until setpoint is reached.

2.2.2 Road Safety - Garage Exhaust & Makeup Air (7750 Hurontario Road):
   .1 Existing controls for makeup air unit shall remain except for changes to fan speed control described below.
   .2 When CO and NOx levels are below the minimum threshold:
      .1 The makeup air unit dampers shall be adjusted to the position associated with this mode of operation. These damper positions are to be coordinated with the balancer on site. Refer to schedule on drawing.
      .2 The exhaust fans and makeup air fan shall operate per the minimum flow rate as indicated on the schedule on drawing. This fan speed shall be coordinated with the balancer on site.
   .3 When CO or NOx levels exceed the minimum threshold:
      .1 The makeup air unit dampers shall be adjusted to the position associated with this mode of operation. These damper positions are to be coordinated with the balancer on site. Refer to schedule on drawing.
      .2 The exhaust fans and makeup air fan shall operate per the associated mode of operation as indicated on the schedule on drawing. This fan speed shall be coordinated with the balancer on site.
      .3 Note: When CO and NOx levels exceed the minimum threshold in either garage, both garages will go into exhaust mode together.
   .4 When CO or NOx levels exceed the high limit threshold:
      .1 An audible alarm shall sound in the associated garage bay.
   .5 When the makeup air system is in unoccupied mode the exhaust fans shall be off and the exhaust fan motorized dampers shall be closed. If CO or NOx levels exceed the minimum threshold in either bay, the system shall move into occupied mode per the above sequences.

2.3 **Standalone Controls**

2.3.1 The following systems shall be controlled using standalone controls systems. The contractor will be responsible for providing a complete installation.

2.3.2 VAV With Reheat (new and relocated)
   .1 Occupied Mode:
      .1 When the zone temperature is between the occupied heating and cooling setpoints the primary air damper will be at the minimum CFM and there will be no mechanical heating.
      .2 On a rise in zone temperature above the cooling setpoint, the primary air damper will increase the CFM and there will be no mechanical heating.
.3 On a drop in zone temperature below the heating setpoint, the reheat coil will modulate and the damper is controlled to provide a minimum CFM.

.4 If the zone temperature remains below the heating setpoint with the reheat coil valve fully open, the VAV damper shall slowly open until setpoint is reached.

.2 Unoccupied Mode:
   .1 When the zone temperature is between the unoccupied heating and cooling setpoints, the primary air damper will be at the minimum CFM and there will be no mechanical heating.
   .2 On a rise in zone temperature above the cooling setpoint, the primary air damper will increase the CFM and there will be no mechanical heating.
   .3 On a drop in zone temperature below the heating setpoint, the reheat coil will modulate and the damper is controlled to provide a minimum CFM. If the zone temperature remains below the heating setpoint with the reheat coil valve fully open, the VAV damper shall slowly open until setpoint is reached.

.3 Notes:
   .1 End users shall have the capability of adjusting the room temperature +/- 2 degrees.
   .2 New control valves shall be provided for all new and/or relocated hydronic heating coils.
   .3 Controllers shall be provided to control to maximum and minimum airflow rates as noted on the schedules for both new and relocated VAV boxes. It is noted on the drawings which existing boxes are DDC controls and which existing boxes are pneumatic controls.

2.3.3 VAV With Supplementary Heating
   .1 Occupied Mode:
      .1 When the zone temperature is between the occupied heating and cooling setpoints, the primary air damper will be at the minimum CFM and there will be no mechanical heating.
      .2 On a rise in zone temperature above the cooling setpoint, the primary air damper will increase the CFM and there will be no mechanical heating.
      .3 On a drop in zone temperature below the heating setpoint, the radiant heating will energize to meet the demand and the damper is controlled to provide a minimum CFM.

   .2 Unoccupied Mode:
      .1 When the zone temperature is between the unoccupied heating and cooling setpoints, the primary air damper will be at the minimum CFM and there will be no mechanical heating.
On a rise in zone temperature above the cooling setpoint, the primary air damper will increase the CFM and there will be no mechanical heating.

On a drop in zone temperature below the heating setpoint, the radiant heating will energize to meet the demand and the damper is controlled to provide a minimum CFM.

Notes:

End users shall have the capability of adjusting the room temperature ±2 degrees.

New control valves shall be provided for all new and/or relocated hydronic heating coils.

Controllers shall be provided to control to maximum and minimum airflow rates as noted on the schedules for both new and relocated VAV boxes. It is noted on the drawings which existing boxes are DDC controls and which existing boxes are pneumatic controls.

Fan Coil Units

Fan operates at all occupied times.

Fan cycles while unoccupied to maintain space temperature set-back.

Modulate heating coil to maintain minimum spaces temperature.

Modulate cooling coil to maintain space temperature.

Thermostats provided shall include a push button for occupancy override. When a fan coil is called into occupied mode, the unit shall run for a period of 2 hours (adjustable).

Notes:

New control valves shall be provided for all new and/or relocated hydronic heating coils.

Existing bypass box control strategy shall be reinstated with new and relocated bypass boxes.

Cycle unit heaters on as required to maintain space temperature.

Provide remote thermostat.

Note: The intent for this sequence is that it will be satisfied by a controller provided with the ERV unit.

General

The air handling unit provides heating, cooling and ventilation to the space.

The unit consists of a supply fan, an exhaust fan, a heating coil, a DX cooling coil, an energy recovery wheel and an electric preheat coil.

The unit is used to deliver ventilation air to the space while maintaining the supply air temperature at setpoint. Setpoints are adjusted for both comfort and
energy efficiency. Fan speed and heat wheel speeds are constant.

.2 Start Up/Shut Down
.1 The exhaust fan starts first at minimum speed. The supply fan starts once exhaust fan status is received.
.2 At start up the initial supply air temperature setpoint will be set to 15 Deg C.

.3 Occupied Mode
.1 Provide a thermostat in the men’s locker room. Modulate the supply air temperature to maintain space temperature setpoint.
.2 The intake damper is open and the supply fan runs continuously.
.3 The exhaust damper is open and the exhaust fan runs continuously.

.4 Heat Wheel Control:
.1 When the outdoor air temperature is below 12 Deg C or above 24 Deg C the heat wheel will be enabled to maintain the supply air temperature at setpoint.
.2 When the outdoor air temperature is above 12 Deg C and less than the return air temperature the heat wheel will be off.
.3 The preheat coil will provide frost control for the wheel.

.5 DX Cooling: Cooling will be staged to maintain the return air temperature at setpoint.

.6 Heating Coil Valve: The valve will be controlled to maintain the supply air temperature at setpoint.

.7 Electric Preheat Coil: The preheat coil will modulate to maintain the preheat coil leaving air temperature at -6 Deg C. The setpoint will be automatically raised by the controller to prevent frosting on the wheel if required.

.4 Unoccupied Mode
.1 Supply and return fan are off. The intake and exhaust dampers are closed.
.2 The heat wheel and DX cooling are off.

.5 Alarms
.1 Fan is commanded on and status is not received (2 minute delay).
.2 Low temperature safety alarm is tripped.
.3 Supply air temperature is more than 4 Deg C above/below setpoint for more than 30 minutes.

2.3.8 Split system AC units AC-1,2,3,4
.1 AC – 1&2 and AC-3&4 serving Lan Room B007 shall operate as duty/standby. Lead AC units shall alternate on a weekly basis (user adjustable)
1. **GENERAL**

1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Intent**

1.2.1 It is the intent of these Specifications and Drawings, to provide the Contractor with sufficient information and details for construction of a complete and operational electrical installation.

1.2.2 These common works relate to all scope of work related within the Electrical Divisions which incorporates the Electrical Drawings, Telecommunications Drawings, Division 26 Electrical, Division 27 Communications, and Division 28 Electronic Safety and Security.

1.2.3 References to work by the Electrical Division, this Division or this Section within specification sections within the Electrical Division will reference the Contractor and their Subcontractors, vendors, agents, distributors, or manufacturers providing the work within the Division or Section.

1.3 **Summary**

1.3.1 Related Sections:

- .1 Section 00 21 13 Instructions to Bidders
- .2 Section 01 33 00 Submittal Procedures
- .3 Section 01 91 00 Commissioning
- .4 Division 02 Existing Conditions
- .5 Section 03 30 00 Cast-in-Place Concrete
- .6 Division 09 Finishes
- .7 Division 26 Electrical
- .8 Division 27 Communications
- .9 Division 28 Electronic Safety and Security

1.4 **Work Included**

1.4.1 Any item or subject which is shown, mentioned, or reasonably implied on either Drawings or in the Specifications, shall be considered to be properly and sufficiently specified and shown; and must be provided. Provide all labour equipment tools, etc. required to complete all the Work of this division.

1.5 **Submittals**

1.5.1 Forward to the Consultant copies of all correspondence and instructions from the Electrical Safety Authority for clarification and action.

1.6 **Quality Assurance**

1.6.1 It is the intention of the Agency to enter into an equitable Contract with the Contractor. Having done so, it is the expectation of the Agency that the Work will be carried out with the utmost precision and care. The standards of Work quality and layout and organization of the installations as listed herein shall be
strictly adhered to. Any Work deemed unacceptable by the Consultant shall be removed and replaced at no additional cost to the Agency.

1.6.2 Regulatory Requirements

.1 All Work carried out under this Contract shall comply with, but not be limited to the requirements of the latest edition of the following codes and regulations:

.1 Ontario Electrical Safety Code complete with Bulletins and Amendments.
.2 Ontario Building Code and its referenced standards.
.3 Applicable C.S.A. and ULC Standards.
.4 All applicable Federal, Provincial, Municipal and Industry standards and regulations.

1.6.3 Qualifications

.1 All work for Division 26 Electrical will be provided by qualified journeyman electricians or apprentices, holding valid Ontario Certificates of Qualification, and be supervised by a competent foreman.

.2 All work for Division 27 Communications and Division 28 Electronic Safety and Security will be provided by qualified technicians with documented certifications by manufacturers of equipment being installed, and be supervised by a competent foreman.

.3 The work of the Electrical Division will be reflected in the quality of installations - any unsatisfactory installations will be removed and replaced accordingly.

.4 Any and all changes or alterations to the installations of this project required by an authorized Inspector of an authority having jurisdiction will be provided in accordance with the terms and conditions of GC-16 of the General Conditions.

1.6.4 Certifications

.1 Obtain all permits and certificates bearing upon this Work and pay all fees and charges for same.

1.7 Compliance and Co-Operation

1.7.1 The Contractor shall be held responsible for the satisfactory completion of all Work. Plan the Work well in advance to eliminate delivery, installation and co-ordination difficulties. Be held responsible to resolve interferences and to co-operate to satisfactorily complete the project (being there first will not be accepted as a legitimate reason).

1.8 Warranty

1.8.1 All materials and installations of this division shall be guaranteed for a period of one year from the date of final acceptance of the Work unless otherwise specified, regardless of the extent of equipment manufacturer's warranties.
1.9 **Price and Payment Procedures**

1.9.1 In the event that a change to the Work is requested, The Contractor shall submit pricing for the change including an itemized list of the associated material and labour changes and costs for the Consultant to review.

1.9.2 A change must be approved by the Consultant before the Work is to proceed. If Work is performed without such approval, it is performed at the Contractor’s risk.

1.9.3 In the event of a disagreement between the Contractor and Consultant over valuation of the change in Work, resolution shall follow the procedure outlined below:

1. Labour shall be derived using the “Means” Costing Manual.
2. Labour rates shall be as stated in the Instructions to Bidders.
3. Material prices shall be Contractor prices provided by a local supplier or distributor.
4. Material requirements shall be obtained from field measurements.
5. Major equipment prices shall be reasonably negotiated.

1.10 **Project Dimensions and Details**

1.10.1 The Electrical Drawings do not generally show any Structural or Architectural details. Any information involving accurate measurements of the building and site shall be taken from the dimensional Drawings.

1.10.2 Dimensioned details and elevations shall generally take precedence over other conflicting details. However, where a conflict exists, it shall be clarified by the Consultant before installation. Changes required to equipment or the installation, due to the Architectural or Structural details, shall be made without additional charges or expense to the Agency.

1.11 **Manufacturers Quotation Procedures**

1.11.1 Manufacturers shall submit a price for each different element which shall be supplied to this Project. Bulk or package prices will not be accepted. Full submission of components required with the Contractor’s first construction draw.

1.12 **Shop Drawings**

1.12.1 Submit all Shop Drawings in accordance to Section 01 33 00 - Submittal Procedures.

1.12.2 Submit for review Shop Drawings and data sheets, in electronic PDF format, covering all items or equipment to be installed under the Contract (faxed and generic documents are not acceptable). Shop Drawings will show all physical properties, relevant performance, and installation information. The drawings and data required will generally be as outlined under each Section of the Specification, but will not be restricted to the items listed. Distribute reviewed Shop Drawings to other Sections as required for completion of their related work.
1.12.3 All submitted Shop Drawings must have been reviewed in detail by the Contractor and must bear their stamp. Should the drawings not have been reviewed and stamped, they will be returned immediately.

1.12.4 Equipment will not be accepted on site until review of Shop Drawings is complete. Shop Drawings marked “Reviewed as Modified” are conditionally approved such that the Contractor will ensure equipment satisfies all Contract requirements. Delivery of equipment may proceed but final, corrected Shop Drawings must be submitted prior to close of Contract.

1.12.5 This review is for the sole purpose of ascertaining conformance with the general design concept. This review will not mean that the reviewer approves the detail design inherent in the shop drawing, responsibility for which will remain with the Contractor submitting same, and such review will not relieve the Contractor of their responsibility for efforts or omissions in the Shop Drawings or of their 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 the fabrication processes or to techniques of construction and installation, for all quantities indicated and for co-ordination of the work of all Sections.

1.13 Maintenance and Instruction Manual

1.13.1 Forward to the Consultant three bound “Maintenance and Instruction Manuals” at the completion of the project.

1.13.2 The manuals shall be in a hard covered three ring binder complete with typed directory and information sheets, and subdivided into appropriate and identified sections.

1.13.3 Each printed copy will include an electronic copy of all documents contained within the binder(s) on a USB flash drive. All individual electronic documents will be organized in directories similar to the tabs in the binder and filenames will be in plain English describing of the contents within each file. All documents will be in unsecured PDF format and all text will be searchable. All audio and video content will be encoded in a format that can be viewed using standard codecs available on the most current version of Microsoft Windows operating system.

1.13.4 Each manual shall contain, but not be restricted to, the following information:

.1 One copy of each Shop Drawing (revised as per the reviewed Drawings).

.2 One copy of equipment parts list.

.3 One copy of recommended list of spare parts.

.4 One copy of operating and maintenance instructions.

.5 One copy of equipment installation details, construction and performance data.

.6 One list of all manufacturing and equipment service depots including telephone numbers.
.7 One copy of the Electrical Safety Authority Final Inspection Certificate.
.8 One copy of emergency lighting test results.
.9 One copy of Fire Alarm Verification Certificate.
.10 One copy of lighting recycling certificate.
.11 One copy of summary of telecommunications cabling test results (comprehensive full results will be included in electronic document)
.12 One copy of any other certificates, approval letters, etc.

1.13.5 Qualified technicians shall instruct the Agency’s Representatives in the operation and maintenance of the systems and equipment included in this division.

1.14 **As-Built Drawings**

1.14.1 During the progress of the Work the Contractor shall keep on the site at all times, a complete and separate set of prints and shall note thereon clearly, neatly, accurately and promptly all Architectural, Structural, Mechanical and Electrical changes, revisions and additions to the Work and deviations from the Contract Documents.

1.14.2 Indicate also on the as-built drawings the location of access panels or removable ceiling tiles which cover equipment or junction boxes which may require future access or where conduit or wiring for future use is located.

1.14.3 The final as-built drawings shall be prepared by a qualified draftsperson in AutoCAD at the Contractor’s expense as an electronic copy and one hard copy to be submitted to the Consultant at the completion of the project with an application for a Certificate of Total Performance.

1.14.4 Each set of as-built drawings will be submitted on three (3) USB flash drives. All documents will be in both AutoCAD and unsecured PDF format.

1.15 **Adjusting and Start-Up**

1.15.1 The Contractor is to conduct acceptance tests to demonstrate that the equipment and systems actually meet the specified requirements. Tests may be conducted as soon as conditions permit. The Contractor shall make all changes, adjustments or replacements required as the preliminary tests may indicate.

1.15.2 The Contractor is to operate all the equipment under normal conditions for a minimum period of five days as a start-up test. Defects disclosed must be repaired and tests repeated until pronounced satisfactory.

1.15.3 Final acceptance tests shall be conducted in the presence of the Consultant.

1.15.4 Provide the services of one journeyman electrician and all ladders, tools and associated equipment to assist the Consultant in carrying out the test.
1.16 **Relation to Other Work**

1.16.1 All cutting and patching required for the electrical work shall be provided at the expense of the Contractor, unless otherwise specified or shown. Refer to the architectural Specifications for details of cutting and patching provisions and requirements.

1.16.2 Provide all sleeves, inserts, hangers and core drilling of slabs, etc., required for completion of the electrical work. The location of inserts, sleeves, hangers, holes, back boxes, tubs, junction boxes, etc., shall be co-ordinated with the respective Contractor, into whose materials they are being installed. All floor and roof sleeves shall extend 100 mm above the finished levels, unless noted otherwise. Roof sleeves shall be completed with roof flashing and rain shields to ensure a weatherproof seal.

1.16.3 Cut holes and install sleeves for electrical installations piercing fire, smoke and acoustic separations to minimum sizes. All gaps shall be sealed on both sides of the separation by a qualified worker using materials and methods described in the applicable Specification section, to maintain the appropriate rating. All costs for such shall be paid for by the Contractor.

1.16.4 Where access doors are required for electrical installations, supply types with self-opening screwdriver lock and positive latching mechanism to the Contractor for installation in the walls or ceiling. Access doors are required where electrical equipment is located behind non-accessible surfaces and where access to, or servicing of the equipment is necessary. The access door size and fire rating must be approved by the Consultant. Refer to the Architectural Specifications for details of access door installation requirements. Provide installations to avoid the need for access doors where indicated.

1.16.5 All electrical equipment and fixtures are to be delivered to the site with the specified finish. Touch up painting of electrical equipment scratched on site shall be provided by the Contractor. Finish painting of primed electrical equipment and all concealed or exposed conduit, boxes, etc., as required will be provided by the Painting Contractor as identified in Division 9, Specifications.

1.16.6 All fixtures, equipment and system components delivered to the site and not contained in sealed cardboard cartons shall be immediately wrapped and sealed in plastic “bubble” wrap. Following installation, the items shall be protected from dirt, dust and damage with similar plastic wrap or protective enclosures until commissioned and put into full operation.

1.16.7 Co-ordinate installation of switches, thermostats, etc., at one common location and obtain approval on site from the Consultant of exact arrangement.
1.17 **Site Conditions**

1.17.1 Visit the site of the building and examine the existing conditions in relation to the Work to be done. The Contractor shall be responsible to allow for any requirements which could have been revealed in the course of such examinations.

1.17.2 Prepare a complete set of Interference Drawings for all typical or critical locations to indicate site installation conditions where space is limited. Field measurements shall be used to indicate accurate dimensions and configurations of all electrical services in relation to structural and architectural conditions as well as mechanical services. Coordination in the preparation of Drawings and layout of the related Work is imperative. Submit these interference Drawings to the Consultant for review prior to proceeding with any related Work, according to normal Shop Drawing procedure.

1.18 **Work in Existing Building**

1.18.1 The Contractor shall visit the site to examine the existing conditions and make necessary allowances in the bid price for demolition, removal, relocation, re-routing and reconnection of existing electrical equipment and wiring as required for the execution and completion of this project. In general, relocate existing services as required to accommodate new Work and architectural changes. In areas being totally renovated, provide all remaining electrical demolition Work and replace existing installations with new as shown. All existing redundant installations shall be removed prior to final acceptance. Extra charges for premium time and temporary provisions, if required to complete the Work as described and according to the schedule provided, shall be included in the bid price.

1.18.2 Install all conduit and feeders through the existing building along routes shown on the Drawings or approved on site by the Agency and Consultant. New installations will not necessarily be allowed along shortest routes, but should follow routes indicated or corridors or routes of other services where possible if not shown.

1.18.3 Unless noted otherwise, all existing electrical equipment and wiring which has not been removed or identified to be turned over to the Agency shall become the property of the Contractor (for disposal or removal from the site as applicable) and have an appropriate salvage value included in the bid amount.

1.18.4 Existing electrical equipment removed and indicated for re-use on this project shall be cleaned, painted as appropriate and be refurbished or replaced as required before re-installation.

1.18.5 Wiring location in areas being altered or demolished, but feeding outlets or equipment required to remain in service shall be re-routed as required to maintain the continuity of these services.
1.18.6 Sequence of removal and relocation of existing equipment and wiring shall be co-ordinated and shall conform to the requirements and conditions outlined.

1.18.7 Provide adequate protection to existing wiring and equipment throughout the project and particularly where wiring and electrical equipment have become exposed to mechanical injury or moisture in the course of alterations or new construction.

1.18.8 In some instances, new outlets and equipment are shown in the same location as the existing outlets, these may be fed through the existing conduits provided that the conduits and wiring are in good condition and are acceptable to the Electrical Safety Authority as reusable. All unused conduit entrance openings shall be sealed.

1.19 **Power Interruptions**

1.19.1 Service and distribution system power interruptions shall be kept to a minimum. Power interruptions must be co-ordinated with the Agency and all other Work by this Contractor. Written application for electrical interruptions must be received from the Contractor indicating the date, time and estimated duration of the interruption. Application for approval of the power interruptions must be submitted to the Agency and Consultant at least two weeks prior to the requested shut-down date.

1.20 **Alternate Manufacturers**

1.20.1 In some sections of this Specification, materials and equipment are specifically described and named by manufacturer for the purpose of establishing a minimum standard of materials, product quality and other specified requirements.

1.20.2 The project systems design as per the Drawings and Specifications is based on the specified manufacturer’s equipment but is intended to be appropriate for equivalent equipment of all other manufacturers.

1.20.3 Products of manufacturers listed as “Alternates” are subject to review during the bidding period only to ensure that they are equivalent to the products of the specified manufacturers. Alternate manufacturer’s equipment shall conform to the space limitations imposed by the project and the intent as outlined in this Specification and Drawings.

1.20.4 The Contractor is encouraged to submit alternative proposals of manufacturers not listed in the Approved Manufacturers List of proposals or modified design with delivery, and system design adjustments which they feel may be advantageous considerations for the project.

1.21 **Incentive Application**

The Contractor will be responsible for supporting the Owner in the completion of all applicable saveONenergy funding applications as required to maximize incentive dollars received. The Owner will manage the incentive application submission process. The Contractor will be
responsible for providing the Consultant/Owner with all required supporting information throughout the saveONenergy process with the Local Distribution Company (the Utility). Information required will include budget estimates, fixture cut sheets, proof of compliance with the saveONenergy requirements, and other documentation as required by the Utility. The Contractor must be able to provide all required documentation as requested to support the Owner in applying for the incentive funding. The process, in which the Owner will complete, includes the following steps:

1.21.1 Pre-application process submission including preparing all worksheets, estimates, supporting material and measurement and verification (M&V) plan as specified by the saveONenergy program.

1.21.2 Documentation of DLC approved selected fixtures.

1.21.3 Confirmation of pre-approval prior to any formal PO issuance for this project.

1.21.4 Post-submission following complete installation of the lighting project including preparing all worksheets, confirming the actual installation metrics, and submitting supporting material to support actual project results achieved.

1.21.5 Completion of M&V reporting as per the approved M&V Plan and submission of document.

END OF SECTION
1. **GENERAL**

1.1 **General Instructions**
   1.1.1 Comply with General Conditions of the Contract, Supplementary Conditions and requirements of Division 01. This section will also comply with 26 05 00 - Common Work Results for Electrical.

1.2 **Summary**
   1.2.1 This Section, "Wire and Cable", shall apply to all systems of this Contract. Variations or alterations of the requirements for a system will be specified in that system Section.
   1.2.2 Refer to the various wiring for equipment schedules and notes on the Drawings for details of devices and components to be provided by the Contractor.
   1.2.3 Refer to other sections of this Specification for material and wiring requirements. Install equipment remote control devices and provide interconnecting wiring as noted. Refer to the Drawings for further details.
   1.2.4 Refer to Section 26 05 53 - Identification for Electrical Systems for low-voltage electrical power conductor and cable tagging and colour coding.

1.3 **References**
   1.3.1 Section 26 05 33 - Raceway and Boxes for Electrical Systems
   1.3.2 Section 26 05 53 - Identification for Electrical Systems
   1.3.3 Section 27 10 00 Structured Cabling

2. **PRODUCTS**

2.1 **General**
   2.1.1 All conductors shall be of copper unless specified or shown otherwise on the Drawings.
   2.1.2 Conductor sizes #20 AWG to #10 AWG shall be stranded or solid type including systems wiring, equipment connections or other special installation requirements. Stranded or multiconductor cable shall be used for conductor sized greater than #8 AWG.
   2.1.3 Minimum #12 AWG for lighting and power branch circuit wiring.
   2.1.4 Minimum #14 AWG for 120V control wiring.
   2.1.5 Minimum #18 AWG for low voltage control wiring.
   2.1.6 Minimum #10 AWG for outdoor lighting, unless otherwise noted.

2.2 **Building Wires**
   2.2.1 R90:
   .1 Single copper conductor.
   .2 Chemically cross-linked polyethylene insulation.
   .3 Rated for 90°C, 600V and 1000V.
   .4 Suitable for handling to minus 40°C.
   .5 For interior installations in conduit.
   2.2.2 RW90:
   .1 Single copper conductor.
   .2 Chemically cross-linked polyethylene insulation.
.3 Rated for 90°C, 600V and 1000V.
.4 Suitable for handling to minus 40°C.
.5 For interior and exterior installations in conduit.

2.2.3 T90 Nylon:
.1 Single copper conductor.
.2 Thin wall PVC insulation with nylon covering.
.3 Rated for 90°C, 600V.
.4 May be used up to size #10 for interior installations.
.5 Conduit fill shall be based on RW90 rating.

2.3 Armoured Cable
2.3.1 AC90:
.1 Two, three or four copper conductors rated RW90, 1000V.
.2 Bare copper ground wire.
.3 Conductors wrapped and covered with bare interlocked aluminum armour.

2.4 Aluminum Sheathed Cable
2.4.1 RA90:
.1 Single or multi copper conductors rated RW90, 1000V.
.2 Liquid and vapour tight solid corrugated aluminum sheath.
.3 Overall PVC Jacket.
.4 Sized as indicated.
.5 FT-4 rated.

2.5 TECK Cable
2.5.1 Single or multi copper conductors rated RW90 1000V.
2.5.2 Bare copper ground conductor.
2.5.3 Inner PVC jacket.
2.5.4 Interlocking aluminum armour
2.5.5 Overall Thermoplastic covering.
2.5.6 Sized as indicated.

2.6 Non-Metallic Sheathed Cable
2.6.1 NMD90:
.1 Two or three copper conductors rated T90, 300V.
.2 Bare copper ground conductor.
.3 Overall PVC jacket.
.4 Minimum size #14.

2.7 Fire Alarm Cables
2.7.1 Two PVC insulated solid copper conductors.
2.7.2 One PVC insulated solid copper ground wire.
2.7.3 Overall RED PVC jacket.
2.7.4 Minimum #16 AWG to all detection devices.
2.7.5 Minimum #12 AWG to all audio/visual devices.

2.8 Low Voltage Wiring
2.8.1 LVT:
.1 Multi conductor PVC insulated.
.2 Bare copper ground conductor.
.3 Overall PVC jacket.
3. **EXECUTION**

3.1 **Applications**

3.1.1 Building Wires:

.1 Install building wires in conduit in accordance with section 26 05 33 - Raceway and Boxes for Electrical Systems.

3.1.2 BX Armoured Cable:

.1 Install cable from main conduit run junction boxes to light fixtures in suspended ceilings.

.2 Install cable from main conduit run junction boxes to devices mounted in partition walls.

.3 Cable lengths shall not exceed 3 m.

3.1.3 Aluminum Sheathed Cable:

.1 Install cables as indicated on Drawings.

.2 Where ever possible group cables on “U” channels.

3.1.4 TECK Cable:

.1 Install TECK cables as indicated on Drawings.

.2 Group cables wherever possible on “U” channels.

3.1.5 Fire Alarm Cables:

.1 Install in conduit in accordance with section 26 05 33 - Raceway and Boxes for Electrical Systems.

3.1.6 Low Voltage Wiring:

.1 Install in conduit in accordance with section 26 05 33 - Raceway and Boxes for Electrical Systems.

3.1.7 Wiring for Mechanical Equipment

.1 The Contractor is directed to the "Wiring for Mechanical Equipment Schedule", on the electrical Drawings for the schedule of devices and wiring.

.2 Wiring for mechanical equipment as described in the Specification and as indicated on the Drawings are based on the specified mechanical equipment. Wiring for this equipment shall not commence until approved wiring diagrams have been obtained from the Contractor.

.3 In general, the Contractor shall provide all required 120 V control equipment and wiring. Only line voltage components built-in to the equipment by the manufacturer or included under the controls or equipment Sections of Division 25 work will be provided by the Contractor. In general, the Contractor will provide all low voltage (24 V) control equipment and wiring and all pneumatic control devices and tubing unless otherwise indicated.

.4 Should alternate equipment other than the specified equipment be substituted all alterations to the wiring incurred by the said substitution will be provided by the Contractor. All changes and costs incurred by the substituted equipment will be subject to the Consultant's approval.
.5 Remote push buttons, pilot lights, and control devices in finished areas shall be heavy duty oil tight devices and contact blocks in flush wall mounted boxes 1200 mm above floor level, and finished with stainless steel covers.

3.1.8 Wiring for Architectural/Agency Purchased Equipment

.1 Provide labour and materials to supply power to architectural or Agency purchased equipment and make the necessary electrical connections. Provide an approved receptacle circuit termination device, disconnect switch, etc., to suit the item requirements. Also install and wire remote control devices for this equipment as noted on the Drawings. Refer to notes on the Electrical Drawings and the Equipment Wiring Schedules for further details. Wiring requirements as indicated are based on the specified equipment. Wiring for this equipment shall not commence until approved equipment Shop Drawings identifying connection point, outlet requirement, rating and wiring diagram have been received by the Contractor.

.2 The Contractor shall provide a power supply to each electrically operated door, dock leveller, etc., terminating in a disconnect switch at the equipment connection point. The equipment supplier will provide the control devices, starters, limit switches, etc., for installation by the Contractor. The Contractor shall complete the wiring between components according to the equipment supplier’s wiring diagram.

3.2 Installation

3.2.1 Wire pulling compound such as Ideal - Yellow 77 or equal shall be used for service, feeder and power cable installations. French chalk or talcum powder shall be used for the installation of the branch circuit wiring in systems requiring very low leakage.

3.2.2 Insulated ground conductors shall be the same type as the line conductors.

3.2.3 Higher temperature rated wire may be used if preferred by the Contractor, but sizes shall be based on a 90 degrees C insulation rating.

3.2.4 All branch circuit wire feeding a 20 Ampere protected lighting circuit shall be minimum #10 AWG wire. All branch circuit wiring feeding a 15 Ampere protected circuit which is over 45 m (150’) in length shall be minimum #10 AWG wire.

3.2.5 Each feeder and branch circuit shall be provided with a separate ground conductor sized in accordance with Electrical Safety Code regulations. All 120 V or 347 V (single phase) branch circuits shall be provided with a separate neutral conductor for each circuit.

3.2.6 The Contractor shall supply and install local motor and equipment disconnecting switches or devices for all items regardless of Electrical Safety Code exceptions. This shall refer to mechanical equipment, architectural equipment; Agency purchased equipment and system control panels. The wiring for equipment schedules and Drawings do not indicate these disconnecting switches or
devices. Some equipment items have integral disconnect switches provided and pre-wired with the equipment. In case of equipment manufacturer supplied disconnecting switches, issue a full credit to the Contract to delete the switches specified under this section.

3.3 **Terminations and Splices**

3.3.1 All terminations and splices shall be of an approved type for the conductors being used.

3.3.2 Where conductors are terminated or spliced, it shall be done in the following manner:

.1 Where a single solid conductor is terminated in a device under one screw or clamping mechanism, no additional terminating hardware is required.

.2 Where multiple or stranded conductors are terminated in a device under one screw or clamping mechanism, self-insulated crimp on cable ends or approved equal shall be used up to and including No. 10 sized conductors. Approved compression lugs shall be used for larger conductor sizes.

.3 Where multiple conductors are spliced, properly sized Wing Nut connectors, or approved equal, shall be used for up to two No. 8 or three No. 10 AWG conductors. Pressure type sleeve cable connectors, splices, tees, etc., shall be used for all larger size connections and terminations.

.4 All bare surfaces of splices shall be insulated with Scotch No. 33 tape, heat shrink sleeving or equivalent.

.5 Conductors connected to ground rods for service or equipment grounding or to building structural or architectural elements shall be terminated, connected and spliced using a thermoweld process or approved non-mechanical compression type connectors.

.6 All service and feeder conductors shall be installed as continuous lengths without breaks, measured and cut based on site dimensions.

3.4 **Field Quality Control**

3.4.1 Feeders and branch circuits rated 100 amperes or greater shall be checked with a 1000 V megger for 15 seconds before energization.

**Voltage Drop**

3.5.1 Voltage drop in power and control conductors shall be in accordance with the requirements of the Electrical Safety Code. Size conductors accordingly when sizes are not identified.

END OF SECTION
1. **GENERAL**

1.1 **Summary**

1.1.1 The Contractor shall provide a conduit system throughout the Project unless indicated otherwise. The conduit systems shall consist of all the necessary conduit, fittings, fastenings, boxes, special supports, etc.

1.2 **Definitions**

1.2.1 "Conduit"

.1 The definitions of "Conduit" (Rigid Metal, Rigid P.V.C., Rigid F.R.E., Flexible, and Electro Metallic Tubing) shall be as defined in the Electrical Safety Code. Other definitions shall be as follows.

1.2.2 "Slabbed Conduit"

.1 Slabbed conduit shall mean conduit which is installed within a monolithic concrete floor slab. No slabbed conduit shall be allowed to be installed for this Project.

2. **PRODUCTS**

2.1 **Conduit, Connectors and Fittings**

2.1.1 Conduit, connectors, and fittings as standard in the trade will be accepted unless noted herein or on the Drawings to be of a specific type, manufacturer, trade name, series or catalogue number.

2.2 **Rigid Metal Conduit**

2.2.1 All fittings must be threaded type. All conduit terminations shall have bushings with insulated plastic lining.

2.3 **Electro Metallic Tubing (EMT)**

2.3.1 All fittings must be steel set screw or rain-tight type. All conduit terminations shall have bushings with insulated plastic lining.

2.4 **Flexible Conduit**

2.4.1 All box connections shall have either a nylon lined connector or be provided with an insuliner sleeve. Liquid tight type shall include sealing ring for fully sealed connection.

2.4.2 All exposed flexible conduit shall be metallic liquid tight type.

2.4.3 Non-metallic type flexible conduit may be used, but only inside concrete block walls.

2.4.4 Concealed flexible conduit shall be approved galvanized steel or aluminum (where approved) interlocking type, minimum size 12 mm.

2.5 **Rigid P.V.C**

2.5.1 Use approved rigid P.V.C. fittings with solvent cement connections for all joints.
2.6 **Outlet Boxes**

2.6.1 Outlet boxes, junction boxes, etc. shall be of the types approved for the application. The following types shall be used for the noted applications:

.1 Recessed boxes in concrete or masonry - Type MBD (masonry box – deep) or MBS (masonry box – shallow) boxes.

.2 Surface mounted with EMT conduit – Model F, Shallow (FS) or Model F, Deep (FD) boxes.

.3 Surface mounted with rigid conduit – Model F, Shallow (FS) or Model F, Deep (FD) boxes.

2.7 **Miscellaneous**

2.7.1 Rigid Metal Expansion Joint - Crouse Hinds "XJ" series with bonding strap or Agency approved equivalent.

2.7.2 Rigid P.V.C. Expansion Joint - Scepter "O" Ring expansion joint "EJ" series or expansion coupler "EC" series, to suit expected length of movement.

3. **EXECUTION**

3.1 **Application**

3.1.1 Rigid metal conduit shall be used for the following:

.1 Raceway sizes in excess of 100 mm (4") diameter above grade.

.2 Where installed as an exterior branch circuit above finished grades.

3.1.2 Electric Metallic Tubing (EMT) shall be used for the following:

.1 Conduit sizes 100 mm and less, where not specified or required to be otherwise due to special applications or conditions.

.2 To carry branch circuit wiring from local distribution or lighting panels to area circuit junction boxes above ceiling systems.

3.1.3 Flexible conduit shall be used for the following:

.1 As branch circuit wiring from area circuit junction boxes above ceiling systems to light fixtures and from outlet boxes to suspended fixtures. The flexible conduit shall be restricted to 3600 mm in length. The flexible conduit used above ceiling systems shall be suitably clipped and supported every 900 mm in length.

.2 As a raceway in stud walls or partitions.

.3 **NOTE:** Flexible conduit shall not be used where conduit is run exposed.

3.1.4 Liquid tight conduit shall be used as the raceway between the distribution conduit and equipment terminal boxes of vibrating and rotating equipment. The length shall generally be restricted to 600 mm.
3.2 **Installation (Conduit and Fittings)**

3.2.1 Where more than one type of Product or method of installation could apply, the most restrictive Products and methods of installation shall take precedence.

3.2.2 All conduit connections shall be as tight as possible. Failure to tighten any conduit connections in block, tile or concrete elements will result in the element being removed and reinstalled at the Contractor's expense.

3.2.3 The conduit system shall not be used as the ground path for the building wiring system. All wiring systems shall be provided with a separate copper ground conductor sized accordingly to ensure ground path continuity.

3.2.4 Conduit shall be concealed in all finished wall areas, but may be run exposed in service and equipment rooms.

3.2.5 Where conduit is run exposed it shall be run parallel to the building lines. Where two or more conduits are grouped concentric bends shall be installed.

3.2.6 Do not install conduit horizontally in masonry walls.

3.2.7 All conduits shall be laid out and installed to avoid the proximity of heating pipes and ducts. Conduit shall not run within 900 mm of such pipes and ducts.

3.2.8 Conduit ends shall be plugged during construction with plastic push pennies. Conduits stubbed for future use shall be capped with conduit caps and sealed, if below grade.

3.2.9 Conduit systems shall be rigidly and securely supported with conduit straps to the building structure. Multiple conduit runs if not easily attached to the building structure directly, shall be supported by Unistrut hanger assemblies. Bailing wire or flexible metal strapping will not be accepted.

3.2.10 Conduits stubbed through equipment bases shall extend a minimum of 38 mm (1½") above the base.

3.2.11 Provide two 32 mm spare empty conduits stubbed into the ceiling space from the top of all recessed panels (power and systems) unless indicated otherwise. Terminate in suitable junction box with blank cover labelled accordingly.

3.2.12 Install a nylon pull cord in all empty conduits. Provide tags at both ends indicating system and destination. Maintain a pull cord in systems conduits used only to partial capacity.

3.2.13 Colour code all conduit systems throughout the building during installation with a patch of paint at all junction and pull boxes and points of concealment as follows:

<table>
<thead>
<tr>
<th>Colour</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>.1 Black</td>
<td>Power distribution (also indicate specific source/panel).</td>
</tr>
<tr>
<td>.2 Red</td>
<td>Fire Alarm System (also indicate circuits).</td>
</tr>
<tr>
<td>.3 Orange</td>
<td>Emergency Power System.</td>
</tr>
<tr>
<td>.4 Yellow</td>
<td>Sound/Intercom Systems</td>
</tr>
<tr>
<td>.5 Green</td>
<td>Telephone System.</td>
</tr>
<tr>
<td>.6 Blue</td>
<td>Electronic or Computer System.</td>
</tr>
</tbody>
</table>
3.3 **Rigid P.V.C. Conduit**

3.3.1 Rigid P.V.C. conduit shall be bent on site using a non-flame type heat source to accommodate the required contours.

3.3.2 All rigid P.V.C. conduit fittings, couplings, etc. shall be watertight type, fastened with an approved cement.

3.3.3 NOTE: Rigid P.V.C. conduit shall not penetrate fire rated walls, floors or ceilings.

3.4 **Partition Walls**

3.4.1 All conduit in demountable, prefabricated or standard stud partition walls shall be fed into the wall from the ceiling. No connections shall be made from the floor or walls. The conduit shall terminate in a junction box in the ceiling space within 900 mm of the ceiling system penetration point.

3.4.2 Flexible conduit in demountable or prefabricated partitions shall be restricted to a maximum 25 mm size.

3.5 **Outlet Boxes**

3.5.1 The location of outlets, fixtures, panels, etc., as shown on the Drawings, are approximately correct, but the Consultant reserves the right to alter the location of any number of them up to 3000 mm without incurring extra cost, if altered before installation is commenced on any individual item.

3.5.2 In general, 100 mm octagon boxes shall be used for light fixture outlets.

3.5.3 Boxes set in concrete slabs or walls shall not be less than 50 mm deep.

3.5.4 Outlet boxes installed in fire rated partitions shall be maximum 160 cm² in area. Outlet boxes installed on opposite sides of a fire rated partition shall be offset at least one stud space to maintain the integrity of the fire separation.

3.5.5 Outlet boxes installed outside of the building shall be watertight with screw fittings and watertight gaskets.

3.5.6 In general, Provide outlet boxes of adequate size and required dimensions for all outlet and conduit junctions.

3.5.7 All outlet boxes must be rigidly secured in position by approved methods. Those intended for hanging fixtures shall be Provided with fixture studs, self-aligning type for sloping ceilings.

3.5.8 Outlet boxes designated for future use shall be Provided with blank-metal coverplates. Coverplates on outlet boxes designated for other than future wiring devices, shall be installed in time to be painted over by the Contractor.

3.5.9 Pull boxes and terminal boxes shall be placed in inconspicuous but accessible locations.

3.5.10 All outlets, panelboards, switches, panels and equipment shall be centred on construction panels, wood paneling or boarding, ceiling tile, etc.

3.5.11 Components or devices such as switches and receptacles or thermostats and receptacles, etc., which occur one above the other in the same general location, shall be installed in the same vertical line.
3.5.12 Adjacent items such as panels and fire hose cabinets, etc., shall have the tops of their trims in line.
3.5.13 Clocks, bells, horns, speakers, etc., shall be located as shown or specified. However, these items shall be mounted symmetrically in paneling or tiles, and bear proper relationship to doors, ventilation grilles, etc. Where specific heights are not covered, the relation shall be discussed with, and approved by the Consultant.
3.5.14 In no case shall luminaires, pipes, ducts or other elements be allowed to obstruct clocks, grilles, exit lights, etc.
3.5.15 Recessed or surface ceiling mounted components shall replace full tiles where possible or be centred on the tile or grid intersections as determined on site.
3.5.16 Light switches shall be located on the knob side of door within 150 mm of the jamb. Verify door swings before proceeding with installation of the switch box and associated conduit/wiring.
3.5.17 Ensure all outlet boxes are installed with vapour barrier protection integral with specific wall or ceiling construction. For each outlet box installed which pierces a vapour barrier, provide an appropriately sized vapour barrier box surrounding outlet box to seal all air leaks and maintain vapour barrier continuity. Verify exact requirements on site with the Consultant prior to proceeding with installations.
3.5.18 In finished areas of the building as much conduit/wiring as possible shall be concealed. Where in the Contractor's opinion it is necessary or advantageous to run wiring on the surface, obtain approval from the Consultant before proceeding. All surface raceways installed shall be as manufactured by Wiremold unless otherwise indicated. Surface raceways shall be types as indicated or be sized to suit conductors being carried. Use only approved components, fittings, and methods of securing, joining and supporting surface raceways and outlet boxes. Where surface mount raceways and outlet boxes are used, they shall be painted to match the specific wall or ceiling finish by the Contractor.

3.6 Mounting Height
3.6.1 Where receptacles or other devices interfere with heating equipment, they shall be mounted in the toe space below the heating unit unless otherwise noted.
3.6.2 For mounting heights of the various system devices not indicated herein refer to the specific system section.
3.6.3 Mounting heights of outlet boxes in special or decorative wall systems shall be verified on site.
3.6.4 For exact mounting heights and requirements of outlets and devices built into millwork or architectural furnishings, refer to elevations and details shown on the architectural Drawings.
3.7 **Conduit Seals**

3.7.1 In areas where conduits pass through walls or other building surfaces in which different temperatures exist (i.e. refrigerated spaces or exterior walls and insulated ceilings or roofs, etc.), the conduits shall be sealed off with appropriate materials and methods to prevent breathing and subsequent condensation. The sealing shall be done such that moisture is not trapped at the seal.

**END OF SECTION**
1. **GENERAL**

1.1 **Summary**

1.1.1 Provide identification nameplates for all electrical apparatus; i.e. panels, motor starters, switchgear, transformers, disconnect switches, breakers, contactors, system control panels, telephone panels, etc.

1.1.2 Provide directory cards for all panelboards; i.e. power, lighting, low voltage systems, communications, etc. All power and systems wiring shall be colour coded in accordance with this Section and be provided with appropriate wire markers identifying panel circuits.

2. **PRODUCTS**

2.1 **Lamicoid Nameplates**

2.1.1 All identification nameplates and nametags unless otherwise specified shall be engraved white letters on black lamicoid stock with bevelled edges. The lamicoid stock shall be 1.5 mm minimum thickness.

2.1.2 The nameplates shall be engraved with the following information:

2.1.3 Nameplates for panel and cabinet identification shall typically include the following:

1. LP-"A" ................................................ 13 mm high lettering
2. 120/208 VOLT ..................................... 8 mm high lettering
3. FED FROM "MCC-1" ............................ 8 mm high lettering

2.1.4 All other electrical equipment shall be typically identified as follows:

1. SUPPLY FAN "SF-1" ............................ 8 mm high lettering
2. 208 VOLT - 3 PHASE ........................... 8 mm high lettering
3. FED FROM "MCC-1" ............................ 8 mm high lettering

2.1.5 The final wording of all nameplates shall be reviewed and approved by the Agency and Consultant prior to fabrication.

2.2 **Panel Directories**

2.2.1 Each panel circuit directory card shall have clearly typed information as with the following example:

1. PANEL NAME.................................................... LP-"A"
2. PANEL VOLTAGE ........................................... 120/208 VOLT
3. PANEL SUPPLY............................................. 150 AMP

<table>
<thead>
<tr>
<th>CIRCUIT NUMBER</th>
<th>LOAD</th>
<th>ROOM NO. OR LOCATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>lighting</td>
<td>143</td>
</tr>
<tr>
<td>2</td>
<td>receptacles</td>
<td>029</td>
</tr>
<tr>
<td>3</td>
<td>supply fan-SF-4</td>
<td>Roof</td>
</tr>
</tbody>
</table>

2.2.2 All systems distribution cabinets shall be complete with a directory card showing circuit numbers, room locations, and a blank column for "REMARKS".
2.3 **Wire and Cable Colour Coding**

2.3.1 All power and systems wiring shall be colour coded as follows:

- Power
  - Phase A - Red
  - Phase B - Black
  - Phase C - Blue
  - Neutral - White
  - Ground - Bare or Green

- Motor Control - Yellow

2.3.2 Provide suitable clip-on or stick-on wire markers for all wires at points of termination and interconnection. Wire markers shall identify panel and circuit number in a clear and logical manner.

3. **EXECUTION**

3.1.1 Lamicoid nameplates shall be mounted behind the panel door, fastened with contact cement.

3.1.2 Temporary panel directory cards shall be provided and filled in as the circuits are installed. The temporary directory card shall be replaced with a typed permanent directory at job completion.

3.1.3 The panel directory card shall be inserted in the card holder on the inside of the panel door and be protected by a clear plastic sheet.

3.1.4 Feeder cables shall be colour coded in each terminal panel and junction box with a minimum 75 mm taped band.

3.1.5 All power and systems junction and terminal box covers shall be marked with permanent black marker as to system installed (i.e. "F.A." for Fire Alarm) and other details such as circuit numbers, detection zone, etc. Exposed boxes shall have marking on inside face of cover.

**END OF SECTION**
1. **GENERAL**

1.1 **SUMMARY**

1.1.1 Work to include all labour, materials, tools, appliances, control hardware, sensors, wiring, junction boxes and equipment necessary for and incidental to the delivery, installation and furnishing of a completely operational standalone lighting control system, as described herein.

1.1.2 All lighting controls shall meet or exceed all locally-enforced energy codes including all mandatory control requirements for Ontario Building Code supplemental standard SB-10 and ASHRAE 90.1-2013.

1.1.3 All spaces shown within the building shall be controlled using the installed lighting control system.

1.1.4 Examine all general Specification provisions and Drawings for related electrical Work required as Work under this section.

1.1.5 Coordinate all Work described in this section with all other applicable plans and Specifications, including but not limited to wiring, conduit, fixtures, HVAC systems and building management systems.

1.1.6 All lighting control is subject to functional testing. Lighting control devices and control system shall be tested to ensure that control hardware and software are calibrated, adjusted, programmed, and in proper working condition in accordance with this section and the manufacturer’s installation instructions.

1.2 **REFERENCES**

1.2.1 Section 01 91 00 Commissioning
1.2.2 Division 25 Integrated Automation
1.2.3 Section 26 05 00 - Common Work Results for Electrical
1.2.4 Section 26 27 26 - Wiring Devices
1.2.5 Section 26 50 00 - Lighting
1.2.6 Ontario Building Code Supplemental Standard SB-10
1.2.7 ASHRAE 90.1-2013 Energy Standard for Buildings Except Low Rise Residential Buildings

1.3 **DEFINITIONS**

1.3.1 A Passive Infrared sensor (PIR sensor) is an electronic device that measures infrared (IR) light radiating from objects in its field of view.

1.3.2 An Ultrasonic sensor works on a principle similar to radar or sonar which evaluate attributes of a target by interpreting the echoes from radio or sound waves respectively. Ultrasonic sensors generate high frequency sound waves and evaluate the echo which is received back by the sensor.

1.3.3 A Microphonic sensor is a microphone that picks up ambient sounds and detects sounds that are typical for human occupancy. Unlike ultrasonic, no sound is transmitted from the unit and is therefore a passive technology. Unit will not record sounds or have any method to transmit sounds to any other device.
Microphonic sensor may be used in locations where ultrasonic sensors are specified herein.

1.3.4 Dual Technology sensors combine both passive infrared and ultrasonic/microphonic technologies into one sensor.

1.3.5 A Photosensor is an electronic device that detects the prevailing light level and sends the information either as an analog or a stepped digital output as a relative representation of the light level.

1.4 **QUALITY ASSURANCE**

1.4.1 All sensors, accessories and components must have a recognized certification mark (such as CSA or ULC) or a recognized field evaluation mark (such as CSA or ESA) as designated by the Ontario Electrical Safety Code.

1.4.2 All components (and associated re-installation) shall be warranted against defective manufacturing and installation for minimum of 2 (two) years from Substantial Completion.

1.5 **SUBMITTALS**

1.5.1 Complete sets of Shop Drawings shall be submitted indicating the following:

1. Product component cut sheets.
2. Wiring/Wireless schematics for typical and standalone room types in this Project (i.e. classroom, private office, lobby, open office, boardroom, etc.).
3. Functional testing sheets with room-by-room requirements table.

2. **PRODUCTS**

2.1 **APPROVED MANUFACTURERS**

2.1.1 The catalogue numbers specified are those of WattStopper/Legrand unless otherwise noted and represent the type and quality of equipment to be provided. Acceptable manufacturers are:

1. Sensor Switch/Acuity
2. Lutron
3. WattStopper/Legrand
4. Leviton
5. Cooper
6. Phillips
7. Or Agency approved equivalent

2.1.2 If any manufacturer requires additional components, wiring, space requirements, structural, etc. over that of the indicated manufacturer in these Specifications; then those items and costs shall be included. Any additional installation requirements shall employ the trades and Consultants already on site to Provide a complete and working lighting control system and paid for by the manufacturer.
2.2 OCCUPANCY SENSORS

2.2.1 Wall Mount Sensors (line voltage)
   .1 Dual Technology sensors
      .1 For use in small conference room, break room, or similar.
      .2 Each room shall be equipped with line voltage, dual relay, wall mounted, dual technology occupancy sensor(s) WattStopper DW-200/203 or Agency approved equivalent.
      .3 Wall sensor shall have features such as large activation buttons, automatic time-delays, automatic sensitivity, and walkthrough modes.
      .4 By default, first relay shall be set to automatic on; second relay shall be set to manual on.
   .2 Passive Infrared sensors
      .1 For use in small utility rooms, small service rooms, small storage rooms, or similar.
      .2 Each room shall be equipped with line voltage, wall mounted, passive infrared occupancy sensor WattStopper WS-100 or Agency approved equivalent.
      .3 Wall sensor shall have large activation button and be set to manual on.
   .3 Ultrasonic sensors
      .1 For use in small utility rooms, single washrooms, small multi-stall washrooms, or similar.
      .2 Each room shall be equipped with line voltage, wall mounted, ultrasonic occupancy sensor WattStopper UW-100 or Agency approved equivalent.
      .3 Wall sensor shall have large activation button and be set to manual on.

2.2.2 Ceiling / Close-to-Ceiling Mount Sensors (low voltage)
   .1 Dual Technology sensors
      .1 For use in offices, training rooms, or similar.
      .2 Each room shall be equipped with low voltage, dual-technology occupancy sensor(s), power/relay module, and digital control switch(es). Dual technology occupancy sensor shall be WattStopper LMDC or LMDX series Occupancy Sensor or Agency approved equivalent.
      .3 All sensors shall work in conjunction with one another through wired or wireless connections.
   .2 Ultrasonic sensors
      .1 For use in corridors, stairwells, utility rooms, service rooms, small storage rooms, multi-stall washrooms, or similar.
      .2 Each room shall be equipped with low voltage, ultrasonic occupancy sensor(s), power/relay module, and digital control switch(es). Ultrasonic occupancy sensor shall be WattStopper LMDC or
2.3 **DAYLIGHTING CONTROL SENSORS**

2.3.1 Provide daylighting control to light fixtures within floor areas substantially illuminated by daylight either through toplight or sidelight windows. The fixtures and spaces affected by the toplight or sidelight illumination are indicated on the Drawings.

2.3.2 In addition to the occupancy based lighting control within this space, the light fixtures in these areas are required to dim or switched off if exterior sunlight levels increase beyond a programmed threshold. Switched systems shall be used in warehouses, corridors, storage, and regularly unoccupied spaces. In offices, meeting spaces, lobbies and other normally occupied spaces dimming controls shall be used with continuous-type dimming ballasts or drivers.

2.3.3 Lighting control manufacturer/installer shall ensure that ballast and/or drivers used by lighting manufacturer are compatible with lighting control system or shall incur all costs for replacement to a compatible unit at no additional cost to the Project.

2.3.4 Provide photosensor capable of multi-zone switching or dimming with a minimum of 3 sensing levels and connect to room controller/relay equal to WattStopper LMLS-500 or Agency approved equivalent.

2.3.5 Combination photosensor/occupancy sensors are not recommended and may be used only where placement of device will not degrade performance of either function.

2.3.6 The system shall operate with multiple users in harmony and not react adversely to manual override inputs. Daylight harvesting shall not impede personal lighting control and the ability to adjust light levels on a per fixture basis.

2.4 **DIGITAL WALL SWITCHES**

2.4.1 Low voltage momentary pushbutton switches in single or multi-button (up to 8 in single gang) configuration and shall be Wattstopper LMSW series or Agency approved equivalent. Digital wall switches shall include the following features:

1. Buttons shall be large enough to have room to be engraved. Manufacturer shall provide engraving service for first set of buttons on each switch.

2. Dimming switches shall include bi-level LEDs to indicate load levels using multiple steps.

2.4.2 Digital wall switches shall be used when low-voltage power/relay modules are used and shall not be used to replace wall-mounted line voltage occupancy sensor switches.

2.5 **POWER/RELAY MODULES**

2.5.1 Power/relay modules shall be standalone or integrated units that shall house one or multiple relays for controlling room or area lighting.
lighting and shall provide control input from lighting control devices. More than one module may be required in any one area to allow for full control. Multiple modules shall be able to be mesh networked to allow communication so that all modules work as one complete system.

2.5.2 Low voltage sensors and digital wall switches shall communicate with power/relay module(s) that will operate lighting within the room being controlled.

2.5.3 Standalone modules without dimming shall be WattStopper LRMC-102 series room controller or Agency approved equivalent and shall have the following properties:
   1. Communications capability with low voltage sensors within the room.
   2. Minimum two relays are required for most spaces.

2.5.4 Standalone modules with dimming shall be WattStopper LRMC-202 series room controller or Agency approved equivalent and shall have the following properties:
   1. Analog (0-10V) or digital (DALI or DMX) control interface to be compatible with connecting devices.
   2. Communications capability and compatibility with other low voltage sensors or switches within room.

2.5.5 The module may be incorporated or integrated into a ballast or driver.

2.5.6 Module shall have additional NO/NC contact for connection to local low voltage HVAC control unit. If module does not incorporate, then the manufacturer/installer shall be responsible for an additional external relay to provide this function where required.

2.5.7 Modules shall be interconnected via plenum-rated (FT-6) low-voltage network wiring or via wireless connections.

2.6 SPARE COMPONENTS

2.6.1 Provide and turn over to the Agency, after six month service visit, 10% spare (rounded up) wiring devices, sensors, buttons, relay modules and relays to allow minor future expansion and ongoing maintenance of lighting control system. Installer may use spare components to adjust Agency’s requirements at one month and six month visits. These spare components are not a replacement for defective components covered under warranty.

3. EXECUTION

3.1 INSTALLATION

3.1.1 The locations and quantities of sensors shown on the Drawings are diagrammatic and indicate only the rooms which are to be provided with sensors. The Contractor shall provide additional sensors and power supplies/relays as required to properly and completely cover the respective room and circuits.

3.1.2 Locate and aim sensors within each space as required for complete and proper volumetric coverage within the range of coverage(s) of controlled areas per the manufacturer's...
recommendations. Rooms shall have ninety (90) to one hundred (100) percent coverage of the controlled area to accommodate all occupancy habits of single or multiple occupants at any location within the room(s).

.1 Occupancy sensors shall be placed to eliminate activation or minimize activation, in the case of multiple entries, from outside the room.

.2 Photosensors shall be placed close to sidelights and within toplight vertical sections, with lens facing as close to north as possible.

3.1.3 It is the Contractor’s responsibility to arrange a pre-installation meeting with manufacturer's factory authorized representative, at Agency’s facility, to verify placement of sensors and installation criteria.

3.1.4 Proper judgment must be exercised in executing the installation so as to ensure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of structural components. The Contractor shall also provide, at the Agency’s facility, the training necessary to familiarize the Agency’s personnel with the operation, use, adjustment, and problem-solving diagnosis of the occupancy sensing devices and systems.

3.1.5 When installing occupancy sensors with ultrasonic sensors, the unit shall be mounted on a vibration free surface and shall installed a minimum of 1220 mm (48”) away from supply ducts, minimum of 1830 mm (72”) away from wall mounted discharge ducts, and minimum of 150 mm (6”) from the power supply.

3.1.6 When installing occupancy sensors in areas where the area is too large to cover with a sensor(s) shown on Drawings or the space has obstructions that do not meet the minimum coverage requirements, then multiple sensors shall cover zones to ensure that the proper coverage is achieved without additional cost to the Agency.

3.1.7 When an area is served by lighting on multiple circuits, a relay or contactor shall be provided to allow all lighting to be controlled by the sensor(s).

3.1.8 When serving areas with high ceilings areas, sensors should be placed at manufacturer's recommended height for coverage and spacing.

3.2 SITE QUALITY CONTROL

3.2.1 Field Testing

.1 Upon completion of the installation, the system shall be completely tested by field technician who will verify all adjustments and sensor placement to ensure a trouble-free lighting control system and compliance with ASHRAE 90.1-2013 functional testing standards.

.2 Each device shall be numbered, labeled and recorded. Tests shall be conducted to ensure that entering the space shall ensure that lighting shall be activated as per
requirements and the vacating a space will cause the lighting to turn off within 30 minutes.

.3 After one month and six months of customer use, the installer and/or manufacturer shall return to the site and make any required adjustments to location, control, sensitivity and timing as required by the users based on their feedback. Provide suitable feedback forms to Agency’s representative two weeks prior to visit. Schedule visits with Agency’s representative.

3.2.2 Functional Testing

.1 The lighting control system shall be functionally tested in accordance with ASHRAE 90.1-2013 functional testing requirements. Manufacturer or Contractor shall provide lighting control narrative and room-by-room control requirements.

.2 At a minimum the following procedures shall be performed:

.1 Confirm the placement, sensitivity and time out adjustments for occupancy sensors yield acceptable performance, lights turn off only after space is vacated and do not turn on unless space is occupied.

.2 Confirm that time switches and programmable schedule controls are programmed to turn the lights off.

.3 Confirm that photosensor controls reduce electric light levels based on the amount of usable daylight in the space as specified.

.3 Functional tester shall provide documentation certifying that the installed lighting controls meet or exceed all documented performance criteria.

.4 Lighting control system shall be complete, operational and all functional testing shall be completed within 7 calendar days of full occupancy.

3.2.3 Training

.1 Provide on-site training to Agency’s maintenance staff and operators to make adjustments to the system for further changes as required. Manufacturer shall provide minimum 12-month (from building occupancy) toll-free telephone support for technical questions concerning re-programming and technical issues.

.2 Training shall consist of one half-day session organized by manufacturer at approximately one month after Agency occupancy. Training facilities shall be provided at Agency’s site. Contact Agency representative with at 3 weeks after occupancy to appropriate schedule time appropriate. Electronic and hardcopy of all slides and handouts used in training presentation shall be turn over to the Agency.

END OF SECTION
1. **GENERAL**

1.1 **Summary**

1.1.1 Work to include all labour, materials, tools, appliances, control hardware, sensors, wiring, junction boxes and equipment necessary for and incidental to the delivery, installation and furnishing of a completely operational networked lighting control system, as described herein.

1.1.2 All networked lighting controls shall meet or exceed all locally-enforced energy codes including all mandatory control requirements for Ontario Building Code supplemental standard SB-10 and ASHRAE 90.1-2013.

1.1.3 All spaces shown within the building shall be controlled using the installed networked lighting control system.

1.1.4 Examine all general specification provisions and Drawings for related electrical Work required as Work under this Section.

1.1.5 Coordinate all Work described in this Section with all other applicable plans and specifications, including but not limited to wiring, conduit, fixtures, HVAC systems and building management systems.

1.1.6 All lighting control is subject to functional testing. Lighting control devices and control system shall be tested to ensure that control hardware and software are calibrated, adjusted, programmed, and in proper working condition in accordance with this Section and the manufacturer’s installation instructions.

1.2 **Related Sections**

1.2.1 Section 01 91 00 Commissioning
1.2.2 Division 25 Integrated Automation
1.2.3 Section 26 05 00 - Common Work Results for Electrical
1.2.4 Section 26 27 26 - Wiring Devices
1.2.5 Section 26 50 00 - Lighting
1.2.6 Ontario Building Code Supplemental Standard SB-10
1.2.7 ASHRAE 90.1-2013 Energy Standard for Buildings Except Low Rise Residential Buildings

1.3 **References**

1.3.1 National Fire Protection Association (NFPA)
1.3.2 cULus Listing/Certification
   .1 Certified as Energy Management Equipment (UL 916)
   .2 Certified as Emergency Lighting Equipment (UL 924)
   .3 Meet Heat and Smoke Release for Air-Handling Spaces (UL 2043)
1.3.3 CSA Listing/Certification
   .1 Emergency lighting equipment (CSA C22.2 NO. 141-15)
   .2 Signal equipment (CSA C22.2 No. 205)
1.3.4 Federal Communications Commission (FCC) / Industry Canada (IC)
1.3.5 California Energy Commission (CEC)
1.3.6 Local Building Codes

1.4 System Description

1.4.1 Lighting Control System includes computer-based software that provides control, configuration, monitoring and reports. System includes the following components:

.1 Wireless Manager
.2 System Server
.3 0-10V Dimming, Fixed Output Ballasts or 0-10V LED Drivers
.4 Wireless Control Modules
.5 Wireless Sensors (Occupancy/Photo)
.6 Low-Voltage Sensors (PIR, Dual-Technology, Photo)
.7 Wall stations – Wireless/Low-Voltage
.8 Lighting Control System Software - Graphical User Interface based
.9 LCD Touch Screen Panel
.10 Communication Wire
.11 Wireless Area Lighting Controllers (to dim/switch a group of luminaires)
.12 AC Phase Cut Dimming Module (Forward and Reverse)
.13 Relay based Lighting Control Panels
.14 Interface to Audio Visual equipment (for integration with 3rd party LCD Touch Screen Panel)
.15 Interface to BACnet
.16 Interface to Tridium Niagara
.17 Interface to customizable Energy dashboard

1.5 Submittals

1.5.1 Complete sets of Shop Drawings shall be submitted indicating the following:

.1 Bill of Materials: Complete list of all parts needed to fully install selected system components.
.2 Product Data: For each type of Product indicated.
.3 Shop and Wiring Drawings: Submit Shop Drawings detailing control system, as supplied, including one-line diagrams, wire counts, coverage patterns, interconnection diagrams showing field-installed wiring and physical dimensions of each item.
.4 Coordination Drawings: Submit evidence that lighting controls are compatible with connected monitoring and control devices and systems specified in other Sections.

.1 Show interconnecting signal and control wiring and interfacing devices that prove compatibility of inputs and outputs.
.2 For networked controls, list network protocols and Provide statements from manufacturers that input and output devices meet interoperability requirements of the network protocol.
.5 Software Operational Documentation:
   .1 Software operating and upgrade manuals
   .2 Program Software Backup: On portable memory storage device, compact disc, or DVD, complete with data files.
   .3 Printout of software application and graphic screens, or upon request, a live demonstration of Control, Configure and Analyze functionality or a video demonstrating above stated system capabilities.

.6 Installation Instructions: Manufacturer’s installation instructions.

.7 Operation and Maintenance Data: For each type of Product to include in emergency, operation, and maintenance manuals.

.8 Warranty: Copy of applicable warranty.

.9 Additional information as required on a project specific basis.

1.6 Quality Assurance

1.6.1 Installer Qualifications: Installer shall be one who is experienced in performing the Work of this Section, and who has specialized in installation of Work similar to that required for this project.

1.6.2 Manufacturer Requirements: The manufacturer shall have a minimum of 15 years’ experience manufacturing networked lighting control systems and shall Provide 24/7 telephone support by qualified technicians.

1.6.3 Contractor shall ensure that lighting system control devices and assemblies are fully compatible and can be integrated into a system that operates as described in the lighting control notes on Drawings and as described within this specification. Any incompatibilities between devices, assemblies, and system controllers shall be resolved between the Contractor and the system provider, as required to ensure proper system operation and maintainability.

1.6.4 Performance Requirements: Shall Provide all system components that have been manufactured, assembled, and installed to maintain performance criteria stated by manufacturer without defects, damage, or failure.

1.6.5 Performance Testing Requirements
   .1 Manufacturer shall 100% test all equipment prior to shipment. Sample testing is not acceptable.

1.6.6 Code Requirements
   .1 System Control Unit and System Field Devices shall be cULus listed and certified.
   .2 All system components shall be FCC /IC compliant.
   .3 All system components shall be installed in compliance with National Electrical Codes and Canadian Electrical Code.
4 Building Codes: All units shall be installed in compliance with applicable, local building codes.

1.6.7 ISO Certification: System components shall be manufactured at ISO-9000 certified plants.

1.6.8 Coordination
  .1 Shall coordinate lighting control components to form an integrated interconnection of compatible components.
  .1 Match components and interconnections for optimum performance of lighting control functions.
  .2 Display graphics showing building areas controlled; include the status of lighting controls in each area.

1.7 Project Conditions
  1.7.1 Operating Temperature Range: -40 degrees F (-40 degrees C) to 140 degrees F (+60 degrees C) 'applicable devices'

1.7.2 Humidity
  .1 Wired field devices: 0% to 100% RH condensing rated for damp locations and 0% to 95% RH non-condensing rated for indoor locations.
  .2 Wireless modules: 5% to 95% RH non-condensing rated for indoor locations.

1.8 Delivery, Storage and Handling
  1.8.1 Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
  1.8.2 Delivery: Deliver materials in manufacturer's original, unopened, undamaged packaging with intact identification labels.
  1.8.3 Storage and Protection: Store materials away from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

1.9 Warranty
  1.9.1 On-going system expansion, service and support shall be available from multiple factory certified vendors. Recommended service agreements shall be submitted at the time of bid complete with manufacturers suggested inventory and pricing for system parts and technical support labor.
  1.9.2 Special Warranty: Manufacturer’s standard form in which manufacturer agrees to repair or replace components of lighting controls that fail in materials or workmanship within specified warranty period.
  1.9.3 Manufacturer's Warranty: All equipment shall be warranted free of defects in materials and workmanship.
  .1 Warranty Period: All system hardware components, excluding third party components, shall have full warranty (non-prorated) for a period of forty-eight (48) months and all software, excluding Open Source Software and third party operating systems, perform substantially in accordance with published specifications for a period of twelve (12) months from the date of System Start-up.
2. **PRODUCTS**

2.1 **Acceptable Manufacturers**

2.1.1 Controls: ENCELIUM® Energy Management System by OSRAM SYLVANIA, Legrand Architectural Dimming Platform or Agency approved equivalent.


2.1.3 0-10V Dimming, Fixed Output Ballasts and/or 0-10V LED Drivers: OSRAM Sylvania, Inc., Tridonic, Universal Lighting Technologies, Philips Lighting or Agency approved equivalent.

2.2 **System Performance Requirements**

2.2.1 This specification is intended to fully describe all of the design, engineering, programming, hardware, software, ancillary devices and associated technical services required to provide a building-wide networked lighting control system. This system is specified to perform scheduled and automated lighting control sequences.

2.2.2 The lighting control “system” shall include a fully distributed WAN/LAN network of global controller/routers, individually addressable System Field Devices that are not integral to luminaires, sensors, switches, relays and other ancillary devices required for a complete and operable system. The system WAN/LAN start-up shall be by the control system manufacturer or Contractors certified by the manufacturer.

2.2.3 The basis of system design shall utilize non-proprietary industry standard 0-10V dimming or fixed output ballasts and/or 0-10V LED drivers, occupancy sensors, daylight sensors, etc.

2.2.4 UL 924 listed devices shall have the ability to control 120V/277V/347V load.

2.2.5 System software interface shall have the ability to notify communication failures to system users via system and email messages. Email messages shall be available in html and text formats.

2.2.6 On-going system expansion, service and support shall be available from multiple factory certified vendors. Recommended service agreements may be submitted at the time of bid complete with manufacturers suggested inventory and pricing for system parts and technical support labor.

2.2.7 Lighting Control Software: The system shall offer two separate levels of lighting control: (1) personal lighting control for the average building occupant to control and adjust basic lighting functions in their workspace, and (2) central lighting control for the facility lighting administrator to perform energy management, configuration maintenance, monitoring operations, and providing support to building occupants.
.1 Native central control software shall be utilized for energy performance monitoring and complete programming without the need for any third party hardware or software. Systems that require any third party linked software or graphics shall be unacceptable.

.2 Software shall provide information on general system settings via mouse click on a floor plan. Left clicking over a device on the graphical software interface shall show a description of the selected device/function attribute.

.3 Central Lighting Control:

.1 Shall provide an interactive, Web-based graphical user interface (GUI) showing floor plans and lighting layouts that are native to the lighting control software. The only means required to program and operate the lighting control system shall be programmed and operated from a user interface that is based on a plan view graphical screen on the user’s computer or the lighting control system’s main computer. Shall include the navigational features listed below to allow for user’s orientation within the controlled space, geographic heading and/or landmarks:
   (a) Interactive;
   (b) Vector based;
   (c) Zoom;
   (d) Rotate;
   (e) Pan;
   (f) Tilt.

.2 Shall allow building operator to navigate through an entire facility both in two-dimensional and three-dimensional multi-floor view, allowing for fast and easy navigation.

.3 Three-dimensional view shall exclude walls and other structural features to avoid shadowing and cluttering of the plan view.

.4 Shall display multiple floors in single view resulting in easier system performance visualization for the entire site as well as individual zones or spaces.

.5 Shall allow system performance visualization across a portfolio of buildings via a single interface.

.6 All programming, assignments of lighting loads to control strategies, lighting status and lighting energy reporting shall be native to the software and executed from this GUI. Editing shall be available from this GUI in a drag and drop format or from drop down menus without the need for any third party software. Systems that utilize or require third party linked graphics are unacceptable. The GUI shall continuously indicate the status of each
connected device on the system and a warning indicator on the software if a device goes offline. Systems requiring spreadsheet editing for programming and that don’t offer real time feedback are not acceptable.

.7 Software settings and properties shall be selectable per individual device, room based, floor based or global building based.

(a) Lighting Control Software interface shall provide current status and enable configuration of all system zones including selected individual luminaire availability, current light level, maximum light level, on/off status, occupancy status, and emergency mode (response to an emergency signal) status.

.8 Shall have the ability to display various lighting system parameters such as Lighting status (ON/OFF); Lighting levels, Load shedding status, or Lighting energy consumption, Occupancy status in a colorized gradient (“weather” map) type of graphical representation.

.9 Energy Analysis data shall be exportable in CSV or image file formats.

.10 Shall allow import of native AutoCAD files.

.4 Reports: Reporting feature shall be native to the lighting control software and capable of reporting the following parameters for each device and zone individually without requiring any third party hardware and software:

.1 Energy consumption broken down by energy management strategy.

.2 Energy demand broken down by energy management strategy.

.3 Occupancy data by zone.

.4 Building wide occupancy status

.5 Time Schedule status

.6 Lighting energy consumption in a color gradient (“weather map” type) view

.7 Energy performance reports shall be printable in a printer friendly format and downloadable for use in spreadsheet applications, etc.

.8 Battery status report indicating device name, location on the floor plan and battery voltage shall be printable in a printer friendly format and downloadable for use in spreadsheet applications, etc.
.9 Color gradient ("weather map" type) view for the following:
   (a) Robustness of the mesh network (hop count)
   (b) Route of the signal
   (c) Wireless signal strength
   (d) Battery status for wireless components

.5 Personal Lighting Control: The Personal Control Software interface shall provide current status and enable each user with the ability to dim and brighten lights, and turn them on and off by individual luminaire or zone. The Software shall offer user configurable light scenes, which may be programmed and then selected via the Software. Personal lighting control shall be available in open/private office environments. This software shall have the capability of acting as a "virtual occupancy sensor" for the system by detecting keyboard or mouse activity on each PC for incremental occupancy status data.

.1 Fade Time: The software shall offer user configurable fade times (up to 86400 seconds) for individual or group of luminaire during transition between scenes.

2.2.8 Daylight Harvesting (Light Regulation Averaging): In a photo sensor-equipped system, the Central Controller Unit shall rationalize changes to light levels when ambient (natural) light is available and shall maintain a steady light level when subjected to fluctuating ambient conditions where 0-10V dimming ballasts and/or drivers exist. Areas equipped with fixed output ballasts and/or drivers shall energize when natural light falls below foot-candle levels specified. System shall utilize light level inputs from common and/or remote sensor locations to minimize the number of photo sensors required. The System shall operate with multiple users in harmony and not react adversely to manual override inputs.

2.2.9 Time Clock Scheduling: The system shall be programmable for scheduling lights on or off via the Lighting Control Software interface.
   .1 Programming: User friendly, Outlook style interface shall be available for programming schedules.
   .2 Override: Manual adjustments via wall stations or personal control software shall temporarily override off status imposed by time clock schedule.
   .3 Response to Power Failure: In the event of a power failure, the time clock shall execute schedules that would still be in progress had they begun during the power outage.
   .4 Flick Warning: Prior to a scheduled lights-off event or expiry of a temporary override, the system shall provide two short light level drops as a warning to the affected
occupants. Flick warning time shall have the ability to be programmed via software between 1 and 5 minutes.

.5 Option to automatically turn on or wait for an input: Using this option, a group of luminaires can be made to turn on automatically in response to a scheduled event or wait for a signal from a wall station to turn the same group of luminaires on (and stay on) for the remainder of the scheduled event.

.6 Shall support BMS Schedules/Calendars

2.2.10 Load Shed Mode: An automatic load shedding mode shall be available where, when activated through the system, the control unit will reduce its output to a programmable maximum electrical demand load. The system shall not shed more load than required and load shedding priority shall be centrally configurable by control zone or by common uses (i.e., all hallways can be treated as one load shed group), with subsequent load shed priority groupings being utilized until the required defined load has been shed, for either a defined period, or until the demand response input has been removed. Systems that simply select a “load shed scene” whereby there is no guarantee that the defined required load will actually be shed are not acceptable.

2.2.11 Emergency Mode: There shall be a mode, when activated through the system, that will immediately adjust lights to full light output and retain that level until the mode is deactivated in the event of an emergency. This setting shall override all other inputs. The system shall interface with the building emergency monitoring system at a convenient point and not require multiple connections.

2.2.12 Addressing: All ballasts and/or drivers shall be centrally addressable, on a per luminaire or multiple luminaire/zone basis, through the Central Control Software. The basis of design shall utilize 0-10V Dimming, Fixed Output Ballasts and/or 0-10V LED Drivers connected to an Output Module. To simplify ongoing maintenance, the system shall not require manual recording of addresses for the purpose of start-up or reconfiguration.

2.2.13 Programmable Task Tuning: The light output level of an individual or group of luminaires shall be programmed via system software.

2.2.14 Continuous Dimming: Individual or group of luminaires dimming in response to user initiated action and/or system generated signal shall be over continuous range.

2.2.15 Unoccupied State: The system shall provide two states when occupancy status is vacant as per an occupancy sensor - lights turn off or lights adjust to configurable (dimmed) light level.

2.2.16 Occupied State: The system shall be capable of creating “comfort” or “support” zones to ensure that occupants are not isolated by turning off lights in adjacent areas, such as a hallway path to exit the premises for occupant comfort and safety.

2.2.17 Overlapping Zones: System shall be capable of creating “overlapping” zones to ensure continuous lighting and safety of the
occupants as they move from one lighting zone to another (for example, hallways) while minimizing the energy use.

2.2.18 Participation in Intelligent Building Framework: The system shall have the ability to be a component of Intelligent Building framework. Wireless Managers and System server communication shall be based on TCP/IP over Ethernet backbone.

2.2.19 LAN Operations: System shall be capable of operating independent of building’s existing network infrastructure if desired and shall not rely on tenant supplied PCs for operation. Network infrastructure shall only be utilized for Personal Control Software.

2.2.20 Network Security: Firewall Technologies and VLAN Configuration methods shall be utilized to separate tenants from the lighting control network and ensure the integrity of lighting control network.

2.2.21 Lamp Burn In: The system software shall have the capability of not permitting dimming of new lamps prior to completion of lamp manufacturer recommended accumulated operation at full brightness.

2.2.22 Lighting Maintenance:

.1 System software shall notify wireless low battery, lamp or ballast failure events via system and email messages.

.2 Wireless devices hop count, route of the signal, signal strength and battery voltage levels shall be available via GUI.

.3 Percentage left in Lamp and Ballast Life Time shall be programmed to display in different colors for easier visual representation and quicker maintenance turnaround time.

.4 0-10V Dimming and/or Fixed Output Ballast/LED Driver replacements shall not require re-programming of the system or re-addressing of the said components.

2.2.23 Group (zone) Configuration: The assignment of individual or group of system components to zones shall be performed via Central Control Software such that physical rewiring will not be necessary when workspace reconfiguration or re-zoning is performed. Removal of covers, faceplates, ceiling tiles, etc. shall not be required.

2.2.24 Sensor Control Parameters: Occupancy sensor time delays shall be configurable through software. Light level sensor parameters shall be configurable through software.

2.2.25 Automatic Time Adjustment: System shall automatically adjust for leap year and daylight savings time and shall Provide weekly routine and annual holiday scheduling.

2.2.26 The system software shall have the capability of providing an optional web based energy dashboard to show real time energy savings data and carbon footprint reductions.

2.2.27 Contact closure input: System shall be capable of receiving a momentary and sustained contact closure input from third party sources to control lighting zones.
2.2.28 The system shall have the ability to control (dim/switch) a group of luminaires with loads up to 20A.

2.2.29 Plug Load Control: The system shall offer occupancy sensing or time schedule based plug load control capability.

2.2.30 Astronomical Clock feature: Luminaires switch ON/OFF with the sunset and sunrise (with an option to select offset, depending on the geographic location (latitude and longitude) of the building. An offset option shall be available to turn the schedule ON/OFF up to 12 hours before or after dusk or dawn.

2.2.31 System shall auto-configure lighting controls for spaces that have been combined or divided temporarily by moving wall or similar systems.

2.2.32 White Light Tuning: System shall emulate the changing colors of the natural daylighting cycle via continuous and smooth tuning of white light sources. Daylight tracking shall be via longitude and latitude settings specific to the building’s astronomical location. Speed of transition and color representation shall be based on the luminaire, its source/s and the sunrise/sunset times.

2.2.33 System shall automatically lock wall stations and/or disable sensors based on one of the following system inputs: contact closure, a time schedule or the status of a monitored space.

2.2.34 BAS Interface: The light management system shall be capable of interfacing digitally with a building automation system via either BACnet/IP or Tridium Niagara AX interface. The lighting control system shall be capable of communicating the status of output devices (lighting loads) as well as input devices (dry contacts, switches, occupancy sensors, vacancy sensors, and photocells) to the BAS. Building Automation System, utilize data from lighting control system input devices such as occupancy sensors to determine the status (occupied/unoccupied) of the mechanical control zones and perform climate adjustments accordingly.

2.2.35 AV Interface: The light management system shall be capable of interfacing with audio-visual system (e.g. LCD Touch Screen Panel) via TCP/IP interface.

2.2.36 Migration plan to control LED luminaire: System shall be capable of migrating from the control of 0-10V Ballasts to 0-10V LED Drivers utilizing the same control hardware.

2.2.37 AC Phase Cut Dimming circuit Integration: System shall have the ability to control Incandescent, Fluorescent or LED lighting load that are otherwise controlled by manual AC Phase Cut Dimmers.

2.2.38 Wireless networks shall be reliable (mesh topology), self-configuring (discovery) and self-healing. Unexpected interruptions in the network shall be automatically compensated for by re-directing communication.

2.2.39 Wireless network shall provide high level of security by employing logically unbreakable secure encryption methods (e.g. 128-bit encryption).

2.2.40 System design shall ensure seamless communication among devices when hybrid wired/wireless control systems are
implemented. Hybrid control system refers to devices that communicate over a DALI/Low-Voltage field bus and/or wireless medium that uses non-proprietary open protocol (e.g., ZigBee) for communication. Devices in the hybrid control system shall communicate with all the devices in the system regardless of their native protocol they are designed to work with.

2.3 **Wireless Wall Stations**

2.3.1 General: The system shall connect with the wall stations via wireless medium that uses non-proprietary open protocol (e.g., ZigBee) for communication.

.1 Software configurable wall station shall provide on/off switching and dimming control for up to six lighting zones/five lighting scenes per wall station or more with allowable multi-gang configurations.

.2 Shall allow manual dimming of light levels and override of the time schedule.

.3 Scenes/zones in the system control software shall be synchronized with the buttons on the wall station.

.4 Addressing: All wall stations shall be individually addressable and reconfigurable via system Control Software.

.5 LED’s: All wall stations shall feature status LED’s

.6 Lighting scenes shall automatically reconfigure based on scene changes from personal control software.

2.3.2 Electrical:

.1 Class 2 Low Voltage device

.2 Power source: 2-AA/4-AAA 10-year life Alkaline batteries

2.3.3 Communication: Shall be via wireless medium that uses non-proprietary open protocol (e.g., ZigBee) for communication

.1 Wireless networks shall be reliable (mesh topology), self-configuring (discovery) and self-healing. Unexpected interruptions in the network shall be automatically compensated for by re-directing communication.

.2 Wireless network shall provide high level of security by employing logically unbreakable secure encryption methods (e.g, 128-bit encryption).

2.3.4 Performance:

.1 Wall station configuration shall be via GUI in a drag and drop format

.1 Custom button cap configuration shall allow combination of scene and zone in one wall station

.2 Custom commands shall be applied to individual wall station buttons

.3 Status LED: Wall station shall display its current status (zone/scene under system control or OFF) when motion is detected in the close proximity of the wall station
.2 The following User Interface and custom labelling options shall be available:
  .1 Up to five (5) scene switching and dimming
  .2 Up to six (6) zone switching
  .3 One (1) zone switching
.3 Shall have icons that will illuminate when Loss of communication with the system control unit, Fire Alarm and Wall station Lock statuses are detected.
.4 Shall allow vacancy sensor configuration
.5 The battery life statuses of wireless wall stations shall be monitored via GUI.

2.3.5 Mechanical:
.1 Dimensions: Shall meet NEMA WD-6 spec.
.2 Color: Shall meet NEMA WD1 color specifications
.3 The following mounting options shall be supported:
  .1 Surface mount
  .2 Mount in standard size wall box
  .3 On mounting brackets for low voltage devices
.4 Shall Provide support for “Decorator” style wall plate installation

2.3.6 Reliability:
.1 Operating temperature range: +14 degrees F (-10 degrees C) to 104 degrees F (40 degrees C)
.2 Humidity: 5% to 95% RH non-condensing rated for indoor locations.

2.3.7 Regulatory:
.1 Safety: UL916 listed
.2 Environmental protection: Rated for dry location; RoHS compliant
.3 Radio Interference: FCC Part 15/ICES-003
.4 Shall comply or exceed the following electromagnetic requirements:
  .1 EN 61000-4-2
  .2 EN 61000-4-4
  .3 EN 61000-4-5

2.4 **Low Voltage Wall Stations**

2.4.1 General: The system shall connect with the wall stations via field bus that carry low voltage control signals.
.1 Software configurable wall station shall Provide on/off switching and dimming control for up to six lighting zones/five lighting scenes per wall station or more with allowable multi-gang configurations.
.2 Shall allow manual dimming of light levels and override of the time schedule.
.3 Scenes/zones in the system control software shall be synchronized with the buttons on the wall station.
Addressing: All wall stations shall be individually addressable and reconfigurable via System Control Software.

LED’s: All wall stations shall feature status LED’s

Lighting scenes shall automatically reconfigure based on scene changes from personal control software.

2.4.2 Electrical:

Class 2 Low Voltage device

Power source: Communication bus

2.4.3 Communication: Shall be via NEC/CEC Class 2 communication wire

2.4.4 Performance:

Wall station configuration shall be via GUI in a drag and drop format

Custom button cap configuration shall allow combination of scene and zone in one wall station

Custom commands shall be applied to individual wall station buttons

Status LED: Wall station shall display its current status (zone/scene under system control or OFF) when motion is detected in the close proximity of the wall station

The following User Interface and custom labelling options shall be available:

(a) Up to five (5) scene switching and dimming

(b) Up to six (6) zone switching

(c) One (1) zone switching

Shall have icons that will illuminate when Loss of communication with the system control unit, Fire Alarm and Wall station Lock statuses are detected.

Shall allow vacancy sensor configuration

2.4.5 Mechanical:

Dimensions: Shall meet NEMA WD-6 spec.

Color: Shall meet NEMA WD1 color specifications

The following mounting options shall be supported:

Mount in standard size wall box

On mounting brackets for low voltage devices

Shall be used with “Decorator” style wall plate

2.4.6 Reliability:

Operating temperature range: 14 degrees F (-10 degrees C) to 140 degrees F (60 degrees C)

Humidity: 5% to 95% RH non-condensing rated for indoor locations.

2.4.7 Regulatory:

Safety: UL916 listed

Environmental protection: Rated for dry location; RoHS compliant

Radio Interference: FCC Part 15/ICES-003
.4 Shall comply or exceed the following electromagnetic requirements:

.1 EN 61000-4-2
.2 EN 61000-4-4
.3 EN 61000-4-5

2.5 **Touch Screen Panel**

2.5.1 General: Shall enable the ability to display light level, status and recall multiple lighting scenes.

2.5.2 Electrical:

.1 Input voltage: Shall be via Power over Ethernet or +9VDC to +16VDC, 1A max.

2.5.3 Communication: Shall be via Ethernet connection that employs TCP/IP protocol

2.5.4 Performance:

.1 Full color 7" TFT LCD, Full VGA (800 x 480 pixels) with 65K colors
.2 CPU: 32 bit, 533 MHz
.3 Memory: 128 Non-volatile Flash Memory
.4 Flexible configurations for custom buttons, text and graphics
.5 Integrated high-resolution capacitive touch screen

2.5.5 Mechanical: Shall be wall mountable

2.5.6 Reliability:

.1 Operating Temperature Range: -32 degrees F (0 degrees C) to +122 degrees F (+50 degrees C)
.2 Humidity: 0% to 95% RH non-condensing rated for indoor locations

2.6 **Wireless Control Modules (WCM)**

2.6.1 General: Wireless Modules shall enable wireless connectivity to 0-10V Dimming, Fixed Output Ballasts and/or 0-10V LED Drivers. Addresses to the wireless modules shall be assigned during system start-up. Upon establishing two way communication with the Wireless Controller, these individually addressable modules shall enable each lighting component to be independently controlled and configured to best meet the needs of the facility.

.1 Addressing: Wireless Modules shall be individually addressable via System Control Software.

.2 System shall automatically address individual wireless modules during system start-up thus eliminating the need to pre-address devices or record serial numbers during installation.

2.6.2 Electrical: Ratings for Ballast/General purpose/Tungsten shall be: 120V – 347VAC (+/-10%)

2.6.3 Communication: Shall be via wireless medium that uses non-proprietary open protocol (e.g., ZigBee) for communication

.1 Wireless networks shall be reliable (mesh topology), self-configuring (discovery) and self-healing. Unexpected
interruptions in the network shall be automatically compensated for by re-directing communication.

.2 Wireless network shall provide high level of security by employing logically unbreakable secure encryption methods (e.g. 128-bit encryption).

.3 Shall connect to NEC/CEC Class 2 communication wire

2.6.4 Performance:

.1 Control Options
   .1 ON/OFF Switching
   .2 Continuous dimming

.2 Air Gap Off: Shall enforce physical disconnection of AC power to the ballast or driver when “OFF” is selected either automatically or manually.

.3 Shall be able communicate with 0-10V ballasts/drivers as well as DALI ballasts/drivers

.4 Shall enable wireless connection to low-voltage infrared, ultrasonic, and multi-technology sensors, Relay based Lighting Control Panels, and AC Phase Cut Dimming Modules.

.5 Shall be used to extend wireless network capability

.6 Memory: Shall retain all system settings in non-volatile memory

2.6.5 Mechanical:

.1 Dual mounting: Mounts inside a standard (4" x 4") j-Box or to ½” knock-out

.2 Material: Plenum rated black plastic (UL2043)

2.6.6 Reliability:

.1 Operating temperature range: -40 degrees F (-40 degrees C) to 140 degrees F (60 degrees C)

.2 Humidity: 5% to 95% RH non-condensing rated for indoor locations.

2.6.7 Regulatory:

.1 Safety: UL916, UL924 and UL2043 listed

.2 Environmental protection: Rated for damp location (IP54); RoHS compliant

.3 Radio Interference: FCC Part 15/ICES-003

.4 Complies with the following electromagnetic requirements:
   .1 EN 61000-4-2
   .2 EN 61000-4-4
   .3 EN 61000-4-5

2.7 Wireless Area Lighting Controller (WALC)

2.7.1 General: Shall provide a common interface (DIM/SWITCH) to a group of 0-10V Dimming, Fixed Output Ballasts and/or 0-10V LED Drivers over wireless medium that uses non-proprietary open protocol (e.g., ZigBee) for communication.

.1 Addressing: Area Lighting Controllers shall be addressable via Control Software.
2. System shall automatically address individual wireless area lighting controllers during system start-up thus eliminating the need to pre-address devices or record serial numbers during installation.

2.7.2 Electrical:
   .1 Maximum Load Ratings:
     .1 20A 120-347 Vac Ballast
     .2 20A 120-347 Vac Resistive
     .3 20A 120-347 Vac Tungsten
     .4 20A 120-347 Vac General Purpose
     .5 1.5 HP 120-277 Vac Motor

2.7.3 Communication: Shall be via wireless medium that uses non-proprietary open protocol (e.g., ZigBee) for communication
   .1 Wireless networks shall be reliable (mesh topology), self-configuring (discovery) and self-healing. Unexpected interruptions in the network shall be automatically compensated for by re-directing communication.
   .2 Wireless network shall provide high level of security by employing logically unbreakable secure encryption methods (e.g. 128-bit encryption).
   .3 Shall connect to NEC/CEC Class 2 communication wire

2.7.4 Communication: Shall be via wireless medium that uses non-proprietary open protocol (e.g., ZigBee)

2.7.5 Performance:
   .1 Control Options
     .1 ON/OFF Switching
     .2 Continuous dimming
     .3 Shall be able to communicate with 0-10V ballasts/drivers
   .2 Shall be used for general purpose plug load control
   .3 Group Control: Shall control up to 50 ballast/LED Drivers
   .4 Shall enable direct 0-10V sensor connection
   .5 Shall enable wireless connection to low-voltage infrared, ultrasonic, and multi-technology sensors, Relay based Lighting Control Panels and AC Phase Cut Dimming Modules.
   .6 Air Gap Off: Shall enforce physical disconnection of AC power to the ballast or driver when "OFF" is selected either automatically or manually.
   .7 Memory: Shall retain all system settings in non-volatile memory

2.7.6 Mechanical:
   .1 Mounting: Standard 1/2" electrical box knockout
   .2 Material: Plenum rated black plastic (UL2043)

2.7.7 Reliability:
   .1 Operating temperature range (wireless): -40 degrees F (-40 degrees C) to 149 degrees F (65 degrees C)
   .2 Humidity: 5% to 95% RH non-condensing rated for indoor locations
2.7.8 Regulatory:
.1 Safety: UL916, UL924 and UL2043 listed
.2 Environmental protection: Rated for damp location; RoHS compliant
.3 Radio Interference: FCC Part 15/ICES-003
.4 Shall comply or exceed the following electromagnetic requirements:
   .1 EN 61000-4-2
   .2 EN 61000-4-4
   .3 EN 61000-4-5

2.8 Communication Wire (Greenbus)
2.8.1 General: The system shall have the capability to use both NEC/CEC Class 1 and Class 2 wiring to integrate peripheral devices such as ballasts/LED drivers, occupancy sensors, photo sensors, relay-based controls, area lighting controllers, wireless sensors and wall stations into a complete, networked programmable lighting control system.

2.8.2 Electrical: NEC/CEC Class 2 Communication bus
2.8.3 Mechanical:
   .1 Multi-conductor cable with stranded-copper conductors

2.8.4 Performance:
   .1 Shall power photo sensors, PIR and dual-technology occupancy sensors.
   .2 Shall allow random devices connection without the need for special network channel termination.
   .3 Minimize system down time by self-diagnosing the field bus for any shorts and open loops.

2.8.5 Regulatory:
   .1 Flame rated jacket for plenum use NFPA 262 (UL: FT6, CSA: CMP).

2.9 Relay Based Lighting Control Panels (RP/RPM)
2.9.1 General: An addressable lighting control panel that allows each relay to be individually controlled and configured.
   .1 Addressing: All lighting control panel relays shall be individually addressable via Central Control Software.
   .2 Relay Panel Modules are suitable for 35 mm DIN rail mounting.

2.9.2 Electrical:
   .1 Input Power Supply: 40 VA, 50/60 Hz

2.9.3 Communication:
   .1 Shall be via NEC/CEC Class 2 communication wire
   .2 Wireless communication shall be enabled via Wireless Control Module/Wireless Area Lighting Controller

2.9.4 Performance: ON/OFF Switching at Circuit level

2.9.5 Reliability:
   .1 Maximum Operating Ambient Temperature: 140 degrees F (60 degrees C).
2.9.6 Regulatory:

.1 Safety: UL916, UL924 listed
.2 Radio Interference: FCC Part 15/ICES-003
.3 Shall comply or exceed the following electromagnetic requirements:
   .1 EN 61000-4-2
   .2 EN 61000-4-4
   .3 EN 61000-4-5

2.10 AC Phase Cut Dimming Module (PCDM)

2.10.1 General: AC Phase Cut Dimming Modules shall Provide a common interface to a group of Incandescent, Fluorescent or LED light systems that are otherwise connected to manual forward/reverse phase cut dimming devices.
   .1 Addressing: AC Phase Cut Dimming Modules shall be individually addressable via Central Control Software.

2.10.2 Electrical:

   .1 Input Voltage: 120-277 VAC 50/60Hz
   .2 Maximum Output Load Ratings shall be:
      .1 120 VAC: 450W, 3.8 A MAX
      .2 277 VAC: 900W, 3.3 A MAX
   .3 Shall have built-in short circuit protection
   .4 Shall offer ANSI C62.41 Category A Transient protection

2.10.3 Communication:

   .1 Shall be via NEC/CEC Class 2 communication wire
   .2 Wireless communication shall be enabled via Wireless Control Module/Wireless Area Lighting Controller

2.10.4 Performance:

   .1 Shall Provide an interface between the phase cut dimmable (forward and reverse phase) ballasts/LED drivers
   .2 Shall have configuration stored in non-volatile flash memory.

2.10.5 Mechanical:

   .1 Dimensions: 4.75" W X 5.0" L X 2.24" H (120.7mm W x 127mm L X 56.9mm H)
   .2 Installation on top of a standard square 4 11/16" junction box

2.10.6 Reliability:

   .1 Operating temperature range: 32 degrees F (0 degrees C) to 104 degrees F (40 degrees C)
   .2 Case Temperature: up to 158 degrees F (70 degrees C)
   .3 Suitable for indoor dry locations only

2.10.7 Regulatory:

   .1 Safety: UL916, UL924 listed
   .2 Radio Interference: FCC 47 CFR Part 18
   .3 Shall comply or exceed the following electromagnetic requirements:
      .1 EN 61000-4-2
2.11 **Low Voltage Photo Sensor**

2.11.1 General: Photo sensor connectivity shall be via field bus that carry low voltage control signals.

2.11.2 Electrical:

.1 Class 2 Low Voltage device

.2 Power source: Communication bus

2.11.3 Communication:

.1 Shall be via Class 2 communication bus

.2 Wireless communication shall be enabled via Wireless Control Module/Wireless Area Lighting Controller

2.11.4 Performance:

.1 Accuracy: +/-1% at 21 degrees C (70 degrees F), derated to +/-5% at 49 degrees C (120 degrees F) or at -18 degrees C (0 degrees F).

.2 The indoor sensor range shall be between 0 and 750 FC.

.3 The Outdoor sensor range shall be between 0 and 750 FC.

.4 Atrium sensor range shall be from 2 to 2,500 FC.

.5 Skylight sensor range shall be between 10 and 7,500 FC.

2.11.5 Mechanical:

.1 Mounting options shall include the following:

.1 Junction Box mounting

.2 Knock-out mounting

2.11.6 Reliability:

.1 Operating temperature range: 13 degrees F (-11 degrees C) to +140 degrees F (60 degrees C)

.2 Humidity: 5% to 95% RH (non-condensing)

2.12 **Low Voltage Occupancy Sensors (PIR, Ultrasonic or Dual-Technology)**

2.12.1 General: Occupancy sensor connectivity shall be via field bus that carry low voltage control signals.

.1 Shall allow timeouts configurable via system software.

.2 Sensors using passive infrared, ultrasonic, microphonic, and multi-technology shall be available.

.3 Shall allow occupancy and vacancy sensor configurations via system software.

.4 Depending on the software configuration shall switch or dim the luminaires.

.5 Shall allow overlapping and comfort zone configurations via system software.

2.12.2 Electrical:

.1 Class 2 Low Voltage device

.2 Power source: Communication bus

2.12.3 Communication:

.1 Shall be via Class 2 communication bus

.2 Wireless communication shall be enabled via Wireless Control Module/Wireless Area Lighting Controller

2.12.4 Performance:

.1 Shall allow flexible timer settings
.2 Shall have the ability to self-calibrate and retain settings during power interruptions
.3 Shall have the ability to automatically analyze and adjust sensitivity and time delay
.4 Shall Provide the following coverage:
   .1 Ceiling mount: 450 sq. ft. to 2000 sq. ft.
   .2 Wall mount: 1200 sq. ft. to 2500 sq. ft.

2.12.5 Mechanical:
   .1 Wired: Sensors for mounting on ceilings and walls, including corners, shall be available.

2.12.6 Reliability:
   .1 Operating temperature range: 32 degrees F to +104 degrees F. (0 degrees C to 40 degrees C)
   .2 Humidity: 0% to 95% RH (non-condensing)

2.13 Wireless Sensors
2.13.1 Sensors shall have built-in occupancy and daylight sensing capability. Shall connect to the Lighting Control System via wireless medium that uses non-proprietary open protocol (e.g., ZigBee) for communication.

2.13.2 Electrical:
   .1 Class 2 Low Voltage device
      .1 Power source: Two (2) AA Alkaline batteries or Agency approved equivalent with 10-year battery life

2.13.3 Communication: Shall be via wireless medium that uses non-proprietary open protocol (e.g., ZigBee) for communication
   .1 Wireless networks shall be reliable (mesh topology), self-configuring (discovery) and self-healing. Unexpected interruptions in the network shall be automatically compensated for by re-directing communication.
   .2 Wireless network shall Provide high level of security by employing logically unbreakable secure encryption methods (e.g. 128-bit encryption).

2.13.4 Performance:
   .1 Shall perform both occupancy and daylight harvesting
   .2 The battery life shall be monitored via system software.
   .3 Indicator light: Indicator light to signify different sensor statuses (failure, start-up, etc.)
   .4 Tool less mounting options shall be available:
      .1 Invisible mark mounting
      .2 Magnetic mounting
   .5 Sensor timeouts shall be configurable via system software.
   .6 Occupancy/Vacancy sensor configurations shall be performed via system software.
   .7 Depending on the software configuration shall switch or dim the luminaires.
   .8 Shall allow overlapping and comfort zone configurations via system software.
.9 Shall supply a wireless signal to the Lighting Management System proportional to the light measured.

.10 Shall Provide the daylight sensor range shall be between 0 and 100 FC (0 to 1000 Lux)

.11 Shall Provide the following occupancy coverage:

.1 450 sq. ft. with micro-motion sensitivity

.2 1500 sq. ft. long range with high sensitivity core

2.13.5 Mechanical:

.1 Dimensions: 3.37” diameter (85.49mm) x 1.13” (28.6mm) height (standard range) / 0.98” (25mm) height (long range)

.2 Mounting

.1 The following tool less mounting options shall be available:

(a) Invisible mark mounting

(b) Magnetic mounting

.2 Other mounting options shall include the following:

(a) Junction Box mounting

(b) Knock-out mounting

.3 Plastic material

2.13.6 Reliability:

.1 Operating temperature range: 32 degrees F to 104 degrees F (0 degrees C to 40 degrees C)

.2 Humidity: 5% to 95% RH (non-condensing)

2.13.7 Regulatory:

.1 Environmental protection: Rated for dry location; RoHS compliant

2.14 **Wireless Manager (WM)**

2.14.1 General: The wireless manager shall be the central intelligence point for the area that it controls, collecting signal information from sensors, wall stations and personal control software and determining appropriate brightness levels or on/off status for each luminaire or zone. Each wireless manager shall control large quantity of wireless devices. The wireless manager shall automatically detect and during start-up addresses the compatible sensors, wall stations and system field devices it is connected to and establishes two-way communication.

2.14.2 The wireless manager shall communicate with the server over Ethernet connection that employs TCP/IP protocol. The wireless manager shall connect with a facility’s or tenant’s Local Area Network (LAN) via Ethernet connection to enable desktop personal control.

2.14.3 Electrical:

.1 Input voltage: Via Power over Ethernet

2.14.4 Communication: Shall be via wireless medium that uses non-proprietary open protocol (e.g., ZigBee) for communication

.1 Wireless networks shall be reliable (mesh topology), self-configuring (discovery) and self-healing. Unexpected
interruptions in the network shall be automatically compensated for by re-directing communication.

.2 Wireless network shall provide high level of security by employing logically unbreakable secure encryption methods (e.g. 128-bit encryption).

.3 Server communication shall be via TCP/IP over Ethernet

2.14.5 Mechanical:

.1 Plastic material

.2 Mounting: Ceiling or wall mount via j-box

2.14.6 Visualization and Performance:

.1 Manages large number of nodes

.2 Shall appear in system software

.3 Shall be configured via system software

.4 Shall display transmit/receive signal strength with the nodes on the floor plan

.5 Shall display hop count information with the nodes on the floor plan

2.14.7 Reliability:

.1 Ambient temperature range: 32 degrees F (0 degrees C) to 104 degrees F (40 degrees C)

.2 Humidity: 5% to 95% RH non-condensing rated for indoor locations.

2.14.8 Regulatory:

.1 Safety: UL916 listed

.2 Environmental protection: Rated for dry location; RoHS compliant

.3 Radio Interference: FCC Part 15/ICES-003

.4 Complies with the following electromagnetic requirements:

.1 EN 61000-4-2

.2 EN 61000-4-4

.3 EN 61000-4-5

2.15 System Server (SSU)

2.15.1 General: System Server shall host the lighting control system database for all the lighting control devices. In addition, it shall provide remote accessing capability to change system settings and/or parameters.

2.15.2 Server shall have the ability to:

.1 Analyze system performance or energy data or generate system report;

.2 Record energy consumption with average sampling every 5 minutes for unlimited duration;

.3 Host the web interface required for the web enabled Personal Control Software or web based Central Control Software;

.4 Reside on a client server (virtual server) thus eliminating the need for dedicated physical hardware if desired;

.5 Interconnect with Wireless Managers over standard Ethernet connection that employs TCP/IP protocol;
2.15.3 Hardware based servers shall at minimum meet the specifications listed below:

2.15.4 Electrical:
   .1 Power Supply: 120V/60Hz/200W. Provide dedicated 120V receptacle fed from a dedicated normal power circuit.

2.15.5 Communication:
   .1 Each System Server shall have two Ethernet 10/100Base-Tx Cat 5 RJ45 ports that employ TCP/IP protocol.

2.15.6 Mechanical:
   .1 Shall mount in a standard 19” rack (1U width), or alternatively where no rack is shown, via an individual wall mount.

2.15.7 Reliability:
   .1 Operating temperature range: 50 degrees F (10 degrees C) to 95 degrees F (35 degrees C)
   .2 Operating Relative Humidity: 10% to 90% (non-condensing)

2.15.8 Regulatory:
   .1 FCC (US only) Class A.
   .2 DOC (Canada) Class A.
   .3 UL 60950.
   .4 CAN/CSA-C22.2 No. 60950.

2.16 **Lighting Control System Software**

2.16.1 Personal Control Software: Shall enable individuals in a building to control lighting levels in their workspace from their own desktop PC. Shall enable light level control for each luminaire in their workspace or control all of the luminaire together as a group. Preset lighting scenes shall be stored, recalled and modified. This software shall have the capability of acting as a “virtual occupancy sensor” for the system by detecting keyboard or mouse activity on each PC for incremental occupancy status data.
   .1 Technical Information:
      .1 TCP/IP network traffic < 2kb/s.

2.16.2 Web based Personal Control Software: Shall enable majority of the Personal Control Software features via a web browser. Shall allow tasks such as individual luminaire dimming control, on/off switching, modify and save preset lighting scenes.
   .1 Technical Information: Adobe Flash ® based user interface.
      .1 System shall require:
         .1 Internet web browser with Flash® Player 8 or later.
         .2 Internet/Intranet connection.
         .3 SSU enabled and configured to host dynamic website.
         .4 Network connection with access to a network-enabled WM.

2.16.4 Web based Central Control Software: Central control software application shall be used to start-up, configure and manage the system. Every system parameter in a building (or campus of
buildings) shall be configured for each individual user or space and baseline settings shall be established for each of the following (depending on the basis of design) system features:

.1 Daylight harvesting.
.2 Occupancy control.
.3 Smart time scheduling.
.4 Task tuning.
.5 Personal control.
.6 Load shedding.

2.16.5 Software shall utilize a web based interface that permits a user to easily navigate between zones, floors or different buildings and allows a user to zoom in or zoom out of specific areas of a building. Both 3-dimensional and two-dimensional multi-floor views shall be available. System features such as creation of zone hierarchies, overlapping and support zone definitions, user access rights, timeout settings for occupancy sensors, calibration of light levels for daylight harvesting and the configuration of multiple time schedule profiles shall be available. A web based Graphical User Interface (GUI) application integral to the system shall be used to develop a dynamic, real-time, point-and-click graphic of each floor plan with representation of all light luminaire, wall stations, sensors, switches, etc. A central system server shall be provided to support system data base and enterprise control management.

.1 System shall require:

.1 Software that can run on a Windows Operating systems (Windows XP or newer) and also on Apple Mac Intel PCs (Mac OS 10.4 or newer).
.2 Ability to support all common browsers, i.e.,
   (a) Internet Explorer 6.0 or later
   (b) Mozilla Firefox 3.0 or later
   (c) Safari
   (d) Google Chrome
.3 Network connection/access to all network-enabled CUs.
.4 Native Energy Performance Monitoring capability
.5 Color gradient ("weather map" type) data view (see below for an example) to display the following criteria:
   (a) Lamp and ballast life time
   (b) Current energy consumption
   (c) Current energy savings
   (d) Current luminaire brightness
   (e) Current luminaire status
   (f) Current occupancy data
   (g) Current load shedding status
   (h) Hop count
   (i) Route of the signal
   (j) Signal Strength
   (k) Battery Voltage Status
2.17 **Audio-Visual Interface**

2.17.1 General: Shall allow users command (e.g. LCD Touch Screen Panel) various lighting scenarios depending on the audio and visual requirements of the room or building.

.1 The lighting control system shall interface to the AV system via TCP/IP protocol using Telnet.

.2 The lighting control system shall allow a common AV processor to individually control multiple rooms from a single TCP/IP port through unique room, zone, and scene addresses for lighting in each room.

2.18 **BAS Interface**

2.18.1 General: Two separate software interfaces (BACnet/IP or Tridium Niagara AX) shall be available for integration with Building Automation System. The lighting control system, via these interfaces, communicate the status of output devices (lighting loads) as well as input devices (dry contacts, switches, occupancy sensors, vacancy sensors, and photocells) over to the building automation system. Building Automation System, utilize data from lighting control system to switch/dim lighting, perform load shedding of lighting load, to turn lights on in response to emergency signal through fire alarm and perform HVAC adjustments.

.1 The Lighting Control System shall support the following BACnet Objects:

.1 **Binary Value:**
   (a) Light Zone State: State of the defined lighting zone – ON or OFF

.2 **Analog Value:**
   (a) Light Zone Dimming: Light output level of the defined lighting zone, from 100% (maximum light output) to 0% (minimum light output)

.3 **Scheduling:**
   (a) Support for BACnet Schedules/Calendars

.4 **Analog Input:**
   (a) Shed Request: Requested total amount of load reduction, defined in watts or as a percentage of sheddable load
   (b) Shed Request (Group): (As above, for the selected group)

.5 **Analog Output:**
   (a) Photo Sensor Daylight Readings (available via BACnet interface only): Reports daylight readings by photo sensors
(b) Sheddable Load: Reports the total lighting load available for load reduction according to the Light Management System, defined in watts

(c) Sheddable Load (Group): (As above, for the selected group)

(d) Shed Status: Reports the total current load reduction achieved according to Light Management System defined prioritization, defined in watts

(e) Shed Status (Group): (As above, for the selected group)

(f) Load Shedding Total Demand: Reports the total lighting demand of all devices in a load shedding group (in Watts)

6. Binary Input:
(a) Fire Alarm State: State of the fire alarm system – alarm activated or alarm not activated

7. Binary Output:
(a) Occupancy State: State of the defined occupancy sensor – occupancy detected or not detected

2. The Lighting Control System shall allow Floor plans imports into Tridium Niagara AX:
1. Importing lighting control software floor plans into Tridium Niagara AX framework for viewing current status and changing the proxy values.

3. EXECUTION

3.1 Examination

3.1.1 Site Verification: Verify that wiring conditions, which have been previously installed under other Sections or at a previous time, are acceptable for Product installation in accordance with manufacturer’s instructions.

3.1.2 Inspection: Inspect all material included in this Contract prior to installation. Manufacturer shall be notified of unacceptable material prior to installation.

3.2 Installation

3.2.1 Coordinate, receive, mount, connect, and place into operation all equipment. Furnish all conduit, wire, connectors, hardware, and other incidental items necessary for properly functioning lighting control as described herein and shown on the plans (including but not limited to System Field Devices, 0-10V dimming ballasts, fixed output ballasts, 0-10V LED drivers and communication wire). The Contractor shall maintain performance criteria stated by manufacturer without defects, damage, or failure.
3.2.2 Power: The Contractor shall test that all branch load circuits are operational before connecting loads to sensor system load terminals, and then de-energize all circuits before installation.

3.2.3 Related Product Installation: Refer to other Sections listed in Related Sections for related Products’ installation.

3.3 Sensor Installation
3.3.1 Adjust sensitivity to cover area installed
3.3.2 Set time delay on occupancy sensors that are connect to the lighting control system to the minimum. Time delays shall be controlled via Central Control Software.
3.3.3 Vacancy sensor configurations shall be via Central Control Software.
3.3.4 Sensors shall be powered through Input Module, Wireless Control Module, Kinetic energy or batteries.
3.3.5 Install occupancy sensors on vibration free stable surface.
3.3.6 Install atrium and skylight light sensor facing toward window or skylight.
3.3.7 Install interior light sensor in ceiling facing the floor.

3.4 Wiring Installation
3.4.1 Wiring Method: Comply with Division 26 Section 26 05 19 Wire and Cable, Subsection "Low Voltage Wiring". Minimum conduit size shall be 3/4 inch.
3.4.2 Wiring within Enclosures: Comply with NEC and CEC. Separate power-limited and non-power-limited conductors according to conductor manufacturer's written instructions.
3.4.3 Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.
3.4.4 Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

3.5 Software Installation
3.5.1 Install and program software with initial settings of adjustable values. Make backup copies of software and user-supplied values. Provide current site licenses for software.

3.6 Field Quality Control
3.6.1 Manufacturer’s Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
3.6.2 Perform the following field tests and inspections with the assistance of a factory-authorized service representative:

.1 Operational Test: After installing wall stations and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.

.2 Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3.6.3 Lighting control devices will be considered defective if they do not pass tests and inspections.
3.6.4 Prepare test and inspection reports.

3.7 **System Start-Up Requirements and Support Services**

3.7.1 System Start-up: The manufacturer shall supply factory trained representatives to start-up the lighting control system.

3.7.2 Training: As part of the system start-up service, the provider of the service shall train the facility staff, or end users, responsible for changing the lighting characteristics in a building in the operation of the system. The start-up service provider shall also provide the Agency’s representatives with system operating manuals.

3.7.3 Extended Service Coverage: Maintenance agreements shall be available from the manufacturer to provide service for the system both during and after the warranty period.

3.7.4 Requests for start-up or technical services shall be at least fifteen (15) business days prior to date desired for service.

3.7.5 Electrical Contractor shall perform functional testing under the guidance of technical service agent and in accordance with factory specified guidelines.

3.7.6 Technical service provider shall provide technical services for the lighting control system.

- Verify proper communication over control wires.
- Map addresses of all devices.
- Verify communication to wireless managers and system server.
- Software configuration of occupancy sensors, light level sensors, wall stations and other contacts to suit design specifications.
- Configure and program lighting control sequences as described on Contract documents.
- Demonstrate to Agency and Engineer proper operation of all areas the system is installed.

3.8 **Testing**

3.8.1 Upon completion of all line, load and interconnection wiring, and after all luminaire are installed and lamped, a qualified factory representative shall completely configure and test the system.

3.8.2 At the time of checkout and testing, the Agency’s representative shall be thoroughly instructed in the proper operation of the system.

3.9 **Demonstration**

3.9.1 The provider of the service shall train the facility staff, or end users, responsible for changing the lighting characteristics in a building to adjust, operate, utilize, troubleshoot, conduct software installation, and maintain lighting controls and software training for PC-based control systems.

END OF SECTION
1. GENERAL

1.1 Summary
1.1.1 Provide indoor distribution dry type transformers of the size and type as shown on the drawings and specified herein.

1.2 Submittals
1.2.1 Provide detailed shop drawings showing equipment sizes, dimensions, nameplate data and all other pertinent details required to complete the installation and connections.

1.3 Quality Assurance
1.3.1 Dry type transformers shall be manufactured and tested in accordance with the latest issue of CSA Standard C-9 for the applicable rating.
1.3.2 Dry type transformers sound level shall comply with the latest issue of NEMA Standard TR1.
1.3.3 Dry-type transformers minimum efficiency values shall comply with CAN/CSA-C802.2-12.
1.3.4 Power transformers maximum losses shall comply with CAN/CSA-C802.3-01 (R2012).

2. PRODUCTS

2.1 Approved Manufacturers
2.1.1 Acceptable manufacturers are:
   .1 Hammond
   .2 Schneider Electric
   .3 Siemens
   .4 Delta
   .5 Rex
   .6 ACME
   .7 Or Agency approved equivalent

2.2 Dry Type Transformers
2.2.1 Indoor distribution transformers shall be two winding (not autotransformers), 60 cycle, high efficiency ANN dry type. Transformers shall be 3 phase two winding type designed for 600 V Delta primary and 208/120V Wye secondary system voltages unless otherwise indicated on the drawings. Transformer capacity ratings shall be as indicated on the drawings.
2.2.2 Transformers shall be complete with four 2 1/2% full capacity taps, two FCAN and two FCBN, and internal core/coil vibration mounts. Transformer enclosures shall be ventilated EEMAC 1 type and be finished with light grey enamel. Provide sprinkler-proof hoods for transformers installed in sprinklered areas and external neoprene vibration isolators.
2.2.3 Transformer primary and secondary windings shall be aluminum or copper.
2.2.4 Transformer insulation shall be rated 220 degrees C (150 degrees C full load operating temperature rise).
2.2.5 Additional features include:
.1 K factor 13 rating as per ANSI/IEEE C57-110 where required;
.2 low sound noise (-3db).

3. EXECUTION

3.1 Installation
3.1.1 All floor mounted transformers shall be mounted on concrete housekeeping pads with external neoprene vibration pads or equivalent.
3.1.2 Transformers shall have flexible conduit connections or equivalent on both the high and low voltage feeders.
3.1.3 Wall mounted transformers shall be mounted on a structural angle iron frame suitably attached to the masonry walls, steel structure, etc., and be set on external neoprene vibration isolators or equivalent.
3.1.4 Dry type transformers up to and including 45 kVA shall be wall mounted. Transformers over 45 kVA are to be floor mounted. Exceptions to the above shall be as noted on the drawings.
3.1.5 Adjust primary voltage tap to achieve desired secondary system voltage as instructed on site by Consultant. Provide grounding terminals and primary and secondary lugs to suit indicated feeder conductors.

END OF SECTION
1. **GENERAL**

1.1 **Summary**

1.1.1 The Contractor shall provide all distribution equipment required for the complete installation. The Section “Low Voltage Distribution Equipment” will generally refer to such items as panelboards, disconnect switches, breakers, splitters, starters, etc.

1.1.2 Refer to Section 26 05 33 - Raceway and Boxes for Electrical Systems, 26 05 19 - Wire and Cable, and 26 05 53 - Identification for Electrical Systems for the additional requirements of materials necessary to complete the work of this Section.

1.1.3 Refer to the “Power Distribution Schematic Diagram” and “Wiring for Mechanical Equipment Schedule” as shown on the drawings, for details of equipment and components to be provided.

1.1.4 Related Sections:

1. Section 26 05 00 - Common Work Results for Electrical
2. Section 26 05 19 - Wire and Cables
3. Section 26 05 33 - Raceway and Boxes for Electrical Systems.
4. Section 26 05 53 - Identification for Electrical Systems
5. Section 26 43 00 Surge Protection Devices

1.2 **References**

1.2.1 Reference Codes and Standards: Versions of the following standards current as of the date of issue of the project, apply to the Work of this Section. Where regulatory requirements use older version of a standard, comply with the version year adopted by the Authority Having Jurisdiction.

1. Ontario Electrical Safety Code
2. CSA-C17 Alternating - Current Electricity Metering

1.3 **Submittals**

1.3.1 All distribution equipment for this project shall have shop Drawings submitted for review (i.e. panelboards, switchboards, circuit breakers, etc.).

1.3.2 Maintenance and operating instructions, parts lists, etc., shall be provided for switchboards, air circuit breakers, meters, ground fault detectors, or any special function equipment.

1.4 **Quality Assurance**

1.4.1 All equipment shall be C.S.A. approved and be finished in light grey enamel paint.

1.4.2 All equipment shall be manufactured in accordance with the applicable sections of C.S.A. Specification C22.2.

1.5 **Delivery, Storage and Handling**

1.5.1 Large pieces of equipment such as switchboards and motor control centres shall be delivered to the site in a suitable enclosure and be protected all around with a plastic covering. A suitable on site storage arrangement must be provided to keep the equipment protected from the elements and other Work. If there
is any sign of damage, rusting or corrosion on the equipment, the affected parts shall be replaced at no charge.

2. **PRODUCTS**

2.1 **Approved Manufacturers**

2.1.1 Acceptable manufacturers are:

1. Eaton
2. Siemens
3. Schneider Electric
4. Or Agency approved equivalent

2.2 **Distribution Panels**

2.2.1 Moulded case circuit breakers shall be of the frame size and rating as shown on the Drawings and include ground fault sensing relays, shunt trip, auxiliary contacts or other special features as noted on the Drawings.

2.3 **Circuit Breaker Panelboards**

2.3.1 Panels shall be of the type, with voltage and current rating as indicated on the Drawings. The panels shall be sized to contain the specified branch breakers with space for future units as indicated.

2.3.2 Panels shall be complete with common key locking doors, and no label, stamp, or nameplate on the exterior of the panel trim or door. Provide a directory card and suitable holder mounted on the back of the panel door. Panel enclosure rating shall suit application requirement.

2.3.3 Flush mounted panelboards shall have doors and trims finished in light grey enamel paint. Surface mounted panelboards shall have tubs, doors and trims finished in light grey enamel paint.

2.3.4 Unless otherwise indicated, circuit breakers shall be moulded case type, with required frame size for trip settings as shown on the Drawings. Breakers mounted in panels shall be bolt-on type.

2.3.5 Unless otherwise noted all breakers shall be rated minimum 14 kA symmetrical interrupting capacity at 600 volts, three phase or 10 kA symmetrical interrupting capacity at 208 volts, three phase as appropriate.

2.3.6 Switching breakers shall be U.L. SWD rated for switching duty.

2.4 **Disconnect Switches**

2.4.1 Disconnect switches shall be heavy duty type with visible blades in the off position, quick- make quick-break operating mechanism, lock-off provision, door/handle interlock with override and shall be horsepower and electric heat rated. Switch fuse holders shall have reinforced clips. Fuses shall be easily removable when the switch is in the off position. All switches shall have ample gutter space for top or bottom wiring and be provided with enclosures to suit the specific application.
3. **EXECUTION**

3.1 **Installation**

3.1.1 Protect installed products and components from damage during construction. Repair damage to adjacent materials caused by equipment installation.

3.1.2 Install equipment in accordance with manufacturer’s instructions or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.1.3 All equipment installed in this scope will meet clearance requirements of OESC. Any equipment installed that does not meet this requirement will be reviewed with the Consultant.

3.1.4 Wall mounted service and distribution equipment shall be mounted on 20 mm plywood backboards. The backboards shall be large enough to contain all the equipment, including future where indicated, in a well-organized and planned arrangement. The backboards shall be finished with two coats of light grey fire retardant paint before the equipment is mounted.

3.1.5 Mounting heights of wall mounted panels shall generally be 2000 mm to the top of the panel trim.

3.1.6 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION
1. **GENERAL**

1.1 **Summary**

1.1.1 Provide all wiring devices and associated fittings of the types as indicated on the legend and Drawings. Applicable devices shall be selected from the "Schedule of Wiring Devices" as specified herein, or as specifically noted on the Drawings.

1.1.2 Related Sections:

1.2 **Quality Assurance**

1.2.1 All installed wiring devices will be CSA listed or equivalent approval by the local authority having jurisdiction.

1.3 **Submittals**

1.3.1 Submittals under this Section will be in accordance with General Conditions, Section 01 33 00 – Submittals, and Section 26 05 00 - Common Work Results for Electrical.

1.3.2 Submit Shop Drawings for the following Products:

1.3.2.1 Special devices not listed in the Schedule of Wiring Devices.
1.3.2.2 Floor boxes.
1.3.2.3 Flat Panel Display outlet boxes
1.3.2.4 Service Poles
1.3.2.5 Cable Reels
1.3.2.6 Floor Monument and associated raceway

2. **PRODUCTS**

2.1 **Approved Manufacturers**

2.1.1 A single manufacturer has been identified in the wiring device schedule. Equivalent devices by other manufacturers will be accepted subject to review by the Consultant. Wiring devices by the following manufacturers will be considered for use on this Project:

2.1.1.1 Hubbell
2.1.1.2 Pass & Seymour
2.1.1.3 Eaton - Arrow-Hart
2.1.1.4 Leviton
2.1.1.5 Or Agency approved equivalent

2.1.2 All wiring devices shall be white in colour unless noted otherwise. Device numbers shown represent required component series and are not meant to be exact part number or identify colour.

2.1.3 The following special colours will be used:

2.1.3.1 Red – Standby or Emergency
2.1.3.2 Blue – UPS Power
.3 Black – Special receptacle not in CSA 5-15R or 5-20R configurations

.4 If an outlet exhibits more than one of the above properties, then a clear permanently-mounted label will be placed above the device stating all the other functions or properties of this wiring device.

2.2 Schedule of Wiring Devices

2.2.1 Standard 120 Volt Devices (based on Hubbell series; refer to Section 2.1.1 for Approved Manufacturers):

| 15 Amp. Toggle Type Switch | Hubbell 1201 Series – single pole |
| 20 Amp. Toggle Type Switch with pilot light | Hubbell HBL1287 Series |
| 20 Amp. Toggle Type Switch | Hubbell 1221 Series – single pole |
| | Hubbell 1222 Series – double pole |
| | Hubbell 1223 Series – 3 way |
| | Hubbell 1224 Series – 4-way |
| 15 Amp. Weatherproof Push Button | Hubbell No. 1251/1795 Switch |
| 15 Amp. Duplex Receptacle | Hubbell No. 5262 |
| 20 Amp. Single Receptacle | Hubbell No. HBL5361 |
| 20 Amp. Duplex Receptacle (T-Slot) | Hubbell No. 5362 |
| 15 Amp. Duplex G.F.I. Receptacle | Hubbell No. GF-5262 |
| 20 Amp. Duplex G.F.I. Weatherproof Receptacle (T-Slot) | Hubbell No. GF- 5362/RW57300 |
| 15 Amp. Duplex Weatherproof In-Use Receptacle | Hubbell No. GF-5262/RW58300 |
| 20 Amp Duplex Split Receptacle | Hubbell No. SNAP5362 Series |

2.2.2 Special Devices (based on Hubbell series; refer to Section 2.1.1 for Approved Manufacturers):

.1 Dryer Outlet - Hubbell No. HBL9430

.2 Above floor furniture base feed (power and communications) - Hubbell No. SC-309OX with one blank plate and 3/4" opening on other plate for flexible conduit nipple connection.

.3 Toggle Switch 347V, 20A - Hubbell No. 18221 Series.

.4 Provide other special wiring devices as noted on the Drawings.

2.3 Special Mounting and Accessories

2.3.1 Flat Panel Display Wall box – as specified on Drawings with matching device plates. Provide standard power kit and decorator wall plates for Audio Visual or Telecommunications. For use with surface mounted flat screen displays only.

2.3.2 Quad receptacle types are not permitted and will be substituted for two duplex receptacles ganged together.
2.3.3 Provide other special wiring devices as noted on the Drawings to the same quality as those listed within the “Schedule of Wiring Devices”.

2.4 **Cable Reel Receptacles**

2.4.1 Reel will have a heavy-duty spring motor, with self-contained rewind power and non-sparking ratchet assembly, a 4-way roller and adjustable cable stop, and a safety chain. Reel will lock when desired cable has been payed out and unlock and retract when cable is pulled to release lock.

2.4.2 Reel will be Provided with minimum 12 m (40’) cable at rated load with required phase conductors, neutral, and equipment grounding conductor. Provide device with CSA configuration as shown.

2.5 **Occupancy Sensors**

2.5.1 Provide occupancy sensors of the types and styles as indicated on the Drawings. Occupancy sensors shall have all incentive program approvals and be as manufactured by The Watt Stopper Inc. or equal and described below.

2.5.2 Wall Mount Sensor Switch (line voltage, 347 VAC) as specified on Drawings.

.1 Dual Technology sensors

.2 For use in small conference room, break room, or similar.

.3 Each room shall be equipped with line voltage, dual relay, wall mounted, dual technology occupancy sensor(s).

.4 Wall sensor shall have features such as large activation buttons, automatic time-delays, automatic sensitivity, and walkthrough modes.

.5 By default, first relay shall be set to automatic on; second relay shall be set to manual on.

2.5.3 Wall Mount Sensor Dimming Switch (line voltage, 347 VAC) as specified on Drawings shall be dual technology rated 1000 watt load at 347 VAC as applicable. Units shall be tamperproof, have white finish and include the following features:

.1 Adjustable sensitivity and protection/coverage area pattern.

.2 Adjustable auto-off time delay.

.3 Daylight filter and auto-off selector switch.

.4 Aesthetic appearance and 3 year warranty.

2.6 **Coverplates**

2.6.1 Coverplates for wall-mounted wiring devices in finished areas shall be high impact smooth nylon coloured to match device. Where ganged devices have different colours, coverplate colour shall be white.

2.6.2 In unfinished areas or surface mounted devices, coverplates will be galvanized type with rounded corners and back boxes will be cast type.

2.6.3 Provide gasketed ‘While-in-Use’ or Extra Duty polycarbonate cover Hubbell RW58300 for all devices exposed to weather or
2.6.4 Provide proper ganged coverplates and backboxes for all grouped outlets. Provide internal barriers between receptacles from different panels, and between receptacles and extra low voltage outlets.

3. **EXECUTION**

3.1 **Installation**

3.1.1 All switches controlling a connected load in excess of 10 amperes will be 20 ampere rated type.

3.1.2 Mounting heights of the wiring devices will be as follows unless subject to special installation conditions, or otherwise indicated on floor plans or dimensioned interior elevations (Mounting heights refer to the centre of the outlet box):

   .1 Light switches and control devices 1100 mm (43").
   .2 Wall Outlets and receptacles 460 mm (18") or 150 mm (6") above countertop or back splash as applicable.
   .3 In barrier-free spaces and suites, mount light switches and control devices at 1050 mm (41.5") above finished floor.

3.1.3 Coverplates will be installed flush and level.

3.1.4 Install wiring devices after wall construction and painting is complete.

3.1.5 All wiring devices shown as being relocated on Drawings will be replaced with new device and cover plate and will be connected to the existing circuit.

3.1.6 Install all wall switches with the OFF position down. All CSA 5-15R and 5-20R configuration receptacles will be installed so the ground is in the bottom position.

3.1.7 Where electrical outlets and wall mounted heating units occur at the same height and location, the outlets will be mounted below or beside the heater, unless noted otherwise.

3.1.8 Work top mounted outlets will be above floor monument type securely fastened to work surface using a threaded connection to conduit system. Provide all required fittings, inserts and accessories required for approved mounting and connection.

3.1.9 Outlets installed in millwork will be standard wall mounted versions, flush-mounted into face of the appropriate vertical surface. Refer to millwork elevations and sections for further details.

3.1.10 Prior to rough-in for wall outlets for flat screen displays, coordinate mounting height such that flat screen mounting bracket is not interfering with wall outlet. Care should be taken to ensure wall outlet is completely behind flat screen display when mounted. If outlet is completely behind flat screen cover will not be installed.

3.1.11 All outlets installed in exterior locations will be weather resistant type and will be protected with an Extra Duty or while-in-use cover for allowing outlet to be covered even while in use.
3.2 **Testing**

3.2.1 When installation is complete, test operation of all devices. All defective devices shall be replaced and all defective wiring shall be repaired.

.1 Switches should be operated to ensure load is switching as expected.

.2 For CSA 5-15R and 5-20R configuration receptacles should be tested with handheld plug-in receptacle tester for open circuits, and reversed wiring. GFCI test shall be completed on all GFCI receptacles and circuits.

.3 For receptacles of other configurations, a multimeter shall be used to perform similar tests.

END OF SECTION
1. **GENERAL**

1.1 **Summary**

1.1.1 Provide all wiring devices and associated fittings of the types as indicated on the legend and Drawings. Applicable devices shall be selected from the "Schedule of Wiring Devices" as specified herein, or as specifically noted on the Drawings.

1.1.2 Related Sections:

- Section 26 05 00 - Common Work Results for Electrical
- Section 26 05 33 - Raceways and Boxes for Electrical Systems
- Section 26 09 43 - Networked Lighting Controls
- Section 27 05 28 - Pathways for Communications Systems

1.2 **Quality Assurance**

1.2.1 All installed wiring devices will be CSA listed or equivalent approval by the local authority having jurisdiction.

1.3 **Submittals**

1.3.1 Submittals under this Section will be in accordance with General Conditions, Section 01 33 00 – Submittals, and Section 26 05 00 - Common Work Results for Electrical.

1.3.2 Submit Shop Drawings for the following Products:

- Special devices not listed in the Schedule of Wiring Devices.
- Floor boxes.
- Flat Panel Display outlet boxes
- Service Poles
- Cable Reels
- Floor Monument and associated raceway

2. **PRODUCTS**

2.1 **Approved Manufacturers**

2.1.1 A single manufacturer has been identified in the wiring device schedule. Equivalent devices by other manufacturers will be accepted subject to review by the Consultant. Wiring devices by the following manufacturers will be considered for use on this Project:

- Hubbell
- Pass & Seymour
- Eaton - Arrow-Hart
- Leviton
- Or Agency approved equivalent

2.1.2 All wiring devices shall be white in colour unless noted otherwise. Device numbers shown represent required component series and are not meant to be exact part number or identify colour.

2.1.3 The following special colours will be used:

- Red – Standby or Emergency
- Blue – UPS Power
.3 Black – Special receptacle not in CSA 5-15R or 5-20R configurations

.4 If an outlet exhibits more than one of the above properties, then a clear permanently-mounted label will be placed above the device stating all the other functions or properties of this wiring device.

2.2 **Schedule of Wiring Devices**

2.2.1 Standard 120 Volt Devices (based on Hubbell series; refer to Section 2.1.1 for Approved Manufacturers):

<table>
<thead>
<tr>
<th>Device Description</th>
<th>Manufacturer Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>15 Amp. Toggle Type Switch</td>
<td>Hubbell 1201 Series – single pole</td>
</tr>
<tr>
<td></td>
<td>Hubbell 1203 Series – 3 way</td>
</tr>
<tr>
<td>20 Amp. Toggle Type Switch with pilot light</td>
<td>Hubbell HBL1287 Series</td>
</tr>
<tr>
<td>20 Amp. Toggle Type Switch</td>
<td>Hubbell 1221 Series – single pole</td>
</tr>
<tr>
<td></td>
<td>Hubbell 1222 Series – double pole</td>
</tr>
<tr>
<td></td>
<td>Hubbell 1223 Series – 3 way</td>
</tr>
<tr>
<td></td>
<td>Hubbell 1224 Series – 4-way</td>
</tr>
<tr>
<td>15 Amp. Weatherproof Push Button</td>
<td>Hubbell No. 1251/1795 Switch</td>
</tr>
<tr>
<td>15 Amp. Duplex Receptacle</td>
<td>Hubbell No. 5262</td>
</tr>
<tr>
<td>20 Amp. Single Receptacle</td>
<td>Hubbell No. HBL5361</td>
</tr>
<tr>
<td>20 Amp. Duplex Receptacle (T-Slot)</td>
<td>Hubbell No. 5362</td>
</tr>
<tr>
<td>15 Amp. Duplex G.F.I. Receptacle</td>
<td>Hubbell No. GF-5262</td>
</tr>
<tr>
<td>20 Amp. Duplex G.F.I. Weatherproof Receptacle (T-Slot)</td>
<td>Hubbell No. GF-5362/RW57300</td>
</tr>
<tr>
<td>15 Amp. Duplex Weatherproof In-Use Receptacle</td>
<td>Hubbell No. GF-5262/RW58300</td>
</tr>
<tr>
<td>20 Amp Duplex Split Receptacle</td>
<td>Hubbell No. SNAP5362 Series</td>
</tr>
<tr>
<td>15 Amp. Decora Type Switch</td>
<td>Hubbell DS115 Series</td>
</tr>
<tr>
<td>20 Amp. Decora Type Switch</td>
<td>Hubbell DS120 Series</td>
</tr>
<tr>
<td>347V 15 Amp. Decora Type Switch</td>
<td>Hubbell 2101347 Series</td>
</tr>
<tr>
<td>347V 20 Amp. Decora Type Switch</td>
<td>Hubbell 2121347 Series</td>
</tr>
<tr>
<td>15 Amp. Decora Duplex Receptacle</td>
<td>Hubbell DR15 Series</td>
</tr>
<tr>
<td>15 Amp. Decora Duplex Receptacle</td>
<td>Hubbell DR20 Series</td>
</tr>
<tr>
<td>15 Amp. Decora Duplex GFCI Receptacle</td>
<td>Hubbell DR15C Series</td>
</tr>
<tr>
<td>20 Amp. Decora Duplex GFCI Receptacle</td>
<td>Hubbell DR20C Series</td>
</tr>
</tbody>
</table>

2.2.2 Special Devices (based on Hubbell series; refer to Section 2.1.1 for Approved Manufacturers):

.1 Dryer Outlet - Hubbell No. HBL9430

.2 Above floor furniture base feed (power and communications) - Hubbell No. SC-309OX with one blank plate and 3/4" opening on other plate for flexible conduit nipple connection.

.3 Toggle Switch 347V, 20A - Hubbell No. 18221 Series.

.4 Provide other special wiring devices as noted on the Drawings.
2.3 **Special Mounting and Accessories**

2.3.1 Flat Panel Display Wall box – as specified on Drawings with matching device plates. Provide standard power kit and decorator wall plates for Audio Visual or Telecommunications. For use with surface mounted flat screen displays only.

2.3.2 Quad receptacle types are not permitted and will be substituted for two duplex receptacles ganged together.

2.3.3 Provide other special wiring devices as noted on the Drawings to the same quality as those listed within the “Schedule of Wiring Devices”.

2.4 **Cable Reel Receptacles**

2.4.1 Reel will have a heavy-duty spring motor, with self-contained rewind power and non-sparking ratchet assembly, a 4-way roller and adjustable cable stop, and a safety chain. Reel will lock when desired cable has been payed out and unlock and retract when cable is pulled to release lock.

2.4.2 Reel will be Provided with minimum 12 m (40’) cable at rated load with required phase conductors, neutral, and equipment grounding conductor. Provide device with CSA configuration as shown.

2.5 **Occupancy Sensors**

2.5.1 Provide occupancy sensors of the types and styles as indicated on the Drawings. Occupancy sensors shall have all incentive program approvals and be as manufactured by The Watt Stopper Inc. or equal and described below.

2.5.2 Wall Mount Sensor Switch (line voltage, 347 VAC) as specified on Drawings.

.1 Dual Technology sensors
.2 For use in small conference room, break room, or similar.
.3 Each room shall be equipped with line voltage, dual relay, wall mounted, dual technology occupancy sensor(s).
.4 Wall sensor shall have features such as large activation buttons, automatic time-delays, automatic sensitivity, and walkthrough modes.
.5 By default, first relay shall be set to automatic on; second relay shall be set to manual on.

2.5.3 Wall Mount Sensor Dimming Switch (line voltage, 347 VAC) as specified on Drawings shall be dual technology rated 1000 watt load at 347 VAC as applicable. Units shall be tamperproof, have white finish and include the following features:

.1 Adjustable sensitivity and protection/coverage area pattern.
.2 Adjustable auto-off time delay.
.3 Daylight filter and auto-off selector switch.
.4 Aesthetic appearance and 3 year warranty.

2.6 **Coverplates**

2.6.1 Coverplates for wall-mounted wiring devices in finished areas shall be high impact smooth nylon coloured to match device.
Where ganged devices have different colours, coverplate colour shall be white.

2.6.2 In unfinished areas or surface mounted devices, coverplates will be galvanized type with rounded corners and back boxes will be cast type.

2.6.3 Provide gasketed ‘While-in-Use’ or Extra Duty polycarbonate cover Hubbell RW58300 for all devices exposed to weather or water splashing. Cover will have ability to install padlock to restrict access and removal of installed plugs.

2.6.4 Provide proper ganged coverplates and backboxes for all grouped outlets. Provide internal barriers between receptacles from different panels, and between receptacles and extra low voltage outlets.

3. EXECUTION

3.1 Installation

3.1.1 All switches controlling a connected load in excess of 10 amperes will be 20 ampere rated type.

3.1.2 Mounting heights of the wiring devices will be as follows unless subject to special installation conditions, or otherwise indicated on floor plans or dimensioned interior elevations (Mounting heights refer to the centre of the outlet box):

- Light switches and control devices 1100 mm (43”).
- Wall Outlets and receptacles 460 mm (18”) or 150 mm (6”) above countertop or back splash as applicable.
- In barrier-free spaces and suites, mount light switches and control devices at 1050 mm (41.5”) above finished floor.

3.1.3 Coverplates will be installed flush and level.

3.1.4 Install wiring devices after wall construction and painting is complete.

3.1.5 All wiring devices shown as being relocated on Drawings will be replaced with new device and cover plate and will be connected to the existing circuit.

3.1.6 Install all wall switches with the OFF position down. All CSA 5-15R and 5-20R configuration receptacles will be installed so the ground is in the bottom position.

3.1.7 Where electrical outlets and wall mounted heating units occur at the same height and location, the outlets will be mounted below or beside the heater, unless noted otherwise.

3.1.8 Work top mounted outlets will be above floor monument type securely fastened to work surface using a threaded connection to conduit system. Provide all required fittings, inserts and accessories required for approved mounting and connection.

3.1.9 Outlets installed in millwork will be standard wall mounted versions, flush-mounted into face of the appropriate vertical surface. Refer to millwork elevations and sections for further details.

3.1.10 Prior to rough-in for wall outlets for flat screen displays, coordinate mounting height such that flat screen mounting bracket is not interfering with wall outlet. Care should be taken to ensure wall
outlet is completely behind flat screen display when mounted. If outlet is completely behind flat screen cover will not be installed.

3.1.11 All outlets installed in exterior locations will be weather resistant type and will be protected with an Extra Duty or while-in-use cover for allowing outlet to be covered even while in use.

3.2 **Testing**

3.2.1 When installation is complete, test operation of all devices. All defective devices shall be replaced and all defective wiring shall be repaired.

.1 Switches should be operated to ensure load is switching as expected.

.2 For CSA 5-15R and 5-20R configuration receptacles should be tested with handheld plug-in receptacle tester for open circuits, and reversed wiring. GFCI test shall be completed on all GFCI receptacles and circuits.

.3 For receptacles of other configurations, a multimeter shall be used to perform similar tests.

**END OF SECTION**
1. **GENERAL**

1.1 **Summary**

1.1.1 The Contractor shall Provide an automatic load transfer switch and accessories.

1.2 **Quality Assurance**

1.2.1 All materials and equipment shall be of new and of current manufacturer. All components shall be Provided by a single Supplier responsible for the total system to ensure complete compatibility. The plant and accessories shall be performance certified and covered by the manufacturer’s warranty against defective parts and workmanship for a period of two (2) years from date of acceptance. The entire installation shall be checked by a qualified technician after the installation is complete.

1.2.2 Three copies of complete instructions shall be supplied to Agency prior to final acceptance. Material shall be in booklet form and shall consist of operating and maintenance manuals, parts manuals, dimensional Drawings, unit wiring diagrams and schematics, interconnecting wiring diagrams, and necessary information for proper operation, service, and maintenance of the equipment and major components supplied.

1.3 **Related Sections**

1.3.1 Section 01 91 00 Commissioning

1.3.2 Section 26 05 00 - Common Work Results for Electrical

1.4 **Testing**

1.4.1 Upon completion of the installation of the power supply system, the installation shall be tested to ensure conformity to the requirements of this Specification. Testing shall include operational, full load and demonstration tests as follows:

   .1 Demonstration Tests

   1. The automatic transfer switch shall be tested as recommended by the manufacturer to ensure that all safety shutdowns and alarms respond as specified herein.

2. **PRODUCTS**

2.1 **Approved Manufacturers**

2.1.1 Acceptable manufacturers are:

   .1 ASCO

   .2 Cummins

   .3 Liebert

   .4 Or Agency approved equivalent
2.2 **Automatic Static Transfer Switch**

2.2.1 Provide a solid-state, three-pole, dual-position transfer switch designed to switch automatically and manually between two synchronized three-phase AC power sources without an interruption of power to the load typically less than 1/4 cycle.

2.2.2 The input power shall be supplied from two different AC power sources, which are nominally of the same voltage level, phase rotation and frequency. The primary purpose is to allow uninterrupted transfer from one source to the other in case of the failure of one source or by manual initiation for test or maintenance.

2.2.3 The switching action shall not connect together the two sources of power that would allow backfeeding one source to the other.

2.2.4 The static transfer switch shall allow for either source to be designated as the preferred source. The switch will automatically transfer to the preferred source and remain so until manually initiated to transfer or until the selected source fails. If the selected source fails, the switch shall transfer without interruption in less than 1/4 cycle to the other source, designated as the alternate source.

2.2.5 The static transfer switch shall be furnished with key-interlocked static switch isolation and bypass fault isolation protection devices to each source, which allow uninterrupted manual transfer to and from either source for maintenance.

2.2.6 By-pass of the load to either power source with complete isolation of the static transfer switch shall be possible regardless of the status. The entire system shall consist of two elements; the automatic transfer switch and the by-pass isolation switch furnished completely factory interconnected and tested.

2.2.7 The static transfer switch shall be fuseless and consist of six pairs of SCR's connected in an AC switch configuration. The SCR’s shall be continuous rated to carry 100% of the rated load while operating within the Specifications.

2.2.8 The static transfer switch logic power shall automatically power up when connected to the power source. The control panel shall be active as long as one input is energized. All settings will be adjusted/configured from the LCD display.

2.2.9 The operating speed of the by-pass switch section shall be the same as the automatic transfer switch.

2.2.10 The electrical ratings of the by-pass/isolation switch shall equal or exceed those of the associated transfer switch.

2.2.11 The automatic transfer and by-pass isolation switch shall be the Product of one manufacturer and be completely factory interconnected and tested so that only the service and load connections to the by-pass isolation switch are required for field installation.

2.2.12 Modes of operation:

.1 Normal Mode: The unit shall be fed by two sources with the output connected to the load. In normal operation, the load shall be connected to the preferred source as long as
all phases of the preferred source are within the acceptable limits. The transfer voltage limits shall default to ±10% of the nominal input voltage for steady state conditions, with low voltage transfer limits having an inverse time relationship that is within the IEEE Std. 446 computer voltage tolerance envelope. Upon failure of the preferred source, the load shall be transferred to the alternate source. After the preferred source returns to within the acceptable voltage limits for at least the preset adjustable retransfer time delay (typically 3 seconds) and is in phase with the alternate source, the load shall be retransferred automatically to the preferred source. The automatic retransfer to the preferred source can be disabled if selected by the user from the operator control panel. When the automatic retransfer is disabled, emergency transfers from the alternate source to the preferred source shall not be disabled upon alternate source failure.

.2 Peak Current Overload: The unit shall sense the load current and, if the load current exceeds an adjustable preset level deemed to represent a load inrush or fault condition, the unit shall disable the automatic transfer even if the voltage on the selected source exceeds the transfer limits. The load current transfer inhibit shall be automatically reset after the current returns to normal to allow for continued protection against a source failure.

.3 Manual Transfer: The unit shall allow manually initiated transfers between the two sources, provided the alternate source is within acceptable voltage limits and phase tolerances with the preferred source. Allowable phase differences between the sources for manually initiated transfers shall be adjustable from the operator control panel. The unit shall be capable of tolerating transfers up to 180 degrees out of phase for emergency conditions. If the transfer is manually initiated, the unit shall transfer between the two sources without interruption of power to the load greater than 1 millisecond provided that both sources are available and synchronized within the user-adjustable phase synchronization window. For sources where the two frequencies are not exactly the same, manually initiated transfers shall be delayed by the unit until the two sources are within the user-adjustable phase synchronization window.

.4 Emergency Transfer: In an effort to maintain power to the load, upon loss of the source that the load is connected to, the unit shall automatically transfer to the other source in less than 1/4 cycle, overriding any retransfer time delays or other inhibits except load overcurrent providing that the other source is available. If one source is shorted upstream, causing an undervoltage condition on that
source, the unit shall sense the undervoltage and transfer to the alternate source.

.5 SCR Failure: The unit shall continuously monitor the status of the SCR switching devices for proper operation. In the event of a shorted SCR on the source powering the load, the unit shall automatically alarm the condition and trip open the other source fault isolation protection device. In the event of a shorted SCR on the other source, the unit shall automatically alarm the condition and trip open the other source fault isolation protection device. In the event of an open SCR, the switch shall automatically alarm the condition and transfer to the other source. All open and shorted SCR alarm conditions shall be latched and require the system to be repaired and reset to restore normal operation.

.6 System Bypass: The unit shall be furnished with key-interlocked maintenance bypass fault isolation protection devices that allow the units power, controls and monitoring electronics to be bypassed to either input source for maintenance without interruption of power to the load. The packaging of the unit shall have all electronics isolated from the input, output and bypass connections to allow servicing of any components without access to hazardous voltages when the unit is in maintenance bypass.

3. **EXECUTION**

3.1 **Installation**

3.1.1 Locate equipment generally as shown on the Drawings in a manner to ensure sufficient clearances are Provided for maintenance.

END OF SECTION
1. **GENERAL**

1.1 **Summary**
1.1.1 Provide electrical equipment and appliances of the types specified herein and shown on the Drawings. The Contractor shall provide collars and tailpieces to enable service connectors to be made by specified trades.

1.2 **References**
1.2.1 CSA 269
1.2.2 IEEE C62.34, C62.41.1, C62.41.2, C62.45, C62.48, C62.62, C62.72
1.2.3 UL 1283
1.2.4 UL 1449

1.3 **Submittals**
1.3.1 Equipment and device Shop Drawings shall be submitted for review.

2. **PRODUCTS**

2.1 **General**
2.1.1 All Surge Protection Device details shall be marked as per CSA 269 requirements.

2.2 **Branch Panel Surge Protection Devices (Category B)**
2.2.1 For indicated new branch panels provided by the Contractor, panel manufacturer shall supply and install a Type 2 SPD integral to the panel suitable for installation in a Type 2 environment complete with an appropriately sized overcurrent protection device.

2.2.2 For indicated existing branch panels, Contractor shall supply and install a Type 2 SPD external to the panel suitable for installation in a Type 2 environment complete with an appropriately sized overcurrent protection device.

2.2.3 The manufacturer shall provide written specifications showing let-through voltage of the unit with six inches of lead length (at the module or at the lug data is not acceptable as it does not represent true "as installed" performance) pursuant to ANSI/IEEE C62.41 and C62.45, 2002, categories A1 & A3 ring wave, 180 degree phase angle, category B3 Ring wave, and UL suppressed voltage ratings, 90 degree phase angle, positive polarity, measurements in peak voltage from the zero reference, all dynamic tests except N-G, which shall be no higher than:

2.2.4 ANSI / IEEE C62.41-1991 Measured Limiting Voltage

| A1 Ring Wave (2kV, 67A) – Tested at 180 degree phase angle |
|-----------------|----------|--------|--------|--------|
| Voltage Code    | L-N      | L-G    | L-L    | N-G    |
| 120/240 (1S240) | 29V      | 46V    | 39V    | 40V    |
| 208/120 (3Y208) | 29V      | 46V    | 39V    | 40V    |
600/347 (3Y600)  56V  99V  76V  88V

A3 Ring Wave (6kV, 200A) – Tested at 180 degree phase angle
Voltage (Voltage Code) L-N  L-G  L-L  N-G
120/240 (1S240)  56V  81V  88V  112V
208/120 (3Y208)  56V  81V  88V  112V

UL Voltage Protection Ratings
Voltage (Voltage Code) L-N  L-G  L-L  N-G
120/240 (1S240)  700V  700V  1000V  700V
208/120 (3Y208)  700V  700V  1000V  700V
600/347 (3Y600)  1200V  1200V  2500V  1200V

2.2.5 The unit shall have a peak surge current of no less than 120kA/phase, 60kA/mode, 8 X 20 µs waveform, single impulse, verified by third party test reports.

2.2.6 Internal Fusing – Overcurrent Protection
.1 Each Metal Oxide Varistor, or other primary suppression component, shall be individually fused for safety and performance to allow the SPD to withstand the full rated single pulse peak surge capacity per mode without the operation or failure of the fuses. Over-current fusing that limits the listed peak surge current of the SPD is not acceptable. Replaceable cartridge type per phase or per mode over-current fusing is not acceptable where there is more than one MOV per mode.
.2 For arc quenching capability, minimization of smoke and contaminates in the event of a failure, and to ensure the safest possible design, all surge components, current carrying paths and fusing shall be packed in fuse grade silica sand.
.3 Fusing shall be present in every mode, including Neutral-to-Ground.
.4 The fusing shall be capable of interrupting up to a 200kA symmetrical fault current with 600VAC applied.

2.2.7 The SPD shall be capable of attenuating internally generated ringing type transients and noise, and shall have an enhanced transient filter supported by a specification sheet which lists the IEEE A1 Ring Wave let-through levels no higher than those set forth above.

2.2.8 The suppressor shall include Form C dry contacts (N.O. or N.C.) for remote monitoring capability, and shall have at minimum a NEMA 1 steel enclosure.

2.2.9 The SPD shall come standard with not less than a Ten (10) Year Warranty, and the warranty shall include unlimited free replacements of the unit if destroyed by lightning or other transients during the warranty period. Special or optional
warranties in excess of the unit’s standard warranty for purposes of this bid are not acceptable.

2.2.10 The SPD shall have an internal audible alarm with mute on front cover.

END OF SECTION
1. **GENERAL**

1.1 **Summary**

1.1.1 The lighting fixtures shall be provided complete with lamps, ballasts, drivers, lenses, etc., and they shall be compatible with the various building elements that affect the installation and operation of the units.

1.2 **References**

1.2.1 Fluorescent ballasts shall be in accordance with CSA Specification No. C82.1 and CBM Standards.

1.2.2 Provide fixtures that will meet the requirements of the various active government incentive programs such as Save-on-Energy, High Performance New Construction prescriptive path, etc.

1.3 **Submittals**

1.3.1 Shop Drawings for luminaires indicating lighting performance details, fixture construction details, air control and ductwork connection details, etc., and pictures of each type of lighting fixture shall be submitted for review.

1.3.2 Shop Drawings shall be submitted for LED drivers, ballasts, and bulbs for all fixtures to be installed. These shall be submitted separately from the lighting fixtures being installed and should indicate each fixture the Product is installed.

1.3.3 Fixture(s) which have been specially designed or altered shall have a full scale mock-up built and submitted for co-ordination and design review when requested by the Consultant.

1.3.4 Mock-up fixtures must have engineering Drawings submitted for approval, after the mock-up has been approved.

1.3.5 Fixtures shall not be released prior to review of the Shop Drawings. Cancellation charges will not be paid for changes to fixtures made before the fixture cuts have been reviewed.

1.4 **Quality Assurance**

1.4.1 All lighting fixtures and components must be CSA approved, ULC approved, or approved by Special Inspection from the Electrical Safety Authority.

1.4.2 LED fixtures shall be DLC listed.

1.5 **Delivery, Storage And Handling**

1.5.1 Light fixtures must be shipped in individual containers. The fixtures must be stored in a dry area protected from the elements and physical damage.

1.6 **Warranty**

1.6.1 LED lamps and drivers for minimum five years, all other lamps and ballasts for a minimum one year warranty period.
2. PRODUCTS

2.1 Approved Manufacturers
2.1.1 Acceptable manufacturers for interior light fixtures are:
   .1 Lithonia
   .2 Cooper
   .3 Hubbell
   .4 Philips
   .5 Or approved equivalent

2.2 General
2.2.1 All fluorescent fixtures with baked white enamel finish shall be
      painted following fixture forming (post painting) to produce an
      even surface finish with an average reflectance of not less than 85
      percent.

2.3 LED Light Fixtures
2.3.1 LED monochrome lighting fixture shall have lighting that shall a
      minimum CRI of 85 for regularly occupied spaces, and a
      minimum of 75 for all other spaces. The fixture shall have a
      minimum L70 of 50,000 hours. All lighting shall have IESNA LM-
      79 and LM-80 testing reports and life calculations based on TM-
      21. Interior area lighting shall have a minimum efficiency of 80
      lumens per watt.
2.3.2 LED drivers shall have minimum lifespan equal or better than the
      lifespan of the L70 lifespan of the LED lamps it serves. Drivers
      shall be integrated into the fixture if serving only that fixture or
      remote if the driver serves more than one fixture. All drivers shall
      be dimmable using 0-10V dimming technology unless noted
      otherwise. LED drivers shall have high power factor. All LED
      lighting and drivers used in unheated applications shall Provide
      start-up and operation in temperatures from -30 degrees C to +50
      degrees C.
2.3.3 Colour-changing LED lighting shall have a minimum L70 lifespan
      of 50,000 hours. Controllers shall allow DMX interface to allow
      colour-changing and intensity controls.

2.4 Fluorescent Ballasts
2.4.1 All standard fluorescent ballasts shall be program rapid start,
      dedicated, low harmonic (less than or approved equivalent to 10
      percent), high power factor, electronic type to suit applicable lamp
      quantity and rating and fixture voltage. Electronic fluorescent
      ballasts shall comply with all current FCC regulations regarding
      EMI and RFI interference feedback onto incoming power supply
      applicable to Class A applications.

2.5 Fluorescent Dimming Ballasts
2.5.1 All dimming fluorescent lamp ballasts shall be Advance Mark 7 or
      approved equivalent, high power factor electronic type to suit
      applicable lamp quantity and rating and fixture voltage. Dimming
      ballasts shall provide full range (5 percent to 100 percent) flicker
free silent dimming and be fully compatible with 0-10V dimming controls.

2.5.2 All specialty rapid start or high output fluorescent lamp ballasts shall be high power factor, sound rated, energy savings electromagnetic type. Provide ballasts suitable for low temperature applications where noted.

2.6 **Hid Ballast**

2.6.1 All ballasts for indoor HID lamp fixtures shall be of a high heat dissipation, high power factor, low sound level type with potted transformer unless otherwise indicate.

2.7 **Lamps**

2.7.1 Fluorescent lamps shall have CRI ≥ 80 and shall have life expectancy ≥20,000 hours for linear lamps and ≥ 10,000 hours for compact fluorescent.

2.7.2 All lamp sizes and types shall be as designated on the "Fixture Schedule" or as required by the fixture manufacturer.

2.7.3 Where identical fixture types are installed in the same room or area, lamps shall have no variation in colour temperature.

2.7.4 Self-contained lamps are lamps that include both the light source (LED or fluorescent) and the driver/ballast in one fixture and which installs into a standard incandescent socket. These lamps shall provide a lumen output comparable to their incandescent counterpart and shall have a colour temperature that closely matches the remaining fixtures in the space and a CRI>80.

2.7.5 Provide as spares, 10 percent of each type of fluorescent, compact fluorescent, LED and self-contained lamps installed and turn over to the Agency upon occupancy of the building.

2.8 **Lenses**

2.8.1 All flat plastic lenses shall be a minimum 3.2 mm thick acrylic type with no mid-span sag.

2.8.2 All metal parabolic louvres shall be fabricated from low iridescent, semi-specular aluminum sheet with cell size, depth and quantity to match existing.

2.8.3 All lenses shall be shipped separately and contained to prevent damage and be enclosed in a clear plastic wrap all around to prevent dust or dirt contamination. Plastic wrap shall not be removed until space is fully cleaned and approval to do so is granted by the Consultant.

2.8.4 All special lenses shall be as specified in fixture schedule.

2.9 **Accessory Products**

2.9.1 Air control and slot provision where applicable shall be fully co-ordinated for a fully compatible installation. Set dampers to fully blank of air slots where instructed.
2.10 **Source Quality Control**

2.10.1 Lighting fixtures shall be Provided with all auxiliary components and mounting hardware required for installation in the building as intended. Verify all catalog numbers with descriptions given including mounting, lamp type and quantity.

3. **EXECUTION**

3.1 **Installation**

3.1.1 Ensure that both recessed and surface mounted light fixtures mounted as part of a suspended ceiling system are adequately supported. Fixtures mounted as part of a fire rated suspended ceiling assembly shall not be suspended directly from the ceiling system supporting grid, but must be supported directly from the building structural members.

3.1.2 Surface mounted fixtures on T-Bar ceilings may be supported using a minimum of two "Caddy" IDS clips from the ceiling suspension grid and which are also separately connected to the building structure.

3.1.3 Co-ordinate the requirements of the ceiling system supports prior to fixture installation. Fixture safety chains or wires shall also be Provided as required by regulatory agencies. The method of attaching suspension wires and safety chains or wires to fixtures and building elements, shall be discussed with and approved by the Consultant prior to installation. Where the structural system is to have a fireproofing material applied, attach all structural system fasteners in advance of the fireproofing.

3.1.4 Pendant mounted fixtures shall have a deep canopy cover to fully cover the supporting outlet box and render it inconspicuous. Provide a self-aligning type cover and support for fixtures mounted to sloped surfaces.

3.1.5 Electrical wiring or components shall not be attached to the ceiling system suspension wires.

3.1.6 For exact details of fixture installation in valances, bulkheads, millwork, etc., refer to the Architectural Drawings.

3.1.7 All electrical fixtures are to be delivered to the site with the specified finish. Where required colour or finish is not available from the fixture manufacturer, the Contractor shall obtain such from an approved paint shop.

3.2 **Field Quality Control**

3.2.1 Check all lighting fixtures prior to their installation to ensure that they are the specified and approved fixtures for the Project. Check the fixture catalogue number, frame and mounting arrangement, lens type, reflector type, lamp socket position, lamp type, fixture operating voltage, etc.

3.2.2 The locations of fixtures are shown generally on the electrical Drawings. For accurate locations refer to the architectural reflected ceiling plans (indoor).
3.3  **Cleaning**

3.3.1 Clean all lenses and interior of all fixtures.

END OF SECTION
1. GENERAL

1.1 General Instructions
1.1.1 Comply with General Conditions of the Contract, Supplementary Conditions and requirements of Division 01. This section will also comply with 26 05 00 - Common Work Results for Electrical.

1.2 Summary
1.2.1 Provide Exit Lighting as shown on the Drawings and in the lighting fixture schedule. Exit Lighting will be fed from an AC voltage dedicated circuit and a DC voltage source connected to the emergency battery lighting system.
1.2.2 Provide complete 24 volt DC emergency battery lighting system for the building areas indicated. The emergency battery units will be located as indicated on the Drawings. The emergency battery system will Provide emergency power automatically on failure of the normal power supply system. When the normal power supply system is restored, the emergency battery unit will restore itself automatically to the charging condition.

1.3 Related Sections
1.3.1 Section 01 91 00 Commissioning
1.3.2 Section 26 05 19 - Wire and Cable
1.3.3 Section 26 05 33 - Raceway and Boxes for Electrical Systems

1.4 References
1.4.1 Reference Codes and Standards: Versions of the following standards current as of the date of issue of the Project apply to the Work of this Section. Where regulatory requirements use older version of a standard, comply with the version year adopted by the Authority Having Jurisdiction.
1.4.1.1 CSA C22.2 No. 141 Emergency lighting equipment
1.4.1.2 CAN/CSA C860 Performance of internally lighted exit signs.
1.4.1.3 Ontario Building Code
1.4.1.4 Ontario Electric Safety Code

1.5 Submittals
1.5.1 Complete sets of Shop Drawings will be submitted indicating the following:
1.5.1.1 System components, specifications, and dimensions.
1.5.1.2 Battery Calculations.
1.5.1.3 Wiring schematics.
1.5.2 For Closeout submittals Provide the following:
1.5.2.1 Emergency lighting runtime test report

2. PRODUCTS

2.1 Approved Manufacturers
2.1.1 Listed below are manufacturers that will Provide complete emergency and exit lighting system. Equivalent emergency and exit lighting systems by other suppliers may be accepted subject
to review by the Consultant. Emergency and Exit Lighting by the following manufacturers will be considered for use on this Project:

- Aimlite
- Beghelli
- Emergi-lite
- Lumacell
- Stanpro
- Or Agency approved equivalent

2.2 **Exit Lighting**

2.2.1 Housing: cold rolled steel minimum 1.0 mm (1/25 in) thick, die-cast or anodized extruded aluminum frame, white finish c/w universal mounting system.

2.2.2 Face and back plates: extruded aluminum alloy white colour.

2.2.3 Graphic: Green “running man” pictogram.

2.2.4 Lamps: LED type, DC emergency power source, maximum 5 watts consumption.

2.2.5 Designed for minimum 50,000 hours of continuous operation without re-lamping.

2.2.6 Exit lighting arrows: exit lighting will be capable of no arrows or configuration with arrows facing left, right, up, down, upper right, upper left, lower right, or lower left. “Running man” pictogram will also be capable of facing either right or left. Refer to Drawings for orientation required for each exit lighting unit.

2.2.7 Photoluminescent Exit signage is not permitted.

2.3 **Emergency Battery Units**

2.3.1 The self-powered battery units will be a sheet steel ventilated type enclosure with a removable front cover. The cabinets will be painted with a corrosion resistant undercoat inside and have a low gloss white enamel exterior finish. The side panel of the battery cabinets will contain an AC on light, charge light and test switch. A supply line fuse will be provided inside the cabinet. The emergency battery unit will be rated for AC power supply. Voltage shall be as specified on the Drawings.

2.3.2 The emergency batteries will be long life sealed lead-acid (SLA) type and be VRLA technology totally maintenance free with a minimum life expectancy of 10 years.

2.3.3 All emergency battery lighting heads on unit battery and remote will be LED type.

2.3.4 The battery capacity will be sized to supply the number of fixtures indicated on the Drawings, plus have an additional 50 watts spare capacity for future heads. The batteries will be capable of providing power to the fixtures for 30 minutes without dropping below 91 percent of the rated battery voltage.

2.3.5 The emergency battery charger will be a solid state, fully automatic rectifier type with Hi and Lo charging rates to re-charge
the batteries to their rated capacity from a discharged condition in less than 24 hours.

2.3.6 The emergency battery units will be complete with the following options:
   .1 Electrolyte low level alarm.
   .2 Battery disconnect switch (70 percent of normal voltage).
   .3 Time delay relay to maintain emergency lighting for ten minutes, powered from the battery charger, following restoration of normal power.
   .4 Auto test and automated self-diagnostic circuitry complying with CSA and building code requirements.

2.3.7 Mounting platforms and accessories will be provided for a permanent and safe installation of the battery unit.

3. EXECUTION

3.1 Exit Lighting
   3.1.1 Ensure that exit lighting AC circuit breaker is locked in on position
   3.1.2 Install exit lighting as indicated, in accordance with building code requirement.

3.2 Emergency Battery Units
   3.2.1 Provide grey coloured conductors in a separate conduit system, for the DC wiring. The wire will be sized to limit voltage drop to furthest fixture to five percent. Connect battery units to remote lamp heads and exit lighting emergency sockets in an approved manner.
   3.2.2 Emergency lighting will be so arranged that the failure of any one lamps will not leave in total darkness the area normally illuminated by it.
   3.2.3 Unit equipment will be installed in such a manner that it will be automatically actuated upon failure of the power supply to the normal lighting in the area covered by that unit equipment.
   3.2.4 Install battery unit mounting shelf at 2000 mm (80 in.) above finished floor.
   3.2.5 All battery units will have a logged runtime test completed prior to occupancy to ensure compliance with Building Code requirements.

END OF SECTION
1. **GENERAL**

1.1 **General Instructions**

1.1.1 Comply with General Conditions of the Contract, Supplementary Conditions and requirements of Division 01. This section will also comply with 26 05 00 - Common Work Results for Electrical.

1.2 **Summary**

1.2.1 Provide complete pathways for the use of the communications system. These systems include but are not limited to data, telephone, fibre optics, security (where allowed), cable TV, and other low voltage systems. The services will include internal building horizontal and vertical pathways. The pathways systems can consist of outlet boxes, cover plates, conduits, cable trays, pull boxes, sleeves, backboards, telecom rooms, shafts, fish wires, innerduct, cable hooks, firestopping, cable managers, service fittings, and direct buried ducts.

1.3 **Related Sections**

1.3.1 Section 07 84 00 Firestopping
1.3.2 Section 21 Fire Suppression
1.3.3 Section 22 Plumbing
1.3.4 Section 23 Heating, Ventilating, and Air Conditioning (HVAC)
1.3.5 Section 26 05 19 Wire and Cable
1.3.6 Section 26 05 33 Raceway and Boxes for Electrical Systems
1.3.7 Section 26 27 26 Wiring Devices

1.4 **References**

1.4.1 Reference Codes and Standards: Versions of the following standards current as of the date of issue of the Project apply to the Work of this Section. Where regulatory requirements use older version of a standard, comply with the version year adopted by the Authority Having Jurisdiction.

.1 ANSI/TIA 569 Telecommunications Pathways and Spaces
.2 ANSI/TIA 606 Administration Standard for Telecommunications Infrastructure
.3 Ontario Building Code (OBC)
.4 Ontario Electrical Safety Code (OESC)

1.5 **Submittals**

1.5.1 Submittals under this Section will be in accordance with General Conditions, Section 01 33 00 – Submittals, and Section 26 05 00 - Common Work Results for Electrical.

1.5.2 Submit Shop Drawings for the following Products:

.1 Fire Rated Pathways
2. **PRODUCTS**

2.1 **Approved Manufacturers**

2.1.1 Equivalent devices by other manufacturers will be accepted subject to review by the Consultant. Fire Rated Pathways by the following manufacturers will be considered for use on this Project:

1. STI EZ-Path
2. Hilti Firestop Speed Sleeve
3. Or Agency approved equivalent

2.2 **Internal Distribution**

2.2.1 The conduit shall be EMT unless specifically noted or required to be otherwise.

2.2.2 Conduit not indicated as to size shall be 27 mm minimum.

2.2.3 L.B. (Elbow Shape) fittings will not be allowed under any conditions.

2.3 **Distribution Terminals**

2.3.1 Provide conduits terminated with an insulated bushing to area ceiling spaces and distribution terminals as shown for zone and feeder conduit installations.

2.4 **Outlets**

2.4.1 Wall outlets shall consist of standard deep single gang outlet boxes unless otherwise indicated. Provide blank coverplates for all un-used outlets.

2.4.2 Coverplates complete with appropriate jacks will be Provided by the Contractor for all active outlets.

2.5 **Fire-Rated Cable Pathways**

2.5.1 Fire-Rated Pathway device modules comprised of steel pathway with self-adjusting intumescent foam pads allowing 0 to 100 percent cable fill without removal of intumescent material.

2.5.2 Quantity and size of pathway will be according to the fill area listed on the Drawings or minimum sizes listed below. Size of devices will be uniform for all devices at same location.

2.5.3 Unless noted on the Drawings, the minimum clear space sizes will be:

1. 160 cm² (25 in²) for telecommunications rooms;
2. for cable tray penetrations, minimum size will be cross-sectional area of cable tray;
3. 80 cm² (12.5 in²) in corridors without cable trays; or
4. 8 cm² (1.25 in²) for room penetrations.

3. **EXECUTION**

3.1 **Installation**

3.1.1 Install empty raceway system, including distribution system, fish wire, outlet boxes, floor boxes, pull boxes, cover plates, conduit, sleeves, cable tray, service poles, miscellaneous and positioning material to constitute complete system.
3.1.2 All horizontal and vertical pathways will run parallel to building lines and will not route diagonally for extended distances.

3.1.3 Since cabling for communications is subject to many add/moves/changes in future, the pathways will be installed in locations that are readily accessible in future and will route below ductwork and piping in ceiling spaces. Coordinate installation of pathways with Division 21 Fire Suppression; Division 22 Plumbing; and Division 23 Heating, Ventilating, and Air Conditioning (HVAC) to minimize interference and maximize accessibility to pathways.

3.1.4 Horizontal data cables from telecommunications rooms patch panels have limitation of cable length of 90 m (297 ft). Pathways shall be optimized to minimize cable length.

3.1.5 Protect installed Products and components from damage during construction.

3.1.6 Repair damage to adjacent materials caused by pathways for communications systems installation

3.1.7 The installation of conduits will be restricted as follows:
   .1 60 m (200 ft) maximum no bends.
   .2 45 m (150 ft) maximum with equivalent of one 90° bend.
   .3 30 m (100 ft) maximum with equivalent of two 90° bends.
   .4 20 m (65 ft) maximum with equivalent of three 90° bends.
   .5 No more than three 90° bends will be allowed in any section of conduit run.

3.1.8 All conduits will be installed with large radius bends. Minimum bending radii will be ten times the diameter.

3.1.9 Mounting heights of the communications outlets unless otherwise noted will be as follows:
   .1 Standard wall outlet 460 mm (16 in) or 150 mm (6 in) above counter top or splash back.
   .2 Wall mounted telephones outlets 1100 mm (43 in) to centre of backbox.
   .3 When mounting adjacent to other devices at same location, communications outlet box will match installation height of adjacent outlet box used for wiring device.

3.1.10 Refer to the systems conduit diagrams for details of distribution and outlet conduit, cabinet and backboard requirements and to floor plans for component and outlet locations.

3.1.11 Contact Agency’s systems service providers as appropriate to verify all conduit sizes, prior to proceeding with installations. Modify provisions accordingly to suit their specific requirements. Co-operate with appropriate installation personnel during construction and give sufficient notice of construction progress to allow scheduling of their installations. The Contractor will generally supply and install distribution cable, terminals, equipment and connectors to complete systems installations. Co-ordinate and arrange for all Work to suit construction phasing as appropriate.

3.1.12 Install nylon pull cords in all empty conduits and tag and identify both ends appropriately. Maintain a pull cord in all conduit systems used only to partial capacity.
3.2 Firestopping

3.2.1 Install at all fire separations Fire-Rated Pathway device modules to allow future cables to be installed through fire separation. Prepare and install device module as per manufacturer’s instructions.

3.2.2 Fire-Rated Pathway device module will be used only for communications systems cabling and will not be used for line voltage applications.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**

1.1.1 Provide a complete telecommunications cabling and patch panel/interconnect system using star-wired topology throughout the Agency’s space for the distribution of electronic signals using both analog and digital transmission schemes. The cabling system shall be capable of carrying information pertaining to the operation of telephone equipment and data communications equipment to be supplied by the Agency.

1.1.2 All cross connection and patching hardware required for the Project is to be included and all system cabling and terminations are to be fully labeled. All cabling shall be fully tested to verify connections and prove performance characteristics.

1.1.3 Upon completion of the communications cabling installations, the cabling and connectors shall be in a condition suitable for immediate use and equipment connection in the intended manner.

1.2 **Peel Regional Police Standards**

1.2.1 Review companion document “Peel Regional Police Network Cabling Specifications” (PRPNCS) included in Appendix 7.22 to this Section. Refer to this document for part numbers and equivalent Products. If any discrepancies exist between this document and the PRPNCS, the PRPNCS shall prevail.

1.3 **Regulation and Code Compliance**

1.3.1 All cabling system equipment shall be designed, manufactured, supplied, installed, and tested in accordance with the requirements of all applicable federal, provincial and local regulatory agencies and codes, and in particular:

.1 ANSI/TIA/EIA 568-C Standard Commercial Building Telecommunications Cabling Standard

.2 ANSI/TIA/EIA 569-B Commercial Building Standard for Telecommunications Pathways and Spaces

.3 ANSI/TIA/EIA 570-A (CSA T525) Residential Telecommunications Wiring Standard

.4 ANSI/TIA/EIA 606-A Administration Standard for the Telecommunications Infrastructure of Commercial Buildings

.5 ANSI/TIA/EIA 607-A Commercial Building Grounding/Bonding Requirements

.6 ANSI/TIA/EIA 758 Customer-Owned Outside Plant Telecommunications Standard

.7 TIA/EIA-854 Full Duplex Ethernet Specification for 1000Mb/s (1000BASE-TX) Operating Over Category 6 Balanced Twisted-Pair Cabling

.8 TIA/EIA-862 Building Automation Cabling Standard for Commercial Building

.9 ANSI/NECA/BICSI 568 Installing Commercial Building Telecommunications Cabling
.11 ANSI/IEEE 802.3 Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications.
.12 ANSI/IEEE 802.3z Gigabit Ethernet Specifications over Fibre Optic Cabling
.13 ANSI/IEEE 802.3ab Gigabit Ethernet Specifications over UTP Cabling
.14 ANSI/IEEE 802.3ae Media Access Control Parameters, Physical Layers and Management Parameters for 10 Gb/s Operation
.15 ANSI/IEEE 802.3af Data Terminal Equipment (DTE) Power via Media Dependent Interface (MDI)
.16 ANSI/IEEE 802.5 Token Ring Access Method and Physical Layer Specifications
.17 Ontario Electrical Safety Code
.18 Cabling system manufacturers’ Design and Installation Guidelines
.19 BICSI Telecommunications Distribution Methods Manual
.20 BICSI Cabling Installation Manual

1.3.2 Federal, Provincial, and local codes, rules, regulations, and ordinances governing the Work, are as fully part of the Specifications as if herein repeated or hereto attached. If the Contractor should note items in the Drawings or the Specifications, construction of which would be Code violations, promptly call them to the attention of the Consultant in writing. Where the requirements of other sections of the Specifications are more stringent than applicable Codes, rules, regulations, and ordinances, the Specifications shall apply.

1.4 Related Sections
1.4.1 Section 01 91 00 - Commissioning
1.4.2 Section 26 05 00 - Common Work Results for Electrical
1.4.3 Section 27 05 28 - Pathways for Communications Systems

1.5 System Description
1.5.1 The telecommunications system shall consist of at least one telecommunications outlet at each workstation.
1.5.2 A typical workstation consists of two four-pair Category 6 cables. Each cable shall be routed from the workstation to floor telecommunications room. In the telecommunications room, terminate cables onto rack mounted patch panels (horizontal cross-connect).
1.5.3 Refer to Drawings for system requirements for furniture in 911 Call Center in 180 Derry Road.
1.5.4 Backbone data cabling consists of multi-strand single-mode fibre optic cable from the main data cross-connect in the equipment room to the horizontal data cross-connect in each telecommunications room.
1.6 **Quality Assurance**

1.6.1 Cabling system manufacturer certified the Contractors with qualified and accredited technicians experienced with the specific Work detailed in this document shall provide all system installations.

1.6.2 All installations shall be continuity and performance tested using the most current available test methods and equipment. All installations shall be subject to sample witness testing as requested by the Consultant. The Contractor shall provide all meters, tools and associated equipment, and the services of technicians as required to carry out all testing.

1.6.3 Prior to proceeding with the installations the Contractor’s methods, layouts and procedures shall be approved by the Agency and the Consultant. Equipment room and telecommunications room backboard patch panel layouts and cable dressing arrangement shall be approved by the Consultant and the Agency prior to starting any related Work.

1.6.4 The telecommunications cabling system and associated components shall provide a minimum 15 year manufacturer’s Product warranty against defects in materials and workmanship from the date of installation.

1.7 **Definitions**

1.7.1 “Category 3” shall be defined as a four-pair unshielded twisted pair cable with cable performance defined to 16 MHz and shall meet or exceed the ANSI/TIA/EIA-568-C Category 3 Specifications. This term applies to cable and connecting hardware for component, link and channel performance.

1.7.2 “Category 5”, “enhanced Category 5” and “Category 5e” shall be defined as a four-pair unshielded twisted pair cable with cable performance defined to 100MHz and shall meet or exceed the ANSI/TIA/EIA-568-C enhanced Category 5 Specifications. This term applies to cable and connecting hardware for component, link and channel performance.

1.7.3 “Category 6” shall be defined as a four-pair unshielded twisted pair cable with cable performance defined to 250 MHz and shall meet or exceed the ANSI/TIA/EIA-568-C Category 6 Specifications. This term applies to cable and connecting hardware for component, link and channel performance.

1.7.4 “Category 6A” shall be defined as a four-pair unshielded twisted pair cable with cable performance defined to 500MHz and shall meet or exceed the ANSI/TIA/EIA-568-C Category 6A Specifications. This term applies to cable and connecting hardware for component, link and channel performance.

1.8 **Firestopping**

1.8.1 All penetrations through the integrity of fire-rated architectural structures and assemblies, such as walls, ceilings and floors, shall be firestopped to maintain the structure’s fire rating. All firestop penetrations shall conform to a specific UL system number. All firestopping systems used for telecommunications cabling shall
use reusable materials (putty, pillows, etc.) unless directed by the Consultant.

1.8.2 The Contractor shall install firestopping material regardless if other non-firestopped penetrations through the fire separation are visible. If existing opening through fire separation is used, the Contractor shall firestop entire opening and all other associated penetrations through that opening. If other trades use this opening as part of the scope of Work of the Project, then the cost of firestopping shall be shared among all trades using opening.

1.8.3 Provide at each firestop penetration a fluorescent colored label indicating the following information: unique identification number, the Contractor name, date installed, UL system number, cable type installed, and cable quantity. The Contractor shall provide a firestopping report with cable test results summarizing all firestop label information.

1.9 **Coordination**

1.9.1 All Work shall be coordinated and scheduled with the Contractor prior to commencing Work.

1.9.2 When installing material in a space where ceiling tiles and access floor tile have already been installed or are existing, it shall be the responsibility of the Contractor to:

.1 Remove and replace all associated tiles,
.2 Perform tile cutouts for Work directly related to the Contractor supplied material, and
.3 Replace any tiles damaged at no additional cost to the Agency.

1.9.3 Coordinate with Agency's service provider technicians for active equipment installation and associated cabling and services to that equipment.

2. **PRODUCTS**

2.1 **Equipment Racks/Cabinets**

2.1.1 Where shown on Drawings, data patch panels and active equipment shall be installed into open frame steel equipment racks with flanged base, 19" black steel two post racks drilled front and back, 84" in height, and tapped to EIA 310 standards with a minimum of 44 rack units. On each side of individual rack include a full height vertical cable management channel with a minimum width of 300 mm (12") between racks and 150 mm (6") on ends.

2.1.2 Each rack shall be outfitted with 8" and 12" vertical cable managers with front channels.

2.1.3 Vertical manages shall under no circumstances exceed a 35% fill upon installation per manufacturers calculations (fill tables).

2.1.4 On rows containing multiple racks, Contractor shall outfit the racks with inter-bay routing paths at the top, middle and bottom of the racks

2.1.5 Mount, on rear of rack or inside rear of cabinet, two (2) vertically mounted unswitched power strips with a minimum of eight 15 A receptacles each, with bottom fed 2.5 m (8') cord with 120 V 15 A
power connector. Racks containing only patch panels require a single power strip.

2.1.6 Clearance around racks should be minimum 914 mm (36") in front of rack and minimum 762 mm (30") in rear of rack.

2.1.7 A ground bar shall be installed at the bottom of rack and shall be complete with #6 lugs.

2.2 **Voice Cabling**

2.2.1 Horizontal voice cables shall be four-pair 24 AWG solid copper conductor, unshielded twisted pair Category 6 cable with color coded insulation and overall jacket. Fire rating is listed as CMP.

2.2.2 In telecom rooms, horizontal voice cabling shall terminate on BIX-block cross-connect system. Follow all recommended practices by manufacturer when installing mounts, distribution connectors, and wire management accessories. Wall mount BIX-blocks on painted 3/4" fire-rated plywood backboard. Neatly dress and comb all voice cabling to the backboard.

2.2.3 At workstation outlet, each voice cable shall be terminated onto one unshielded eight-pin, Category 6 rated, flat unkeyed, white modular jack pinned to T568B configuration. Workstation voice modular jack shall be mounted on same faceplate as data modular jack.

2.2.4 At single voice outlets provide wall phone faceplate with phone mounting posts Panduit KWP5EY or equal.

2.3 **Data Cabling**

2.3.1 Horizontal data cables shall be four-pair 24 AWG solid copper conductor, unshielded twisted pair Category 6 cable with color coded insulation and overall jacket. Fire rating is listed as CMP.

2.3.2 In telecom rooms, horizontal data cabling shall terminate onto 482 mm rack-mountable patch panels with eight-pin, modular, rated Category 6, black, unkeyed outlets pinned/terminated to T568A configuration. Neatly terminate and dress all cables in the rear of the panel.

2.3.3 At workstation outlet, each data cable shall be terminated onto one unshielded eight-pin, Category 6 rated, flat unkeyed, black modular jack pinned to T568B configuration. Workstation data modular jack shall be mounted on same faceplate as voice modular jack.

2.3.4 Supply four-pair unshielded twisted pair, rated Category 6, 24 AWG, stranded copper modular patch cords with eight-pin modular connector. Lengths shall be determined on site by field conditions to minimize slack cable using factory standard lengths. Provide quantity of patch cords equal to number of horizontal data outlets plus 20 percent. All cables shall be factory terminated and tested.

2.3.5 Supply four-pair unshielded twisted pair, rated Category 6, 24 AWG, stranded copper modular line cords with eight-pin modular connector. Provide quantity of line cords equal to number of horizontal data outlets plus 20 percent. All cables shall be factory
terminated and tested. Lengths of line cords shall be as follows: 50 percent at 3 m, 30 percent at 7 m, and 20 percent at 15 m.

2.4 **Coaxial Wireless Cable**
2.4.1 Provide as specified on the Drawings.
2.4.2 Provide corrugated copper, 7/8 in, black PE jacket (Halogen free jacketing non-fire-retardant)

2.5 **Copper Patch Panels**
2.5.1 Horizontal data cabling shall terminate onto patch panels with eight-pin, modular, rated Category 6, black, unkeyed outlets pinned/terminated to T568B configuration. Neatly terminate and dress all cables in the rear of the panel.

2.6 **Optical Fibre Panels**
2.6.1 Backbone data cabling shall terminate onto 19" rack-mountable fibre optic patch panel with ceramic ferrule, field installed duplex LC optical fibre connectors meeting ANSI/EIA/TIA 568-C Specifications and 0.2 dB typical insertion loss. For backbone, fibre optic cable shall be enclosed in conduit or corrugated tubing between each patch panel within telecom room.

2.7 **Termination Blocks**
2.7.1 Backbone and horizontal voice cabling shall terminate on BIX-block cross-connect system. Follow all recommended practices by manufacturer when installing mounts, distribution connectors, and wire management accessories. Wall mount BIX-blocks on painted 3/4" fire-rated plywood backboard. Neatly dress and comb all voice cabling to the backboard.

2.8 **Consolidation Points**
2.8.1 All horizontal cabling shall be routed through consolidation points and shall fall within 15 m and 65 m from the horizontal patch panels. Provide one or two 24-port, non-angled patch panels within each consolidation point as required. Bundle 24 cables together back to the main patch panel. Loop excess cable in ceiling space near consolidation point.
2.8.2 Workstation cables shall be FT-6 rated, pre-manufactured and shall be terminated at one end with an 8P8C jack and the other end with an eight-position connector. Length shall provide at least 1 m spare, coiled neatly above each ceiling conduit entry point.
2.8.3 Line Cord cables for intercom stations and wireless access points shall be FT-6 rated, pre-manufactured and shall be terminated at both ends with an 8P8C jack. Length shall provide at least 1 m spare, coiled neatly above each ceiling conduit entry point or at device.
2.8.4 Provide 20 percent space workstation cables and line cords at each length required and turn over to the Agency at end of Project.
3. **EXECUTION**

3.1 The Contractor's Responsibilities

3.1.1 The Contractor shall visit Project site prior to installation and meet with the Agency's representative to coordinate efforts. Review site conditions and cable routing and solve any potential interferences and conflicts prior to starting installation. Review the construction schedule and any crucial milestones.

3.1.2 Attendance at weekly construction site meetings is required by the site foreman or Project manager to address construction and coordination issues.

3.1.3 The Contractor shall be responsible for safekeeping of the equipment and material on the Project site. The Agency assumes no responsibility for protection of the above named property against fire, theft, and environmental conditions.

3.1.4 Effectively protect the Agency's facilities, equipment and materials from dust, dirt and damage during construction. Any protection shall be removed at the completion of Work. Replacement of ceiling or floor tiles shall be the responsibility of the Contractor. The Contractor shall replace all cable damaged from lack of effective protection during construction period with no additional cost to the Agency.

3.2 Installation

3.2.1 Refer to floor plan Drawings for quantities, types and locations of all outlets, and to schematics for cabling requirements. Prior to electrical rough in, coordinate the installation of all telecommunications infrastructure routing with the Contractor to resolve all interferences and cabling infrastructure requirements. Final locations will be advised prior to installation and provided these are within the total shown and the average cable length to the telecommunications room does not change more than 3 m no additional costs shall be paid for location changes.

3.2.2 All cabling shall be installed according to applicable standards and cabling system manufacturer's Specifications, including cable stress, bending radius, maximum length, separation from other services, etc. and shall be handled in strict accordance with cabling system manufacturer's cable Specifications. All backbone and horizontal cabling shall be continuous. No splicing is permitted.

3.2.3 Provide printed labels on all outlets, patch panels, consolidation points as per ANSI/TIA/EIA-606-A.

3.2.4 All voice cross-connects between main cross connect and the intermediate cross-connect or to the horizontal cross connect shall be done by the telecommunications Contractor.

3.3 Phasing

3.3.1 System shall be partially operational as each phased area is completed. This will require multiple testing and sequencing as required and connection and disconnection of temporary locations. All cost associated with multiple sequencing shall be
included in base costs, refer to phasing Drawing for information about required phasing.

3.4 **Performance Tests**

3.4.1 Perform testing for each outlet and consolidation point as follows:

.1 Perform Category 6 link tests in accordance with TIA-568-C.1 and TIA-568-C.2. Tests shall include wire map, length, insertion loss, NEXT, PSNEXT, ELFEXT, PSELFEXT, return loss, propagation delay, and delay skew. Provide plot data.

.2 Optical fiber Links. Perform optical fiber end-to-end link tests in accordance with TIA-568-C.3. Provide plot data.

3.5 **Removals**

3.5.1 Exercise extreme caution when working at or near any live connections to insure that no interruption to active users occurs.

3.5.2 All existing cabling, terminations, faceplates, patch panels within the space shall be completely removed and disposed of unless indicated on the Drawings or labeled for future use.

END OF SECTION
1. **GENERAL**

1.1 **Summary**

1.1.1 The Contractor shall provide a complete master time and program system as shown on the Drawings and as specified herein. Slave clocks when used shall be supervised both hourly and twice a day by the master time control unit and individually self-regulated to the master clock time.

1.1.2 The system is to be designed for 120 volt 60 cycle, two wire power supply.

1.2 **Related Sections**

1.2.1 Section 01 91 00 Commissioning
1.2.2 Section 26 05 00 - Common Work Results for Electrical
1.2.3 Section 27 05 28 Pathways for Communications Systems

1.3 **Submittals**

1.3.1 Complete sets of Shop Drawings shall be submitted indicating the following:

1. **System component number and dimensions.**
2. **System operating characteristics and functions.**
3. **Rough-in details.**
4. **Wiring schematics.**

1.4 **Quality Assurance**

1.4.1 The clock system shall be installed in accordance with the requirements of the following agencies and codes:

1. **Electrical Safety Code.**
2. **Canadian Standards Association.**

2. **PRODUCTS**

2.1 The catalogue numbers specified herein are those of Simplex and represent the type and quality of equipment to be provided.

2.2 **Master Time/Program Unit**

2.2.1 The existing master time and program control unit is a SimSYNC Catalogue No. 6400 Series microprocessor based type.

2.2.2 Provide SimSYNC Software/6400 PC Synchronisation Module Catalogue No. 6400-9505.

2.2.3 Controller shall allow user programming and control of output circuits individually with 7 day, 24 hour control, automatic holiday operation and momentary (0-99 seconds) or maintained (on/off) contact output. Controls shall be included to allow manual correction or disconnection of slave clocks. Controller shall include non-volatile program memory with storage capacity of up to 1000 individual commands.

2.2.4 Synchronous wired clock correction shall be 59 minutes slow and 55 seconds fast. Twelve hour supervision advances units in excess of eleven hour slow, synchronizing them to the correct hour, minute and second.
2.2.5 Digital display shall be a liquid crystal type displacing hours, minutes, seconds, day of the week, and the schedule selected. Display may be user selected for the 12, or 24 hour format.

2.2.6 Master time centre will be capable of accurate time keeping independent of power source frequency. The selection of line frequency, or crystal oscillator as the time base may be field selectable. Unit to be capable of maintaining accurate time for a minimum of 120 hours during power outage. Master time centre to have seven day, twenty-four hour programming, and also be equipped with a 365 day calendar, so that automatic daylight saving time change may be pre-programmed at any time during the year. On/off programming may be determined to the second.

2.2.7 Master clock will have the ability to program in delay functions whereby a program switch may be activated manually, and then a function shall activate at a pre-determined time later.

2.3 **System Clocks**

2.3.1 Standard clocks shall be Simplex Celestra Catalogue No. 6334-9410 semi-flush mount 4" diameter synchronous wired 120 V AC slave clocks complete with standard black numerals, white face, shatterproof lens, hour, minute and second hands and aluminum finish case. Provide for each clock a compatible backbox complete with Mounting Bracket Adapter Plate Catalogue No. 6334-9802 and wiring harness Catalogue No. 6334-9803.

3. **EXECUTION**

3.1 **Installation**

3.1.1 The Contractor shall Provide all wiring, conduit and backboxes; in accordance with these Specifications and the manufacturer's instructions required for installation and proper operation of the system.

3.1.2 Provide wiring to all system clocks installed in conduit. Three wires are to be used for operation of the clocks, and are to be colour coded as follows: Black for power, White for neutral, and Red for the correction armature. Provide one 15 amp., 120 volt power circuit to master time centre and make wired-in connection. Power to slave clocks to be supplied from the master time clock.

3.1.3 The size of the different wires shall be those as specified by the system manufacturer. (No. 14 copper minimum). All wires shall be tagged at all junction points and be installed in a separate conduit system.

3.1.4 Final connections between the master time centre and clocks shall be made under direct supervision of a representative of the manufacturer.

3.1.5 Refer to Drawings for device mounting heights.

3.2 **Field Quality Control**

3.2.1 The manufacturer shall make a complete inspection of all equipment after installation to ensure the following:
1. That the system is complete and in accordance with the Specifications.

2. That the system is connected in accordance with the manufacturer's recommendations.

3.2.2 Any subsequent changes to conform to the above shall be done by the Contractor with technical advice supplied by the manufacturer.

3.2.3 During the period of inspection, the Contractor shall supply to the manufacturer all personnel necessary to complete the inspection and also supply any required equipment such as ladders, scaffolding, etc.

3.2.4 On completion of the inspection the manufacturer shall supply the Agency with a certificate together with detailed inspection record sheets, confirming that the system is installed in accordance with the above outlined requirements. He shall also confirm in writing that all authorized building personnel have been instructed as to system operation and maintenance procedures etc.

END OF SECTION
1. **GENERAL**

1.1 **Summary**

1.1.1 The existing Honeywell Security system shall be expanded with new components as required. All devices shall be installed as new, except card readers shown on Drawings to remain. Existing WinPak software shall be expanded with purchase of new licences for new components.

1.1.2 The Contractor shall provide access control modifications to the existing system for a complete and operating electrically supervised, zone annunciated integrated intrusion alarm/access control system. This shall consist of central control equipment, interface software, hardware and software licences, multiplex/control panels, remote devices, power supplies with battery backup, etc., required for full and complete operation of the system.

1.1.3 The system is designed such that all data required to perform real time functions resides in the system memory or is distributed among the databases of the field devices.

1.1.4 The intrusion alarm door monitoring functions shall provide basic building perimeter protection through magnetic door contacts or electric door strikes. System control shall be provided from central control equipment and point multiplexers. The system shall contain all required components for alarm receiving circuits, control circuits and signal circuits.

1.1.5 The access control function shall provide controlled access to the building and internal spaces through the use of card readers and contact devices interfacing with door control devices. System control shall be provided from central control equipment through interface software, access control units and reader multiplexers. The system shall contain all required components for interface, signal and control circuits.

1.1.6 On failure of the normal AC power source, the intrusion alarm/access control panels shall automatically switch to standby battery power. When the normal AC power is restored, the panels shall automatically switch back to AC operation and the battery pack shall be automatically recharged.

1.1.7 The system is designed for 120 volt, 60 cycle, two wire power supply to power supply units which will provide 12V DC system power supply.

1.2 **Related Sections**

1.2.1 Section 01 91 00 Commissioning

1.2.2 Section 26 05 00 - Common Work Results for Electrical

1.2.3 Section 27 05 28 Pathways for Communications Systems

1.3 **Submittals**

1.3.1 Complete sets of Shop Drawings shall be submitted indicating the following:

- System component numbers and dimensions.
.2 System operating characteristics and functions.
.3 Rough-in details.
.4 Wiring schematics.

1.4 **Quality Assurance**

1.4.1 The access control system modifications shall be installed by the Contractor in accordance with the requirements of the manufacturer and all applicable regulatory agencies and Codes including:

.1 CSA and ULC Standards
.2 Ontario Building Code
.3 Electrical Safety Code

1.4.2 All system components shall conform to the following standards where appropriate:

.1 Manufacturing: ISO 9003
.2 Design: MIL 275E
.3 Communications: IEEE RS232C and RS 485
.4 EMI emissions: FCC part 15
.5 Electrostatic immunity: IEC 801.2 level 4
.6 AC transients: UL 864

1.4.3 The access control system modifications shall be programmed, tested and commissioned by an Agency-approved Security System Installer.

.1 Convergint.
  Contact: Tim Chreptak
  Work: 1 (905) 602-8622
  Mobile: 1 (416) 948-1869
  Email: tim.chreptak@convergint.com

1.4.4 Qualifications

.1 All system components shall be manufactured by reliable firms with at least 15 years’ experience in the development and manufacture of access control and point monitoring Products.

1.4.5 All materials and equipment shall be of new and of current manufacturer. All components will be provided by a single Supplier responsible for the total system to ensure complete compatibility. The equipment and accessories will be performance certified and covered by the manufacturer’s warranty against defective parts and workmanship for a period of two years from date of acceptance. The entire installation will be checked by a qualified technician after the installation is complete.

1.5 **Support Services**

1.5.1 The Supplier shall be capable of providing on-going training and service for all system components.
1.6 **Scope of Work**

1.6.1 The security system Supplier must design and furnish the discrete monitoring system modifications complete in all respects including miscellaneous associated equipment and subsystems as hereinafter described or required for the proper operation of the system.

1.6.2 The security system installation shall be by the Contractor.

1.6.3 Testing and commissioning of the security system modifications shall be by the Agency-approved Security System Installer (refer to Section 1.4).

1.6.4 The system shall be a fully distributed architecture with intelligent door controllers capable of conducting a non-degraded access transaction in less than one second. Should any part of the system fail, the remainder shall be capable of granting access based on a valid card until full operation is restored.

1.6.5 The system shall support Proximity card technologies. Each card shall have a unique card number.

1.6.6 The time for which the door relay is energized shall be user definable. The system shall be capable of detecting both Door Held Open and Forced Entry conditions, and of reporting these events to the host system and dispatch console as alarms. The duration for activating a Door Held Open alarm condition shall be user definable.

1.6.7 A Request to Exit (RTE) facility shall be available at each controlled door to allow personnel to exit through the door without generating a Forced Entry alarm.

1.6.8 Manual commands shall be available for Door, Floors, Input Points and Output Relays, which allow the user to override automatic or Timed Commands. The manual override shall take precedence and devices shall only return to an automatic state when manually commanded to do so.

1.6.9 All manual commands shall be available for a user-definable TIMED COMMAND to allow the user to set up regular, automatic schedules for these functions.

1.6.10 The system shall provide a user-definable scrolling text window for facility management and emergency situations. This window shall provide the user with the ability to enter, and modify at any time site specific information to be used to assist in managing the facility. This information must be readily available via function key to the operator.

1.7 **General Access Control Requirements**

1.7.1 In addition to the basic function of access control by cardholder ID and Time Zone, the system shall support the following modes of operation (if available at no additional cost to the system)
.1 Antipassback Mode
   .1 The system shall allow the user to define readers for both IN/OUT and Timed Antipassback. Should the cardholder not use an OUT reader before an IN reader, or re-use the card within user-defined period, access will be denied.

.2 Dual Custody Mode
   .1 The system shall have provision for defining doors which require TWO valid cards within ten seconds before access is granted.

.3 Escort Mode
   .1 The system shall support an enhanced Dual Custody mode where the first card shall be that of a supervisor.

1.8 Warranty
   1.8.1 All system components shall be warranted to be free from defects in material and workmanship for the period of one year from acceptance of the system. The warranty shall provide for free parts and labour for correction of problems as a result of defects in material or workmanship, including regular wear and tear, but does not cover customer operating negligence or abuse.

   1.8.2 During the warranty period, bi-annual Site Inspections shall be performed, which include the following Work:
      .1 Systematically examine, clean, adjust and service as required under manufacturers Specifications, all security equipment purchased under this Contract.
      .2 Inspect operability of computer hardware and software.

2. PRODUCTS

2.1 All Specifications defined herein are to be standard features of the Product and shall not require any custom software or special configuration. The catalogue numbers are those of Honeywell and shall be used to establish the standard and function required of the security system.

2.2 Security Platform – WinPak (Existing)
   2.2.1 Configuration
      .1 The software program shall be loaded on the Agency's PCs or computer terminal for the necessary system programming and adjustments. All required software licences and installation shall be provided for two locations.

   2.2.2 Database
      .1 All database information for the Security Server will be held at the controller itself, not at the host PC system.

   2.2.3 Alarm Processing
      .1 Alarms reported from the Security Server will be entered into one of two queues; local alarms in the first queue and alarms from the remote sites in the second queue.
.2 Each queue shall keep a user defined number of recent alarms, archiving the oldest alarm as new ones are added.
.3 Each alarm shall be tagged with the site name of the controller originating the alarm.
.4 The operator shall be provided with an alarm processing window which allows him/her to scroll through the alarms in each queue and randomly acknowledge each alarm.

2.2.4 Event Auditing
.1 The Security Server shall keep an electronic copy of all transactions. This file is to be backed-up for archival and reporting purposes at regular intervals, or when the file gets to a user-selectable capacity.

2.2.5 System Management
.1 The operator shall be provided with an integrated system management environment which allows all maintenance functions to be performed without leaving the software.
.2 System Management functions shall include, but not be confined to, the following functions:
  .1 Online programming of Security Server
  .2 The software shall be capable of direct (hard-wired) and internet connection to remote Security Servers.
  .3 Site Reports
    .1 The software shall provide reports by site for each Security Server.
    .2 Reports on system activity shall include:
      .1 All transactions
      .2 Valid transactions by door
      .3 All invalid transactions
      .4 All alarms
      .5 Report by cardholder number
      .6 Report by cardholder name
      .7 Report by door
      .8 Report by any key word
      .9 The user shall have the option of directing reports either to the screen or a printer or saved as PDF.
  .4 Event File Maintenance
    .1 The software will have the facility to purge, both automatically and manually, the site event files which will keep the transactions of a user-specified number of days.
  .5 Password Configuration
    .1 The administrator shall have access to a password maintenance file which will allow operator access levels to be defined in the range of one to four for the various programs in the system. Up to 50 users will be supported by the system.
2.3 **Security Server – WinPak (Existing)**

2.3.1 All real-time access control shall be provided by self-contained security servers. Each security server shall be capable of granting access, responding to alarm conditions and shall contain the site database such that the remote host is required only for reporting purposes. Each security server should require no more than a web browser to program its database.

2.3.2 All control software shall reside in onboard RAM, solid state, or flash memory. No moving parts such as disk drives will be acceptable. Database information shall be stored in non-volatile memory in the Security Server.

2.3.3 **General Specifications**

.1 The security servers shall provide the following minimum capacities:

.1 2000 card capacity with names
.2 60 doors
.3 Five client workstations
.4 128 elevator control floors
.5 90 inputs
.6 120 outputs
.7 40 timed commands

2.3.4 **Hardware Specifications**

.1 The Security Server hardware will be mounted in a tower or rack mount, complete with a power supply and battery/UPS. There shall be provision for up to double expansion in the same configuration. The backup from the battery/UPS shall be sufficient to provide one hour of operation in the absence of power.

2.3.5 **Device Communications**

.1 Communications between the Security Server and Door/Elevator Controllers shall be via TCP/IP and/or RS485 communications in a poll/response format.

.2 If a device does not respond to a poll, a verification of communications failure shall be performed and the device reported as being in a state of communications failure.

2.3.6 **Inputs/Outputs**

.1 The Security Server shall support a flexible Point Monitoring capability which can be used to trigger external devices such as mobile phones, video surveillance hardware on the change of state of an input point.

.2 A minimum to 90 Supervised Input Points and 120 Output relays shall be available to the user.

.3 A system-wide Input-Output relationship is to be supported, with up to four relays triggered on the change of state of one input point, anywhere in the same Security Server.

.4 The system must be capable of reporting four states on each input; i.e., Secure, Alarm, Trouble Open, Trouble Short.
2.3.7 Investigate/Control

.1 The system shall support a wide range of functions which allow the user to manually control and investigate the status of individual points and/or readers.

.2 There shall also be a system-wide status report which shows the complete list of devices/points/readers with the exception conditions existing at the time of requesting the report.

2.3.8 Database Updates

.1 All device databases shall be automatically synchronized by the host Security Server. Updating of individual controllers by manual command will not be accepted.

2.3.9 Diagnostics

.1 The system shall be equipped with power-up diagnostics that display the general configuration of the system and a report of the devices connected to both RS485 lines and TCP/IP. This report shall indicate the type of device found at each address.

2.4 Door Controllers

2.4.1 The system shall support a range of single and two-door controllers with card capacities of a minimum of 500 cards.

2.4.2 Door Controllers shall be intelligent devices, capable of functioning without degraded mode in the event of communication failure.

2.4.3 Each Door Controller shall support Wiegand, Magnetic Stripe, and Proximity readers. Optional integrated keypads shall be supported in both the Wiegand and Magnetic Stripe readers. Styles available must include Insert and Swipe and be surface-, flush-, or mullion-mount.

2.4.4 The Door Controller shall be capable of operating with cable distances of up to 600 feet to the reader.

2.4.5 The Door Controller shall keep a buffer of all transactions and send these as messages to the host Security Server when polled. Should a communications failure with the host be in effect, buffered transactions shall be sent to the host as historic messages when communications resume.

2.4.6 Doors shall be provided with the following manual commands:

.1 UNLOCK MOMENTARY
.2 UNLOCK MAINTAINED
.3 LOCK
.4 CARD PLUS PIN MODE
.5 CARD ONLY
.6 INVOKE DUAL CUSTODY
.7 RESCIND DUAL CUSTODY
.8 INVOKE ESCORT MODE
.9 RESCIND ESCORT MODE
.10 LOCKOUT ALL CARDS
.11 RE-INSTATE ALL CARDS
.12 RETURN TO TIMED OPERATION

2.5 **Proximity Readers**

2.5.1 The HID ProxPoint or MiniProx Series Proximity Reader contains a magnetic coil which energizes a proximity card, Key Tag or Badge Tag as it comes into range. The preprogrammed code generated by the custom microchip in the card or tag is instantly transmitted back to the reader. Numerous identical signals must be received from a card or tag, and verified by the reader, to assure valid data. Card reader shall operate at industry standard 125 kHz proximity technology.

2.5.2 The proximity reader contains a microprocessor which decodes the signal and translates it to the proper data format (Wiegand, magnetic stripe or other popular card type). The proximity reader transmits one code pulse train to the host processor—even through the card or tag remains in range. To send out another data stream, the card or tag must be removed and presented again. This operation simulates exactly the operation of a typical mechanical card reader.

2.5.3 The proximity reader shall give visual and audible feedback of access status. Reader shall be able to be mounted indoors or outdoors and shall be able to be mounted on door mullions.

2.6 **Exit Pushbuttons**

2.6.1 Provide exit pushbuttons on card access doors without panic hardware or double card access requirements where shown on Drawings.

2.6.2 Doors with panic hardware will have deactivating switch to allow door to open without causing alarm.

2.6.3 Mount exit pushbutton in single gang box.

2.7 **Door Detector Devices**

2.7.1 Provide door monitoring magnet devices to monitor status of man doors and garage doors. Mount in head of door frame.

2.8 **Electric Door Strikes**

2.8.1 Electric door strikes and hinges will be provided by the Door Hardware Contractor for wiring by the Contractor.

2.9 **Dispatch Console**

2.9.1 Provide rack modules in the dispatch console to monitor the alarm status and condition of each remotely monitored door. The module to be compatible in colour and presentation with other elements of the console, and to identify each door as "HELD OPEN" or "FORCED ENTRY" with LED lights and pushbutton or toggle switch for those doors to be remotely opened from the console.

2.10 **Wiring**

2.10.1 Provide all wiring required for system interconnection in accordance with manufacturer’s requirements. All wiring shall be
multi-conductor type, shielded as appropriate, complete with an overall jacket. Size and colour code wiring to suit system requirements. At connection points, terminate all wiring with crimp-on solder spade connectors to suit specific requirements.

3. **EXECUTION**

3.1 **Installation**

3.1.1 Provide wiring of detection zones, initiating devices, control devices and signalling and annunciation equipment as indicated on Drawings. Identify all wiring appropriately at points of connection and at control panel.

3.1.2 Mount all equipment and components as shown and arrange conveniently to suit dimensions of equipment and functional requirements. Refer to interconnection riser diagram for further details of requirements and to floor plans for component locations.

3.1.3 The security system Supplier will provide a qualified installation crew to install all devices make final connections to security console and make all tests and adjustments as necessary for a fully functional system.

3.1.4 The Supplier shall supply and install all system components covered by this Specification. All wiring for communications, monitoring, and alarm output will be supplied and installed by the electrical control.

3.1.5 The Supplier shall provide three complete sets of documentation covering installation, operation and maintenance of all system components.

3.1.6 On-site training for the number of operators determined by the Agency, for one day shall be provided as a precondition to acceptance.

3.1.7 The purchaser shall provide 120 VAC power to the point of installation of each system component requiring AC power.

3.2 **Phasing**

3.2.1 System shall be partially operational as each phased area is completed. This will require multiple testing and sequencing as required and connection and disconnection of temporary locations. All cost associated with multiple sequencing shall be included in base costs, refer to phasing Drawing for information about required phasing.

3.3 **Field Quality Control**

3.3.1 At the completion of the installation of all system equipment and devices and after the connection of all controls, test and verify the entire system.

3.3.2 Only after the testing and verification task is completed, and all deficiencies rectified, demonstrate the proper functioning of the entire system.

3.3.3 The purpose of a verification procedure for the system is to make certain that all equipment operates as intended. Upon completion of the verification procedures, an approved certificate of
verification shall be kept as part of the system documentation. An equipment schedule listing each device and showing confirmation that it was verified shall be provided.

3.3.4 The wiring to every device shall be inspected and tested to verify that removal of the device or breaking wire will cause the trouble signals to operate properly. Trouble signals shall be verified to operate on open circuit, short circuit, ground fault or the removal of any plug-in individual component. Verify that terminations have been provided for all conductors and that where applicable correct polarities have been observed. All equipment installed as part of the system shall be inspected for visible damage or tampering which might interfere with its intended operation.

3.3.5 Any device which is field adjustable shall be tested to ensure that its setting is acceptable under ambient conditions at the location of installation.

3.3.6 Tests shall be made to verify that adequate power is available from both normal and standby sources under the maximum system load.

3.3.7 The normal system power supply shall be inspected to ensure that it is properly fused, locked away from unauthorized interruption, adequate to meet system requirements and separated from auxiliary device power sources such that a fault in such circuits cannot affect the system's unit control power.

3.3.8 All control equipment shall be tested for acceptable operation. An inspection and test shall be made of all cable terminals, plug connectors and plug-in circuits.

3.3.9 All field wiring shall be verified to be terminated on a single conductor per terminal basis.

3.3.10 Simulation of open circuits, short circuits and ground faults shall be performed on selected components to confirm proper trouble circuit response.

3.3.11 Ancillary equipment connections shall be tested for proper operation.

3.3.12 Provide a comprehensive service, maintenance and warranty for the entire system for one year after substantial completion.

3.4 System Startup

3.4.1 Prior to final set-up and programming of the system features and restrictions, the Security System Installer shall review with the Agency the specific operational options available. System set-up and programming shall be based on the results of this interview. All data for "First Day" system operation will be entered by the Security System Installer as instructed by the Agency.

3.4.2 The Successful Security System Installer shall be responsible for providing a group training session(s) to the Agency’s satisfaction by a qualified instructor regarding proper use and operation of the system. This training session(s) shall include a description of the features available with the new system and an explanation of the feature access procedure. Provide adequate facilities at the Agency's premises for the training session/period.
3.4.3 Upon completion of the training session, the Security System Installer shall provide copies of printed literature describing the system features and their access procedure to be used for future reference. A brief review session shall be provided by the Security System Installer at the Agency’s request at a future date.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**

1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Intent**

1.2.1 Provide alterations to the existing fire detection and alarm system to suit the specific building requirements as indicated in this Scope of Work.

1.2.2 The existing fire alarm control panel, fire alarm devices, and existing components are to be reused and expanded to suit this Scope of Work. The system alterations will consist of new and relocated initiating devices, signalling devices, supervisory circuits, and components as specified herein.

1.2.3 At the completion of the Scope of Work, the modified fire alarm system will be a fully functional system and will be compliant with all local, provincial, and federal codes and standards.

1.2.4 Modify the existing fire alarm graphics to suit changes.

1.2.5 Connect devices to existing fire alarm system with wire and conduit as required by code, standards, and equipment manufacturer. Provide any components, expansion cabinets, reprogramming, and make any modifications necessary to the fire alarm control panel.

1.2.6 Related Sections:

.1 Division 21 Fire Suppression

.2 Division 23 Heating, Ventilating, and Air Conditioning (HVAC)

.3 Division 25 Integrated Automation

.4 Section 26 05 19 - Wire and Cable

.5 Section 26 05 33 - Raceway and Boxes for Electrical Systems

.6 Section 26 05 53 - Identification of Electrical Systems

1.3 **References**

1.3.1 Reference Codes and Standards: Versions of the following standards current as of the date of issue of the Project apply to the Work of this Section. Where regulatory requirements use older version of a standard, comply with the version year adopted by the Authority Having Jurisdiction.

.1 CAN/ULC S524 Installation of Fire Alarm Systems

.2 CAN/ULC S536 Inspection and Testing of Fire Alarm Systems

.3 CAN/ULC S537 Verification of Fire Alarm Systems

.4 CAN/ULC S561 Installation & Services for Fire Signal receiving Centre Equipment

.5 CSA B44.1/ASME-A17.5 Elevator and Escalator Electrical Equipment
1.4 Quality Assurance
1.4.1 In the case of any discrepancy between these specifications, the Project Drawings, and any applicable local codes, the installed Fire Alarm / Life Safety System will comply with the most stringent requirement.
1.4.2 Provide passive fire alarm graphic displays at annunciator and control panel location. Fabrication of the graphic display will be by an approved signage supplier or the fire alarm supplier.
1.4.3 Employ fully trained mechanics who are regularly employed in the field of graphics design and/or sign production to create the fire alarm zoning graphic.

1.5 Submittals
1.5.1 Submittals under this Section will be in accordance with General Conditions, Section 01 33 00 – Submittals, and Section 26 05 00 - Common Work Results for Electrical.
1.5.2 Submit the following as part of the Shop Drawings:
   .1 System component numbers and dimensions.
   .2 Wiring schematics indicating expanded and/or new loops.
   .3 Battery Size Calculation.
   .4 Fire Alarm Zoning Graphic.

1.6 Related Work
1.6.1 Coordinate work in this Section with all related Sections. Work and/or equipment provided in other Sections and related to the fire detection and alarm system will include, but not be limited to:
   .1 Duct smoke detectors will be furnished, wired and connected under this Section. Division 23 Heating, Ventilating, and Air Conditioning (HVAC) will furnish necessary duct opening to install the duct smoke detectors.
   .2 Air handling and smoke exhaust system fan control circuits and status contacts to be provided by the HVAC control equipment as part of Division 25 Integrated Automation and connected to Fire Alarm System by this Section.
   .3 Fire Suppression Pre-action system release valve control circuits and supervision contacts will be provided by Division 21 Fire Suppression and connected to Fire Alarm System by this Section.

1.7 Related Sections
1.7.1 Section 01 91 00 Commissioning
1.7.2 Division 21 Fire Suppression
1.7.3 Division 23 Heating, Ventilating, and Air Conditioning (HVAC)
1.7.4 Division 25 Integrated Automation
1.7.5 Section 26 05 00 - Common Work Results for Electrical

1.8 **System Operation**
1.8.1 All fire alarm stations, thermal detectors, products of combustion detectors, notification appliances, sprinkler system flow switches, and sprinkler/standpipe tamper switches will be fully supervised.
1.8.2 All integrated life safety system equipment will be arranged and programmed to provide an integrated system for the early detection of fire, the notification of building occupants, the automatic summoning of the local fire department, the override of the HVAC system operation, and the activation of other auxiliary systems to inhibit the spread of smoke and fire, and to facilitate the safe evacuation of building occupants. In all operating modes, the processing of fire alarms will have the highest priority.
1.8.3 The system will contain all required components for alarm receiving circuits and signal circuits as shown on the Drawings. The system will be so arranged that the operation of any manual pull station or automatic thermal or smoke detector or sprinkler flow switch will activate system signalling sequence. All system circuits, wiring and devices will be fully supervised for faults. A circuit fault such as an open or ground or actuation of a valve tamper switch will sound the trouble signal but will not cause a false alarm.

1.9 **System Provisions**
1.9.1 The system will display both alarm and trouble indications from each fire alarm detection zone. The activities of the system will be complete with custom labels, indicating the exact location of the activity, and will be displayed on the fire alarm control panel and remote annunciator panels.
1.9.2 As a result of alarm conditions received the fire alarm control panel will automatically operate specified control points such as transmitting a signal to the fire signal receiving centre to summon the fire department, or stopping recirculating fan systems, etc.

2. **PRODUCTS**

2.1 **General**
2.1.1 Provide all modifications and additions to the existing installations to incorporate the new control equipment and other Work and comply with the latest codes and regulations. Consult the manufacturer to verify the existing system provisions and include all necessary modifications to comply with the system requirements as described.
2.1.2 Replace all existing system wiring as required to comply with new system specified requirements. Upgrade existing wiring arrangements to suit zoning changes, the addition of initiating and signal devices in existing areas, etc. Existing conduit and raceways may be used for new wiring where appropriate.
2.1.3 All equipment and components will be the manufacturer's current model. The materials, appliances, equipment and devices will be tested and listed by a nationally recognized approvals agency for use as part of a protected premises protective signaling fire alarm system. The authorized representative of the manufacturer of the major equipment, such as control panels, will be responsible for the satisfactory installation of the complete system. Provide, from the acceptable manufacturer's current product lines, equipment and components, which comply, with the requirements of these specifications.

2.1.4 The system will utilize node-to-node, direct wired, multi-priority peer-to-peer network operations. The system will utilize electronically addressed, smoke detectors, heat detectors and input/output modules as described in this specification.

2.1.5 All integrated life safety system equipment will be arranged and programmed to provide an integrated system for the early detection of fire, the notification of building occupants, the automatic summoning of the local fire department, the override of the HVAC system operation, and the activation of other auxiliary systems to inhibit the spread of smoke and fire, and to facilitate the safe evacuation of building occupants. In all operating modes, the processing of fire alarms will have the highest priority.

2.2 **Control Panel**

2.2.1 The existing Fire Alarm Control Panel (FACP) in 7750 Hurontario Street (non-sprinklered building) is a Simplex 4100U with horns/strobes.

2.2.2 The existing Fire Alarm Control Panel (FACP) in 180 Derry Road (sprinklered building) is a Simplex 4100U with speakers/strobes.

2.2.3 Consult the manufacturer to verify existing system provisions and the compatibility of the new control equipment with existing system and provide all necessary modifications to existing wiring or control panel accordingly.

2.3 **Standby Power**

2.3.1 The battery packs will be sized in accordance with Building Code and CAN/ULC-S524, including capacity for special function 24 V DC auxiliary control circuits (24 hr supervisory and trouble signal current, followed by 30 minute alarm - battery).

2.3.2 Test system and, if required, replace standby battery pack housed inside the main control panel. The replacement batteries will be gelled electrolyte type. The presence of the battery pack and the wiring to the battery pack will be electrically supervised; a fault will energize the trouble circuitry.

2.4 **System Configuration**

2.4.1 Each addressable analog loop will be circuited so device loading is not to exceed 80% of loop capacity in order to allow for the addition of future devices.
2.4.2 Provide alarm receiving modules as required in the control panel for all alarm receiving circuits. Modules will include an individual amber trouble lamp for each alarm receiving circuit to indicate the source of any faults.

2.4.3 The alarm receiving circuits will have Class "A" operation. A single break or grouped fault in the wiring to any initiating device will cause a trouble signal but will not affect detection of an alarm from any initiating device while this fault exists.

2.4.4 Provide supervisory receiving modules as required in the control panel for all supervisory circuits. Modules will include individual alarm and trouble lamps for each supervisory circuit to indicate circuit condition.

2.4.5 The supervisory circuits will have Class "B" operation. A single break or ground fault in the wiring to any initiating device will provide a trouble signal. A supervisory circuit alarm condition will activate trouble sequence only.

2.4.6 Provide audible signal circuit modules as required in control panel for all signal circuits. Modules will include individual alarm and trouble lamps for each signal circuit to indicate the circuit condition.

2.4.7 Provide auxiliary control relay modules as required in control panel for all auxiliary control circuits. Modules will include individual trouble lamps for each circuit and supervised on-off-auto control switch for manual circuit operation override.

2.4.8 The signal and auxiliary control circuits will have Class "B" operation. A single break or ground fault in the wiring to any audible signal or control device will produce a trouble signal.

2.4.9 Provide sufficient spare capacity to assure that the addition of five (5) audible devices can be supported without the need for additional control components (power supplies, signal circuit modules, batteries, etc.)

2.4.10 Provide sufficient spare capacity to assure that the addition of three (3) visual devices can be supported without the need for additional control components (power supplies, signal circuit modules, batteries, etc.)

2.4.11 Provide a dedicated 24 V DC circuit as required to feed all auxiliary relays required for inductive loads. Circuits will be supervised via an end-of-line relay and addressable input module. Auxiliary relays will not derive their power from the starter or load being controlled.

2.4.12 Provide remote control relays connected to supervised ancillary circuits for control of fans, dampers, door releases, etc. Relay contact ratings will be DPDT and rated for 10 amperes at 115 V AC. A single relay may be energized from a voltage source of 24 V DC, 24 V AC, 115 V AC, or 230 V AC. A red LED will indicate the relay is energized. A metal enclosure will be provided.
2.5 **System Devices**

2.5.1 All new and existing/re-used system devices will be fully compatible with existing control equipment and match in operation and performance characteristics of the existing system. All signal devices and manual pull stations will be identical in appearance and function. All accessories will be supplied by the fire alarm manufacturer.

2.5.2 Provide system devices where indicated on the drawings and described below.

.1 Manual Pull Stations types include:
   1) Manual Station, Single Stage, single-action pull lever, extruded aluminum with NO/NC contacts.

.2 Manual Pull stations will include these accessories where required:
   1) Where surface mounted, use a vendor approved surface wall box.
   2) Where indicated on drawings provide a vendor approved polycarbonate shield and frame that fits easily over manual pull station. The shield will have integrated battery-operated horn.
   3) Use manufacturer-approved manual pull station lowering kit to adjust height of existing manual pull stations.

.3 Automatic thermal detectors types include:
   1) Fixed Temperature Heat Detector. 57 °C (135 °F), separate mounting base.

.4 Where indicated to provide a fire detector, provide suitable thermal detector listed above.

.5 Automatic smoke detectors types include:
   1) Photoelectric Area Type with separate mounting base
   2) Photoelectric Type Duct Smoke Detector with housing, Form-C shut down relay and LED remote indicator and sampling tubes to suit duct dimensions and key-operated remote test station. Provide wall mount remote indicator minimum 300 mm (1 ft) below ceiling at detector location.

.6 Addressable Carbon Monoxide (CO) Detector - with audible sounder base. The CO detection element will indicate a trouble condition at the FACP signaling end of life and the CO element of the detector will be field replaceable. It will be programmed at the main control panel as a supervisory indication and transmit a separate supervisory signal to the central station.

.7 The intelligent Analog detectors will be suitable for mounting on any detector-mounting base.
   1) Standard Detector Mounting Bases - The base will be capable of supporting one Remote Alarm LED Indicator. Provide remote LED alarm indicators where shown on the plans.
2) Relay Detector Mounting Bases – The base will be provided for area smoke detectors as indicated on plans to provide a remote alarm indication or perform auxiliary functions as applicable. Relay bases to be 4 wire version with end of line relay. Power source for relay activation to be run separately from detection circuit to allow multiple unit operation. The relay will be a bi-stable type and selectable for normally open or normally closed operation. The position of the contact will be supervised.

3) Isolator Detector Mounting Bases – The base’s respective detector processor will control the operation of the isolator base. Following a short circuit condition, each isolator/detector will be capable of performing an internal self-test procedure to re-establish normal operation.

.8 Input modules will have a minimum of 2 diagnostic LEDs mounted behind a finished cover plate. A green LED will flash to confirm communication with the loop controller. A red LED will flash to display alarm status.

1) Single Input Module - (Waterflow Detectors, Tamper Switches etc.) The Single Input Module will provide one (1) supervised Class B input circuit capable of a minimum of 4 personalities, each with a distinct operation. The single input module will support the following circuit types: Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.), Normally-Open Alarm Delayed Latching (Waterflow Switches), Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.), Normally-Open Active Latching (Supervisory, Tamper Switches).

2) Dual Input Module - The Dual Input Module will provide two (2) supervised Class B input circuits each capable of a minimum of 4 personalities, each with a distinct operation. The dual input module will support the following circuit types: Normally-Open Alarm Latching (Manual Stations, Heat Detectors, etc.), Normally-Open Alarm Delayed Latching (Waterflow Switches), Normally-Open Active Non-Latching (Monitor, Fans, Dampers, Doors, etc.), Normally-Open Active Latching (Supervisory, Tamper Switches).

3) Single Input Signal Module - The Single Input (Single Riser Select) Signal Module will provide one (1) supervised Class B output circuit capable of a minimum of 2 personalities, each with a distinct operation. When selected as a telephone power selector, the module will be capable of generating its own “ring tone”. The single input signal module will
support the following operations: Audible/Visible Signal Power Selector (Polarized 24 V DC @ 2 A).

End of Line Resistors complete with a white plastic single gang cover plate appropriately marked and must be CSA or CAN/ULC approved.

2.5.3 Provide appropriate wire guard installed over detector for detector protection where shown on drawings.

2.5.4 Notification appliances will be as follows:

1. Horns: with a field selectable peak output of LA = 97 dB at 10 feet at high output and LA = 92 dB at low output. Horn to have a red finish. Horn output to be set at LA = 97 dB unless noted otherwise. When surface mounted use surface wall box with a colour to match device.

2. Strobes: synchronized strobe with a field selectable output of 15, 30, 75 or 110 cd; complete with white finish. To be selected for 15 cd unless noted otherwise noted on plans. When surface mounted use surface wall box with a colour to match device. Strobes in sleeping rooms will have minimum output of 177 cd.

3. Combination Horn-Strobes: with a field selectable peak output of LA = 97 dB at 10 feet at high output and LA = 92 dB at low output. Unit to be complete with a synchronized strobe with a field selectable output of 15, 30, 75 or 110 cd. Horn/strobe to have a red finish. Horn output to be set at LA = 97 dB and strobe to be selected for 15 cd unless noted otherwise. When surface mounted use surface wall box with a colour to match device. Strobes in sleeping rooms will have minimum output of 177 cd.

4. Speaker: Recess ceiling mount 200 mm (8 in) diameter voice quality speaker unit complete with 300 mm (12 in) round white baffle, backbox/enclosure and 70 V line matching transformer with 1/4 to 2 W taps. Where required, equivalent surface mount version with a square matte white baffle and finished surface backbox. Set tap initially to 1 W, then individually adjust to suit specific requirements.

5. Combination Speaker/Strobe: Recess ceiling mount 200 mm (8 in) diameter voice quality speaker unit complete with 300 mm (12 in) round white baffle, backbox/enclosure and 70 V line matching transformer with 1/4 to 2 W taps. Where required, equivalent surface mount version with a square matte white baffle and finished surface backbox. Set tap initially to 1 W, then individually adjust to suit specific requirements. Multi-Candela Addressable Strobe with intensity selectable as: 15, 30, 75 or 110 cd. Strobes in sleeping rooms will have minimum output of 177 cd.

6. Surface wall mount high efficiency Horn type speaker complete with metal housing/enclosure and 70 V line matching transformer with 1 to 7 ½ W taps. Initially set tap...
to 2 W, then individually adjust to suit specific requirements.

.7 Trim Plates: Provide trim plates for two-gang or 100 mm (4 in) square boxes.

2.5.5 Fire alarm system manufacturer to modify existing system to include one (1) spare additional signal circuit.

2.5.6 Fire Alarm Zoning Graphic

.1 Provide Fire Alarm Zoning Graphic to replace existing and adjacent to each new annunciator.

.2 Sample Graphic

1) Submit a sample of the graphic to the Consultant prior to the colouring and final framing process for approval.

.3 Rejections

1) Defective materials or workmanship whenever found at any time prior to final acceptance of work will be rejected regardless of previous inspection. Inspection will not relieve responsibility but is a precaution against oversight and error.

.4 Colour

1) Building walls: Black
2) Symbols and Text: Black ("You are here" marker to be red).
3) Zones: Each zone to be a different colour as selected by the graphic designer to ensure contrast between adjacent zones and text. Text colour should be changed to white if contrast improves text legibility when placed on dark background colour.

.5 Materials will be new and in perfect condition, free from defects impairing physical or appearance performance.

.6 Graphic: 450 mm x 600 mm (18 in x 24 in) or sized to match existing in high impact styrene with screened graphics. Zone colours will be as selected by the Consultant from the standard range samples provided by the supplier of the graphic.

.7 Frame: Clear anodized aluminum picture frame with nominal 19 mm (3/4 in) face width.

.8 Protective Covering: Minimum 3 mm (1/8 in) thick, non-glare acrylic.

.9 Text font will be a light sans serif typeface and have a minimum text size of 10 point. All text should be upright and horizontal regardless of the rotation of the plan.

.10 The following information is required to be shown on the fire alarm zoning graphic:

1) All exterior and interior walls,
2) All stairs and elevators,
3) All door openings,
4) Exit door locations indicated with arrows pointing out from door and "Exit" label,
5) "You are here" marker and text,  
6) North arrow,  
7) Annunciator panel location(s),  
8) Fire alarm zones and zone designations, and  
9) Legend.

Floor plan shall be rotated and oriented such that when viewing the graphic, and standing in directly in front of it, the direction the viewer is looking towards is up on the floor plan.

3. **EXECUTION**

3.1 **General**

3.1.1 The entire system will be installed in accordance with the latest edition of CAN/ULC-S524 and the approved manufacturer's manuals and wiring diagrams. Furnish all labour, conduit, wiring, outlet boxes, junction boxes, cabinets and similar devices necessary for a complete, functional life safety fire alarm system. Provide all necessary power supply, interconnecting and remote signal wire in dedicated conduit throughout and installed in accordance with the manufacturer’s wiring diagrams and the requirements of the Building Code, Electrical Code, and Inspection Authorities. All penetration of floor slabs and fire separations will be fire stopped in accordance with all local fire codes.

3.1.2 Take alternate measures in co-ordination with the Agency during any temporary interruption or reduction of fire alarm detection or signalling to ensure the safety of the building occupants. These measures shall be approved by the local fire department and be conveyed to them in writing in accordance with the requirements of the Fire Code.

3.2 **Work with Existing Fire Alarm Panel**

3.2.1 Consult the manufacturer to verify the existing system provisions, the compatibility of the new control equipment with existing system and Provide all necessary modifications to existing wiring or control panel accordingly, to accommodate the system alterations and comply with the system requirements.

3.2.2 Remove all special modifications upon completion of system wiring and device upgrade. All existing auxiliary control circuits will be reconnected to new control to operate in the specified manner.

3.2.3 The manufacturer will supply reasonable amounts of technical information with respect to any changes necessary to accommodate the system alterations.

3.2.4 Modifications to the fire alarm control panel to accommodate the system alterations will be by the manufacturer's technician.

3.2.5 Provide all rewiring and modifications to existing circuit arrangements to comply with the new system circuit zoning, devices and wiring requirements.

3.2.6 It is the intention to install new fire alarm devices and wiring without any interruption of the existing fire alarm system protection.
to occupied areas of the building in the building. Maintain fire alarm system operation during construction in accordance with Ontario Fire Marshall’s Guidelines for Maintaining Fire Safety During Construction in Existing Buildings. Any required testing of the fire alarm system during construction must be proceeded by a warning and announcement to the appropriated supervisory personnel. Arrange the time and duration of testing with the Agency to cause minimal disturbance and inconvenience to all concerned.

3.2.7 Take alternate measures in co-ordination with the Agency during any temporary interruption or reduction of fire alarm detection or signalling to ensure the safety of the building occupants such as a fire watch. These measures will be approved by the local fire department and be conveyed to them in writing in accordance with the requirements of the Authority Having Jurisdiction (AHJ).

3.3 **Wiring**

3.3.1 Fire alarm system wiring will be sized and colour coded in accordance with manufacturer's and Electrical Code requirements, (minimum 14 AWG - signal and control circuits, minimum 18 AWG - annunciation, minimum 16 AWG detection and supervisory circuits, minimum 12 AWG power supply).

3.3.2 All fire alarm system wiring will be provided with a separate insulated ground conductor sized in accordance with Electrical Code regulations. All signal and auxiliary wiring will be installed as standard Class ‘B’ type in a separate conduit system and an alarm receiving wiring will be installed as Class ‘A’ type in two runs of conduit in accordance with this specification and Electrical Code requirements complete with recessed device boxes for approved component mounting.

3.3.3 Connect auxiliary control circuits to the system to provide proper equipment operation. Provide in-line fuse protection at control panel for all auxiliary control circuits.

3.3.4 Wiring connections will be made as shown on Drawings. Final connection to panel will not be applied to the circuit until the representative of the manufacturer has approved the connections to the control equipment.

3.3.5 Wiring requirements for shielding certain conductors from others or routing in a separate raceway will be as recommended by the manufacturer's documentation and included in the Bid.

3.3.6 AC90 wiring shall only be permitted for fire alarm system wiring drops from accessible ceiling junction boxes to ceiling mounted devices. All other fire alarm initiating/signal wiring shall be installed in conduit.

3.4 **Installation**

3.4.1 Refer to Drawings for mounting heights of equipment.

3.4.2 New devices installed at existing locations will also be mounted at these mounting heights.
3.4.3 Locate detectors as shown considering spacing and mounting requirements contained in CAN/ULC-S524. Locate detectors away from radiating surfaces or positions affected by ventilation grilles.

3.4.4 End-of-line resistors will be furnished as required for mounting as directed by the manufacturer. These devices are not shown on plans but shall be located in public spaces.

3.4.5 Connect supervisory device contacts to the system to indicate a trouble condition on the appropriate supervisory zone. Connect auxiliary control circuits to the system to provide proper equipment operation. Provide in-line fuse protection at control panel for all auxiliary control circuits.

3.4.6 Connect auxiliary control circuits to the system to provide proper equipment operation. Provide in-line fuse protection at control panel for all auxiliary control circuits.

3.5 Field Quality Control
3.5.1 The manufacturer will make a complete inspection of all installed fire alarm equipment including each and every component such as signal devices, initiating devices, annunciation and control equipment, etc. in accordance with CAN/ULC-S537 to ensure the following:

.1 That the system is complete and in accordance with the specifications.
.2 That the system is connected according to ULC requirements.
.3 That the system is installed in accordance with the manufacturer's recommendations.
.4 That the regulations concerning the supervision of components have been adhered to.

3.5.2 Any subsequent changes to conform to the above will be done with technical advice supplied by the manufacturer.

3.5.3 The manufacturer will supply reasonable amounts of technical information with respect to any changes necessary. During the period of inspection by the manufacturer, this Section will make available to the manufacturer, appropriate staff as designated by the manufacturer.

3.5.4 On completion of the inspection, the manufacturer will Provide the Consultant with a certificate together with detailed inspection record sheets, confirming that the system is installed in accordance with the above outlined requirements. The manufacturer will also confirm in writing that all authorized building personnel have been instructed as to system operation, maintenance procedures, etc.

3.5.5 All costs involved in this inspection both from the manufacturer and this Section’s Work, will be included with the total tender price.

3.5.6 It will be the responsibility of this Section to assure that construction debris does not adversely affect any sensing devices installed as part of this Project. Should it be deemed necessary by
the Consulting Engineer, End-User, or authority having jurisdiction, this Section will be responsible for the cleaning of all smoke detectors prior to final acceptance.

3.6 **Third-Party Verification**

3.6.1 Verification shall be carried out in accordance to CAN/ULC-S537 Verification of Fire Alarm Systems. The Third-party verifier shall provide a Verification Certificate and Verification Report to show compliance with CAN/ULC-S537 Verification of Fire Alarm Systems.

3.6.2 Verification must be carried out by an agency (or individual) acceptable to the Authority Having Jurisdiction, who can demonstrate they have the sufficient training or experience, and who is not the installing contractor, fire alarm manufacturer, or involved in the design or installation of the fire alarm system.

3.6.3 All fire alarm system testing and verification will use only safe, non-damaging test methods in accordance with CAN/ULC-S536. Open flame or smoke will not be used for any on-site testing of detection devices for proper operation.

3.7 **Audibility Testing**

3.7.1 All rooms within the Scope of Work shall be tested with a professional sound level meter that has an accuracy of ± 1.5 dB. Sound level meter used in testing shall be the same for all areas of the building for both with alarm and without. Tester will be calibrated immediately before and after the audibility measurements are taken based on ANSI S1.40, Specifications for Acoustical Calibrators.

3.7.2 Sound level measurements shall be taken in accordance to CAN/ULC-524 Appendix C - Sound Level Measurements with the following additional requirements.

- .1 Tester will perform all tests with all doors and windows closed and when unusual noises are not present.
- .2 Tester will perform test to get ambient noise level without alarm to measure ambient sound level and perform the test again with the with alarm to measure alarm sound level.
- .3 All test results should be tabulated showing the following columns: room number/name, building code minimum sound level, ambient noise level, and alarm noise level

3.8 **Firewatch**

3.8.1 If during the course of construction, the fire alarm system or zones within the building are required to be fully or partially shut down for any period of time, Provide a Firewatch for all the affected areas in accordance with the Fire Code during that time period. This Firewatch should be in place for the entire duration of the shutdown.
3.9 **Sequence of Operation**

3.9.1 All fire safety within the building will follow the requirements set out in the building’s existing Fire Safety Plan.

3.9.2 The overall operation of the existing fire alarm panel will not change. All new or relocated devices added to the system shall function in the same manner as all other existing devices.

END OF SECTION
1. **GENERAL**

1.1 **Instructions**

1.1.1 Comply with Instructions to Bidders, the General Conditions of the Contract, Supplementary Conditions, requirements of Division 1 and The Region of Peel Document 2019-165T.

1.2 **Section Includes:**

1.2.1 Provide prefabricated louvered fences and all accessories for a complete installation.

1.3 **Related Work**

1.3.1 Mechanical Divisions for equipment requirements.

1.3.2 Structural Drawings for fencing support structure and foundations.

1.4 **Rejections**

1.4.1 Defective materials or quality of Work, whenever found, at any time prior to acceptance of the Work, shall be rejected regardless of previous inspection. Inspection will not relieve responsibility, but is a precaution against oversight or errors.

1.4.2 Remove and replace defective materials and Work affected by this replacement, at no additional cost to the Agency.

1.5 **Submittals**

1.5.1 Submittals under this Section shall be in accordance with Section 01 33 00 - Submittals.

1.5.2 Product Data:

   .1 Submit manufacturer's Product data sheets for Products proposed for use in the Work of this Section. Include printed technical data, installation instructions and general recommendations for all materials and components. Include certification indicating compliance of materials with project requirements

1.5.3 Shop Drawings:

   .1 Submit shop drawings indicating Fence Panels, posts, anchoring methods, components, gates, anchors and dimensions shall be clearly detailed on drawings.

1.5.4 Samples:

   .1 Submit samples for colour verification. Colour as selected from manufacture's full colour range by Consultant.

1.6 **Delivery, Storage And Handling**

1.6.1 Refer to Section 01 61 00 – Common Product Requirements.

1.6.2 Deliver and store materials undamaged in original cartons or wrappings.

1.6.3 Store material in a secure, dry area.
2. **PRODUCTS**

2.1 **Manufacturers**

2.1.1 Subject to conformance with the requirements of the Drawings, Schedules and Specifications, Products of other Manufacturers may be acceptable.

2.1.2 Submit all Substitutions in accordance with Section 01 25 00 – Substitution Procedures.

2.2 **Materials**

2.2.1 General: Provide new materials in perfect condition, free from defects impairing strength, durability or appearance.

2.2.2 Steel: to CAN/CSA-S136, identified as to specification, type, grade and mechanical properties; finished to ASTM A653/A653M, Z275 or ASTM A792/A792M, AZM150.

2.2.3 Bolts and Nuts: to ASTM A307 or ASTM A325M; hot-dipped galvanized, c/w washers.

2.2.4 Screws: Sheet metal type, minimum zinc coating of .008 mm. Other coatings providing equal or better corrosion protection may be used.

2.2.5 Welding electrodes shall be of the 480 MPa minimum tensile strength series (eg. E480XXX, E480S-X).

2.2.6 Carbon Steel: in conformance with AISI 1008

2.2.7 Louvered Panels

.1 Louver panels shall be 0.08 in. (2 mm) thick horizontal louvers welded to two vertical plates at the ends. Comply with AISI 1008 and ASTM A505-00 (2005).

.2 11ga. vertical plates are 0.12 in. (3 mm) thick and 2 in. (50 mm) wide. Vertical plates are heat-formed and comply with AISI 1008 and ASTM A505-00 (2005).

.3 8GA vertical wires, 0.16 in. (4.06 mm) AISI 1018 steel, in accordance with ASTM A853-04 (2010), are resistance-welded to the louvers. All these welded components create 5.20 in. x 1.80 in. (132 mm X 45.77 mm) screens in the panels.

.4 The cold-rolled steel bars tensile strength is 75000 psi (515 MPa) and breaking load is 1499 lb (680.0 kg) per bar.

.5 Louver shall have free area in accordance with AHU requirements, refer to mechanical sections.

.6 Louvers shall block 100 percent visibility of equipment from public view.

.7 Acceptable products and manufacturers:

.1 Omega100 Horizontal Louver Fence by Omega II Fence Systems.

.2 Or Agency approved equivalent.

2.2.8 Gates shall be of same construction welded to gate frames. All hinges, latches and accessories shall as recommended by the manufacturer.

2.2.9 Refer to Structural drawings for posts and structural supports.
2.2.10 Panel Tolerances:
   .1 The panel longitudinal curvature shall not exceed 1/200 of the frame length. The transverse curvature shall be less than or equal to 0.394 in. per 39.37 in. (10 mm per 1 m) of panel length.
   .2 The difference between the panel width at the top and the width at the bottom shall be less than 0.25 in. (6.4 mm).
   .3 The panel diagonals shall not present a difference of more than 0.25 in. (6.4 mm) in length.
   .4 The difference between centre to centre distances of horizontal bars shall not be more than 0.25 in. per 59.05 in. (6.4 mm per 1.5 m) of panel length.

2.3 Accessories
2.3.1 Attachment hardware:
   .1 The panels are secured to the posts with vertical plates.
   .2 Round posts: Galvanized 3/8 in. X 1 ½ in. (9.5 mm x 38 mm) carriage bolts and galvanized 3/8 in. (9.5 mm) nuts are required to secure panels to flat posts.
   .3 HSS: Galvanized 3/8 in. x 3 ½ in. (9.5 mm x 89 mm) carriage bolts and galvanized 3/8 in. (9.5 mm) nuts.
   .4 Louvered panels will require four (4) attachment points.

2.4 Finishes
2.4.1 Prefinished polyester coating shall be at least 4 mils (0.10 mm) thick applied by electrostatic process after fabrication. All panel and post surfaces must be coated. Post caps shall be coated with black polyester. A polyester finish is applied to bolts, nuts and washers for black fence projects. No polyester finish is applied to hardware components of any other color projects. Flat posts shall undergo a surface preparation treatment in conformity with SPC-SP 7 / NACE NO.4. This finish shall satisfy the following tests:
   .1 Mechanical Adhesion - ASTM D3359-09e2 - Method B
   .3 Salt Spray Resistance Tests (minimum 1000 hrs without red rust) – ASTM B117-11
   .4 Humidity Resistance - ASTM D2247-11
   .5 UV Light Exposure (1000-hr exposure at 145.4° F (63°C) without effect) - ASTM D1499-13 (Type E apparatus).

2.4.2 Color: Black

3. Execution
3.1 Examinations
3.1.1 Report to the Consultant, in writing, all defects of Work or unsatisfactory site conditions.
3.1.2 Do not commence the Work of this Division until surfaces, area, conditions specified or indicated on Drawings, to receive louvered fences are compatible with the manufacturer's installation requirements.
3.1.3 Commencement of Work implies total acceptance of all preliminary installation requirements by the Contractor.

3.1.4 Waive any after claims by failure to comply with the above procedure of examination.

3.2 Installation
3.2.1 Install all louvered fences in compliance with manufacturers written recommendations.

3.2.2 Install the fence along the specified layout according to the drawings.

3.2.3 The fence panel shall be installed to maintain a clear minimum distance of 1 ¼ in. (30 mm) and a maximum distance of 2 in. (50 mm) from the ground surface.

3.3 Cleaning and Protection
3.3.1 Upon completion of installation, remove all excess material, empty cartons, wrappings, etc. and remove any dirt spots and foreign material from the installed items, leaving them in a clean, usable condition.

3.4 Clean-up
3.4.1 Upon the completion of Work, remove from the site all surplus materials and debris caused by this Work and leave the site in a clean condition to the satisfaction of the Consultant.

END OF SECTION
TYPICAL HANDRAIL DETAIL - ELEVATION

38x6mm (1\frac{1}{2}\" x \frac{3}{8}\") FLAT BAR c/w VINYL COVER
O/A CROSS SECTION NOT TO EXCEED 45mm (1\frac{3}{4}\")

STANDARD WALL BRACKET LAGGED TO WALL @
1075mm (42\") O.C. (MAX)

LAG BOLTS

TYPICAL HANDRAIL DETAIL - SECTION

min. 50 [2\""]
max. 45 [1\frac{3}{4}\"]

38x6mm (1\frac{1}{2}\" x \frac{3}{8}\") FLAT BAR c/w VINYL COVER
O/A CROSS SECTION NOT TO EXCEED 45mm (1\frac{3}{4}\")

STANDARD WALL BRACKET LAGGED TO WALL @1075mm (42\") O.C. (MAX)

LINE OF WALL

WALTERFEDY

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scale: 1:2
sheet no.: 5003-10

CAD file: 5003-1a12
APPENDIX 5.11

SECTION THROUGH BARRIER FREE RAMP
HANDRAIL DETAIL

38mm (1½") STEEL PIPE BALUSTRADE
TRIM/CAP (IF REQUIRED)
SOLID CONC. BLOCK TOP COURSE
38mm (1½") STEEL PIPE HANDRAIL
WALL MOUNTED ON FLANGES
LAGGED TO MASONRY WALL

140mm (5½") CONC. BLOCK KNEEWALL
PAINTED

PREFIN. METAL REVEAL AND
EDGING TO RUBBER TILE FINISH
RUBBER TILE FINISH TO MATCH EXISTING,
RUN UP INTERIOR FACE OF NEW BLOCK
WALL TO LEVEL OF REVEAL
LINE OF EXISTING FLOOR AND STAIRS
TO BE REMOVED FOR NEW RAMP

10M @ 800 O/C GROUTED IN CORE
CONCRETE STRIP FOOTINGS
2–15M CONTINUOUS

scale: 1:10
sheet no.: 5005-1
The Walter Fedy Partnership, Architects and Engineers
Copyright © 2011 The Walter Fedy Partnership
**APPENDIX 5.11**

**NOTES LEGEND:**

1. **RECESSED SHELVING PILASTERS**
2. **PROVIDE VALANCE WHEREVER ELECTRICAL DRAWINGS INDICATE UNDER COUNTER LIGHT**
3. **INTERIOR GABLES AT MAX. 600mm (24") o/c**
4. **FOR PROJECT SPECIFIC BACKSPLASH AND NOISING PROFILES REFER TO SPEC.**
5. **FACE OF FRAME TO HAVE FINISH TO MATCH DOORS AND DRAWER FRONTS**
6. **19mm (3/4") PLYWOOD BASE FOR EACH UNIT FOR BASE FINISH REFER TO FINISHES PLAN**
7. **SINK BEYOND (IF APPLICABLE)**
8. **BULKHEAD FROM TOP OF CUPBOARD TO CEILING (TYPICAL FOR ALL UPPER CABINETS)**

**FOR MATERIALS REFER TO SPECIFICATION SECTION 6400**

**DETAIL SECTION: TYPICAL CUPBOARD**
- UPPER CABINET - OPEN SHELVING
- LOWER CABINET - CUPBOARD WITH DOOR
NOTES LEGEND:

1. RECESSED SHELVING PILASTERS
2. PROVIDE VALANCE WHEREVER ELECTRICAL DRAWINGS INDICATE UNDER COUNTER LIGHT
3. INTERIOR GABLES AT MAX. 600mm (24") o/c
4. FOR PROJECT SPECIFIC BACKSPLASH AND NOSING PROFILES REFER TO SPEC.
5. FACE OF FRAME TO HAVE FINISH TO MATCH DOORS AND DRAWER FRONTS
6. 19mm (3/4") PLYWOOD BASE FOR EACH UNIT FOR BASE FINISH REFER TO FINISHES PLAN
7. SINK BEYOND (IF APPLICABLE)
8. BULKHEAD FROM TOP OF CUPBOARD TO CEILING (TYPICAL FOR ALL UPPER CABINETS)
9. DRAWER
10. METAL DRAWER GUIDES

FOR MATERIALS REFER TO SPECIFICATION SECTION 6400
NOTES LEGEND:

1. ALL EXPOSED MILLWORK FACES TO BE FINISHED. REFER TO SPEC.

2. 13mm HIGH DENSITY PARTICLE BOARD ON 19x59mm WOOD FRAMING TO BE FINISHED. REFER TO SPEC.

GENERAL NOTES:

PRIOR TO COMMENCING WORK, CONTRACTOR TO SITE VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCY TO THE ARCHITECT.
NOTES LEGEND:

1. 6mm (¾") CLEAR POLISHED MIRROR PROVIDE CONTINUOUS CONCEALED SILICONE SEALANT AROUND ALL EDGES MAX. 3mm (⅜") JOINT

2. POST FORMED COUNTER TOP c/w WITH DOUBLE RADIUS NOSE AND BACK SPLASH. REFER TO SPECIFICATION. REFER TO ARCHITECTURAL DRAWINGS FOR LENGTH AND LOCATION OF VANITY.

3. P.LAM UP--STAND TO MATCH HEIGHT OF BACK SPLASH, BOTH ENDS OF COUNTER TOP. REFER TO SPECIFICATION

4. LAVATORY DIMENSIONS MUST COMPLY WITH O.B.C. UNIVERSAL TOILET ROOM DESIGN REQUIREMENTS (3.8.3.11.)

5. FRONT P. LAM FASCIA BOARD u/s AT 735mm (2’–5") LEVEL A.F.F., TYP.

6. 75x64x6mm (3"x2½"x¼") STEEL ANGLE FRAMING SUPPORT BRACKET w/ 50x64x6mm (2"x2½"x¼") FRONT ANGLE

7. CONTINUOUS 19mm (¾") P. LAM FASCIA BOARD FASTENED TO u/s OF COUNTER c/w CUT-OUTS AT SINKS

8. 19mm (¾") P.LAM. GABLE SUPPORT

9. 19mm (¾") P.LAM. BACKER BOARD

10. FRAMED WALLS:

11. MASONRY WALLS:

½" Ø x 16" LONG STEEL ROD WELDED TO BACK ANGLE. FILL VOID WITH CONCRETE

title: BARRIER FREE VANITY SECTION DETAIL

APPENDIX 5.11
GENERAL NOTES:

1. PRIOR TO COMMENCING WORK, CONTRACTOR TO SITE VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCY TO ARCHITECT

NOTES LEGEND:

1. 19mm(¾") PLYWOOD PLASTIC LAMINATE FINISH ON ALL EXPOSED FACES AND EDGES
2. 19mm(¾") PLYWOOD GABLES AT 1200mm(4’-0") O.C. PLASTIC LAMINATE FINISH ON ALL EXPOSED FACES AND EDGES
3. 25mm(1") Ø STAINLESS STEEL COAT ROD

TYPICAL COAT ROD AND SHELF

WALTERFEDY
LEGEND

1. Aluminum louvre, where indicated on door schedule.
2. Panic hardware, refer to door schedule
3. For glazing type, refer to door schedule

Maximum glass sizes (OBC 3.1.8.15):
- 0.0645 sq.m. - 150 x 430
- 0.0645 sq.m. - 100 x 645
- 0.8000 sq.m. - 600 x 1300

GENERAL NOTE:
Minimum door width to be 965mm, 1015mm with panic set.
LEGEND

1. Line of base below
2a. Provide "blueskin" membrane flashing, lap and seal to air/vapour barrier
2b. Provide "blueskin" membrane flashing, lap and seal to metal liner and to frame
3. Backer rod and sealant typical (keep sealant flush to edge of frame)
4a. Thermally broken insulated aluminum frame
4b. Thermally broken insulated hollow metal frame
5. Aluminum angle clips supplied by window contractor
6. Block lintel refer to structural drawings
7. Fill with grout (typical)
8. For base finish refer to finishes plan
9. Metal gable support as required
10. Concrete block below sill
11. G.W.B. wrap-around frame
12. Wood shim
13. Wood trim
14. Double stud
15. Steel stud
16. 16 [3/4"] gypsum board
17. Aluminum door, refer to spec.
18. Jamb anchor clip
19. Spot grout
20. 3-piece knock-down steel frame

GENERAL NOTE:
See spec for concrete block corner treatment

Title: DOOR FRAMING DETAILS
APPENDIX 5.11

Door head section detail

Typical H.M. frame floor junction

H.M. frame floor junction

H.M. frame at wall corner (typ.)

Refer to 8002-1 for Legend and Notes
DF19
Jamb - wide or heavy door

DF20
Jamb - standard door

DF21
Jamb - standard door

DF22
Jamb anchor clip

STEEL STUDS

RUNNER - FASTENED w/ SCREWS TO STRUCT. STUDS

LOCATE JAMB ANCHOR CLIPS ABOVE HINGE REINFORCEMENT, AND JUST BELOW TOP REINFORCEMENT - CLIPS ON STRIKE SIDECLIPS TO OCCUR DIRECTLY OPPOSITE HINGE SIDE.

FOR 3-PIECE FRAMES, PARTITION RUNNER ANCHORED WITH TWO SUITABLE FASTENERS.

FLOOR ANCHOR CLIPS SECURED WITH NO LESS THAN TWO SUITABLE FASTENERS

FRAME ELEVATION

SCALE 1:20

Refer to 8002-1 for Legend and Notes
WALL ASSEMBLY

OVERHEAD DOOR HARDWARE

DRIP FLASHING

305x305mm [12"x12"] DOCK SEAL

LINTEL AND 6mm [1/4"] THICK STEEL PLATE

6mm [1/4"] WRAP-AROUND BENT PLATE JAMBS
(76mm [3"] LEG)

INSULATED SECTIONAL OVERHEAD DOOR

T/O FLOOR SLAB

SECTION SCALE 1:20

PLAN DETAIL AT JAMB SCALE 1:10

DOCK SEAL

BENT METAL PLATE FRAME

ROLLING OVERHEAD DOOR ASSEMBLY

APPENDIX 5.11
## Finish Schedule

<table>
<thead>
<tr>
<th>Swatch</th>
<th>Tag</th>
<th>Material Type</th>
<th>Mfr.</th>
<th>Product Line/Number</th>
<th>Colour</th>
<th>Size</th>
<th>Notes</th>
</tr>
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<tbody>
<tr>
<td><img src="image1" alt="Plastic Laminate" /></td>
<td>PL1</td>
<td>Plastic Laminate</td>
<td>ARBORITE</td>
<td>P124 CA</td>
<td>TATAMI NEZUMI</td>
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<td><img src="image2" alt="Rubber Base" /></td>
<td>B6</td>
<td>Rubber Base</td>
<td>TARKETT</td>
<td>MILLWORK WALL BASE EQUINOX MW-179-R</td>
<td>82 BLACK PEARL</td>
<td>4&quot; HIGH</td>
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<td><img src="image3" alt="Wood Edge Banding" /></td>
<td>EB1</td>
<td>Wood Edge Banding</td>
<td>DOLLKEN</td>
<td>DESIGN LINE 3D 2-IN-1 ACRYLIC</td>
<td>3D59R2 GLASS/BRUSHED ALUMINUM</td>
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<td><img src="image4" alt="Plastic Laminate" /></td>
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<td>Plastic Laminate</td>
<td>WILSONART</td>
<td>4783-60</td>
<td>WHITE TRIGRIS</td>
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<td><img src="image5" alt="Quartz" /></td>
<td>QT1</td>
<td>Quartz</td>
<td>CORIAN</td>
<td>GROUP 3</td>
<td>GEO GRIGIO</td>
<td>3cm</td>
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<tr>
<td><img src="image6" alt="Quartz" /></td>
<td>QT2</td>
<td>Quartz</td>
<td>CORIAN</td>
<td>GROUP 1</td>
<td>STORM GREY</td>
<td>3cm</td>
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## FINISH SCHEDULE

**Project Name:** PEEL REGIONAL POLICE PHASE 1  
**Date:** 2019-10-23

**Location:** 7750 HURONTARIO ST. BRAMPTON ON  
**Issued For:**  

**Project No.:** 2018-0176-10

### COLOUR SWATCH

<table>
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<tr>
<th>TAG</th>
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<th>NOTES</th>
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</thead>
</table>
| SS1 | SOLID SURFACE ALTERNATE QT1 | CORIAN | GROUP 6 | NATURAL GREY | LOCATION: WASHROOM COUNTER TOP  
*AGENCY APPROVED EQUIVALENT MANUFACTURER AND PRODUCT. |
| PTC | PORCELAIN COUNTER TOP ALTERNATE TO QT1 | CROSSVILLE | | BALTIC POLISHED | LOCATION: COUNTER TOP WITH A SINK  
*AGENCY APPROVED EQUIVALENT MANUFACTURER AND PRODUCT. |

### 09 30 00 TILING

<table>
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<th>TAG</th>
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</thead>
</table>
| F3  | CERAMIC FLOOR TILE | UNICOM STARKER DISTRIBUTED BY HOLTEN IMPEX | ICON COMPACT | GUN POWDER | 12" x 24" | LOCATION: SEE FLOOR FINISH PLAN. INSTALL 70/30 RUNNING BOND  
*AGENCY APPROVED EQUIVALENT MANUFACTURER AND PRODUCT. |
| G1  | GROUT | LATICRETE | | STERLING SILVER 78 | | USE WITH F3, B3, P3 & P6 TILE  
*AGENCY APPROVED EQUIVALENT MANUFACTURER AND PRODUCT. |
| B3  | CERAMIC WALL TILE BASE | UNICOM STARKER DISTRIBUTED BY HOLTEN IMPEX | ICON COMPACT | GUN POWDER | 4" HIGH | USE SCHLUTER QUADE-K FINISHED EDGE TRIM SATIN ANODIZED ALUMINUM. USE WITH F3.  
*AGENCY APPROVED EQUIVALENT MANUFACTURER AND PRODUCT. POLISHED EXPOSED EDGES. |
| F4  | CERAMIC FLOOR TILE | UNICOM STARKER DISTRIBUTED BY HOLTEN IMPEX | ICON COMPACT | JET BLACK | 12" x 24" | LOCATION: SEE FLOOR FINISH PLAN. INSTALL 70/30 RUNNING BOND  
*AGENCY APPROVED EQUIVALENT MANUFACTURER AND PRODUCT. |
# FINISH SCHEDULE

**Project Name:** PEEL REGIONAL POLICE PHASE 1  
**Date:** 2019-10-23  
**Location:** 7750 HURONTARIO ST. BRAMPTON ON  
**Issued For:**  
**Project No.:** 2018-0176-10

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</thead>
</table>
| G2            | CERAMIC WALL TILE BASE | LATICRETE | ICON COMPACT | RAVEN 45 | 4" HIGH | USE WITH F4 TILE & B5 BASE.  
*AGENCY APPROVED EQUIVALENT MANUFACTURE AND PRODUCT.* |
| B5            | CERAMIC WALL TILE BASE | UNICOM STARKER DISTRIBUTED BY HOLTEN IMPEX | ICON COMPACT | JET BLACK | 4" HIGH | USE SCHLUTER QUADEC-K FINISHED EDGE TRIM SATIN ANODIZED ALUMINUM. USE WITH F4.  
*AGENCY APPROVED EQUIVALENT MANUFACTURER AND PRODUCT. POLISHED EXPOSED EDGES.* |
| P3            | CERAMIC WALL TILE | ROYAL MOSA DISTRIBUTED BY HOLTEN IMPEX | MOSA MURALS BLEND | BRIGHT WHITE STONE MATTE 31010 & BRIGHT WHITE PLAIN GLOSS 31510 | 12" x 24" | STACK BOND ALTERNATE ROWS WITH MATTE AND GLOSS TILES.  
*AGENCY APPROVED EQUIVALENT MANUFACTURER AND PRODUCT.* |
| P6            | CERAMIC WALL TILE | CENTURA | SCALE HEXAGON | WHITE POLISHED #HE21911 AND MATTE #HE21767 | 4" x 5" | RANDOM MIX OF 80% MATTE AND 20% POLISHED.  
*AGENCY APPROVED EQUIVALENT MANUFACTURER AND PRODUCT.* |
| F5            | NON SLIP CERAMIC FLOOR TILE | OLYMPIA TILE | QUEBEC SERIES | GRAPHITE | 2" x 2" | LOCATION: SHOWER FLOORS. REFER TO FLOOR FINISH PLAN.  
*AGENCY APPROVED EQUIVALENT MANUFACTURE AND PRODUCT.* |
| B4            | CERAMIC TILE COVE BASE | OLYMPIA TILE | QUEBEC SERIES | GRAPHITE | 2" x 2" | USE WITH F5.  
*AGENCY APPROVED EQUIVALENT MANUFACTURER AND PRODUCT.* |
# Project Name: Peel Regional Police Phase 1
## Date: 2019-10-23
### Location:
7750 Hurontario St. Brampton ON
### Issued For:

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<tr>
<td>Vinyl Sheet Flooring</td>
<td>F1</td>
<td>Tarkett</td>
<td>IQ Optima</td>
<td>Sidewalk 866</td>
<td>Sheet Field Colour</td>
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<td>Location: See Floor Finish Plan</td>
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<tr>
<td>Vinyl Sheet Flooring</td>
<td>F6</td>
<td>Tarkett</td>
<td>IQ Optima</td>
<td>Thunder Head 853</td>
<td>Hexagon Pattern</td>
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<tr>
<td>Rubber Flooring</td>
<td>F7</td>
<td>Mondo</td>
<td>Ramflex</td>
<td>Grey G707</td>
<td>24”x24” Interlocking Tile Format</td>
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<tr>
<td>Rubber Base</td>
<td>B1</td>
<td>Johnsonite</td>
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<td>Black Pearl 82</td>
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<td>Use with F1, F2, F6 and Millwork</td>
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<tr>
<td>Rubber Wall Base</td>
<td>B2</td>
<td>Johnsonite</td>
<td></td>
<td>Pewter 38</td>
<td>4” High</td>
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<td>Use with F7</td>
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</tbody>
</table>
## CEILING PAINT

**Tag:** C-3  
**Material Type:** SHERWIN WILLIAMS  
**Product Line/Number:** SW 7757  
**Colour:** HIGH REFLECTIVE WHITE  
**Notes:** *Finish: Flat*  
*Location: Gypsum Board*  
*Agency Approved Equivalent Manufacturer and Product.*

## WALL PAINT

**Tag:** P1  
**Material Type:** SHERWIN WILLIAMS  
**Product Line/Number:** SW 7647  
**Colour:** CRASHED ICE  
**Notes:** *Finish: Eggshell*  
*Location: Refer to Floor Finish Plan*  
*Or Approved Equivalent Manufacturer and Product.*

## ACCENT PAINT, DOOR & FRAME PAINT

**Tag:** P2  
**Material Type:** SHERWIN WILLIAMS  
**Product Line/Number:** SW 7017  
**Colour:** DORIAN GRAY  
**Notes:** *Finish: Varies*  
*Location: HM Doors & Frames, Gypsum Bd. Ceiling in Communications*  
*Agency Approved Equivalent Manufacturer and Product.*

## ACCENT CEILING PAINT

**Tag:** P4  
**Material Type:** SHERWIN WILLIAMS  
**Product Line/Number:** SW 6772  
**Colour:** CAY  
**Notes:** *Finish: Flat*  
*Location: Skylights*  
*Agency Approved Equivalent Manufacturer and Product.*
**FINISH SCHEDULE**

Project Name: PEEL REGIONAL POLICE PHASE 1  
Date: 2019-10-23  
Location: 7750 HURONTARIO ST. BRAMPTON ON  
Issued For:  
Project No.: 2018-0176-10

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<th>TAG</th>
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<th>COLOUR</th>
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<th>NOTES</th>
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<tbody>
<tr>
<td>P5</td>
<td>ACCENT WALL PAINT</td>
<td>ICI</td>
<td>10BB 15/154</td>
<td>SOARING EAGLE</td>
<td></td>
<td>FINISH: EGG SHELL LOCATION: REFER TO FINISH PLAN *AGENCY APPROVED EQUIVALENT MANUFACTURER AND PRODUCT.</td>
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**10 21 00 INTERIOR SPECIALTIES**

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<thead>
<tr>
<th>TP1</th>
<th>TOILET PARTITIONS</th>
<th>HADRIAN</th>
<th>900</th>
<th>BRUSHED STAINLESS STEEL</th>
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<td></td>
<td></td>
<td>*AGENCY APPROVED EQUIVALENT MANUFACTURER AND PRODUCT.</td>
</tr>
</tbody>
</table>
JAMB / CORNER INTERSECTION

- JAMB ANCHOR CLIP
- 110mm (3/8") TYPE 'S'
- PAN HEAD SCREWS
- SPOT GROUT
- METAL TRIM
- TYPE 'S' SCREWS

JAMB / WALL INTERSECTION

- JAMB ANCHOR CLIP
- SPOT GROUT
- OPTIONAL STUD
- STEEL STUD

ATTACH THIS PANEL AFTER DOOR JAMB IS ANCHORED TO WALL

APPENDIX 5.11
JUNCTION OF METAL STUD & GYPSUM BOARD PARTITION WITH U/S OF SUSPENDED GYPSUM BOARD CEILING.

INTERSECTION OF METAL STUD & GYPSUM BOARD PARTITION PASSING THROUGH ACOUSTIC CEILING.

INTERSECTION OF METAL STUD & GYPSUM WALL BOARD PARTITION PASSING THROUGH SUSPENDED GYPSUM BOARD CEILING.

JUNCTION OF METAL STUD & GYPSUM BOARD PARTITION WITH U/S OF SUSPENDED GYPSUM BOARD CEILING.
PLAN: DOUBLE ACOUSTIC PARTITION

SECTION: DOUBLE ACOUSTIC PARTITION - CEILING ATTACHMENT

SECTION: DOUBLE ACOUSTIC PARTITION - FLOOR ATTACHMENT

SECTION: SINGLE ACOUSTIC PARTITION - CEILING ATTACHMENT

SECTION: SINGLE ACOUSTIC PARTITION - FLOOR ATTACHMENT

APPENDIX 5.11
FIRE PROTECTION OF STEEL COLUMNS IS ECONOMICALLY ACHIEVED WITH LIGHTWEIGHT GYPSUM WALL BOARD SYSTEMS CONSISTING OF ONE OR MORE LAYERS GYPSUM WALL BOARD SCREW-ATTACHED TO FLANGES AND WEBS OF 41mm (1 1/2") ST TYPE STEEL STUDS LOCATED AT COLUMN CORNERS.
GYPSUM WALL BOARD PARTITION UNDER STEEL FRAMING - ONE-HOUR RATED

- STEEL DECK
- FIRESTOP CAULKING
- MINERAL WOOL INFILL IN DECK FLUTES
- 2 LAYERS OF 12.7mm (1/2") TYPE "X" GYPSUM WALL BOARD ON METAL FRAMING
- CORNER REINFORCEMENT
- 92mm (3 5/8") METAL STUDS AT 600mm (24") O.C.
- 15.9mm (5/8") TYPE 'X' GYPSUM WALL BOARD BOTH SIDES. ULC DESIGN No. W407 ON EACH (ONE HOUR RATING)

GYPSUM WALL BOARD PARTITION UNDER STEEL FRAMING - NON-RATED

- ROOF OR FLOOR STRUCTURE
- FLUTE CLOSURE WHEN STEEL DECK OCCURS
- STEEL BEAM OR JOIST
- 15.9mm (5/8") GYPSUM WALL BOARD ON METAL FRAMING TAPE & FILL JOINTS
- CORNER REINFORCEMENT
- METAL STUD AND GYPSUM WALL BOARD PARTITION
JUNCTION OF GYPSUM WALL BOARD PARTITION WITH FIRE DAMPER OPENING

DAMPER SLEEVE AND RETAINING RING
MINERAL WOOL
GYPSUM WALL BOARD FILLER PIECES TO BE INSTALLED AROUND ENTIRE OPENING AND SCREWED 300mm (12") O.C. TO WEB OF RUNNERS AND STUDS
STUD OR RUNNER
METAL STUD AND GYPSUM WALL BOARD PARTITION

JUNCTION OF GYPSUM WALL BOARD PARTITION WITH WALL OF ANOTHER MATERIAL

CAULKING
METAL STUD AND GYPSUM WALL BOARD PARTITION

Title:
METAL STUD AND GYPSUM WALL BOARD PARTITIONS ABUTTING VARIOUS CONDITIONS JUNCTION DETAILS
CERAMIC TILE AT SHOWER TRENCH

HEIGHT OF TRENCH VARIES – MIN. 50mm (2") TO MAX. 100mm (4") AT MID POINT OF DRAIN

50x50mm (2"x2") UNGLAZED FLOOR TILE ON THIN SET OR MORTAR BED

USE MORTAR BED TO ACHIEVE SLOPE IN TRENCH

CERAMIC TILE AT FLOOR DRAIN

CUT TILE AS REQUIRED

MORTAR BED TO PRODUCE SLOPE AND BRING FINISHED TILE FLUSH WITH DRAIN EDGE.

WHERE CONCRETE SLAB IS SLOPED, PROVIDE MORTAR BED OR LEVELLER TO PRODUCE FINAL SLOPE.
**GENERAL NOTES:**

A. ALL GRAB BARS INSTALLED SHALL RESIST A VERTICAL OR HORIZONTAL LOAD OF AT LEAST 1.3KN (300lb.)

B. ALL GRAB BARS SHALL HAVE SLIP RESISTANT SURFACE

C. DISTANCE IN PLAN VIEW FROM CENTRELINE OF TOILET TO WALL WITH GRAB BARS SHALL BE 460min. - 480max. (18½" min. - 18¾" max.)

**NOTES LEGEND:**

1. 38Φ(1½") GRAB BAR 610(24") LONG, CENTRED OVER TOILET. IN NO CASE SHALL THE BAR INTERFERE WITH THE TOILET SEAT LID IN THE UP POSITION

2. 38Φ(1½") 'L' SHAPED GRAB BAR 760(30") LONG IN BOTH DIRECTIONS. CLEARANCE FROM WALL SHALL BE 50(2").

3. LOCATE TOILET TISSUE DISPENSER WITHIN AREA SHOWN BY DASHED LINES. NOT MORE THAN 300(12") FROM FRONT EDGE OF TOILET TO DISPENSER.

4. TOILET SEAT LID REQUIRED

5. TOILET AS SPECIFIED
GENERAL NOTES:

A. ALL GRAB BARS INSTALLED SHALL RESIST A VERTICAL OR HORIZONTAL LOAD OF AT LEAST 1.3KN (300lb.)

B. ALL GRAB BARS SHALL HAVE SLIP RESISTANT SURFACE

C. DISTANCE IN PLAN VIEW FROM CENTRELINE OF TOILET TO WALL WITH GRAB BARS SHALL BE 460min.–480max. (18½"min.–18½"max.)

NOTES LEGEND:

1. 38Ø(1½") GRAB BAR 610(24") LONG, CENTRED OVER TOILET. IN NO CASE SHALL THE BAR INTERFERE WITH THE TOILET SEAT LID IN THE UP POSITION

2. 38Ø(1½") ‘L’ SHAPED GRAB BAR 760(30") LONG IN BOTH DIRECTIONS. CLEARANCE FROM WALL SHALL BE 50(2”).

3. LOCATE TOILET TISSUE DISPENSER WITHIN AREA SHOWN BY DASHED LINES. NOT MORE THAN 300(12”) FROM FRONT EDGE OF TOILET TO DISPENSER.

4. TOILET SEAT LID REQUIRED

5. TOILET AS SPECIFIED
BARRIER-FREE LAVATORY MOUNTING HEIGHTS AND DISTANCES

NOTE: LAVATORY MAY BE MOUNTED IN A VANITY PROVIDED THE ABOVE CLEARANCES ARE MAINTAINED AND A CLEAR WIDTH OF 920mm (3'-0") IS PROVIDED UNDER THE VANITY FOR WHEELCHAIR ACCESS.
ELECTRIC HAND DRYER / PAPER TOWEL DISPENSER

TOILET PAPER DISPENSER

TOILET PAPER DISPENSER (BARRIER-FREE)

ACCESS PANEL COVER AT VALVE LOCATION

SANITARY NAPKIN DISPENSER

SANITARY NAPKIN DISPOSAL

SANITARY NAPKIN DISPOSAL BARRIER-FREE

'L' GRAB BAR

610 GRAB BAR

610 GRAB BAR

MIRROR ABOVE VANITY

MIRROR ABOVE VANITY - BARRIER-FREE

COAT HOOK WITH BUMPER FOR STANDARD STALLS

ROBE HOOK

ROBE HOOK - BARRIER-FREE
10. Utility shelf at custodian rooms

11. Mop / broom holder at custodian rooms

12. Emergency call switch (see electrical documents)

13. Push button for powered door operator

14. Toilet partition

15. Urinal partition

16A. Urinal

16B. Urinal - barrier free

Note: For barrier free lavatory mounting requirements refer to detail 10000-5
## Schedule of Finish Hardware

**ARCHITECT/DESIGNER:**
WALTERFEDY  
675 QUEEN STREET SOUTH  
KITCHENER ON N2M 1A1  
PHONE  -  519-576-2150  
FAX  -  519-576-5499

**CONTRACTOR:**
PEEL REGIONAL POLICE PHASE 1  
7750 HURONTARIO STREET  
BRAMPTON ON  
PHONE  -  437-925-6786  
FAX  -

**PROJECT:**
PEEL REGIONAL POLICE PHASE 1 - ISSUED FOR BID (180)  
180 DERRY ROAD EAST  
MISSISSAUGA ON L5T 2Y5  
4018

**PROJECT CONSULTANT:**
ROB TOMCHICK

**PREPARED:**
October 28, 2019

**REVISED:**
October 12, 2019  SECOND DRAFT  
August 05, 2019  FIRST DRAFT
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CARD ACCESS BY SECURITY

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<th>1 SGL DOOR B005A CORRIDOR B017 FROM COMMUNICATIONS OFFICE B006</th>
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CARD ACCESS BY SECURITY
### HARDWARE SCHEDULE - CODE # 4018

PEEL REGIONAL POLICE PHASE 1 ISSUED FOR BID (180)

180 DERRY ROAD EAST

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CARD ACCESS BY SECURITY

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<td>1     WALL STOP</td>
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<td>1     WEATHER STRIPPING</td>
<td>W-22 X 17-2 X BL</td>
<td></td>
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<tr>
<td>1     AUTO DOOR BOTTOM</td>
<td>CT-52F X 965MMOA</td>
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### HARDWARE SCHEDULE - CODE # 4018

PEEL REGIONAL POLICE PHASE 1 ISSUED FOR BID (180)
180 DERRY ROAD EAST

#### Heading # 076

1 SGL DOOR B009 CORRIDOR B017 TO INSPECTOR B009

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Qty</th>
<th>Model</th>
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<tbody>
<tr>
<td>4</td>
<td>90° LH AR-3</td>
<td>965 x 2150 x 45 WD Door/ HMF Frame</td>
<td>NON-RTD Door/NON-RTD Frame</td>
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<tr>
<td>3</td>
<td>HVY WEIGHT HINGE</td>
<td>CB168 114MM X 114MM</td>
<td>26D</td>
<td>STA</td>
</tr>
<tr>
<td>1</td>
<td>OFFICE LEVER</td>
<td>28-10G05 X LL X KD X LA</td>
<td>US26D</td>
<td>SAR</td>
</tr>
<tr>
<td>1</td>
<td>CYLINDER</td>
<td>V65673-COMP X 51</td>
<td>626</td>
<td>ASSA</td>
</tr>
<tr>
<td>1</td>
<td>WALL STOP</td>
<td>GSH 240</td>
<td>C32D</td>
<td>GAL</td>
</tr>
<tr>
<td>1</td>
<td>WEATHER STRIPPING</td>
<td>W-22 X 17-2 X BL</td>
<td>KNC</td>
<td></td>
</tr>
<tr>
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#### Heading # 077

1 SGL DOOR B010 CORRIDOR B017 TO STORAGE B010

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<tbody>
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<td>HVY WEIGHT HINGE</td>
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<td>26D</td>
<td>STA</td>
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<tr>
<td>1</td>
<td>STOREROOM LEVER</td>
<td>28-10G04 X LL X KA</td>
<td>US26D</td>
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<tr>
<td>1</td>
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<td>V65673-COMP X 51</td>
<td>626</td>
<td>ASSA</td>
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<tr>
<td>1</td>
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<td>GSH 240</td>
<td>C32D</td>
<td>GAL</td>
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#### Heading # 078

1 SGL DOOR B011 CORRIDOR B017 TO COMMUNICATIONS SUPPORT SUPERVISOR B011

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<td>NON-RTD Door/NON-RTD Frame</td>
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<td>HVY WEIGHT HINGE</td>
<td>CB168 114MM X 114MM</td>
<td>26D</td>
<td>STA</td>
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<tr>
<td>1</td>
<td>OFFICE LEVER</td>
<td>28-10G05 X LL X KD X LA</td>
<td>US26D</td>
<td>SAR</td>
</tr>
<tr>
<td>1</td>
<td>CYLINDER</td>
<td>V65673-COMP X 51</td>
<td>626</td>
<td>ASSA</td>
</tr>
<tr>
<td>1</td>
<td>WALL STOP</td>
<td>GSH 240</td>
<td>C32D</td>
<td>GAL</td>
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Page 7 of 11
# HARDWARE SCHEDULE - CODE # 4018

PEEL REGIONAL POLICE PHASE 1 ISSUED FOR BID (180)
180 DERRY ROAD EAST

### Heading # 079

**1 SGL DOOR B012 CORRIDOR B017 TO QUIET ROOM B012**

<table>
<thead>
<tr>
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<th>Model/Details</th>
<th>Quantity</th>
<th>Hinge Type</th>
<th>Strike Type</th>
</tr>
</thead>
<tbody>
<tr>
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<td>CB168 114MM X 114MM</td>
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<tr>
<td>OFFICE LEVER</td>
<td>28-10G05 X LL X KD X LA</td>
<td>1</td>
<td>US26D</td>
<td>SAR</td>
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<tr>
<td>CYLINDER</td>
<td>V65673-COMP X 51</td>
<td>1</td>
<td>626</td>
<td>ASSA</td>
</tr>
<tr>
<td>WALL STOP</td>
<td>GSH 240</td>
<td>1</td>
<td>C32D</td>
<td>GAL</td>
</tr>
<tr>
<td>WEATHER STRIPPING</td>
<td>W-22 X 17-2 X BL</td>
<td>1</td>
<td></td>
<td></td>
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<td>AUTO DOOR BOTTOM</td>
<td>CT-52F X 965MMOA</td>
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<td>CLEAR</td>
<td>KNC</td>
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</table>

**965 x 2150 x 45 WD Door/ HMF Frame**

<table>
<thead>
<tr>
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<th>Model/Details</th>
<th>Quantity</th>
<th>Strike Type</th>
<th>Hinge Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>HVY WEIGHT HINGE</td>
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### Heading # 080

**1 SGL DOOR B013 CORRIDOR B017 TO MALE WASHROOM B013**

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<th>Strike Type</th>
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</thead>
<tbody>
<tr>
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<td>7900CL (CLASSROOM DEADLOCK)</td>
<td>1</td>
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<td>ASSA</td>
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<tr>
<td>PUSH PLATE</td>
<td>GSH 81A X 2-SIDED TAPE X 508MMW X 127MMH</td>
<td>1</td>
<td></td>
<td>C32D</td>
</tr>
<tr>
<td>PULL HANDLE</td>
<td>4712-2 X THROUGH BOLT MOUNTING</td>
<td>1</td>
<td></td>
<td>C32D</td>
</tr>
<tr>
<td>DOOR CLOSER</td>
<td>1461 X RW/PA X SRT</td>
<td>1</td>
<td>AL</td>
<td>LCN</td>
</tr>
<tr>
<td>KICK PLATE</td>
<td>GSH 80A X 203MM X 927MM</td>
<td>1</td>
<td></td>
<td>C32D</td>
</tr>
<tr>
<td>WALL STOP</td>
<td>GSH 240</td>
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</table>

**965 x 2150 x 45 WD Door/ HMF Frame**

<table>
<thead>
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<th>Model/Details</th>
<th>Quantity</th>
<th>Strike Type</th>
<th>Hinge Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>HVY WEIGHT HINGE</td>
<td>CB168 114MM X 114MM</td>
<td>3</td>
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### Heading # 081

**1 SGL DOOR B014 CORRIDOR B017 TO FEMALE WASHROOM B014**

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<tr>
<td>PUSH PLATE</td>
<td>GSH 81A X 2-SIDED TAPE X 508MMW X 127MMH</td>
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<td>C32D</td>
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<td>PULL HANDLE</td>
<td>4712-2 X THROUGH BOLT MOUNTING</td>
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<td></td>
<td>C32D</td>
</tr>
<tr>
<td>DOOR CLOSER</td>
<td>1461 X RW/PA X SRT</td>
<td>1</td>
<td>AL</td>
<td>LCN</td>
</tr>
<tr>
<td>KICK PLATE</td>
<td>GSH 80A X 203MM X 927MM</td>
<td>1</td>
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<td>C32D</td>
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<tr>
<td>WALL STOP</td>
<td>GSH 240</td>
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## HARDWARE SCHEDULE - CODE # 4018

PEEL REGIONAL POLICE PHASE 1 ISSUED FOR BID (180)

180 DERRY ROAD EAST

<table>
<thead>
<tr>
<th>Heading # 082</th>
<th>1 SGL DOOR B017 EXISTING CORRIDOR FROM CORRIDOR B017</th>
<th>90° LHR TBA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>965 x 2150 x 45 WD Door/ HMF Frame</strong></td>
<td>Non-RTD Door/NON-RTD Frame</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>HVY WEIGHT HINGE CB168 114MM X 114MM</td>
<td>26D STA</td>
</tr>
<tr>
<td>1</td>
<td>STOREROOM LEVER 28-10G04 X LL X KA</td>
<td>US26D SAR</td>
</tr>
<tr>
<td>1</td>
<td>CYLINDER V65673-COMP X 51</td>
<td>626 ASSA</td>
</tr>
<tr>
<td>1</td>
<td>ELECTRIC STRIKE 5000C-12/24D-630</td>
<td>630 ESH</td>
</tr>
<tr>
<td>1</td>
<td>DOOR CLOSER 1461 X RW/PA X SRT</td>
<td>AL LCN</td>
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<tr>
<td>1</td>
<td>KICK PLATE GSH 80A X 203MM X 927MM</td>
<td>C32D GAL</td>
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<tr>
<td>1</td>
<td>WALL STOP GSH 240</td>
<td>C32D GAL</td>
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<tr>
<td><strong>CARD ACCESS BY SECURITY</strong></td>
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<table>
<thead>
<tr>
<th>Heading # 083</th>
<th>1 PR DOORS B017A CORRIDOR B017 FROM CLOSET</th>
<th>90° RHRA AR-1</th>
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<tbody>
<tr>
<td><strong>915/915 x 2150 x 45 WD Door/ HMF Frame</strong></td>
<td>Non-RTD Door/NON-RTD Frame</td>
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</tr>
<tr>
<td>6</td>
<td>STD WEIGHT HINGE CB179 114MM X 114MM</td>
<td>26D STA</td>
</tr>
<tr>
<td>2</td>
<td>FLUSH BOLT, MANUAL, EXTENSION FB457-12</td>
<td>US26D IVE</td>
</tr>
<tr>
<td>1</td>
<td>DUST PROOF STRIKE DP2</td>
<td>US26D IVE</td>
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<tr>
<td>1</td>
<td>STOREROOM LEVER 28-10G04 X LL X KA</td>
<td>US26D SAR</td>
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<tr>
<td>1</td>
<td>CYLINDER V65673-COMP X 51</td>
<td>626 ASSA</td>
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<tr>
<td>2</td>
<td>OH STOP 904S</td>
<td>652 GLY</td>
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<table>
<thead>
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<tbody>
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<td><strong>965 x 2150 x 45 WD Door/ HMF Frame</strong></td>
<td>Non-RTD Door/NON-RTD Frame</td>
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<tr>
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<td>HVY WEIGHT HINGE CB168 114MM X 114MM</td>
<td>26D STA</td>
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<tr>
<td>1</td>
<td>STOREROOM LEVER 28-10G04 X LL X KA</td>
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<tr>
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<td>CYLINDER V65673-COMP X 51</td>
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<tr>
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<td>ELECTRIC STRIKE 5000C-12/24D-630</td>
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<tr>
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<td>DOOR CLOSER 1461 X RW/PA X SRT</td>
<td>AL LCN</td>
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<tr>
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<td>KICK PLATE GSH 80A X 203MM X 927MM</td>
<td>C32D GAL</td>
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<tr>
<td>1</td>
<td>WALL STOP GSH 240</td>
<td>C32D GAL</td>
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<tr>
<td><strong>CARD ACCESS BY SECURITY</strong></td>
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## HARDWARE SCHEDULE - CODE # 4018

PEEL REGIONAL POLICE PHASE 1 ISSUED FOR BID (180)

180 DERRY ROAD EAST

### Heading # 085

1 PR DOORS B017C CORRIDOR B017 FROM CLOSET

<table>
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<th>Quantity</th>
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<th>Type</th>
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</thead>
<tbody>
<tr>
<td>STD WEIGHT HINGE</td>
<td>6</td>
<td>CB179 114MM X 114MM</td>
<td>26D</td>
<td>STA</td>
</tr>
<tr>
<td>FLUSH BOLT, MANUAL, EXTENSION</td>
<td>2</td>
<td>FB457-12</td>
<td>US26D</td>
<td>IVE</td>
</tr>
<tr>
<td>DUST PROOF STRIKE</td>
<td>1</td>
<td>DP2</td>
<td>US26D</td>
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</tr>
<tr>
<td>STOREROOM LEVER</td>
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<td>28-10G04 X LL X KA</td>
<td>US26D</td>
<td>SAR</td>
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<tr>
<td>CYLINDER</td>
<td>1</td>
<td>V65673-COMP X 51</td>
<td>626</td>
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<tr>
<td>OH STOP</td>
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### Heading # 086

1 SGL DOOR B018 CORRIDOR TO SWITCHBOARD B018

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<td>US26D</td>
<td>SAR</td>
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<td>CYLINDER</td>
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<tr>
<td>ELECTRIC STRIKE</td>
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<td>AUTO DOOR BOTTOM</td>
<td>1</td>
<td>CT-52F X 965MMOA</td>
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</table>

CARD ACCESS BY SECURITY.
REUSE EXISTING FRAME, DOOR, HINGES, CLOSER AND STOP

### Heading # 087

1 SGL DOOR 2059 SECOND FLOOR ADMIN TO SUPERINTENDENT

<table>
<thead>
<tr>
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<th>Quantity</th>
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<th>Brand</th>
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</thead>
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<tr>
<td>HVY WEIGHT HINGE</td>
<td>3</td>
<td>CB168 114MM X 114MM</td>
<td>26D</td>
<td>STA</td>
</tr>
<tr>
<td>OFFICE LEVER</td>
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<td>28-10G05 X LL X KD X LA</td>
<td>US26D</td>
<td>SAR</td>
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<tr>
<td>CYLINDER</td>
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<td>V65673-COMP X 51</td>
<td>626</td>
<td>ASSA</td>
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<td>WALL STOP</td>
<td>1</td>
<td>GSH 240</td>
<td>C32D</td>
<td>GAL</td>
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<td>WEATHER STRIPPING</td>
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</table>
# HARDWARE SCHEDULE - CODE # 4018

PEEL REGIONAL POLICE PHASE 1 ISSUED FOR BID (180)
180 DERRY ROAD EAST

## Heading # 088

**1 SGL DOOR 2056 SECOND FLOOR ADMIN FROM FILE STORAGE**

<table>
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</tr>
<tr>
<td>1</td>
<td>CYLINDER</td>
<td>V65673-COMP X 51</td>
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<tr>
<td>1</td>
<td>ELECTRIC STRIKE</td>
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<tr>
<td>1</td>
<td>DOOR CLOSER</td>
<td>1461 X RW/PA X SRT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>KICK PLATE</td>
<td>GSH 80A X 203MM X 927MM</td>
<td></td>
<td></td>
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<tr>
<td>1</td>
<td>WALL STOP</td>
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CARD ACCESS BY SECURITY

## Heading # 089

**1 SGL DOOR 2055 SECOND FLOOR ADMIN FROM BOARDROOM**

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<td>HYV WEIGHT HINGE</td>
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<td>695 x 2150 x 45 EXST Door/ EXST Frame</td>
<td>NON-RTD Door/NON-RTD Frame</td>
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<td>OFFICE LEVER</td>
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<tr>
<td>1</td>
<td>CYLINDER</td>
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<tr>
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<tr>
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<td>KICK PLATE</td>
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<td></td>
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<tr>
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Card Access by Security
Schedule of Finish Hardware

ARCHITECT/DESIGNER: WALTERFEDY
675 QUEEN STREET SOUTH
KITCHENER ON N2M 1A1
PHONE - 519-576-2150
FAX - 519-576-5499

CONTRACTOR: PEEL REGIONAL POLICE PHASE 1
7750 HURONTARIO STREET
BRAMPTON ON
PHONE - 437-925-6786

PROJECT: PEEL REGIONAL POLICE PHASE 1 - ISSUED FOR BID (7750)
7750 HURONTARIO STREET
BRAMPTON ON L6Y 3W6
3923

PROJECT CONSULTANT: ROB TOMCHICK

PREPARED: October 28, 2019

REVISED: October 14, 2019 2ND DRAFT
August 05, 2019 FIRST DRAFT
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### HARDWARE SCHEDULE - CODE # 3923

**PEEL REGIONAL POLICE PHASE 1 ISSUED FOR BID (7750)**

**7750 HURONTARIO STREET**

#### Heading # 001

**1 SGL DOOR 1001 CORRIDOR 1027 TO ROAD SAFETY-OLD FLEET 1001**

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**965 x 2150 x 45 HMD Door/ HMF Frame**

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<td>OFFICE LEVER</td>
<td>28-10G05 X LL X KD X LA</td>
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<td>V65673-COMP X 51</td>
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<td>DOOR CLOSER</td>
<td>1461 X RW/PA X SRT</td>
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<tr>
<td>1</td>
<td>KICK PLATE</td>
<td>GSH 80A X 203MM X 927MM</td>
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<td>GSH 240</td>
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**45 MIN Door/45 MIN Frame**

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#### Heading # 002

**1 SGL DOOR 1002 CORRIDOR 1027 TO MENS LOCKER 1002**

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**965 x 2150 x 45 HMD Door/ HMF Frame**

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<td>1461 X RW/PA X SRT</td>
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<td>KICK PLATE</td>
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**NON-RTD Door/NON-RTD Frame**

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**1 SGL DOOR 1003 MENS LOCKER 1002 TO MENS WASHROOM 1003**

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**965 x 2150 x 45 HMD Door/ HMF Frame**

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**NON-RTD Door/NON-RTD Frame**

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### HARDWARE SCHEDULE - CODE # 3923

#### PEEL REGIONAL POLICE PHASE 1 ISSUED FOR BID (7750)

#### 7750 HURONTARIO STREET

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<td>AL LCN</td>
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<td>C32D GAL</td>
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# Appendix 5.13

## HARDWARE SCHEDULE - CODE # 3923

**Peel Regional Police Phase 1 Issued for bid (7750)**  
**7750 Hurontario Street**

### Heading # 008

1 SGL DOOR 1008A Corridor 1008 from Women's Lockers 1004

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<td>GAL</td>
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### Heading # 010

1 SGL DOOR 1009 Road Safety Enforcement Office 1023 to Quiet Room 1009

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<tbody>
<tr>
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<td>HVY Weight Hinge</td>
<td>CB168 114MM X 114MM</td>
<td>26D</td>
<td>STA</td>
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<tr>
<td>1</td>
<td>Office Lever</td>
<td>28-10G05 X LL X KD X LA</td>
<td>US26D</td>
<td>SAR</td>
</tr>
<tr>
<td>1</td>
<td>Cylinder</td>
<td>V65673-COMP X 51</td>
<td>626</td>
<td>ASSA</td>
</tr>
<tr>
<td>1</td>
<td>Wall Stop</td>
<td>GSH 240</td>
<td>C32D</td>
<td>GAL</td>
</tr>
<tr>
<td>1</td>
<td>Weather Stripping</td>
<td>W-22 X 17-2 X BL</td>
<td>KNC</td>
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</tr>
<tr>
<td>1</td>
<td>Auto Door Bottom</td>
<td>CT-52F X 965MMOA</td>
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### Heading # 011

1 SGL DOOR 1010 Road Safety Enforcement Office 1023 to Impaired Driving Lab 1010

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<tr>
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<td>26D</td>
<td>STA</td>
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<tr>
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<td>Office Lever</td>
<td>28-10G05 X LL X KD X LA</td>
<td>US26D</td>
<td>SAR</td>
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<td>1</td>
<td>Cylinder</td>
<td>V65673-COMP X 51</td>
<td>626</td>
<td>ASSA</td>
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<td>1</td>
<td>Wall Stop</td>
<td>GSH 240</td>
<td>C32D</td>
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<td>Weather Stripping</td>
<td>W-22 X 17-2 X BL</td>
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<tr>
<td>1</td>
<td>Auto Door Bottom</td>
<td>CT-52F X 965MMOA</td>
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### HARDWARE SCHEDULE - CODE # 3923

#### PEEL REGIONAL POLICE PHASE 1 ISSUED FOR BID (7750)

**7750 HURONTARIO STREET**

#### Heading # 012

1 SGL DOOR 1011 CORRIDOR 1027 TO EQUIPMENT 1011

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<td>STOREROOM LEVER</td>
<td>28-10G04 X LL X KA</td>
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<td>ASSACYLINDER</td>
<td>V65673-COMP X 51</td>
<td>ASSA</td>
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<td>WALL STOP</td>
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#### Heading # 013

1 SGL DOOR 1012 CORRIDOR 1027 TO OFFICE SUPPLIES 1012

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<td>STOREROOM LEVER</td>
<td>28-10G04 X LL X KA</td>
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<td>ASSACYLINDER</td>
<td>V65673-COMP X 51</td>
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<td>GSH 240</td>
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#### Heading # 014

1 SGL DOOR 1013 CORRIDOR 1027 TO FIRST AID ROOM 1013

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<td>3</td>
<td>STOREROOM LEVER</td>
<td>28-10G04 X LL X KA</td>
<td>SAR</td>
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<tr>
<td>1</td>
<td>ASSACYLINDER</td>
<td>V65673-COMP X 51</td>
<td>ASSA</td>
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<td>WALL STOP</td>
<td>GSH 240</td>
<td>GAL</td>
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### HARDWARE SCHEDULE - CODE # 3923

**PEEL REGIONAL POLICE PHASE 1 ISSUED FOR BID (7750)**

**7750 HURONTARIO STREET**

#### Heading # 015

1 SGL DOOR 1014 ROAD SAFETY ENFORCEMENT OFFICE 1023 TO PARADE ROOM 1014

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<thead>
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<th>Item</th>
<th>Description</th>
<th>Model/Part Number</th>
<th>Angle</th>
<th>Orientation</th>
<th>Code</th>
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<th>NON-RTD Door/NON-RTD Frame</th>
<th>26D</th>
<th>STA</th>
</tr>
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<tbody>
<tr>
<td>3 Hvy Weight Hinge</td>
<td>CB168 114MM X 114MM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Office Lever</td>
<td>28-10G05 X LL X KD X LA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Cylinder</td>
<td>V65673-COMP X 51</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Door Closer</td>
<td>4040XPH X RW/PA X SRT</td>
<td></td>
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</tr>
<tr>
<td>1 Kick Plate</td>
<td>GSH 80A X 203MM X 927MM</td>
<td></td>
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</tr>
<tr>
<td>1 Wall Stop</td>
<td>GSH 240</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 Weather Stripping</td>
<td>W-22 X 17-2 X BL</td>
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<tr>
<td>1 Auto Door Bottom</td>
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#### Heading # 016

1 SGL DOOR 1014A ROAD SAFETY ENFORCEMENT OFFICE 1023 TO PARADE ROOM 1014

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<th>615 x 2150 x 45 HMD Door/ HMF Frame</th>
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<th>26D</th>
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<tbody>
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<td>3 Hvy Weight Hinge</td>
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<tr>
<td>1 Office Lever</td>
<td>28-10G05 X LL X KD X LA</td>
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<tr>
<td>1 Cylinder</td>
<td>V65673-COMP X 51</td>
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<tr>
<td>1 Door Closer</td>
<td>4040XPH X RW/PA X SRT</td>
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<tr>
<td>1 Kick Plate</td>
<td>GSH 80A X 203MM X 927MM</td>
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<td>1 Wall Stop</td>
<td>GSH 240</td>
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<tr>
<td>1 Weather Stripping</td>
<td>W-22 X 17-2 X BL</td>
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<td>1 Auto Door Bottom</td>
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#### Heading # 017

1 SGL DOOR 1015 ROAD SAFETY ENFORCEMENT OFFICE 1023 TO LIDAR 1015

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<th>615 x 2150 x 45 HMD Door/ HMF Frame</th>
<th>NON-RTD Door/NON-RTD Frame</th>
<th>26D</th>
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<tbody>
<tr>
<td>3 Hvy Weight Hinge</td>
<td>CB168 114MM X 114MM</td>
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</tr>
<tr>
<td>1 Office Lever</td>
<td>28-10G05 X LL X KD X LA</td>
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<tr>
<td>1 Cylinder</td>
<td>V65673-COMP X 51</td>
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<tr>
<td>1 Wall Stop</td>
<td>GSH 240</td>
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<tr>
<td>1 Weather Stripping</td>
<td>W-22 X 17-2 X BL</td>
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<tr>
<td>1 Auto Door Bottom</td>
<td>CT-52F X 965MMOA</td>
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HARDWARE SCHEDULE - CODE # 3923

PEEL REGIONAL POLICE PHASE 1 ISSUED FOR BID (7750)
7750 HURONTARIO STREET

Heading # 018
1 SGL DOOR 1016 ROAD SAFETY ENFORCEMENT OFFICE 1023 TO STAFF SERGEANT ENF. 1016

<table>
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<tbody>
<tr>
<td>3</td>
<td>HVY WEIGHT HINGE</td>
<td>CB168 114MM X 114MM</td>
<td>26D</td>
<td>STA</td>
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<tr>
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<td>28-10G05 X LL X KD X LA</td>
<td>US26D</td>
<td>SAR</td>
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<tr>
<td>1</td>
<td>CYLINDER</td>
<td>V65673-COMP X 51</td>
<td>626</td>
<td>ASSA</td>
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<td>1</td>
<td>WALL STOP</td>
<td>GSH 240</td>
<td>C32D</td>
<td>GAL</td>
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<tr>
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<td>WEATHER STRIPPING</td>
<td>W-22 X 17-2 X BL</td>
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<tr>
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<td>AUTO DOOR BOTTOM</td>
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965 x 2150 x 45 HMD Door/ HMF Frame
NON-RTD Door/NON-RTD Frame

90° LH AH-2

Heading # 019
1 SGL DOOR 1017 ROAD SAFETY ENFORCEMENT OFFICE 1023 TO SERGEANTS OFFICE ENF. 1017

<table>
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<tr>
<th>Item</th>
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<th>Location</th>
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<td>3</td>
<td>HVY WEIGHT HINGE</td>
<td>CB168 114MM X 114MM</td>
<td>26D</td>
<td>STA</td>
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<td>OFFICE LEVER</td>
<td>28-10G05 X LL X KD X LA</td>
<td>US26D</td>
<td>SAR</td>
</tr>
<tr>
<td>1</td>
<td>CYLINDER</td>
<td>V65673-COMP X 51</td>
<td>626</td>
<td>ASSA</td>
</tr>
<tr>
<td>1</td>
<td>WALL STOP</td>
<td>GSH 240</td>
<td>C32D</td>
<td>GAL</td>
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<tr>
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<td>WEATHER STRIPPING</td>
<td>W-22 X 17-2 X BL</td>
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<td>KNC</td>
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<td>CT-52F X 965MMOA</td>
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965 x 2150 x 45 HMD Door/ HMF Frame
NON-RTD Door/NON-RTD Frame

90° LH AH-3

Heading # 020
1 SGL DOOR 1018 ROAD SAFETY ENFORCEMENT OFFICE 1023 TO SERGEANTS OFFICE ENF. 1018

<table>
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<th>Item</th>
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<td>3</td>
<td>HVY WEIGHT HINGE</td>
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<td>STA</td>
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<tr>
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<td>OFFICE LEVER</td>
<td>28-10G05 X LL X KD X LA</td>
<td>US26D</td>
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<tr>
<td>1</td>
<td>CYLINDER</td>
<td>V65673-COMP X 51</td>
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<td>1</td>
<td>WALL STOP</td>
<td>GSH 240</td>
<td>C32D</td>
<td>GAL</td>
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<td>WEATHER STRIPPING</td>
<td>W-22 X 17-2 X BL</td>
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<tr>
<td>1</td>
<td>AUTO DOOR BOTTOM</td>
<td>CT-52F X 965MMOA</td>
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965 x 2150 x 45 HMD Door/ HMF Frame
NON-RTD Door/NON-RTD Frame

90° RH AH-3
### HARDWARE SCHEDULE - CODE # 3923

#### PEEL REGIONAL POLICE PHASE 1 ISSUED FOR BID (7750)

#### 7750 HURONTARIO STREET

---

**Heading # 021**

1 SGL DOOR 1021 ADMIN. 1020 TO INSPECTOR ENF. 1021

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<th>AH-1</th>
</tr>
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<tr>
<td>3</td>
<td>HVG WEIGHT HINGE</td>
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<tr>
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<td>28-10G05 X LL X KD X LA</td>
<td>US26D</td>
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<td>1</td>
<td>CYLINDER</td>
<td>V65673-COMP X 51</td>
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<tr>
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<td>WALL STOP</td>
<td>GSH 240</td>
<td>C32D</td>
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<td>WEATHER STRIPPING</td>
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**Heading # 022**

1 SGL DOOR 1022 VESTIBULE 1022 FROM ROAD SAFETY ENFORCEMENT OFFICE 1023

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<th>90°</th>
<th>LHR</th>
<th>AH-1</th>
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</thead>
<tbody>
<tr>
<td>3</td>
<td>HVG WEIGHT HINGE</td>
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<td>26D</td>
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<td>DOOR CLOSER</td>
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<td>AL</td>
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<tr>
<td>1</td>
<td>KICK PLATE</td>
<td>GSH 80A X 203MM X 927MM</td>
<td>C32D</td>
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<tr>
<td>1</td>
<td>WALL STOP</td>
<td>GSH 240</td>
<td>C32D</td>
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<td>W-5S X 2150MM</td>
<td>MILL</td>
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<td>DOOR SWEEP</td>
<td>W-24S X 965MMW</td>
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MOUNT CLOSER ON PUSH SIDE OF DOOR

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**Heading # 023**

1 SGL DOOR 1023 CORRIDOR 1027 TO ROAD SAFETY ENFORCEMENT OFFICE 1023

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<table>
<thead>
<tr>
<th></th>
<th>90°</th>
<th>LH</th>
<th>AH-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>HVG WEIGHT HINGE</td>
<td>CB168 114MM X 114MM</td>
<td>26D</td>
</tr>
<tr>
<td>1</td>
<td>STOREROOM LEVER</td>
<td>28-10G04 X LL X KA</td>
<td>US26D</td>
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<td>5000C-12/24D-630</td>
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<td>C32D</td>
</tr>
<tr>
<td>1</td>
<td>WALL STOP</td>
<td>GSH 240</td>
<td>C32D</td>
</tr>
</tbody>
</table>

CARD ACCESS BY SECURITY
# HARDWARE SCHEDULE - CODE # 3923

PEEL REGIONAL POLICE PHASE 1 ISSUED FOR BID (7750)

7750 HURONTARIO STREET

## Heading # 024

<table>
<thead>
<tr>
<th>1 SGL DOOR 1023A CORRIDOR 1027 TO ROAD SAFETY ENFORCEMENT OFFICE 1023</th>
<th>90°</th>
<th>LH</th>
<th>AH-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>965 x 2150 x 45 HMD Door/ HMF Frame</td>
<td>NON-RTD Door/NON-RTD Frame</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>HVY WEIGHT HINGE</td>
<td>CB168 114MM X 114MM</td>
<td>26D</td>
</tr>
<tr>
<td>1</td>
<td>STOREROOM LEVER</td>
<td>28-10G04 X LL X KA</td>
<td>US26D</td>
</tr>
<tr>
<td>1</td>
<td>CYLINDER</td>
<td>V65673-COMP X 51</td>
<td>626</td>
</tr>
<tr>
<td>1</td>
<td>ELECTRIC STRIKE</td>
<td>5000C-12/24D-630</td>
<td>630</td>
</tr>
<tr>
<td>1</td>
<td>DOOR CLOSER</td>
<td>1461 X RW/PA X SRT</td>
<td>AL</td>
</tr>
<tr>
<td>1</td>
<td>KICK PLATE</td>
<td>GSH 80A X 203MM X 927MM</td>
<td>C32D</td>
</tr>
<tr>
<td>1</td>
<td>WALL STOP</td>
<td>GSH 240</td>
<td>C32D</td>
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</table>

CARD ACCESS BY SECURITY

## Heading # 025

<table>
<thead>
<tr>
<th>1 SGL DOOR 1025 ROAD SAFETY ENFORCEMENT OFFICE 1023 TO TRAINING COORDINATOR 1025</th>
<th>90°</th>
<th>LH</th>
<th>AH-7</th>
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</thead>
<tbody>
<tr>
<td>965 x 2150 x 45 HMD Door/ HMF Frame</td>
<td>NON-RTD Door/NON-RTD Frame</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>HVY WEIGHT HINGE</td>
<td>CB168 114MM X 114MM</td>
<td>26D</td>
</tr>
<tr>
<td>1</td>
<td>OFFICE LEVER</td>
<td>28-10G05 X LL X KD X LA</td>
<td>US26D</td>
</tr>
<tr>
<td>1</td>
<td>CYLINDER</td>
<td>V65673-COMP X 51</td>
<td>626</td>
</tr>
<tr>
<td>1</td>
<td>WALL STOP</td>
<td>GSH 240</td>
<td>C32D</td>
</tr>
<tr>
<td>1</td>
<td>WEATHER STRIPPING</td>
<td>W-22 X 17-2 X BL</td>
<td>KNC</td>
</tr>
<tr>
<td>1</td>
<td>AUTO DOOR BOTTOM</td>
<td>CT-52F X 965MMOA</td>
<td>CLEAR</td>
</tr>
</tbody>
</table>

## Heading # 026

<table>
<thead>
<tr>
<th>1 SGL DOOR 1026 ROAD SAFETY ENFORCEMENT OFFICE 1023 TO LARGE STORAGE ROOM ENF. 1026</th>
<th>90°</th>
<th>LH</th>
<th>AH-13</th>
</tr>
</thead>
<tbody>
<tr>
<td>965 x 2150 x 45 HMD Door/ HMF Frame</td>
<td>NON-RTD Door/NON-RTD Frame</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>HVY WEIGHT HINGE</td>
<td>CB168 114MM X 114MM</td>
<td>26D</td>
</tr>
<tr>
<td>1</td>
<td>STOREROOM LEVER</td>
<td>28-10G04 X LL X KA</td>
<td>US26D</td>
</tr>
<tr>
<td>1</td>
<td>CYLINDER</td>
<td>V65673-COMP X 51</td>
<td>626</td>
</tr>
<tr>
<td>1</td>
<td>ELECTRIC STRIKE</td>
<td>5000C-12/24D-630</td>
<td>630</td>
</tr>
<tr>
<td>1</td>
<td>DOOR CLOSER</td>
<td>1461 X RW/PA X SRT</td>
<td>AL</td>
</tr>
<tr>
<td>1</td>
<td>KICK PLATE</td>
<td>GSH 80A X 203MM X 927MM</td>
<td>C32D</td>
</tr>
<tr>
<td>1</td>
<td>WALL STOP</td>
<td>GSH 240</td>
<td>C32D</td>
</tr>
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</table>

CARD ACCESS BY SECURITY

APPENDIX 5.13
### HARDWARE SCHEDULE - CODE # 3923

PEEL REGIONAL POLICE PHASE 1 ISSUED FOR BID (7750)
7750 HURONTARIO STREET

#### Heading # 027

1 SGL DOOR 1027 EXTERIOR FROM CORRIDOR 1027

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Description</th>
<th>Quantity</th>
<th>Width</th>
<th>Height</th>
<th>Length</th>
<th>Notes</th>
</tr>
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<tbody>
<tr>
<td>965 x 2150 x 45 HMD Door/ HMF Frame</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>3</td>
<td>HVY WEIGHT HINGE</td>
<td>CB168NRP 114MM X 114MM</td>
<td></td>
<td></td>
<td></td>
<td>26D STA</td>
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<tr>
<td>1</td>
<td>RIM EXIT DEVICE X</td>
<td>88043 X 1067MM X ETL X 649 X KD</td>
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<td></td>
<td></td>
<td>US32D SAR</td>
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<tr>
<td>1</td>
<td>MORTISE CYLINDER</td>
<td>V6554-2-COMP X 51</td>
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<td></td>
<td></td>
<td>626 ASSA</td>
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<td>ELECTRIC STRIKE</td>
<td>9500-12/24D-630</td>
<td></td>
<td></td>
<td></td>
<td>630 ESH</td>
</tr>
<tr>
<td>1</td>
<td>AUTO OPERATOR</td>
<td>BESAM AUTO OPERATOR PACKAGE (AUTO OPERATOR C/W 2 ACTUATORS)</td>
<td></td>
<td></td>
<td></td>
<td>ASSA</td>
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<tr>
<td>1</td>
<td>KICK PLATE</td>
<td>GSH 80A X 2-SIDED TAPE X 203MM X 876MM</td>
<td></td>
<td></td>
<td></td>
<td>C32D GAL</td>
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<tr>
<td>2</td>
<td>WEATHER STRIPPING-JAMBS</td>
<td>W-50S X 2150MM</td>
<td></td>
<td></td>
<td></td>
<td>MILL KNC</td>
</tr>
<tr>
<td>1</td>
<td>WEATHER STRIPPING - HEADER</td>
<td>W-20S X 965MMW</td>
<td></td>
<td></td>
<td></td>
<td>CLEAR KNC</td>
</tr>
<tr>
<td>1</td>
<td>DOOR SWEEP</td>
<td>W-24S X 965MMW</td>
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<td></td>
<td></td>
<td>CLEAR KNC</td>
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<tr>
<td>1</td>
<td>THRESHOLD</td>
<td>CT-10 X 38</td>
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110 VAC TO HEADER, POWER SUPPLIES BY DIV. 16 ALL CONDUIT AND PULL STRINGS BY DIV. 16

#### Heading # 028

1 SGL DOOR 1028 OPEN OFFICE 1031 TO LARGE STORAGE ROOM MCB 1028

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Description</th>
<th>Quantity</th>
<th>Width</th>
<th>Height</th>
<th>Length</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>965 x 2150 x 45 HMD Door/ HMF Frame</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>HVY WEIGHT HINGE</td>
<td>CB168 114MM X 114MM</td>
<td></td>
<td></td>
<td></td>
<td>26D STA</td>
</tr>
<tr>
<td>1</td>
<td>STOREROOM LEVER</td>
<td>28-10G04 X LL X KA</td>
<td></td>
<td></td>
<td></td>
<td>US26D SAR</td>
</tr>
<tr>
<td>1</td>
<td>CYLINDER</td>
<td>V65673-COMP X 51</td>
<td></td>
<td></td>
<td></td>
<td>626 ASSA</td>
</tr>
<tr>
<td>1</td>
<td>WALL STOP</td>
<td>GSH 240</td>
<td></td>
<td></td>
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<td>C32D GAL</td>
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#### Heading # 029

1 SGL DOOR 1029 OPEN OFFICE 1031 TO PROJECT ROOM 1029

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Description</th>
<th>Quantity</th>
<th>Width</th>
<th>Height</th>
<th>Length</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>965 x 2150 x 45 HMD Door/ HMF Frame</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>HVY WEIGHT HINGE</td>
<td>CB168 114MM X 114MM</td>
<td></td>
<td></td>
<td></td>
<td>26D STA</td>
</tr>
<tr>
<td>1</td>
<td>OFFICE LEVER</td>
<td>28-10G05 X LL X KD X LA</td>
<td></td>
<td></td>
<td></td>
<td>US26D SAR</td>
</tr>
<tr>
<td>1</td>
<td>CYLINDER</td>
<td>V65673-COMP X 51</td>
<td></td>
<td></td>
<td></td>
<td>626 ASSA</td>
</tr>
<tr>
<td>1</td>
<td>DOOR CLOSER</td>
<td>4040XP X RW/PA X SRT</td>
<td></td>
<td></td>
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<td>AL LCN</td>
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<tr>
<td>1</td>
<td>KICK PLATE</td>
<td>GSH 80A X 203MM X 927MM</td>
<td></td>
<td></td>
<td></td>
<td>C32D GAL</td>
</tr>
<tr>
<td>1</td>
<td>WALL STOP</td>
<td>GSH 240</td>
<td></td>
<td></td>
<td></td>
<td>C32D GAL</td>
</tr>
<tr>
<td>1</td>
<td>WEATHER STRIPPING</td>
<td>W-22 X 17-2 X BL</td>
<td></td>
<td></td>
<td></td>
<td>CLEAR KNC</td>
</tr>
<tr>
<td>1</td>
<td>AUTO DOOR BOTTOM</td>
<td>CT-52F X 965MMOA</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>
## HARDWARE SCHEDULE - CODE # 3923

### PEEL REGIONAL POLICE PHASE 1 ISSUED FOR BID (7750)

### 7750 HURONTARIO STREET

### Heading # 030

<table>
<thead>
<tr>
<th>Description</th>
<th>Model/Part Number</th>
<th>Quantity</th>
<th>Orientation</th>
<th>Holdback</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 SGL DOOR 1031 CORRIDOR TO OPEN OFFICE 1031</td>
<td></td>
<td>1</td>
<td>90°</td>
<td>RH</td>
</tr>
<tr>
<td>965 x 2150 x 45 HMD Door/ HMF Frame</td>
<td></td>
<td></td>
<td>AH-1</td>
<td></td>
</tr>
<tr>
<td>1 SGL DOOR 1032 OPEN OFFICE 1031 TO SERGEANTS OFFICE MCB 1032</td>
<td></td>
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<td>90°</td>
<td>LH</td>
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### Heading # 031

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<th>Description</th>
<th>Model/Part Number</th>
<th>Quantity</th>
<th>Orientation</th>
<th>Holdback</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 SGL DOOR 1032 OPEN OFFICE 1031 TO SERGEANTS OFFICE MCB 1032</td>
<td></td>
<td>1</td>
<td>90°</td>
<td>LH</td>
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### Heading # 032

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<th>Description</th>
<th>Model/Part Number</th>
<th>Quantity</th>
<th>Orientation</th>
<th>Holdback</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 SGL DOOR 1034 OPEN OFFICE 1031 TO MAPPING 1034</td>
<td></td>
<td>1</td>
<td>90°</td>
<td>LH</td>
</tr>
</tbody>
</table>

### Card Access by Security

---

Note: Additional hardware items and specifications are listed in the document for each heading, including hinges, cylinders, door closers, kick plates, wall stops, and weather stripping.
### Heading # 033

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Type</th>
<th>Color</th>
</tr>
</thead>
</table>
| 1 SGL DOOR 1036 OPEN OFFICE 1031 TO POUNDS OFFICE 1036 | 90° RH AH-9 | 965 x 2150 x 45 HMD Door/ HMF Frame | NON-RTD Door/NON-RTD Frame | 3
| HVY WEIGHT HINGE | CB168 114MM X 114MM | 26D | STA |
| OFFICE LEVER | 28-10G05 X LL X KD X LA | US26D | SAR |
| CYLINDER | V65673-COMP X 51 | 626 | ASSA |
| WALL STOP | GSH 240 | C32D | GAL |
| WEATHER STRIPPING | W-22 X 17-2 X BL | | KNC |
| AUTO DOOR BOTTOM | CT-52F X 965MMOA | | KNC |

### Heading # 034

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<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Type</th>
<th>Color</th>
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</thead>
</table>
| 1 SGL DOOR 1037 OPEN OFFICE 1031 TO STAFF SERGEANT MCB 1037 | 90° RH AH-4 | 965 x 2150 x 45 HMD Door/ HMF Frame | NON-RTD Door/NON-RTD Frame | 3
| HVY WEIGHT HINGE | CB168 114MM X 114MM | 26D | STA |
| OFFICE LEVER | 28-10G05 X LL X KD X LA | US26D | SAR |
| CYLINDER | V65673-COMP X 51 | 626 | ASSA |
| WALL STOP | GSH 240 | C32D | GAL |
| WEATHER STRIPPING | W-22 X 17-2 X BL | | KNC |
| AUTO DOOR BOTTOM | CT-52F X 965MMOA | | KNC |

### Heading # 035

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<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Type</th>
<th>Color</th>
</tr>
</thead>
</table>
| 1 SGL DOOR 1038 OPEN OFFICE 1031 TO ANALYST C.I. 1038 | 90° LH AH-14 | 965 x 2150 x 45 HMD Door/ HMF Frame | NON-RTD Door/NON-RTD Frame | 3
| HVY WEIGHT HINGE | CB168 114MM X 114MM | 26D | STA |
| OFFICE LEVER | 28-10G05 X LL X KD X LA | US26D | SAR |
| CYLINDER | V65673-COMP X 51 | 626 | ASSA |
| WALL STOP | GSH 240 | C32D | GAL |
| WEATHER STRIPPING | W-22 X 17-2 X BL | | KNC |
| AUTO DOOR BOTTOM | CT-52F X 965MMOA | | KNC |
### Heading # 036

1 SGL DOOR 1039 OPEN AREA TO SUPERVISOR REC. 1039

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Hinge Weight</th>
<th>Lever</th>
<th>Cylinder</th>
<th>Wall Stop</th>
<th>Weather Stripping</th>
<th>Door Bottom</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>90° LH AP-30</td>
<td>1</td>
<td>STAHVY</td>
<td>SAROFFICE</td>
<td>ASSACYLINDER</td>
<td>GALWALL STOP</td>
<td>KNCWEATHER STRIPPING</td>
<td>KNCAUTO DOOR BOTTOM</td>
</tr>
<tr>
<td>2</td>
<td>965 x 2150 x 45 HMD Door/ HMF Frame</td>
<td></td>
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<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3</td>
<td>HVY WEIGHT HINGE CB168 114MM X 114MM</td>
<td>26D</td>
<td>STA</td>
<td></td>
<td></td>
<td>C32D</td>
<td>KNC</td>
<td>CLEAR</td>
</tr>
<tr>
<td>1</td>
<td>OFFICE LEVER 28-10G05 X LL X KD X LA</td>
<td>US26D</td>
<td>SAR</td>
<td></td>
<td></td>
<td>C32D</td>
<td>KNC</td>
<td>CLEAR</td>
</tr>
<tr>
<td>1</td>
<td>CYLINDER V65673-COMP X 51</td>
<td>626</td>
<td>ASSA</td>
<td></td>
<td></td>
<td>C32D</td>
<td>KNC</td>
<td>CLEAR</td>
</tr>
<tr>
<td>1</td>
<td>WALL STOP GSH 240</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C32D</td>
<td>KNC</td>
<td>CLEAR</td>
</tr>
<tr>
<td>1</td>
<td>WEATHER STRIPPING W-22 X 17-2 X BL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C32D</td>
<td>KNC</td>
<td>CLEAR</td>
</tr>
<tr>
<td>1</td>
<td>AUTO DOOR BOTTOM CT-52F X 965MMOA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C32D</td>
<td>KNC</td>
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### Heading # 037

1 SGL DOOR 1040 OPEN AREA TO STAFF SERGEANT REC. 1040

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<th>Item</th>
<th>Description</th>
<th>Quantity</th>
<th>Hinge Weight</th>
<th>Lever</th>
<th>Cylinder</th>
<th>Wall Stop</th>
<th>Weather Stripping</th>
<th>Door Bottom</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>90° LH AP-34</td>
<td>1</td>
<td>STAHVY</td>
<td>SAROFFICE</td>
<td>ASSACYLINDER</td>
<td>GALWALL STOP</td>
<td>KNCWEATHER STRIPPING</td>
<td>KNCAUTO DOOR BOTTOM</td>
</tr>
<tr>
<td>2</td>
<td>965 x 2150 x 45 HMD Door/ HMF Frame</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>HVY WEIGHT HINGE CB168 114MM X 114MM</td>
<td>26D</td>
<td>STA</td>
<td></td>
<td></td>
<td>C32D</td>
<td>KNC</td>
<td>CLEAR</td>
</tr>
<tr>
<td>1</td>
<td>OFFICE LEVER 28-10G05 X LL X KD X LA</td>
<td>US26D</td>
<td>SAR</td>
<td></td>
<td></td>
<td>C32D</td>
<td>KNC</td>
<td>CLEAR</td>
</tr>
<tr>
<td>1</td>
<td>CYLINDER V65673-COMP X 51</td>
<td>626</td>
<td>ASSA</td>
<td></td>
<td></td>
<td>C32D</td>
<td>KNC</td>
<td>CLEAR</td>
</tr>
<tr>
<td>1</td>
<td>WALL STOP GSH 240</td>
<td></td>
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<td>C32D</td>
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<td>CLEAR</td>
</tr>
<tr>
<td>1</td>
<td>WEATHER STRIPPING W-22 X 17-2 X BL</td>
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<td></td>
<td></td>
<td>C32D</td>
<td>KNC</td>
<td>CLEAR</td>
</tr>
<tr>
<td>1</td>
<td>AUTO DOOR BOTTOM CT-52F X 965MMOA</td>
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<td>C32D</td>
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### Heading # 038

1 SGL DOOR 1043 FOI ANALYST 1044 TO OFFICE STORES REC. 1043

<table>
<thead>
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<th>Item</th>
<th>Description</th>
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<th>Hinge Weight</th>
<th>Lever</th>
<th>Cylinder</th>
<th>Wall Stop</th>
<th>Weather Stripping</th>
<th>Door Bottom</th>
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<tbody>
<tr>
<td>1</td>
<td>90° LH AP-30</td>
<td>1</td>
<td>STAHVY</td>
<td>SAROFFICE</td>
<td>ASSACYLINDER</td>
<td>GALWALL STOP</td>
<td>KNCWEATHER STRIPPING</td>
<td>KNCAUTO DOOR BOTTOM</td>
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<tr>
<td>2</td>
<td>965 x 2150 x 45 HMD Door/ HMF Frame</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>HVY WEIGHT HINGE CB168 114MM X 114MM</td>
<td>26D</td>
<td>STA</td>
<td></td>
<td></td>
<td>C32D</td>
<td>KNC</td>
<td>CLEAR</td>
</tr>
<tr>
<td>1</td>
<td>OFFICE LEVER 28-10G05 X LL X KD X LA</td>
<td>US26D</td>
<td>SAR</td>
<td></td>
<td></td>
<td>C32D</td>
<td>KNC</td>
<td>CLEAR</td>
</tr>
<tr>
<td>1</td>
<td>CYLINDER V65673-COMP X 51</td>
<td>626</td>
<td>ASSA</td>
<td></td>
<td></td>
<td>C32D</td>
<td>KNC</td>
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<tr>
<td>1</td>
<td>WALL STOP GSH 240</td>
<td></td>
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<td>KNC</td>
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<tr>
<td>1</td>
<td>WEATHER STRIPPING W-22 X 17-2 X BL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C32D</td>
<td>KNC</td>
<td>CLEAR</td>
</tr>
<tr>
<td>1</td>
<td>AUTO DOOR BOTTOM CT-52F X 965MMOA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>C32D</td>
<td>KNC</td>
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### HARDWARE SCHEDULE - CODE # 3923

**PEEL REGIONAL POLICE PHASE 1 ISSUED FOR BID (7750)**

**7750 HURONTARIO STREET**

#### Heading # 039

**1 SGL DOOR 1047 CORRIDOR REC. 1045 TO TRAINERS OFFICE 1047**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Code</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>90° LH AP-37</td>
<td>26D STA</td>
<td>626 ASSA</td>
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#### Heading # 040

**1 SGL DOOR 1048 CORRIDOR REC. 1045 TO TRAINING 1048**

<table>
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<tr>
<th>Item</th>
<th>Description</th>
<th>Code</th>
<th>Quantity</th>
<th>Notes</th>
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<tbody>
<tr>
<td>90° RH AP-36</td>
<td>26D STA</td>
<td>626 ASSA</td>
<td>C32D GAL</td>
<td>CLEAR KNC</td>
</tr>
</tbody>
</table>

#### Heading # 041

**1 SGL DOOR 1048A CORRIDOR REC. 1045 TO BOARDROOM / MEETING ROOM 1048A**

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Code</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>90° LH AP-35</td>
<td>26D STA</td>
<td>626 ASSA</td>
<td>C32D GAL</td>
<td>CLEAR KNC</td>
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## HARDWARE SCHEDULE - CODE # 3923

PEEL REGIONAL POLICE PHASE 1 ISSUED FOR BID (7750)
7750 HURONTARIO STREET

### Heading # 042

1 SGL DOOR 1049 OPEN AREA TO MEETING ROOM 1049

<table>
<thead>
<tr>
<th></th>
<th>90°</th>
<th>RH</th>
<th>AP-35</th>
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<tr>
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<td>STA</td>
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<tr>
<td>1</td>
<td></td>
<td>US26D</td>
<td>SAR</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>626</td>
<td>ASSA</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>C32D</td>
<td>GAL</td>
</tr>
<tr>
<td>1</td>
<td></td>
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</tr>
<tr>
<td>1</td>
<td></td>
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**965 x 2150 x 45 HMD Door/ HMF Frame**

**NON-RTD Door/NON-RTD Frame**

- **HVY WEIGHT HINGE**: CB168 114MM X 114MM
- **OFFICE LEVER**: 28-10G05 X LL X KD X LA
- **CYLINDER**: V65673-COMP X 51
- **WALL STOP**: GSH 240
- **WEATHER STRIPPING**: W-22 X 17-2 X BL
- **AUTO DOOR BOTTOM**: CT-52F X 965MMOA

### Heading # 043

1 SGL DOOR 1050 CORRIDOR TO FINGERPRINT 1050

<table>
<thead>
<tr>
<th></th>
<th>90°</th>
<th>LH</th>
<th>AP-32</th>
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<tr>
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<td>1</td>
<td></td>
<td>US26D</td>
<td>SAR</td>
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<tr>
<td>1</td>
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<td>626</td>
<td>ASSA</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>C32D</td>
<td>GAL</td>
</tr>
<tr>
<td>1</td>
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<td>KNC</td>
</tr>
<tr>
<td>1</td>
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<td>CLEAR</td>
</tr>
</tbody>
</table>

**965 x 2150 x 45 HMD Door/ HMF Frame**

**NON-RTD Door/NON-RTD Frame**

- **HVY WEIGHT HINGE**: CB168 114MM X 114MM
- **OFFICE LEVER**: 28-10G05 X LL X KD X LA
- **CYLINDER**: V65673-COMP X 51
- **WALL STOP**: GSH 240
- **WEATHER STRIPPING**: W-22 X 17-2 X BL
- **AUTO DOOR BOTTOM**: CT-52F X 965MMOA

### Heading # 044

1 SGL DOOR 1050A CORRIDOR FROM CORRIDOR

<table>
<thead>
<tr>
<th></th>
<th>90°</th>
<th>RHR</th>
<th>AP-35</th>
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<tr>
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<td>US32D</td>
<td>SAR</td>
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<tr>
<td>1</td>
<td></td>
<td>626</td>
<td>ASSA</td>
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<tr>
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<td>C32D</td>
<td>GAL</td>
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<tr>
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<td>ESH</td>
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<tr>
<td>1</td>
<td></td>
<td></td>
<td>ASSA</td>
</tr>
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</table>

**965 x 2150 x 45 HMD Door/ HMF Frame**

**45 MIN Door/45 MIN Frame**

- **HVY WEIGHT HINGE**: CB168 114MM X 114MM
- **RIM EXIT DEVICE X**: 12-8804 1067MMWX ETL X 649 X KD
- **STOREROOM LEVER**: V6554-2-COMP X 51
- **MORTISE CYLINDER**: 9500-12/24D-630
- **KICK PLATE**: GSH 80A X 203MM X 927MM
- **WALL STOP**: GSH 240
- **AUTO OPERATOR**: BESAM AUTO OPERATOR PACKAGE (AUTO OPERATOR C/W 2 ACTUATORS)

110 VAC TO HEADER, POWER SUPPLIES BY DIV. 16 ALL CONDUIT AND PULL STRINGS BY DIV. 16
### HARDWARE SCHEDULE CODE # 3923

#### PEEL REGIONAL POLICE PHASE 1 ISSUED FOR BID (7750)

**7750 HURONTARIO STREET**

<table>
<thead>
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<th>Heading # 045</th>
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<tbody>
<tr>
<td><strong>1 SGL DOOR 1053 CORRIDOR TO MEN'S WASHROOM 1053</strong></td>
</tr>
<tr>
<td><strong>90° RH AP-1</strong></td>
</tr>
<tr>
<td><strong>965 x 2150 x 45 HMD Door/ HMF Frame</strong></td>
</tr>
<tr>
<td><strong>45 MIN Door/45 MIN Frame</strong></td>
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<tr>
<td>3</td>
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<tr>
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</thead>
<tbody>
<tr>
<td><strong>1 SGL DOOR 1054 CORRIDOR TO WOMEN'S WASHROOM 1054</strong></td>
</tr>
<tr>
<td><strong>90° LH AP-1</strong></td>
</tr>
<tr>
<td><strong>965 x 2150 x 45 HMD Door/ HMF Frame</strong></td>
</tr>
<tr>
<td><strong>45 MIN Door/45 MIN Frame</strong></td>
</tr>
<tr>
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<thead>
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<tbody>
<tr>
<td><strong>1 SGL DOOR 1055 CORRIDOR FROM EXIST STAIR EG-021</strong></td>
</tr>
<tr>
<td><strong>90° LHR AP-1</strong></td>
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<tr>
<td><strong>965 x 2150 x 45 HMD Door/ HMF Frame</strong></td>
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<tr>
<td><strong>45 MIN Door/45 MIN Frame</strong></td>
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<tr>
<td>3</td>
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CARD ACCESS BY SECURITY
### Heading # 048

1 SGL DOOR 3001 CORRIDOR TO BOARDROOM 3001

<table>
<thead>
<tr>
<th>Part Description</th>
<th>Model/Specifications</th>
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<tbody>
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<td>NON-RTD Door/NON-RTD Frame</td>
</tr>
<tr>
<td>3 H VY WEIGHT HINGE</td>
<td>CB168 114MM X 114MM</td>
</tr>
<tr>
<td>1 OFFICE LEVER</td>
<td>28-10G05 X LL X KD X LA</td>
</tr>
<tr>
<td>1 CYLINDER</td>
<td>V65673-COMP X 51</td>
</tr>
<tr>
<td>1 CLOSER, REGULAR ARM</td>
<td>1461 X RW/PA X SRT</td>
</tr>
<tr>
<td>1 WALL STOP</td>
<td>GSH 240</td>
</tr>
<tr>
<td>1 WEATHER STRIPPING</td>
<td>W-22 X 17-2 X BL</td>
</tr>
<tr>
<td>1 AUTO DOOR BOTTOM</td>
<td>CT-52F X 965MMOA</td>
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</tbody>
</table>

### Heading # 049

1 SGL DOOR 3002 CONSTABLES-CRIME PREVENTION 3005 TO SGT. CRIME PREVENTION 3002

<table>
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<th>Part Description</th>
<th>Model/Specifications</th>
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<tbody>
<tr>
<td>965 x 2150 x 45 HMD Door/ HMF Frame</td>
<td>NON-RTD Door/NON-RTD Frame</td>
</tr>
<tr>
<td>3 H VY WEIGHT HINGE</td>
<td>CB168 114MM X 114MM</td>
</tr>
<tr>
<td>1 OFFICE LEVER</td>
<td>28-10G05 X LL X KD X LA</td>
</tr>
<tr>
<td>1 CYLINDER</td>
<td>V65673-COMP X 51</td>
</tr>
<tr>
<td>1 WALL STOP</td>
<td>GSH 240</td>
</tr>
<tr>
<td>1 WEATHER STRIPPING</td>
<td>W-22 X 20-4 X BL</td>
</tr>
<tr>
<td>1 AUTO DOOR BOTTOM</td>
<td>CT-52F X 965MMOA</td>
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### Heading # 050

1 SGL DOOR 3003 CONSTABLES-CRIME PREVENTION 3005 TO STORAGE 3003

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<tbody>
<tr>
<td>965 x 2150 x 45 HMD Door/ HMF Frame</td>
<td>NON-RTD Door/NON-RTD Frame</td>
</tr>
<tr>
<td>3 H VY WEIGHT HINGE</td>
<td>CB168 114MM X 114MM</td>
</tr>
<tr>
<td>1 STOREROOM LEVER</td>
<td>28-10G04 X LL X KA</td>
</tr>
<tr>
<td>1 CYLINDER</td>
<td>V65673-COMP X 51</td>
</tr>
<tr>
<td>1 ELECTRIC STRIKE</td>
<td>5000C-12/24D-630</td>
</tr>
<tr>
<td>1 DOOR CLOSER</td>
<td>1461 X RW/PA X SRT</td>
</tr>
<tr>
<td>1 KICK PLATE</td>
<td>GSH 80A X 203MM X 927MM</td>
</tr>
<tr>
<td>1 WALL STOP</td>
<td>GSH 240</td>
</tr>
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CARD ACCESS BY SECURITY
# HARDWARE SCHEDULE - CODE # 3923

**PEEL REGIONAL POLICE PHASE 1 ISSUED FOR BID (7750)**

7750 HURONTARIO STREET

## Heading # 051

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<th>Description</th>
<th>Manufacturer</th>
<th>Model/Part No.</th>
<th>Location</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>SGL DOOR 3004 CORRIDOR TO FILE STORAGE 3004</td>
<td>90° LH AM-93</td>
<td>26D STA</td>
<td>NON-RTD Door/NON-RTD Frame</td>
</tr>
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<td>965 x 2150 x 45 HMD Door/ HMF Frame</td>
<td>CB168 114MM X 114MM</td>
<td>26D STA</td>
<td>NON-RTD Door/NON-RTD Frame</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>HVY WEIGHT HINGE</td>
<td>CB168 114MM X 114MM</td>
<td>26D STA</td>
<td>NON-RTD Door/NON-RTD Frame</td>
</tr>
<tr>
<td>1</td>
<td>STOREROOM LEVER</td>
<td>28-10G04 X LL X KA</td>
<td>US26D SAR</td>
<td>NON-RTD Door/NON-RTD Frame</td>
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<tr>
<td>2</td>
<td>CYLINDER</td>
<td>V65673-COMP X 51</td>
<td>626 ASSA</td>
<td>NON-RTD Door/NON-RTD Frame</td>
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<td>ELECTRIC STRIKE</td>
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<tr>
<td>1</td>
<td>KICK PLATE</td>
<td>GSH 80A X 203MM X 927MM</td>
<td>C32D GAL</td>
<td>NON-RTD Door/NON-RTD Frame</td>
</tr>
<tr>
<td>1</td>
<td>WALL STOP</td>
<td>GSH 240</td>
<td>C32D GAL</td>
<td>NON-RTD Door/NON-RTD Frame</td>
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<td>CARD ACCESS BY SECURITY</td>
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<th>Description</th>
<th>Manufacturer</th>
<th>Model/Part No.</th>
<th>Location</th>
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<tr>
<td>1</td>
<td>SGL DOOR 3006 CORRIDOR 3024 TO DET. FAM. IP. VIO. 3006</td>
<td>90° LH AM-59</td>
<td>26D STA</td>
<td>NON-RTD Door/NON-RTD Frame</td>
</tr>
<tr>
<td>965 x 2150 x 45 HMD Door/ HMF Frame</td>
<td>CB168 114MM X 114MM</td>
<td>26D STA</td>
<td>NON-RTD Door/NON-RTD Frame</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>HVY WEIGHT HINGE</td>
<td>CB168 114MM X 114MM</td>
<td>26D STA</td>
<td>NON-RTD Door/NON-RTD Frame</td>
</tr>
<tr>
<td>1</td>
<td>OFFICE LEVER</td>
<td>28-10G05 X LL X KD X LA</td>
<td>US26D SAR</td>
<td>NON-RTD Door/NON-RTD Frame</td>
</tr>
<tr>
<td>1</td>
<td>CYLINDER</td>
<td>V65673-COMP X 51</td>
<td>626 ASSA</td>
<td>NON-RTD Door/NON-RTD Frame</td>
</tr>
<tr>
<td>1</td>
<td>WALL STOP</td>
<td>GSH 240</td>
<td>C32D GAL</td>
<td>NON-RTD Door/NON-RTD Frame</td>
</tr>
<tr>
<td>1</td>
<td>WEATHER STRIPPING</td>
<td>W-22 X 17-2 X BL</td>
<td>KNC</td>
<td>NON-RTD Door/NON-RTD Frame</td>
</tr>
<tr>
<td>1</td>
<td>AUTO DOOR BOTTOM</td>
<td>CT-52F X 965MMOA</td>
<td>CLEAR KNC</td>
<td>NON-RTD Door/NON-RTD Frame</td>
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## Heading # 053

<table>
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<th>Manufacturer</th>
<th>Model/Part No.</th>
<th>Location</th>
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<tr>
<td>1</td>
<td>SGL DOOR 3007 CORRIDOR 3024 TO SGT. COMM. MOB. 3007</td>
<td>90° RH AG-3</td>
<td>26D STA</td>
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<tr>
<td>965 x 2150 x 45 HMD Door/ HMF Frame</td>
<td>CB168 114MM X 114MM</td>
<td>26D STA</td>
<td>NON-RTD Door/NON-RTD Frame</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>HVY WEIGHT HINGE</td>
<td>CB168 114MM X 114MM</td>
<td>26D STA</td>
<td>NON-RTD Door/NON-RTD Frame</td>
</tr>
<tr>
<td>1</td>
<td>OFFICE LEVER</td>
<td>28-10G05 X LL X KD X LA</td>
<td>US26D SAR</td>
<td>NON-RTD Door/NON-RTD Frame</td>
</tr>
<tr>
<td>1</td>
<td>CYLINDER</td>
<td>V65673-COMP X 51</td>
<td>626 ASSA</td>
<td>NON-RTD Door/NON-RTD Frame</td>
</tr>
<tr>
<td>1</td>
<td>WALL STOP</td>
<td>GSH 240</td>
<td>C32D GAL</td>
<td>NON-RTD Door/NON-RTD Frame</td>
</tr>
<tr>
<td>1</td>
<td>WEATHER STRIPPING</td>
<td>W-22 X 17-2 X BL</td>
<td>KNC</td>
<td>NON-RTD Door/NON-RTD Frame</td>
</tr>
<tr>
<td>1</td>
<td>AUTO DOOR BOTTOM</td>
<td>CT-52F X 965MMOA</td>
<td>CLEAR KNC</td>
<td>NON-RTD Door/NON-RTD Frame</td>
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</table>
### HARDWARE SCHEDULE - CODE # 3923

#### PEEL REGIONAL POLICE PHASE 1 ISSUED FOR BID (7750)

**7750 HURONTARIO STREET**

### Heading # 055

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<thead>
<tr>
<th>Description</th>
<th>Model/Code</th>
<th>Notes</th>
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<tr>
<td>SGL DOOR 3009 CORRIDOR TO GUN STORAGE 3009</td>
<td>90° RH TBA</td>
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<tr>
<td>965 x 2150 x 45 HMD Door/ HMF Frame</td>
<td>NON-RTD Door/NON-RTD Frame</td>
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</tr>
<tr>
<td>3 HYV WEIGHT HINGE</td>
<td>CB168 114MM X 114MM</td>
<td>26D STA</td>
</tr>
<tr>
<td>1 STOREROOM LEVER</td>
<td>28-10G04 X LL X KA</td>
<td>US26D SAR</td>
</tr>
<tr>
<td>1 CYLINDER</td>
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**CARD ACCESS BY SECURITY**

### Heading # 056

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### Heading # 057

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CARD ACCESS BY SECURITY

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<td>V65673-COMP X 51</td>
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### HARDWARE SCHEDULE - CODE # 3923

#### PEEL REGIONAL POLICE PHASE 1 ISSUED FOR BID (7750)

7750 HURONTARIO STREET

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<td>US26D</td>
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### HARDWARE SCHEDULE - CODE # 3923

#### PEEL REGIONAL POLICE PHASE 1 ISSUED FOR BID (7750)

**7750 HURONTARIO STREET**

**Heading # 066**

1 SGL DOOR 3023 CORRIDOR TO INSPECTOR 3023

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<td>28-10G05 X LL X KD X LA</td>
<td>US26D SAR</td>
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<td>GSH 240</td>
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965 x 2150 x 45 HMD Door/ HMF Frame

NON-RTD Door/NON-RTD Frame

**Heading # 067**

1 SGL DOOR B011 EXISTING CORRIDOR TO KITCHENETTE B-013

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<td>OVERHEAD STOP</td>
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<td>CLOSER, REGULAR ARM</td>
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<td>AL LCN</td>
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<td>KICK PLATE</td>
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NOTE: MOUNT CLOSER ON PULL SIDE, REGULAR ARM MOUNT

MOUNT OVERHEAD DOOR STOP ON PUSH SIDE

965 x 2150 x 45 HMD Door/ HMF Frame

NON-RTD Door/NON-RTD Frame

**Heading # 068**

1 SGL DOOR B011A EXISTING TO NPU ROOM B-011

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NOTE: MOUNT CLOSER ON PULL SIDE, REGULAR ARM MOUNT

MOUNT OVERHEAD DOOR STOP ON PUSH SIDE

965 x 2150 x 45 HMD Door/ HMF Frame

NON-RTD Door/NON-RTD Frame
### HARDWARE SCHEDULE - CODE # 3923

#### PEEL REGIONAL POLICE PHASE 1 ISSUED FOR BID (7750)

#### 7750 HURONTARIO STREET

**Heading # 069**

1 SGL DOOR B014 CORRIDOR B017 TO FEMALE WASHROOM B014

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<td>28-10G05 X LL X KD X LA</td>
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</tr>
<tr>
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**Heading # 070**

1 SGL DOOR EB13 2ND FLOOR DIV 22 TO PROJECT ROOM EB-13

<table>
<thead>
<tr>
<th>90°</th>
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<tbody>
<tr>
<td>965 x 2150 x 45 HMD Door/ HMF Frame</td>
<td>NON-RTD Door/NON-RTD Frame</td>
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<td>3</td>
<td>HVY WEIGHT HINGE</td>
<td>CB168 114MM X 114MM</td>
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<td>28-10G05 X LL X KD X LA</td>
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<td>CYLINDER</td>
<td>V65673-COMP X 51</td>
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<tr>
<td>1</td>
<td>WALL STOP</td>
<td>GSH 240</td>
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<tr>
<td>1</td>
<td>WEATHER STRIPPING</td>
<td>W-22 X 17-2 X BL</td>
</tr>
<tr>
<td>1</td>
<td>AUTO DOOR BOTTOM</td>
<td>CT-52F X 965MMOA</td>
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<tr>
<td>26D</td>
<td>STA</td>
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<tr>
<td>US26D</td>
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**Heading # 071**

1 SGL DOOR B015 BASEMENT DIV 22 TO SUPERVISOR B-015

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<tr>
<td>26D</td>
<td>STA</td>
<td></td>
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<td>US26D</td>
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CARD ACCESS BY SECURITY
## APPENDIX 5.13

**HARDWARE SCHEDULE - CODE # 3923**

**PEEL REGIONAL POLICE PHASE 1 ISSUED FOR BID (7750)**

7750 HURONTARIO STREET

### Heading # 072

1 SGL DOOR B016 BASEMENT DIV 22 TO SECURE PROP STORAGE B-016

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<th>Item</th>
<th>Description</th>
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<th>Width</th>
<th>Height</th>
<th>Depth</th>
<th>Hinge</th>
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<th>Cylinder</th>
<th>Closer</th>
<th>Kick Plate</th>
<th>Wall Stop</th>
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<tr>
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<td>1</td>
<td>ELECTRIC STRIKE</td>
<td>5000C-12/24D-630</td>
<td>AL</td>
<td>LCN</td>
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<td>1</td>
<td>KICK PLATE</td>
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</table>

CARD ACCESS BY SECURITY
OUTLET COVER TO REPLACE FULL BASE
SCALE: 1/2"=1'-0"

HALF OUTLET COVER TO REPLACE HALF BASE AT WALL
SCALE: 1/2"=1'-0"

OUTLET COVER TO REPLACE HALF BASE AND BORDER COMPONENTS
SCALE: 1/2"=1'-0"

NOTE:
1. CUSTOM SIZE IS AVAILABLE
2. X=4 FOR GRIDD 40
   X=7 FOR GRIDD 70

FREEAXEZ LLC
PHONE: (856) 764-0400
FAX: (856) 764-0700
www.freeaxez.com
FA-7221 OUTLET COVER
23.50" x 13.688" x 2.75"

FA-7220 OUTLET COVER
23.50" x 23.50" x 2.75"

FA-7222 OUTLET COVER
23.25" x 18.50" x 2.75"

FA-4250 OUTLET COVER PLATE
30" x 15"

*AVAILABLE IN CUSTOM SIZES*

Appendix 5.14

FREEAXEZ LLC
PHONE: (856) 764-0400
FAX: (856) 764-0700
www.freeaxez.com

GRIDD70 Outlet Covers

GRIDD70-OutletCovers
# Specification Version History

<table>
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<th>Version #</th>
<th>Implemented</th>
<th>Revision</th>
<th>Approved</th>
<th>Approval</th>
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<td>1.1</td>
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# Table of Contents

<table>
<thead>
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<tbody>
<tr>
<td><strong>I. General</strong></td>
<td>4</td>
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<tr>
<td>A. Purpose of Document</td>
<td>4</td>
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<tr>
<td>B. Scope of Work – Typical</td>
<td>4</td>
</tr>
<tr>
<td>C. General Guidelines</td>
<td>5</td>
</tr>
<tr>
<td>D. Terminology from TIA 569</td>
<td>6</td>
</tr>
<tr>
<td>E. Applicable Regulatory References</td>
<td>8</td>
</tr>
<tr>
<td>F. Peel Regional Police Substitution Policy</td>
<td>9</td>
</tr>
<tr>
<td>G. Contractor Qualifications</td>
<td>9</td>
</tr>
<tr>
<td>H. Warranty</td>
<td>11</td>
</tr>
<tr>
<td><strong>II. Subsystems and Components</strong></td>
<td>13</td>
</tr>
<tr>
<td>A. Cabling Subsystem 1 – Horizontal Copper Cabling System</td>
<td>13</td>
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<tr>
<td>B. Cabling Subsystem 2 – Intrabuilding (Within Building) Fiber</td>
<td>16</td>
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<tr>
<td>C. Racks, Cabinets, and Cable Management</td>
<td>18</td>
</tr>
<tr>
<td>D. Communications Grounding Network</td>
<td>21</td>
</tr>
<tr>
<td>E. Network Infrastructure Labeling</td>
<td>25</td>
</tr>
<tr>
<td>F. Cabling Accessories</td>
<td>27</td>
</tr>
<tr>
<td>G. Rack Power Distribution Units</td>
<td>27</td>
</tr>
<tr>
<td><strong>III. Testing and Acceptance</strong></td>
<td>29</td>
</tr>
<tr>
<td>A. General</td>
<td>29</td>
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<tr>
<td>B. Copper Channel Testing</td>
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<td>C. Fiber Testing</td>
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<td>D. System Documentation</td>
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<td>E. Inspection and Acceptance</td>
<td>31</td>
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<tr>
<td>F. Post Installation Maintenance Agreement</td>
<td>32</td>
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<tr>
<td><strong>IV. Project Scope of work</strong></td>
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<tr>
<td>A. Scope of Work</td>
<td>33</td>
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<tr>
<td><strong>V. Appendix A – Materials List</strong></td>
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</table>
I. General

A. Purpose of Document

1. This document is to provide a standard defining the structured communications cabling systems to be installed within Peel Regional Police facilities. It is geared toward leveraging our legacy cabling infrastructure while upgrading to more recent technologies in new installations. The goal is to accomplish this in the most economic and systematic fashion possible, and in a manner compliant with the latest codes, cabling standards, and industry best practices.

2. Within this document, the facilities owner is Peel Regional Police, and shall be referred to as such, or as Information Technology Services. Bidding low-voltage installers shall be referred to as “Installer” or “Contractor”.

3. It is the responsibility of the installing Contractor to evaluate these general recommendations and adapt them effectively to actual projects. Contractor is responsible for identifying and bringing to the attention of Peel Regional Police any design directions that may be improved. All such changes shall be approved in writing from Information Technology Services.

4. This specification defines quality standards and practices common to all Peel Regional Police network cabling upgrades and Greenfield (new) projects. The system offered and quoted, shall incorporate all features and facilities listed in this specification.

5. In addition to this cabling standard, individual projects will also have associated documentation such Requests for Proposals (RFP), facility drawings, and project schedules pertaining to that particular job. Such collateral will be referred to in this document as “Project-specific Documentation”, “Project Documentation”, or simply “Construction Documents”. Many of the requirements described herein may be detailed or expanded upon by such project-specific documents.

6. Any conflict between this general specification and any project-specific documentation shall be brought to the attention of Peel Regional Police and will be resolved by Peel Regional Police in writing.

7. Note that while many portions of this specification are addressed to “The Contractor”, these requirements apply equally to architects, engineers, project managers, planning, or anyone doing network cabling and infrastructure work within Peel Regional Police facilities, whether those persons are outside contractors or persons directly employed by Peel Regional Police.

B. Scope of Work – Typical

1. Contractor shall be solely responsible for all parts, labor, testing, documentation, and all other processes and physical apparatus necessary to turn over the completed cabling system and associated infrastructure fully warranted and operational for acceptance by Peel Regional Police.
2. This specification includes structured cabling for the production Ethernet network, but may address other systems that have converged onto Ethernet-style cabling. These associated systems may include VoIP, Building Automation Systems (BAS), Building Access Control, Security Cameras and Audio Visual Systems.

3. The following cabling subsystems will be defined:
   a. Cabling Subsystem 1 – Horizontal Copper Cabling
   b. Cabling Subsystem 2 – Intrabuilding Fiber Backbone Cabling OM4 or OS1
   c. Cabling Subsystem 3 – Interbuilding Fiber Backbone Cabling OS2
   d. Racks and Cable Management
   e. Bonding and Grounding
   f. Cable Pathways
   g. Network Labeling
   h. Cabling Accessories
   i. Cabling Subsystem 1 – Horizontal Copper Cabling
   j. Cabling Subsystem 2 – Intrabuilding Fiber Backbone Cabling OM4 or OS1
   k. Cabling Subsystem 3 – Interbuilding Fiber Backbone Cabling OS2
   l. Racks and Cable Management
   m. Bonding and Grounding
   n. Cable Pathways
   o. Network Labeling
   p. Cabling Accessories

4. In the event that requirements of the project documents cannot be met during design or installation, a written description of the need for variance will be submitted to the Peel Regional Police Project Manager for review by the Information Technology Services Team.

C. General Guidelines

1. All voice telephony systems shall be VoIP unless otherwise specified in the project-specific documentation.

2. Any copper or fiber patch cords shall be factory terminated. Hand terminated patch cords will not be accepted.

3. All Greenfield (new) projects shall use Cat 6 cable or better.
4. On Brownfield (existing) installations, Contractor shall consult project documentation for guidance on the current Category of copper cable to be installed.

5. Any deviation from Cat 6 cabling shall be approved in writing by Brad Masterson C.E.T.

6. Wiring configuration on Cat 6 systems shall be T568A.

7. Any communications/IT consulting engineers retained by Peel Regional Police shall be at the sole discretion of Information Technology Services.

D. Terminology from TIA 569

1. New Terms for Telecommunications Spaces (Rooms)
   a. This section reviews some of the current terminology for communications rooms and spaces as defined in TIA 569-D (April 2015).
   b. Awareness of these new terms is important for communicating accurately and for clearly understanding language used in specifications and other documents.
   c. This specification will use both new and old terms side-by-side for clarity.
   d. The table below shows some of the most important new terms and how they relate to traditional terminology:

<table>
<thead>
<tr>
<th>Old Term(s)</th>
<th>New Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entrance Facility.</td>
<td>Entrance Room</td>
</tr>
<tr>
<td>Telecommunications Room, Equipment Room.</td>
<td>Distributor Room</td>
</tr>
<tr>
<td>Telecommunications Room, Equipment Room.</td>
<td>Telecommunications Space</td>
</tr>
<tr>
<td>Cross-connect, Patching System, Optical Enclosure.</td>
<td>Distributor</td>
</tr>
<tr>
<td>Horizontal Cross-connect. Usually copper patch panels in enterprise installations.</td>
<td>Distributor A</td>
</tr>
<tr>
<td>Main Cross-connect, Main Distribution Frame. Usually singlemode optical enclosure in enterprise installations. Can apply to intra and interbuilding fiber cabling subsystems.</td>
<td>Distributor C</td>
</tr>
<tr>
<td>Faceplate, Surface Box, Work Area Appliance.</td>
<td>Equipment Outlet</td>
</tr>
<tr>
<td>Work Area.</td>
<td>Equipment Outlet Location</td>
</tr>
<tr>
<td>Horizontal Cabling. Extends from Equipment Outlet to Distributor A, B, or C depending on size of cable plant. Usually balanced twisted pair cable in enterprise installations.</td>
<td>Cabling Subsystem 1</td>
</tr>
<tr>
<td>Extends from Distributor A to Distributor B or C, depending on size of cable plant.</td>
<td>Cabling Subsystem 2</td>
</tr>
</tbody>
</table>
**Old Term(s)** | **New Term**
--- | ---
Usually 50-micron intra-building backbone fiber cable in enterprise installations. But may be singlemode fiber. | 
Connects Distributor A to Distributor B. In enterprise installations, this is usually singlemode fiber between buildings. | Cabling Subsystem 3

Example of a logical cabling topology with the new terminology see illustration below:
E. Applicable Regulatory References

1. Contractor is responsible for knowledge and application of current versions of all applicable standards and codes.

2. ANSI/TIA:
   a. ANSI/TIA 568 series, most recent revisions, addenda and systems bulletins. All applicable
   b. ANSI/TIA-569 Telecommunications Pathways and Spaces, most recent revision including all relevant addenda and systems bulletins
   c. ANSI/TIA-606 Administration Standard for Telecommunications Infrastructure, most recent revision including all addenda and systems bulletins
   d. ANSI/TIA-607 Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises, most recent revision including all addenda and systems bulletins
   e. ANSI/TIA-862 Structured Cabling Infrastructure Standard for Intelligent Building Systems, most recent revision including all addenda and systems bulletins
   f. ANSI/TIA-942 Telecommunications Infrastructure Standard for Data Centers, most recent revision including all addenda and systems bulletins
   g. ANSI/TIA-1179 Healthcare Facility Telecommunications Infrastructure Standard, most recent revision including all addenda and systems bulletins
   h. ANSI/TIA-4966 Telecommunications Infrastructure Standard for Educational Facilities, most recent revision including all addenda and systems bulletins
   i. TIA-TSB-162 Telecommunications Cabling Guidelines for Wireless Access Points, most recent revision including all addenda and systems bulletins

3. BICSI – Building Industry Consultative Services International – Manuals
   a. Telecommunications Distribution Methods Manual, most recent edition
   b. Information Transport Systems Installation Methods Manual (ITSIMM), most recent edition

4. National Electric Codes – all applicable

5. OSHA Standards and Regulations – all applicable

6. Local Codes and Standards – all applicable

7. Anywhere cabling standards conflict with one another or with electrical or safety codes, Contractor shall defer to the CEC and any applicable local codes or ordinances, or default to the most stringent requirements listed by either

8. Any violations of applicable standards or codes committed by the Contractor shall be remedied at the Contractor’s expense
F. Peel Regional Police Substitution Policy

1. This is a performance-based specification developed from the experience of the Peel Regional Police Information Technology Services in providing exceptional solutions for all our facilities and departments. As such, substitution of specified products or systems named in this document is highly discouraged.

2. Any Contractor wishing to offer substitutions for any part of the systems specified herein shall be responsible for proving equivalency and shall follow the procedure below:
   a. Contractor shall submit a request for product substitution to Peel Regional Police in writing no less than one week in advance of bid.
   b. Contractor shall provide three (3) each samples of the product being offered for evaluation by Peel Regional Police.
   c. Samples of products offered for substitution shall be accompanied by product drawings, specification sheets and engineering documents proving equivalency in transmission performance (where applicable) and mechanical function.
   d. Category Cat 6 cable and components offered in substitution to those specified shall be accompanied by third party test reports proving equal or better channel performance. Such test reports shall name exact products by part number and state channel results in worst-case connector links of maximum length that include both cross-connect and consolidation points.

3. Equivalent product acceptance must be received from Peel Regional Police in writing.

4. Contractor shall be responsible for and assume all costs for removal and replacement of any substituted product installed without prior written approval from Peel Regional Police. Such costs shall include but not be limited to labor, materials as well as any penalties, fees or costs incurred for late completion.

G. Contractor Qualifications

1. General
   a. Contractor shall be a current Panduit One™ Partner that has completed the Structured Cabling Deployment training (Panduit Certified Installer). A copy of the corporate Panduit manufacturer certification shall be included with all quotes.
   b. Contractor shall have at least 5 years documented experience installing and testing structured cabling systems of similar type and size.
   c. Contractor shall employ at least one BICSI Registered Communication Distribution Designer (RCDD) to sign-off on all designs offered, including stamping the design with their current BICSI/RCDD stamp.
   d. Contractor shall have all necessary permits, licenses, and inspections required for the performance of data, voice, and fiber optic cable installations.
e. At least 30 percent of the technicians installing low-voltage copper systems on the job shall have a current Panduit Certified Copper Technicians certificate or equivalent to be approved by Peel Police IT Services.

f. At least 30 percent of the technicians installing any Fiber Distribution Systems shall have a current Panduit Certified Fiber Technicians certificate or equivalent to be approved by Peel Police IT Services.

g. The Telecommunications contractor shall provide a Project Manager to serve as the single point of contact to manage the installation, speak for the contractor and provide the following functions:
   - Initiate and coordinate tasks with the Peel Regional Police Project Manager and others as specified by the project schedule.
   - Provide day-to-day direction and-site supervision of Contractor personnel.
   - Ensure conformance with all contract and warranty provisions.
   - Acknowledge and remediate findings of Peel Regional Police weekly site project meetings.
   - This individual will remain Project Manager for the duration of the project. The contractor may change Project Manager only with the written approval of Peel Regional Police.

h. Contractor Project Manager on site shall have completed the Panduit Structured Cabling Deployment training and hold certificates for both copper and fiber.

2. References and Response Times
   a. Communication Contractor shall provide with bid, a list of four (4) reference accounts where similar Data, Voice, Fiber Optic Cable, and related equipment installation work was performed within the last year (twelve-month period).

3. Termination of Services
   a. Peel Regional Police reserves the right to terminate the Communication Contractor’s services if at any time it is determined the Communication Contractor is not fulfilling their responsibilities as defined within this document and all associated project documentation.
   b. Upon termination, the Communications Contractor shall be restricted from the premises and compensated for the percentage of work completed satisfactorily.
   c. Contractor’s appearance and work ethic shall be of a professional manner. Dress shall be appropriate to the work being performed.
   d. Conduct on Peel Regional Police property will be professional in nature.
   e. Any person in the Contractor’s employ working on a Peel Regional Police project considered by Peel Regional Police to be incompetent, disorderly, or for any other reason unsatisfactory or undesirable to Information Technology Services, such person shall be removed from the Peel Regional Police project.

4. Other Contractor Responsibilities
   a. Confirmation of Pathway and Cable Manager sizing:
Wherever cabling pathways or managers are installed, it is the Contractor’s responsibility to confirm pathway or manager sizing to represent no more than 25% fill upon installation according to manufacturer’s fill tables.

Pathways deemed overfilled upon installation will not be accepted and shall be remedied at Contractor expense.

b. Contractor is responsible for the removal and disposal of all installation and construction debris created in the process of the job.

c. All work areas will be cleaned at the conclusion of the workday and no tools or materials shall be left in a manner as to pose a safety hazard.

d. Projects are not considered finished and will not be paid by Peel Regional Police until all debris, dust, etc. has been cleaned and removed to the satisfaction of Peel Regional Police.

e. Contractor shall remove all abandoned cable per Article 800 of the National Electrical Code and per TIA and BICSI standards, recycling these materials where possible. Removal of orphaned cable is mandatory. Contractors shall consider this when placing bids.

f. Contractor shall abide by all Peel Regional Police Security Policies pertaining to access and conduct while on Peel Regional Police property.

g. Contractor shall obey all posted speed limits and parking regulations at the Peel Regional Police facilities where the work is being performed.

h. Contractor understands that illegally parked vehicles will be towed and Contractor is responsible for and will assume all costs associated with towing.

**H. Warranty**

1. Contractor shall provide a 25 year PanNet® System Warranty on all copper and fiber links and/or channels.

2. PanNet® System Warranty shall meet the following criteria:

   a. A 25-year guarantee that the installed cabling system will pass the Commercial Building Telecommunications Standards cited in this document.

   b. This warranty will cover all registered links and/or channels.

   c. Contractor shall indicate in warranty documentation whether registered links are to be link or channel.

      - If links are covered, this warranty may be invoked only if the links are comprised entirely of Panduit components and cable.

      - If channels are covered, this warranty may be invoked only if entire channel links are comprised of continuous Panduit components and patch cables.

   d. The communications Contractor will correct any problems and malfunctions that are warranty-related issues without charge for the entire warranty period.
e. If the PanNet® System Warranty is needed by Peel Regional Police within the warranted period and the original installer is no longer in business, Panduit shall find a substitute Panduit ONE\textsuperscript{SM} (certified) contractor and assume costs to fulfill the obligations of the warranty.

f. Upon acceptance of the warranty paperwork and test results from the Contractor, Panduit will mail a notification letter to the installer and a notification letter with warranty certificate to Peel Regional Police.

g. The warranty period shall commence following the final acceptance of the project by Peel Regional Police and written confirmation of warranty from Panduit.
II. Subsystems and Components

A. Cabling Subsystem 1 – Horizontal Copper Cabling System

1. See Appendix A for Part Numbers

2. Installation Guidelines

   a. Installation of horizontal cabling shall be compliant with most recent versions of all applicable standards, national and local codes, as well as the local Authority Having Jurisdiction (AHJ).

   b. The cabling system and support hardware shall be installed so as not to obscure any valves, fire alarm conduit, boxes, or other control, security or life safety devices.

   c. Contractor shall use the same Category of performance for both cable and connecting hardware through the entire horizontal channel.

   d. Anywhere there is a conflict between standards, codes, installation specifications or project specific documentation contractor shall default to the most stringent.

   e. If clarification is needed, contractor shall submit a written request for clarification to Peel Regional Police. Response from Peel Regional Police shall be in writing.

   f. All cable pulled and terminated shall be Cat 6 unless specified otherwise in the project documentation.

   g. Contractor is responsible for maintenance of maximum pulling tensions, minimum bend radius, and approved termination methods required by cited standards, as well as manufacturer's recommendations and industry accepted best practices.

   h. Contractor shall use low to moderate force when pulling cable. Maximum tensile load may not exceed 25' lbs. maximum pulling force per 4 pair cable.

   i. Bundles of cable shall be pulled using pulling socks to distribute the tensile force over all cables in the bundle.

   j. Contractor shall take care not to knot, snag or otherwise deform the cable while pulling. The jacket on installed cable shall be continuous, free from pinholes, splits, blisters, burn holes or other imperfections. Damaged or deformed cable shall be removed and replaced at no cost to Peel Regional Police.

   k. Bend radius on 4 pair cable shall never be below 4 times the cable outer diameter, or manufacturer's requirements, whichever is most stringent.

   l. Cables shall not be attached to lighting support wires nor touch the drop-ceiling assembly. Any portion of the communications cabling making contact with ceiling structures shall be remedied at Contractor expense.

   m. Cables shall be kept as far away from potential sources of EMI (electrical cables, transformers, light fixtures, etc.) as practical and in shall in no cases pass closer than recommended in cited TIA standards.
n. When using miniature horizontal cable or small diameter patch cables, the channel length shall be derated per manufacturer’s recommendations.

o. Contractor shall take care to never deform the cable by over cinching with cable ties. All cable ties shall be cinched firmly, but not so firmly that the tie cannot be rotated or moved on the bundle by hand.

p. Cable bundles in telecom spaces (rooms) shall be dressed using only hook and loop style cable ties. Plastic ties shall not be used in Peel Regional Police telecom rooms and shall be removed and replaced with hook and loop ties at Contractor expense.

q. Cable ties on all cable bundles shall be applied at random intervals to avoid harmonic effects.

r. All horizontal cabling installed shall include a cable slack loop of not less than 12 inches at the Equipment Outlet and not less than 36 inches in the horizontal telecom room.

s. Equipment outlet cable slack shall be stored in the box behind the faceplate if there is room to do so without violating the bend radius of the cable according to manufacturer’s recommendations.

t. Contractor may affix 12 inch slack loop above ceiling using hook and loop cable ties if allowed in the project specific documentation or otherwise in writing from Peel Regional Police. Cable loops touching the drop ceiling shall not be accepted.

u. Service loops in the telecommunications room may be wall mounted or contained in pathways or racking systems if done according to manufacturer and industry best practices.

v. All terminations on new (Greenfield) Peel Regional Police projects shall be terminated using the T568A pin-out (wire map).

w. All terminations in existing Peel Regional Police facilities (Brownfield), shall match the pin-out and Category of the legacy cable plant, unless otherwise specified in the project documentation.

x. Contractor shall terminate twisted pairs so that the last twist is never more than ½ inch from the point of termination (insulation displacement clip). Maintaining the last twist closer than ½ inch is preferred.

y. Contractor shall maintain the cable jacket as close as possible to the connecting hardware. Twisted pair conductors deemed by Peel Regional Police to be unnecessarily exposed shall be re-terminated at Contractor’s expense.

z. Contractor shall be responsible for using plenum cable, ties and appliances in any air-return (plenum) spaces as required by applicable codes, standards, and the local AHJ (Authority Having Jurisdiction).

3. Copper Horizontal Cable

a. Copper cable shall have the following attributes:
   - Panduit Category 6 cable shall meet ANSI/TIA-568-C.2
   - IEC 61156-5 Category 6 standards
   - Conductors shall be 23 AWG
   - Construction with FEP/polyolefin (CMP)
• Plenum – NFPA 262 and CSA FT-6
• PoE compliance: Meets IEEE 802.3af and IEEE 802.3at for PoE applications
• Cable diameter: 0.203 in. (5.2mm) nominal
• Color Blue

4. Equipment Outlet Copper Connectors (Jacks)
   a. Copper Connectors shall have the following attributes:
      • Category 6/Class E, 8-position, UTP jack module shall terminate 4-pair, 22 – 26 AWG
      • 100-ohm unshielded twisted pair cable and shall not require use of a punchdown tool
      • PoE & PoH compliance: Rated for 2500 cycles with IEEE 802.3af / 802.3at and proposed 802.3bt type 3 and type 4. Supports Power over HDBaseT up to 100 watts
      • Operating Temperature: -10°C to 65°C (14°F to 149°F)
      • Wire cap compatible with 22 – 26 AWG solid or stranded cable with conductor insulation diameters of 0.060 in. max. and overall cable O.D. 0.200 in. to 0.330 in
      • Color: Blue for work station and end-point devices such as printer or others
      • Color: Yellow for Security cameras and related devices

5. Equipment Outlet Appliances – Faceplates
   a. Faceplates shall have the following attributes:
      • 2 ports decora
      • Color White

6. Equipment Outlet Appliances – Surface Mount Boxes
   a. Surface Mount Boxes shall have the following attributes:
      • 2 ports
      • Color White

7. Copper Horizontal Patch Panels (Distributor A)
   a. Patch panels shall have the following attributes:
      • 24 ports 1RU and 48 ports 2RU
      • Modular accept Mini Com copper connectors
      • Color Black
8. Copper Patch Cords – Work Area
   a. Copper patch cords shall have the following attributes:
      • Category 6, 24 AWG UTP patch cord with TX6™ Modular Plugs on each end.
      • Color Blue for workstation and other end-point devices
      • Color Yellow for Security cameras and other related devices

9. Copper Patch Cords – Telecom Room
   a. Copper patch cords shall have the following attributes:
      • Category 6, 28 AWG UTP patch cord with TX6-28™ Modular Plugs on each end.
      • Color blue for Workstation and other end-point devices
      • Color Yellow for Security cameras and other related devices

B. Cabling Subsystem 2 – Intrabuilding (Within Building) Fiber

1. See Appendix A for Part Numbers

2. Installation Guidelines (Applies to all Fiber Trunks)
   a. Fiber terminations shall be done according to recommendations of TIA, manufacturer’s requirements, and accepted industry best practices.
   b. Fiber optic cabling system additions and upgrades to existing facilities (Brownfield) shall match the fiber type (OM/OS designation) of the system to which it is being installed. Contractor shall under no circumstances mix different OM/OS classes of cable or termination devices (connectors) within the same channel unless specifically instructed to do so within the project specific documentation.
   c. When installing fiber cable, Contractor shall maintain a minimum bend radius of 20 times the outer diameter of the cable when it is under load (being pulled).
   d. Fiber service loops shall be stored to maintain a minimum bend radius of 10 times the outer diameter of the cable.
   e. Optical fiber shall only be pulled using its internal strength member in conjunction with a properly rated multi-weave mesh grip and swivel pulling eye.
   f. All unjacketed fiber shall be contained within appropriate fiber enclosures. Exposed tight-buffered, fan-out or loose-tube strands will not be tolerated and shall be remedied at Contractor’s expense.
   g. Direct connection of terminated fiber backbone links to equipment is not allowed. All fiber connections shall go through a fiber enclosure interconnect and connect to active equipment via fiber jumpers.
   h. Contractor shall perform fiber testing of all strands according to guidelines in the “Testing and Acceptance” section of this document.
i. Service loop (slack) in telecommunications rooms shall be at least 3 meters. Consult project documentation for length of service loops and storage method within a specific telecom room or space.

j. Slack shall be stored per manufacturer instructions inside the enclosure, or stored outside the enclosure using appliances built for that purpose. Consult project documentation for details on storage of service loops.

k. Fiber pulls using multiple pull points shall use the “figure-8” technique any time excess cabling is piled on the floor as slack to supply the next pull-point.

l. Cable shall be rolled off the spinning cable reel, not pulled off the end.

m. During all fiber cable pulls Contractor shall have one person at each end of the pull to ensure proper cable pay out and pile up without damage to the fiber.

n. Fiber backbone cables shall be installed separately from horizontal distribution cables. Under no circumstances may copper and fiber cables be pulled in common bundles.

o. In pathways containing both fiber and copper cables, the fiber cable must either be of armored construction, or segregated in innerduct.

p. Where cables are housed in sleeves or conduits, the backbone and horizontal cables shall be installed in separate conduits or the fiber segregated in separate innerduct within the conduits.

q. Fiber shall be segregated within racks and patching systems unless instructed otherwise in the project documentation.

r. Where possible fiber enclosures shall be mounted at the top of equipment racks and the fiber cable kept separate from copper cable.

s. Contractor shall inspect fiber end faces with a fiber scope and clean the connectors (if needed) whenever plugging in a fiber connector.

3. Fiber Between Telecom Rooms

a. Backbone fiber cable between telecoms rooms on the same floor within building shall have the following attributes:
   - 9um OS2 Singlemode
   - Minimum 12 Fiber Indoor Distribution Cable
   - Plenum (OFNP), 900um Buffered Fibers

4. Fiber Connectors

a. Intrabuilding fiber connectors shall have the following attributes:
   - LC Cam-Style OptiCam® Connectors
   - 9/125μm OS1/OS2
   - Ferrule type: Zirconia ceramic with a pre-polished fiber stub
• Insertion loss: Ceramic: 0.3dB average (multimode and singlemode)
• Fiber cable size: 1.6mm – 2.0mm and 3.0mm jacketed cable with optional boots

5. Fiber Enclosures

a. Fiber enclosures shall have the following attributes:
   • Rack mount fiber enclosures shall house, organize, manage and protect fiber optic cable, terminations, splices, connectors and patch cords.
   • Enclosure shall accommodate all Panduit trunk cables, connectors, patch cords, fiber adapter panels (FAP) and fiber mount panels (FMP)
   • Fiber optic enclosures shall be constructed of steel material.
   • Molded front and back doors shall be removable for cabling and connector installation
   • 1 RU and 2 RU enclosures shall provide full front and rear access with a drawer that slides forward and backward.

b. Fiber Adapter Panels shall have the following attributes:
   • Zirconia ceramic: OS1/OS2 singlemode adapters.
   • Snap quickly into Opticom® Fiber Adapter Patch Panels and Enclosures

c. Fiber patch cords (jumpers) for shall have the following attributes:
   • SINGLEMODE
   • 1.6mm DUPLEX LC/LC
   • STANDARD IL

C. Racks, Cabinets, and Cable Management

1. See Appendix A for Part Numbers

2. Installation Guidelines

   a. Racks shall be securely attached to the concrete floor using appropriate mounting hardware.
   b. All racks shall be grounded to the telecommunications ground bus bar in accordance with cited standards the bonding and grounding section of this document.
   c. Rack mount screws (#12-24) not used for installing fiber panels and other hardware shall be bagged and left with the rack upon completion of the installation.
   d. In telecommunications rooms with multi-bay rack rows, Contractor is responsible to include in design interbay routing pathways at the top, middle, and bottom of each rack to provide efficient and neat patch routing between any two points within rack rows.
e. See the 2-post rack configuration example below for general guidelines for pathways between ganged racks:

![Rack Configuration Example](image)

f. For bottom-of-rack interbay routing where cable quantities exceed capacity of interbay troughs, Contractor should substitute 4RU troughs.

g. All racks shall be outfitted with a vertical grounding busbar along one rail, with all equipment bonded to ground according to the Bonding and Grounding Standards cited in this document. See Bonding and Grounding section of this document for details.

h. Cabinets should be positioned to create aisle widths able to accommodate the movement and installation of the largest equipment anticipated.

i. Minimum aisle width is 3 feet clearance in the front of the cabinet and not less than 2 feet of clearance in the rear. Consult project documentation for clearance requirements on a specific job.

j. Cabinets shall be secured to the building structures according to the manufacturer’s instructions and in compliance with applicable codes, standards, and the requirements of the local AHJ. Please also refer to project-specific documentation as appropriate.

k. Racks and cabinets shall be individually electrically bonded to the communications earthing system according to the manufacturer’s instructions and in compliance all applicable standards, codes and the requirements of the local AHJ.

l. All cabinets shall be clearly identified at both the top and bottom of the in both the front and back of each cabinet with a large label (not less than 1” in height). Labels must be visible with the cabinet doors open or closed.
m. Empty horizontal spaces in cabinets in equipment rooms may be blanked with panels or blanking shades to facilitate hot/cold aisle cooling strategies. Consult project documentation for blanking requirements.

n. Cable entrances in tops of cabinets shall be sealed using preinstalled brushes or using the appropriate sized Panduit cool boot seals.

3. Two-Post Communications Racks

a. Two-post communications racks shall have the following properties:
   - 16 gage steel, black powder coat finish
   - #12-24 threaded equipment mounting rails
   - 84.0"H x 20.3"W x 3"D, 45 RU

b. Four-post communications racks shall have the following properties:
   - 16 gage steel, black powder coat finish
   - #12-24 threaded equipment mounting rails
   - 84.0"H x 20.3"W x 30.0"D, 45 RU

4. Rack-mounted Cable Management – Vertical Managers

a. Contractor shall size vertical cable managers to represent not more than 25% fill by manufacturer tables based on worst cast density estimates.

b. Contractor shall use larger vertical cable managers between racks as described elsewhere in this section.

c. Rack-mounted cable management – vertical managers shall have the following properties:
   - The vertical cable manager shall consist of a metal backbone with cable management fingers that align with EIA rack spacing
   - The fingers shall be molded out of plastic and provide integral bend radius control throughout the entire length.
   - The backbone shall have pass through holes for front to back cabling, with the option to blank off with a plug
   - The manager shall accept a metal, hinged, push-to-close door that can open to the right or left.
   - The door support brackets shall be integrated into the manager with no assembly required

5. Rack-mounted Cable Management – Horizontal Managers

a. Contractor shall size horizontal cable managers to represent not more than 25% fill by manufacturer tables based on worst cast density estimates.
b. Rack-mounted cable management – horizontal managers shall have the following properties:
   • The high capacity horizontal cable managers shall be capable of managing high performance cable on the front and rear of any 19” EIA rack
   • Inset fingers Fingers slope inward offering greater access to network cabling for easier moves, adds, and changes
   • Available in 1RU, 2RU, 3RU and 4RU

D. Communications Grounding Network

1. See Appendix A for Part Numbers

2. Installation Guidelines

   a. Contractor is responsible for bonding to ground all newly placed equipment and installed racks or cabinets per the TIA Standards.

   b. All racks, metallic backboards, cable sheaths, metallic strength members, splice cases, cable trays, etc. entering or residing in the entrance facility or distributor (telecom) rooms shall be grounded to the respective PBB (Primary Bonding Busbar otherwise known as TMGB – Telecommunications Main Grounding Busbar) or SBB (Secondary Bonding Busbar otherwise known as TGB – Telecommunication Grounding Busbar) using a minimum #6 AWG stranded copper bonding conductor and compression connectors.

   c. Metallic panels attached to the rack or cabinet shall be bonded to the rack or cabinet using a green thread forming screw.

   d. The copper conductor size shall be upgraded based on the largest power conductor feeding any rack-mount equipment.

   e. All jacketed wires used for telecommunications grounding purposes should be identified with green or green with yellow stripe insulation. Non-insulated wires shall be identified at each termination point with a wrap of green tape.

   f. All cables and busbars shall be identified and labeled in accordance with the labeling standards cited in the Regulatory References section of this specification.

   g. The TBB (Telecommunications Bonding Backbone) shall adhere to the recommendations of the ANSI/TIA grounding and bonding standards cited in the Regulatory References section of this document and shall be installed in accordance with cited standards and best industry practices.

   h. Installation and termination of the main bonding conductor to the building service entrance ground shall be performed by a licensed electrical contractor.

3. Entrance Room
4. Distributor (Telecommunications) Rooms

a. Within the telecommunications rooms and data centers all pathways and racks shall be grounded and bonded as indicated in the diagram below.

b. Contractor is responsible for properly grounding all network equipment, racks and cabinets and bonding them to the wall mounted busbars as described in the TIA 607 series of standards.

c. All newly installed racks and cabinets shall have installed a Panduit vertical strip mounted along one equipment rail to serve as a clean, low-resistance bonding place for equipment grounding jumpers used to bond equipment such as chassis switches, that come equipped with a designated grounding pad, back to the rack.

d. Smaller equipment without an integrated grounding pad shall be bonded to the vertical busbar through the use of a thread-forming grounding screw that is anodized green and includes serrations under the head to cut through oxidation or paint on the equipment flange.

e. Larger equipment (chassis switches) with a designated grounding terminal shall be bonded to the vertical busbar with an EBC (equipment bonding conductor) kit built to that purpose.
f. Contractor shall take care to clean (wire brush, Scotch Brite pads) any metallic surface to be bonded down to bare metal and apply a film of anti-oxidation paste to the surfaces prior to effecting the bond.

g. All bonding lugs on racks and busbars shall be of two-hole irreversible compression type. Mechanical lugs and single-hole lugs will not be accepted and shall be removed and replaced at Contractor's expense.

h. Every rack or cabinet shall have an individual bonding conductor into the grounding network, serially connecting (daisy-chaining) of racks is expressly forbidden and will not be accepted.

i. Rack Bonding Conductors (RBC) may tap into an overhead or underfloor aisle ground, or may run to the wall-mounted grounding busbar in smaller Telecommunications rooms containing 5 racks or less.

j. A minimum of every other rack or cabinet shall be outfitted with a properly installed and bonded ESD (electro-static discharge) port along with a wrist strap and lead to be used by any technicians servicing network equipment. On four post racks and cabinets these ESC ports and straps shall be provided on front and back to be accessible and able to reach any active equipment needing servicing.

k. Armored cables shall be properly bonded to the earthing system on both ends with a kit built to that purpose.

l. For an example of telecom room grounding, refer to the illustration that follows:
m. For an example of proper rack grounding, see the illustration below:

**Property Bonded Rack Example**

![Diagram of Proper Bonded Rack Example]

*NOTE: An actual rack will bond to the communications bonding network at either the top or bottom, not both as shown in illustration.*
n. For an example of proper cabinet grounding, see the illustration below:

E. Network Infrastructure Labeling

1. See Appendix A for Part Numbers

2. Installation Guidelines
   a. Questions or comments regarding labeling strategies at Peel Regional Police may be sent to Brad Masterson C.E.T. at Peel Regional Police.
   b. Contractor shall, wherever possible, pre-print labels using Panduit Easy-Mark software and desktop printer.
   c. The Panduit PanTher LS8E (or equivalent) hand-held thermal transfer printer shall be used onsite to print labels that were unanticipated, or that become damaged in application.
   d. Labels shall be legible and placed in a position that insures ease of visibility.
   e. All newly installed cables shall be labeled within 3 inches at both ends using a permanent self-laminating cable labels built to that purpose and designed to outlast the cable to which they attach.
f. Contractor is responsible for ordering the correct self-laminating cable labels appropriate to the cable outer diameter.

g. Each end of the cable shall have the same label.

h. The same identifier shall be contained in one line and repeated to be visible from all sides without having to rotate the cable to read it.

i. All labels shall be machine printed, bold font and centered at the highest point that can fit all characters legibly. Hand written labels will not be accepted and shall be remedied at Contractor’s expense.

j. This labeling strategy shall, at a minimum, clearly identify all components of the system: racks, cables, panels and outlets, grounding, pathways and spaces like telecommunications rooms.

k. Racks and patch panels shall be labeled to identify the location within the cable system infrastructure.

l. All test documents shall accurately reflect the labeling scheme.

m. Outlet, patch panel and wiring block labels shall be installed on, or in, the space provided on the device.

n. Machine-generated labels shall be installed behind the clear lens or cover on any device that provides such an option.

o. All labels will be permanently affixed to installed cables, patch panels, racks, cabinets, and enclosures.

p. Conduit shall be marked indicating the identification of the cable within.

q. Consult project specific documentation for the labeling scheme for a particular project.

3. Communication and Systems Elements Requiring Labeling

a. The following communications elements shall be labeled:
   - Equipment outlets – faceplates
   - Equipment outlets – surface boxes
   - Copper horizontal cable
   - Copper patch panels
   - Communications patch cords
   - Zone boxes (MUTOAs or consolidation points)
   - Equipment racks
   - Communications cabinets
   - Telecommunications rooms – (closets)
   - Fiber backbone cable
   - Fiber enclosures
   - Fiber optic patch cords (jumpers)
4. Other Systems Requiring Labeling

   a. The following systems shall be labeled:
      • Communications conduit and pathways
      • Firestopping locations
      • Grounding busbars
      • Grounding backbone

5. Labeling Records

   a. Contractor shall provide a spreadsheet showing link records that list all labeled elements, including jack numbers, patch ports and telecom space identifiers.
   
   b. All labeling information shall be recorded on the as-built drawings, and cross-reference sheets as described in project documentation.

F. Cabling Accessories

1. Refer to Appendix A for Part Numbers

2. Physical Security Devices

   a. Some portions of Peel Regional Police networks require additional physical security devices. These take three forms:
      • Devices that block-out copper and fiber ports in patch fields and faceplates that require a special tool for removal.
      • Devices that lock-in copper patch cords and require a special tool for removal of those patch cords.
      • Devices that temporarily or permanently block USB ports on laptops and computers.
   
   b. Areas where such devices are required will be called out in the project documentation.

G. Rack Power Distribution Units

1. Vertical Intelligent Power Distribution Unit

   a. Plug Type
      i. NEMA L21-30P
   
   b. Receptacle Type
      i. IEC C13, IEC C19, NEMA 5-20R
   
   c. Plug & Play Sensors: 
i. Digital sensors not only allow for multiple sensors on the same bus; but also identify themselves to the controller to simplify setup & commissioning.

d. Operating Temperature:
   i. 60°C ambient at full load for operational reliability in high temperature areas

e. 1GB Ethernet:
   i. The 1G controller is compatible with the new Data Center Network switches being deployed - reducing special network configurations/resources required to support the iPDU

<END OF SECTION>
III. Testing and Acceptance

A. General

1. All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions.

2. All copper pairs or optical fibers of each installed cable shall be tested and verified prior to system acceptance.

3. Any defect in the cabling system performance or installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors or fibers in all cables installed.

4. All cables shall be tested in accordance with this document, the ANSI/TIA Standards, the Panduit warranty guidelines, and industry best practice. If any of these are in conflict, the Contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.

B. Copper Channel Testing

1. All twisted-pair copper cable links shall be tested for compliance to the requirements in ANSI/TIA for the appropriate Category of cabling installed using a test unit meeting a minimum IEC IIIe level of accuracy.

2. All testers used must have been factory calibrated by the manufacturer within one year of use or according to factory calibration recommendations, whichever is more stringent.

3. Contractor shall set references according to manufacturer’s recommendation prior to each day’s testing and reset references anytime the tester unit shuts down due to inactivity.

4. Resetting references shall also be done whenever test results become sporadic or the tester demonstrates a consistent deterioration of test measurement performance.

5. Testing of any links that include field-terminated plugs shall follow the procedure outlined in Panduit document #PN614, available from the Panduit representative, or downloadable from www.panduit.com.

C. Fiber Testing

1. All installed fiber shall be tested for link-loss in accordance with ANSI/TIA standards cited in this document.

2. For horizontal cabling system using multimode optical fiber, attenuation I should be measured in at least one direction, according to customer requirements, at either 850 nm (nanometer) or 1300 nm using an appropriate light source and power meter.

3. Fiber testing must be performed using reference grade test leads. Test results from tests using test leads that are not reference grade will not be accepted and must be retested at the Contractor’s expense.
4. Backbone multimode fiber cabling should be tested at both 850 nm and 1300 nm (or 1310 and 1550 nm for singlemode) in both directions.

5. Test set-up and performance shall be conducted in accordance the Method B (One Jumper Method).

6. Where links are combined to complete a circuit between devices, the Contractor shall test each link from end to end to ensure the performance of the system. Only basic link loss testing (OLTS) is required, not OTDR testing. OTDR testing is optional as a secondary test method but, by itself, is not a valid means by which links or channels can be certified.

7. The contractor can optionally install Panduit patch cords to complete the circuit and then test the entire channel, though Panduit currently issues only a link warranty, not a channel warranty. The test method shall be the same used for the test described above.

8. Attenuation testing shall be performed with a stable launch condition using two-meter jumpers to attach the test equipment to the cable plant. The light source shall be left in place after calibration and the power meter moved to the far end to take measurements.

9. Qualification of the reference cords shall be completed after each reference and the insertion loss of the reference connectors shall be saved and presented as part of the testing documentation.

10. Panduit highly recommends utilizing the practice of individual end face inspection, cleaning if necessary then re-inspection before connecting any fiber end faces together in a link. This complete process should be performed BEFORE any OLTS testing takes place. For further process clarification, refer to Panduit Visual Inspection and Cleaning Best Practices #FS061.

11. Contractor shall further inspect, clean and re-inspect the Reference Lead connector end faces anytime testing shows inconsistent results. If this does not correct accuracy, contractor shall re-certify (test) the reference leads and replace them if necessary.

D. System Documentation

1. Documentation During Installation Phases
   a. Peel Regional Police will provide floor plans in paper and electronic (DWG, AutoCAD) formats on which as-built construction information can be added. These documents will be modified accordingly by the telecommunications contractor to denote as-built information and returned to Peel Regional Police.
   b. Documentation shall be submitted within ten (10) working days of the completion of each testing phase. This is inclusive of all test results and draft as-built drawings. The Contractor shall annotate the base drawings and return a hard copy (same plot size as originals) and electronic (AutoCAD) form.
   c. When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be documented.
d. It is mandatory that the test results from each phase be delivered in the tester native format. At the request of the Peel Regional Police project lead, the telecommunications contractor shall provide copies of the original test results.

e. The As-Built drawings are to include cable routes and outlet locations. Their sequential number as defined elsewhere in this document shall identify outlet locations. Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided.

2. Documentation at Project Completion

a. A final, complete set of all documentation shall be provided in electronic format within three weeks after the completion of the project.

b. The testing results shall also be provided to Panduit in raw data format (native tester format), along with all associated warranty paperwork for evaluation and issuance of warranty.

c. All documentation shall be clearly marked with the words “Project Test Documentation” plus the project name, and the date of completion.

d. The test documentation shall detail the test methods used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.

e. The test results shall further include a record of test frequencies, cable type, conductor pair and cable (or outlet) I.D., measurement direction, reference setup, and crew member name(s).

f. The test equipment name, manufacturer, model number, serial number, software version and last calibration date will also be provided at the end of the document.

3. Unless the manufacturer specifies a more frequent calibration cycle, an annual factory calibration is mandatory on all test equipment used for the installation.

4. The project lead from Peel Regional Police may request that a 10% random field re-test be conducted on the cable system, at no additional cost, to verify documented findings. Tests shall be a repeat of those defined above.

5. If retest findings contradict the documentation submitted by the telecommunications contractor, additional testing can be requested to the extent determined necessary by the Project Lead, including a 100% re-test. This re-test shall be at no additional cost to Peel Regional Police.

E. Inspection and Acceptance

1. During Installation

a. The Peel Regional Police Project Lead will make periodic inspection of the project in progress.

b. One inspection will be performed at the conclusion of cable pulling, prior to closing of the drop ceiling, to inspect the method of cable routing and support, and the firestopping of penetrations.
c. A second inspection will be performed at completion of cable termination to validate that cables were dressed and terminated in accordance with ANSI/TIA recommendations for jacket removal and pair untwist, compliance with Manufacturer’s minimum bend radius, and that cable ends are dressed neatly and orderly.

2. Final Inspection

a. Upon completion of the project, the Peel Regional Police Project Lead will perform a final inspection of the installed cabling system with the Contractor’s project foreman.

b. The final inspection will be performed to validate that all horizontal and backbone cables were installed as defined in the drawing package, and that the installation meets the technical performance and aesthetic expectations of the Peel Regional Police.

3. Live System Performance Verification

a. During the three-week period between final inspection and delivery of the test and as-built documentation, Peel Regional Police will activate and validate operation of the cabling system.

4. Final Acceptance

a. Final acceptance is possible after completion of the installation, in-progress and final inspections, receipt of the test results, receipt of the as-built documentation, and receipt of the manufacturer’s system performance warranty and successful performance of the system for a three-week period.

b. Acceptance of the installed system by Peel Regional Police must be in writing to be valid

F. Post Installation Maintenance Agreement

1. The Contractor shall furnish an hourly rate with the proposal submittal which shall be valid for a period of one year from the date of acceptance.

2. This rate will be used when cabling support is required to do moves, adds, and changes (MACs) to the system.

3. MACs shall not void the Contractor’s nor Manufacturer’s warranty.
IV. Project Scope of work

A. Scope of Work

Here place general synopsis for scope of work

1. Requirements

   a. Attribute
   
   b. Attribute

<END OF SECTION>
## Appendix A – Materials List

<table>
<thead>
<tr>
<th>Product Category</th>
<th>Part Number</th>
<th>Manufacturer</th>
<th>Part Description</th>
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<tbody>
<tr>
<td>Copper Cabling Products</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>PUP6C04BU-F</td>
<td>Panduit</td>
<td>Category 6 copper cable, 4-pair, 23AWG, U/UTP, CMP, Blue 1000 feet in a carton.</td>
</tr>
<tr>
<td></td>
<td>CJ688TGBU</td>
<td>Panduit</td>
<td>The Category 6, RJ45, 8-position, 8-wire, UTP Mini-Com® universal jack module has TG-style termination and is blue</td>
</tr>
<tr>
<td></td>
<td>CJ688TGYL</td>
<td>Panduit</td>
<td>Category 6, RJ45, 8-position, 8-wire universal module. Yellow.</td>
</tr>
<tr>
<td></td>
<td>CFG2WH</td>
<td>Panduit</td>
<td>Mini Com rectangular adapter, mounts behind standard GFCI faceplates, accepts two Mini-Com® Module, White.</td>
</tr>
<tr>
<td></td>
<td>CPPL48WBLY</td>
<td>Panduit</td>
<td>Mini Com 48-port modular patch panel with faceplates in black, with label and label covers, (2RU).</td>
</tr>
<tr>
<td></td>
<td>CPPL24WBLY</td>
<td>Panduit</td>
<td>Mini Com 24-port modular patch panel with faceplates in black, with label and label covers, (1RU).</td>
</tr>
<tr>
<td></td>
<td>UTPSP10BUY</td>
<td>Panduit</td>
<td>Category 6, UTP patch cord with TX6™ PLUS Modular Plugs on each end, 10 ft. Work Station</td>
</tr>
<tr>
<td></td>
<td>UTP28SP7BU</td>
<td>Panduit</td>
<td>Category 6 Performance, 28 AWG UTP patch cord with TX6™ Modular Plugs on each end. Blue, 7 ft. Telecom room</td>
</tr>
<tr>
<td></td>
<td>UTPSP1YLY</td>
<td>Panduit</td>
<td>Category 6, UTP patch cord with TX6™ PLUS Modular Plugs on each end. Yellow, 1 ft. Security camera</td>
</tr>
<tr>
<td></td>
<td>UTP28SP7YL</td>
<td>Panduit</td>
<td>Category 6 Performance, 28 AWG UTP patch cord with TX6™ Modular Plugs on each end. Yellow, 7 ft. Telecom room</td>
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<td>Fiber Cabling Products</td>
<td>FSDP912Y</td>
<td>Panduit</td>
<td>9um OS2 12 Fiber Indoor Distribution Cable, Plenum (OFNP), 900um Buffered Fibers</td>
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<tr>
<td>Product Category</td>
<td>Part Number</td>
<td>Manufacturer</td>
<td>Part Description</td>
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</tr>
<tr>
<td>FRME1U</td>
<td>Panduit</td>
<td>Rack Mount Fiber Enclosure ensures network reliability by housing, organizing, managing and protecting up to 72 fiber optic cable, terminations, splices, connectors and patch cords using up to 3 FAP or FMP adapter panels or FOSM splice modules.</td>
<td></td>
</tr>
<tr>
<td>FAP6WBUDLCZ</td>
<td>Panduit</td>
<td>LC OS1/OS2 FAP loaded with six LC duplex singlemode fiber optic adapters (Blue) with zirconia ceramic split sleeves.</td>
<td></td>
</tr>
<tr>
<td>FLCSSCBUY</td>
<td>Panduit</td>
<td>Pre-Polished LC Simplex OptiCam Style OS2 Connector, Natural Housing with 900um Blue Boot</td>
<td></td>
</tr>
<tr>
<td>F92ERLNLNSNM003</td>
<td>Panduit</td>
<td>OS2 Singlemode Riser (OFNR) LC Duplex patch cord</td>
<td></td>
</tr>
<tr>
<td>Racks, Cabinets, and Cable Management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R2P</td>
<td>Panduit</td>
<td>The Panduit Two-post Rack System provides a reliable foundation for mounting telecommunication and data center equipment. Aluminum, 45 RU, #12-24 Threaded Mounting Holes, Black, 1pc + hardware kit and paint piercing bonding kit.</td>
<td></td>
</tr>
<tr>
<td>PR2VFD06</td>
<td>Panduit</td>
<td>Patchrunner® 2 Vertical Cable Manager combines high-density capability and versatility, freeing up valuable floor space. The fully pre-assembled manager lowers overall costs and sets the standard for the entire cable management industry. Single-sided, Steel, 45RU, Black, 1pc, includes one full-length metal, dual-hinging, push-to-close door.</td>
<td></td>
</tr>
<tr>
<td>RGRB19U</td>
<td>Panduit</td>
<td>Grounding busbar, 19” (483mm) length, tinned, twenty holes arranged for flexibility in mounting with twenty #12-24 x 1/2” hex head screws installed, mounting hole sets have 5/8” (15.9mm) spacing, provided with two each #12-24 x 1/2”, M6 x 12mm thread-forming screws, and two #12 flat washers for mounting.</td>
<td></td>
</tr>
<tr>
<td>RGTBSG-C</td>
<td>Panduit</td>
<td>Green thread-forming bonding screw, #12-24 x 1/2”.</td>
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<td>Product Category</td>
<td>Part Number</td>
<td>Manufacturer</td>
<td>Part Description</td>
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<tr>
<td></td>
<td>RGCBNJ660P22</td>
<td>Panduit</td>
<td>#6 AWG (16mm²) jumper, 60 (1.52m) length, 45° bent lug on grounding strip side, provided with .16 oz. (5cc) of antioxidant, two each #12-24 x 1/2, M6 x 12mm, #10-32 x 1/2 and M5 x 12mm thread-forming screws and a copper compression HTAP</td>
</tr>
<tr>
<td>Network Labeling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Labels</td>
<td>Panduit</td>
<td>See Panduit web site for options <a href="https://www.panduit.com">click here</a></td>
</tr>
<tr>
<td>Rack Power Distribution Unit</td>
<td>P30D02M</td>
<td>Panduit</td>
<td>SmartZone™ G5 Monitored Input (MI Series) Rack PDU, 30 A 3-Phase, 120/208V, (18) C13, (6) C19 and (6) 5-20R receptacles, NEMA L21-30P plug and measures 68.898&quot;L x 2.047&quot;W x 2.1&quot;D (1750.1mm x 50.8mm x 53.3mm). Color: Black</td>
</tr>
</tbody>
</table>
ASM STANDARD CONSTRUCTION
- ALL COMPONENTS POWER COATED
- 16 GA DOORS
- HAT SHELF
- COAT ROD
- 4 COAT HOOKS (2 HOOKS ON BACK OF DOOR)
- VENTILATED DOOR & DRAWER
- GUN STORAGE & LOCKABLE LOWER DRAWER
- LOWER DRAWER FRONT TO BACK IS 30" DEEP
  - 2/3 EXTENTION DRAWER SLIDE (DRAWER EXTENDS 20" OUT)
  * 30" DRAWER SLIDES CARRY AN 8-WEEK LEAD TIME

PEEL POLICE
CONSTABLE LOCKER
PEEL REGIONAL POLICE

DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS SURVEY
180 DERRY ROAD EAST, MISSISSAUGA, ONTARIO

AUGUST 27, 2018
DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS SURVEY
180 DERRY ROAD EAST, MISSISSAUGA, ONTARIO
PEEL REGIONAL POLICE

VERSION 1

PROJECT NO.: 181-10995-00
DATE: AUGUST 2018

WSP
WSP.COM
August 27, 2018

PEEL REGIONAL POLICE
Facilities Management
7750 Hurontario Street
Brampton, Ontario
L6V 3W6

Attention: Mr. Jaison John

Dear Sir:

Subject: Designated Substances and Hazardous Materials Survey, 180 Derry Road East, Mississauga, Ontario

WSP Canada Inc. (WSP) was retained by Peel Regional Police to carry out a Designated Substances & Hazardous Materials Survey (DSS) of the occupied law enforcement building located at 180 Derry Road East, Mississauga, Ontario.

The purpose of this survey is to determine the presence/absence of Designated Substances within the surveyed building, and to provide Designated Substances information to contractors and/or maintenance personnel to ensure complete and correct procedures are followed in the event of any removal or potential disturbance.

The following report discusses the methodologies and findings of this survey.

We trust that the attached report is satisfactory for your purposes at this time. Please contact the undersigned should you have any questions or concerns.

Yours sincerely,

Erin Kennealy, CIH
Manager, Hazardous Materials.

EK/JB

WSP ref.: 181-10995-00
# QUALITY MANAGEMENT

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<td>Josip Bosnjak</td>
<td></td>
<td></td>
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<tr>
<td>Reviewed by</td>
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</table>
SIGNATURES

PREPARED BY

Josip Bosnjak, B.Sc.
Project Manager, Hazardous Materials

REVIEWED BY

Erin Kennealy, CIH
Manager, Hazardous Materials

This report was prepared by WSP Canada Inc for the account of PEEL REGIONAL POLICE, in accordance with the professional services agreement. The disclosure of any information contained in this report is the sole responsibility of the intended recipient. The material in it reflects PEEL REGIONAL POLICE's best judgement in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. PEEL REGIONAL POLICE accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. This limitations statement is considered part of this report.

The original of the technology-based document sent herewith has been authenticated and will be retained by WSP for a minimum of ten years. Since the file transmitted is now out of WSP’s control and its integrity can no longer be ensured, no guarantee may be given with regards to any modifications made to this document.
# Production Team

## Client

<table>
<thead>
<tr>
<th>Role</th>
<th>Name</th>
</tr>
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<tr>
<td>Project Manager</td>
<td>Jaison John</td>
</tr>
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## WSP

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<tr>
<td>Manager</td>
<td>Erin Kennealy</td>
</tr>
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<td>Project Manager</td>
<td>Josip Bosnjak</td>
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**DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS SURVEY**

Project No. 181-10995-00

PEEL REGIONAL POLICE

WSP

August 2018

Page v
EXECUTIVE SUMMARY

WSP Canada Inc. (WSP) was retained by Peel Regional Police to carry out a Designated Substances & Hazardous Materials Survey (DSS) of the occupied law enforcement building located at 180 Derry Road East, Mississauga, Ontario.

The subject site is a three-storey law enforcement building located approximately six-hundred and twenty (620) metres east of the main intersection of Hurontario Street and Derry Road East in Mississauga, Ontario. The site has one (1) basement level and is currently occupied by Peel Regional Police. It is understood the building was constructed in the early 2000s.

The purpose of this survey is to determine the presence/absence of Designated Substances within the surveyed building, and to provide Designated Substances information to contractors and/or maintenance personnel to ensure complete and correct procedures are followed in the event of any removal or potential disturbance.

A summary of the results of WSP’s site inspection and bulk sampling is presented below:

Table 1 – Designated Substances & Hazardous Materials Survey Findings at 180 Derry Road East, Mississauga, Ontario

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SURVEY FINDINGS</th>
</tr>
</thead>
</table>
| Asbestos | Based on the laboratory results, none of the eleven (11) homogeneous building material samples collected and analyzed are considered to be asbestos-containing (defined as material that contains 0.5% or more asbestos by dry weight).
| Notes: |
| — Given the age of the building, asbestos-containing materials are not expected to be present in inaccessible areas throughout the building (i.e. wall/ceiling cavities, electrical/mechanical equipment, etc.) |
| — The roof was accessible during the survey. However, given the age of the building, asbestos-containing roofing material is not expected to be present. |
| — The investigation was non-intrusive in nature and as such, select materials that may compromise the integrity of the structure, or cause significant damage to property were not sampled (i.e. exterior caulking materials). However, given the age of the building, asbestos-containing materials are not expected to be present. |
| Lead | Based on the laboratory results, one (1) of the six (6) paint samples collected and analyzed have detectable concentrations of lead. The following materials are considered lead-containing:
<p>| — Floor paint (Grey) observed throughout the LAN Room (Room B0117A) in the basement of the building (0.026%). |
| Lead is also expected to be present in the following building components: |
| — painted surfaces visually similar to the above noted lead-containing paints; |
| — in lead acid batteries in emergency lighting throughout the surveyed area; |
| — as a component in ceramic building products such as tiles and bricks; |
| — as a component of the solder on sweated joints between copper pipe and fittings; |
| — as a component of the solder on wire connections of electric components; |
| — as a component of solder used to seal the bell fitting of cast iron rain water leader pipes; and |
| — as a malleable metal sheeting/flushing around roof edges, vent stacks, HVAC fixtures, etc. |</p>
<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SURVEY FINDINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mercury</td>
<td>Although no samples were analyzed for mercury, it is presumed to be present as a gas in fluorescent and CFL light tubes observed throughout the surveyed area.</td>
</tr>
<tr>
<td>Silica</td>
<td>Building materials and components known to contain silica such as glass, concrete, masonry, stone and mortar etc., were observed throughout the surveyed area.</td>
</tr>
<tr>
<td>PCBs</td>
<td>Individual fluorescent light ballasts were not inspected for the presence of PCBs as they were operational at the time of the site visit and therefore inaccessible to the surveyor. Given the age of the building, PCB-containing ballasts aren’t expected to be present within the building. Furthermore, transformers potentially containing PCBs were not observed in the surveyed areas, and are not expected to be present.</td>
</tr>
<tr>
<td>Radioactive Materials</td>
<td>Smoke detectors were observed throughout the building at the time of the assessment. It should be noted that smoke detectors may contain radioactive materials (Americium-7).</td>
</tr>
</tbody>
</table>
| Ozone Depleting Substances (ODS) | The following equipment containing ozone depleting substances (ODS) was observed within the surveyed area:  
  - One (1) refrigerator containing R-12 refrigerant observed in the basement Exercise Room (Room B0135-A).  
  - One (1) refrigerator containing R-12 refrigerant observed in the Main Telecom Room (Facilities Management) in the basement of the building.  
  - One (1) refrigerator containing R-12 refrigerant observed in the Employee Lunch Room (Room 1096) on the 1st floor of the building.  
  - One (1) refrigerator containing R-12 refrigerant observed in Room 2056 on the 2nd floor of the building.  
  - One (1) refrigerator containing R-12 refrigerant observed in Room 2069-A on the 2nd floor of the building.  
  - One (1) air conditioning unit containing R-22 refrigerant observed in the Diversity Relations Office (Room 2092-B) on the 2nd Floor of the building.  
  - One (1) refrigerator containing R-12 refrigerant observed in the Storage Room (Room 3025) on the 3rd floor of the building. |
| Mould                          | Water-stained ceiling tiles were observed in select areas throughout the building. |
| Radon                          | A radioactive gas naturally emitted from the earth through the breakdown of uranium in soil. It enters buildings by seeping in through cracks, pipes, windows and the foundation etc. |
| Aboveground Storage Tanks (ASTs) | One (1) steel aboveground storage tank (AST) for fuel oil was observed in the Mechanical Room (Room B0121) in the basement of the building. The tank was observed in good condition at the time of the site investigation. |

**RECOMMENDATIONS**

All designated substances must be handled in accordance with the appropriate guidelines and regulations. Designated Substance and Hazardous Material information will require updating if corrective measures have been instituted and materials have been removed from the building.
Special precautions should be taken when disturbing any concrete or painted surfaces given the presence of silica, lead and potentially arsenic. All designated substances must be handled in accordance with the appropriate guidelines and regulations. The Ministry of Labour (MOL) has published guidelines for handling and controlling lead and silica in construction and it is recommended that these guidelines be followed when removing and cutting into the concrete. Coring, sawing or breaking up the materials containing silica, lead and potentially arsenic should be completed only with appropriate dust suppression methods, proper respiratory protection and general worker safety precautions as outlined in the MOL Guidance documents and in the Occupational Health and Safety Act.

The presence of mercury within assembled units (e.g. fluorescent light bulbs) should not be considered a hazard provided that the assembled units remain sealed and intact. Avoid direct skin contact with mercury and avoid inhalation of mercury vapour. Dispose of mercury following applicable legislative requirements.

It is the intention of the federal government to phase out the use of ODSs by the year 2030 in order to protect the upper atmosphere. The MOE has issued Regulation 356 regarding the use, disposal and recycling of ODS’s. Recapturing of ODS’s during servicing must be done by licensed personnel.

Equipment containing ODSs (i.e. R-12/22) were observed in select areas throughout the building at the time of the site investigation. If other equipment is discovered and observed to contain ODSs (i.e. R-22 or R-12) the units should be recycled following Ontario Regulation 189/94, Refrigerants (O. Reg. 189/94), as amended. All equipment containing ODSs must be serviced by an individual holding a valid Ozone Depletion Prevention (ODP) Card, issued by the MOE and the refrigerant drained from the unit and collected for recycling or disposal in accordance with all applicable legislation.

If mould is discovered during demolition and/or renovation, mould contaminated materials should be removed/handled in accordance with the Canadian Construction Association document CCA 82/2004. Contractors should be warned of the potential presence of mould and every precaution should be taken to prevent airborne exposure to workers where mould is present and where workers are likely to inhale or ingest mould.

In accordance with the Canadian Nuclear Safety Commission (CNSC), if smoke alarms contain radium or if more than 10 units have to be disposed of, then the smoke detectors must be disposed of at a low-level radioactive waste management facility. Smoke detectors containing Am-241 isotope source of less than 5.0 μCi can be disposed of at a regular landfill site.

Radon is a radioactive gas naturally emitted from the earth through the breakdown of uranium in soil. It enters buildings by seeping in through cracks, pipes, windows and the foundation etc. As such, it is recommended that radon-resistant design features be considered for future buildings constructed on the site. It is also, recommended that the building be tested for elevated radon levels.

If during renovation or demolition, additional materials suspected of containing asbestos are encountered, they must be handled in accordance with the appropriate guidelines and regulations. It should be noted that asbestos may be present in the enclosed spaces not accessible at the time of the site visit.

Complete commentary on each of the designated substances in the project area will be discussed in the report to follow. This executive summary is not intended to substitute for the complete report, nor does it discuss certain specific issues documented within the report.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Chapter</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>INTRODUCTION</td>
<td>11</td>
</tr>
<tr>
<td>1.1</td>
<td>BACKGROUND</td>
<td>11</td>
</tr>
<tr>
<td>1.2</td>
<td>SURVEY OBJECTIVES</td>
<td>11</td>
</tr>
<tr>
<td>1.3</td>
<td>SCOPE OF WORK</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>METHODOLOGY</td>
<td>33</td>
</tr>
<tr>
<td>2.1</td>
<td>GENERAL SURVEY METHODOLOGY</td>
<td>33</td>
</tr>
<tr>
<td>2.2</td>
<td>ASBESTOS SURVEY METHODOLOGY</td>
<td>33</td>
</tr>
<tr>
<td>2.3</td>
<td>LEAD SURVEY METHODOLOGY</td>
<td>44</td>
</tr>
<tr>
<td>2.4</td>
<td>SILICA</td>
<td>55</td>
</tr>
<tr>
<td>2.5</td>
<td>MERCURY</td>
<td>55</td>
</tr>
<tr>
<td>2.6</td>
<td>POLYCHLORINATED BIPHENYLS (PCB)</td>
<td>55</td>
</tr>
<tr>
<td>2.7</td>
<td>MOULD</td>
<td>55</td>
</tr>
<tr>
<td>3</td>
<td>SITE OVERVIEW</td>
<td>55</td>
</tr>
<tr>
<td>3.1</td>
<td>SITE DESCRIPTION</td>
<td>55</td>
</tr>
<tr>
<td>3.2</td>
<td>RECORDS REVIEW</td>
<td>66</td>
</tr>
<tr>
<td>3.3</td>
<td>HEATING/MECHANICAL SYSTEM</td>
<td>66</td>
</tr>
<tr>
<td>3.4</td>
<td>SITE INSPECTION</td>
<td>66</td>
</tr>
<tr>
<td>4</td>
<td>REGULATORY CONTEXT</td>
<td>77</td>
</tr>
<tr>
<td>4.1</td>
<td>DESIGNATED SUBSTANCES</td>
<td>77</td>
</tr>
<tr>
<td>4.2</td>
<td>ADDITIONAL REGULATORY REQUIREMENTS FOR ASBESTOS</td>
<td>77</td>
</tr>
<tr>
<td>4.3</td>
<td>ADDITIONAL REGULATORY REQUIREMENTS FOR LEAD</td>
<td>77</td>
</tr>
<tr>
<td>4.4</td>
<td>ADDITIONAL REGULATORY REQUIREMENTS FOR WASTE MANAGEMENT</td>
<td>88</td>
</tr>
</tbody>
</table>

EXECUTIVE SUMMARY .................................................................. V-VI

APPENDIX 5.17
4.5 OTHER APPLICABLE REGULATIONS AND GUIDELINES 88

5 OBSERVATIONS AND RESULTS 99

5.1 ASBESTOS 99

5.1.1 ASBESTOS-CONTAINING MATERIALS 99

5.1.2 SUSPECTED ASBESTOS-CONTAINING MATERIALS 99

5.1.3 SUMMARY OF BULK SAMPLES IDENTIFIED AS ‘NON-ASBESTOS’ 99

5.2 LEAD 1013

5.3 OTHER DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS 1215

6 LIMITATIONS 1721

TABLES

TABLE 1 – DESIGNATED SUBSTANCES & HAZARDOUS MATERIALS SURVEY FINDINGS AT 180 DERRY ROAD EAST, MISSISSAUGA, ONTARIO 92

TABLE 2 - MINIMUM NUMBER OF BULK SAMPLES TO BE COLLECTED UNDER O. REG. 278/05 ACCORDING TO MATERIAL AREA, APPLICATION AND FRIABILITY 44

TABLE 3 - ASBESTOS-CONTAINING MATERIALS 99

TABLE 4 - SUMMARY OF BULK SAMPLES IDENTIFIED AS “NON-ASBESTOS” 1012

TABLE 5 - SUMMARY OF LEAD CONCENTRATIONS IN BULK PAINT SAMPLES 1013

APPENDICES

A ANALYTICAL RESULTS – ASBESTOS & LEAD

B SITE PHOTOGRAPHS

C EVALUATION CRITERIA

D GLOSSARY OF TERMS

E DRAWINGS
DRAWINGS

DRAWING 1  BASEMENT LEVEL – SAMPLING LOCATIONS
DRAWING 2  1ST FLOOR – SAMPLING LOCATIONS
DRAWING 3  2ND FLOOR – SAMPLING LOCATIONS
DRAWING 4  3RD FLOOR – SAMPLING LOCATIONS
1 INTRODUCTION

1.1 BACKGROUND

WSP Canada Inc. (WSP) was retained by Peel Regional Police to carry out a Designated Substances & Hazardous Materials Survey (DSS) of the occupied law enforcement building located at 180 Derry Road East, Mississauga, Ontario.

The subject site is a three-storey law enforcement building located approximately six-hundred and twenty (620) metres east of the main intersection of Hurontario Street and Derry Road East in Mississauga, Ontario. The site has one (1) basement level and is currently occupied by Peel Regional Police. It is understood the building was constructed in the early 2000s.

The purpose of this survey is to determine the presence/absence of Designated Substances within the surveyed building, and to provide Designated Substances information to contractors and/or maintenance personnel to ensure complete and correct procedures are followed in the event of any removal or potential disturbance.

1.2 SURVEY OBJECTIVES

This survey is required to satisfy a building owner’s requirements under Section 30 of the Ontario Occupational Health & Safety Act (OHSA) which requires building owners to determine if there are any Designated Substances present, prior to commencement of a project, which may involve construction, renovation or demolition related activities. This information allows workers to take appropriate steps to prevent accidental exposure to these harmful substances. This report should be provided to all maintenance workers, prospective contractors (and in turn to their sub-trades) who are likely to handle, come into contact with, or disturb building materials. Contractors who may work in close proximity to the identified materials and who may also disturb the materials should also be notified.

The primary objectives of the survey were to:

— Develop an up-to-date inventory, and gain a better understanding of the Designated Substances and/or hazardous materials that are present in the building;
— Document their locations, applications, concentrations, quantities, and conditions in the surveyed areas in order to provide workers, and prospective contractors, with adequate information to prevent accidental exposures; and
— Provide recommendations for the safe removal, handling and disposal of the identified Designated Substances and hazardous materials as necessary.

The asbestos information in this survey report complies with the requirements of the Occupational Health & Safety Act, Ontario Regulation 278/05: Designated Substance - Asbestos on Construction Projects and in Building and Repair Operations with respect to asbestos-containing materials for the structures.

Regulation 490/09 states that all necessary measures and procedures are to be taken to ensure the time-weighted average exposure of a worker to any form of airborne asbestos does not exceed 0.1 fibres per cubic centimeter of air, averaged over an 8-hour work period. In order to abide by this regulation, contractors specializing in asbestos removal are required to remove all asbestos-containing building materials from the buildings prior to any renovation or demolition that will disturb these materials.
1.3 SCOPE OF WORK

The scope of this work program was to sample and analyze materials considered to be suspect or possible designated substances or asbestos-containing materials. This Designated Substances and Hazardous Materials Survey entailed:

— A room by room visual inspection of the accessible areas of the building for Designated Substances and hazardous materials;
— Collection of bulk samples of materials suspected to contain asbestos according to the requirements stipulated in O. Reg. 278/05 (see Table 2);
— Assessment of the condition of the asbestos-containing materials;
— Collection of a representative number of bulk paint samples;
— Inventory of (visibly) evident sources of mercury (e.g. light tubes and thermostats);
— Assessment of the likelihood of exposure to designated substances with recommendations for appropriate corrective action where required;
— Visual identification of suspected and/or obvious signs of mould; and
— Visual identification of other Designated Substances and hazardous materials including equipment containing ODS, fuel, oil and/or waste oil storage, chemical storage, and/or radioactive materials. Where possible name plate/label information and quantities were recorded.

The survey did not involve destructive sampling (i.e. inspection within drywall (false) walls or ceilings, mechanical equipment such as boilers, furnaces, HVAC systems, or within electrical equipment). These areas are considered not accessible to the surveyor and as such materials suspected to contain asbestos and other Designated Substances and hazardous materials may be present within these inaccessible areas.

The survey included the identification of potential friable and non-friable asbestos-containing materials within the building. Asbestos means any of the following fibrous silicates: actinolite, amosite, anthophyllite, chrysotile, crocidolite or tremolite. According to the above-mentioned Ontario Regulation 278/05, the term ‘friable material’ is applied to a material that when dry, can be crumbled, pulverized or powdered with moderate hand pressure. Asbestos materials that are friable have a greater potential to release airborne asbestos fibres when disturbed. Common friable asbestos-containing buildings materials used in the past include sprayed fireproofing, stucco texture coat, and thermal pipe and jacket insulation.

Common non-friable asbestos containing materials include vinyl floor tiles, gasket materials, asbestos cement (Transite™) pipe, Transite™ board and asbestos textiles. If these materials do however release fine dust due to deterioration or during removal, the free dust is considered friable.
2 METHODOLOGY

2.1 GENERAL SURVEY METHODOLOGY

WSP’s survey sought to identify those substances defined as Designated Substances under the Ontario Occupational Health and Safety Act including: asbestos (friable and non-friable), lead, mercury, silica, benzene, acrylonitrile, arsenic, coke oven emissions, ethylene oxide, isocyanates, and vinyl chloride. In addition, other hazardous materials, such as PCBs, ozone-depleting substances (ODS), Radioactive Materials and other stored chemicals and wastes were included in the survey scope.

WSP’s surveyors performed a systematic survey of the building for the purposes of identifying Designated Substances and hazardous materials and documenting observations made about their locations, estimated quantities and respective conditions. These observations form the basis for developing the recommendations provided within this report.

The survey of the structure for designated substances consisted of a walk through and physical examination of suspected materials in accessible areas of the building. A physical examination was completed to assess the condition of materials and to examine for underlying layers. In situations where asbestos-containing materials or other Designated Substances extended into a non-accessible area, such as asbestos cement pipes (Transite™), it would be assumed that the asbestos-containing materials were also present in these areas and were reported as such.

2.2 ASBESTOS SURVEY METHODOLOGY

The surveyors inspected the building for the presence of friable and non-friable asbestos-containing materials (ACM). Examples of ACM commonly found in buildings may include:

- Sprayed insulation
- Acoustic/texture plaster
- Drywall joint compound
- Mechanical insulation
- Asbestos cement
- Pipe Insulation
- Acoustic ceiling tiles
- Vinyl floor tiles and vinyl sheet flooring
- Plaster

Bulk samples were collected from suspect materials (i.e. materials known as having the potential to be asbestos-containing) and analyzed to identify or confirm the presence/absence of asbestos. Asbestos samples are collected by taking a small volume of material (approximately two square centimeters in size) from either intact material or preferably from a damaged section. The collected samples were placed in zipper storage plastic bags, sealed and forwarded to an analytical laboratory.

The bulk samples collected were then submitted to an accredited, independent laboratory for analysis (accompanied by a chain of custody form) of asbestos content via US EPA Method EPA/600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials in accordance with the requirements of O. Reg.
The laboratory was instructed to use “stop-positive” analysis when asbestos is identified via Polarized Light Microscopy (PLM) analysis.

The number of bulk samples required, in order to establish whether a material is asbestos-containing according O. Reg. 278/05, is summarized in Table 2.

### Table 2 - Minimum Number of Bulk Samples to be collected under O. Reg. 278/05 According to Material Area, Application and Friability

<table>
<thead>
<tr>
<th>TYPE OF MATERIAL</th>
<th>SIZE OF HOMOGENEOUS MATERIAL</th>
<th>MINIMUM NUMBER OF BULK SAMPLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surfacing material, including without limitation material that is applied to surfaces by spraying, by troweling or otherwise, such as acoustical plaster on ceilings, fireproofing materials on structural members and plaster</td>
<td>Less than 90 m²</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>90 m² or more, but less than 450 m²</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>450 m² or more</td>
<td>7</td>
</tr>
<tr>
<td>Thermal insulation, except as described below</td>
<td>Any size</td>
<td>3</td>
</tr>
<tr>
<td>Thermal insulation patch</td>
<td>Less than 2m or 0.5 m²</td>
<td>1</td>
</tr>
<tr>
<td>Other material</td>
<td>Any size</td>
<td>3</td>
</tr>
</tbody>
</table>

As per the requirements set out in Table 1 of O. Reg. 278/05, a total of thirty-seven (37) samples were collected and submitted for asbestos analysis as part of this survey. Fibreglass insulation was not submitted for analysis as it can be identified visually and was never manufactured with asbestos.

In accordance with the analysis techniques required by O. Reg. 278/05:

— for layered materials, subsamples are taken from each individual or discrete layer and each subsample is then treated as a discrete sample; and

— if a material is found to contain greater than 0.5% asbestos, additional bulk material samples taken from the same homogeneous material are not required to be analyzed.

As per these requirements, a total of forty-five (45) samples were analyzed by the laboratory for this assessment.

### 2.3 LEAD SURVEY METHODOLOGY

Bulk paint samples (paint chips) were collected from each distinct colour of paint observed within the surveyed area. Samples were collected with the aid of a thin-bladed knife, which was cleaned prior to each sampling event. WSP’s surveyor selected sample locations where it appeared that the paint application was most representative of all areas on which it was applied. Each paint chip sample was placed in a clear bag with a tight closure, uniquely labelled and then placed in a second, similar bag. A chain of custody form was completed and accompanied the bulk samples to an accredited, independent laboratory for analysis of lead.
content. Lead analysis was performed following ASTM Method, ASTM D3335-85A “Standard Method to Test for Low Concentrations of Lead in Paint by Atomic Absorption Spectrophotometry”.

### 2.4 SILICA

The surveyor inspected the building for the presence of materials known to contain silica. Silica is present in materials such as glass, concrete, masonry, stone and mortar which are prevalent materials in building construction. No samples were collected or analyzed.

### 2.5 MERCURY

The surveyor inspected the building for equipment which is likely to contain mercury. Pertinent information of the suspected equipment including: manufacturer, dates, model and serial numbers, and quantities were recorded when available. No samples were collected or analyzed.

### 2.6 POLYCHLORINATED BIPHENYLS (PCB)

The surveyor inspected the building for equipment which may contain PCBs. Equipment that is generally suspected of containing PCBs includes lamp ballasts, transformers, hydraulic fluid, compressors, switchgears, capacitors and other electric equipment. Pertinent information of the suspected equipment including: manufacturer, dates, model and serial numbers, and quantities were recorded when available. No samples were collected or analyzed.

### 2.7 MOULD

The surveyor inspected the building for the presence of mould. This included a non-intrusive visual assessment of exterior and interior building material surfaces and components for evidence of obvious visible mould, and/or areas conducive to mould growth (i.e. demonstrating significant moisture saturation and water damage). No samples were collected or analyzed.

### 2.8 RADON

Radon is a radioactive gas naturally emitted from the earth through the breakdown of uranium in soil. It enters buildings by seeping in through cracks, pipes, windows and the foundation etc. As such, it is recommended that radon-resistant design features be considered for future buildings constructed on the site. It is also, recommended that the building be tested for elevated radon levels.

### 3 SITE OVERVIEW

#### 3.1 SITE DESCRIPTION

The subject site is a three-storey law enforcement building located approximately six-hundred and twenty (620) metres east of the main intersection of Hurontario Street and Derry Road East in Mississauga, Ontario.
The site has one (1) basement level and is currently occupied by Peel Regional Police. It is understood the building was constructed in the early 2000s.

The floors within the building generally consist of concrete finished with carpet, ceramic tile, rubber tile, vinyl floor tiles and vinyl sheet flooring. Walls were generally constructed of concrete block, concrete, ceramic tile and drywall. Ceilings were either open to the steel structure or finished with drywall and suspended ceiling tiles. The exterior of the building was finished with brick.

### 3.2 RECORDS REVIEW

No previous asbestos related or designated substance reports were provided for review during this study.

### 3.3 HEATING/Mechanical System

The structure was heated via furnace units with associated ductwork. Furthermore, wall mounted floor radiators were also identified in select locations throughout the building.

Mechanical pipe straights observed during the site reconnaissance were either not insulated or insulated with non-asbestos pipe insulation.

### 3.4 SITE INSPECTION

The building was inspected by WSP representative Mr. Josip Bosnjak and Ms. Patricia Baptiste on August 14th and 15th, 2018.
4 REGULATORY CONTEXT

4.1 DESIGNATED SUBSTANCES

Section 30 of the Occupational Health and Safety Act (the Act) stipulates that prior to the commencement of a project a list shall be prepared of all Designated Substances that are present at the project site (i.e. a Designated Substances survey). In accordance with the Act, the locations of Designated Substances must be identified in writing to all prospective constructors, contractors and sub-contractors who may work, disturb or come into contact with this type of material, at the same time as, or prior to, project tendering.

The term “Designated Substance” refers to the eleven chemical or physical agents specifically identified within the Act. Each of these substances is governed by a consolidated regulation, Designated Substances - Ontario Regulation 490/09 (O. Reg. 490/09) that defines the minimum health and safety requirements for assuring safe worker-substance interaction as well as the obligations of employers and workers in workplaces containing these substances. O. Reg. 490/09 further stipulates the maximum concentrations of each of the respective substance to which a worker may be exposed, according to short-term exposure values and time-weighted average exposure values.

4.2 ADDITIONAL REGULATORY REQUIREMENTS FOR ASBESTOS

Among the Designated Substances, asbestos is unique in that it is governed by two regulations under the Act - one for the general mining and processing operations of asbestos and one for asbestos on construction projects and in buildings and repair operations.

Ontario Regulation 278/05 (O. Reg. 278/05), made under the Act, entitled “Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations” came into effect on November 1, 2005, with some sections contained therein becoming effective on November 1, 2007. This regulation revoked and replaced the previous asbestos regulation, O. Reg. 838/90.

4.3 ADDITIONAL REGULATORY REQUIREMENTS FOR LEAD

The Ontario Ministry of Labour (MOL) has not prescribed specific criteria for classification of lead-containing paints or other surface coatings and construction materials. The Surface Coating Materials Regulation (SOR/2005-109) made under the federal Hazardous Products Act (HPA) prescribes an acceptable level of 0.009% (90 ppm) lead by dry weight or less, as determined by bulk chemical analysis in accordance with good laboratory practises. Under the Surface Coating Materials Regulation (SOR/2005-109) Section 4.2, the following paints and surface coatings are excluded from the above noted acceptable lead level:

1. as an anti-corrosive or an anti-weathering coating applied on the interior or exterior surface of any building or equipment that is used for an agricultural or industrial purpose;
2. as an anti-corrosive or an anti-weathering coating applied on any structure other than a building, that is used for an agricultural, industrial or public purpose;
3. as a touch-up coating for metal surfaces;
4. on traffic signs;
5. for graphic art on billboards or similar displays;
for identification marks in industrial buildings; or
as materials for the purposes of arts, crafts or hobbies, other than material for use by children.

However, based on a recent publication (EACO Lead Guideline For Construction, Renovation, Maintenance or Repair dated October 2014) from the Environmental Abatement Council of Ontario (EACO), an industry group representing consultants and contractors in the Ontario abatement industry, various occupational and workplace safety authorities and agencies consider that any detectable amount of lead in paint and similar materials has the potential to produce an airborne hazard to workers and building occupants when these materials are disturbed.

As such, for the purpose of this survey, WSP has classified any material containing detectable/measurable amounts of lead as “lead-containing” materials and recommends that all disturbances to these materials be conducted in accordance with the EACO or MOL document Guidelines, Lead on Construction Projects.

4.4  ADDITIONAL REGULATORY REQUIREMENTS FOR WASTE MANAGEMENT

The disposal of Designated Substances is regulated under the Ontario Environmental Protection Act, specifically R.R.O. 1990, Regulation 347, General – Waste Management (most recently amended by O. Reg. 334/13). The regulation details the minimum requirements for the appropriate transport and disposal of wastes.

4.5  OTHER APPLICABLE REGULATIONS AND GUIDELINES

The following regulations and guidance documents may also apply to this survey:

— Guideline for Lead on Construction Projects (MOL, September 2004, as amended)
— Guideline for Silica on Construction Projects (MOL, September 2004, as amended)
— The United States Department of Housing and Urban Development (HUD) Guidelines for the Evaluation and Control of Lead-Based Paint in Housing
— Canadian PCB Regulations (SOR/2008-273)
— O. Reg. 362 Waste Management – PCBs
— Mercury-Containing Products Pollution Prevention Fact Sheet #21 (Ministry of Environment (MOE), September 2001, as amended)
— O. Reg. 347/90 General Waste Management
— Canadian Construction Association document CCA 82/2004
— Canadian Chlorofluorocarbon Regulations (SOR/90-127), Ozone-depleting, Substances Regulation (SOR/94-408) and Ozone Depleting Substances Products Regulations (SOR/90-584)
— O. Reg. 463/10 ODS and Other Halocarbons
— Lead Guideline For Construction, Renovation, Maintenance or Repair (Environmental Abatement Council of Ontario – October 2014)
— EACO Lead Guideline for Construction, Renovation, Maintenance and Repair, October 2014.
— EACO Mould Abatement Guidelines, 2010
5 OBSERVATIONS AND RESULTS

Information in this section of the report should be provided to all prospective contractors, tenants, and/or workers who are likely to handle, come into contact with, or disturb asbestos or other designated substances. Detailed specifications that outline specific abatement procedures are recommended when tendering the renovation/demolition work.

This information may require updating upon the removal of Designated Substances upon completion of the renovations or demolition. A close out report stating that the materials are no longer present is also required once the materials are removed. If ACM is to remain in place, O. Reg. 278/05 requires the preparation and establishment of an Asbestos Management Plan for the building.

Contractors and maintenance personnel should be warned of the possibility of undisclosed materials when breaking into enclosed areas. Friable and Non-Friable building materials discovered in enclosed areas should be treated as asbestos until proven otherwise and other substances, self-evident as designated substances, should be handled in a likewise fashion.

5.1 ASBESTOS

5.1.1 ASBESTOS-CONTAINING MATERIALS

In accordance with the requirements of O. Reg. 278/05, homogenous materials (i.e. materials uniform in color and texture) must be considered to be asbestos-containing, if any sample which is collected from that homogeneous material, is identified to have an asbestos concentration of 0.5% or greater.

A total of thirty-seven (37) building material samples were collected from eleven (11) homogeneous building materials and submitted for laboratory analysis of asbestos content. The laboratory analytical results indicated that none of these materials are considered asbestos-containing. Additionally, no materials suspected of containing asbestos were identified within the surveyed areas. Given the age of the building (early 2000s), asbestos-containing materials are unlikely to be present within the inaccessible locations.

Buried services such as underground piping were commonly manufactured from a non-friable form of asbestos cement but are inaccessible for sampling without excavation work. If encountered during the work, the cement pipes should be treated as asbestos-containing unless proven otherwise.

5.1.2 SUMMARY OF BULK SAMPLES IDENTIFIED AS “NON-ASBESTOS”

The table below summarizes the results of bulk material samples collected from suspect materials during this survey, which had either no detectable concentrations of asbestos, or had asbestos concentrations less than the regulated threshold limit of 0.5% (by weight), and therefore can be considered as “non-asbestos” in accordance with O. Reg. 278/05.
Table 34 - Summary of Bulk Samples Identified as "Non-Asbestos"

<table>
<thead>
<tr>
<th>MATERIAL DESCRIPTION / LOCATION</th>
<th>SAMPLE ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vinyl floor tiles (12” x 12” Light Blue with White Flecks) and the associated mastic (Yellow) observed in select areas throughout the building.</td>
<td>AS 1-1 to AS 1-3</td>
</tr>
<tr>
<td>Vinyl floor tiles (12” x 12” Charcoal with Grey Flakes) observed in select areas throughout the building.</td>
<td>AS 2-1 to AS 2-3</td>
</tr>
<tr>
<td>Vinyl floor tiles (12” x 12” Beige with Light Beige Flecks) and the associated mastic (Black/Beige) observed in select areas throughout the building.</td>
<td>AS 3-1 to AS 3-3</td>
</tr>
<tr>
<td>Vinyl floor tiles (2’ x 2’ Blue/Grey) observed in select areas throughout the building.</td>
<td>AS 4-1 to AS 4-3</td>
</tr>
<tr>
<td>Vinyl floor tiles (12” x 12” Grey with White Specks) observed in the Women’s Locker Room (Room BS-0134) in the basement of the building.</td>
<td>AS 5-1 to AS 5-3</td>
</tr>
<tr>
<td>Wall caulking (White) observed in select areas throughout the building.</td>
<td>AS 6-1 to AS 6-3</td>
</tr>
<tr>
<td>Drywall joint compound observed throughout the building.</td>
<td>AS 7-1 to AS 7-7</td>
</tr>
<tr>
<td>Firestop caulking (Grey) observed in select areas throughout the building.</td>
<td>AS 8-1 to AS 8-3</td>
</tr>
<tr>
<td>Baseboard mastic (Yellow) observed in the Gymnasium (Room 1135-B) on the 1st floor of the building.</td>
<td>AS 9-1 to AS 9-3</td>
</tr>
<tr>
<td>Vinyl floor tiles (12” x 12” Red with Dark Red Flecks) and the associated mastic (Grey/Black) observed in the Lunch Room (Room 1096) on the 1st floor of the building.</td>
<td>AS 10-1 to AS 10-3</td>
</tr>
<tr>
<td>Vinyl sheet flooring (Light Brown) observed in the Victim’s Support Office Reception (Room 2180) on the 2nd floor of the building.</td>
<td>AS 11-1 to AS 11-3</td>
</tr>
</tbody>
</table>

1 - Laboratory confirmation of non-asbestos-containing material is provided in the laboratory results found within Laboratory Certificates of Analysis.

2 - For sample locations refer to Appendix E: Drawings.

5.2 LEAD

A total of six (6) paint samples were collected and analyzed at the time of the investigation. The table below summarizes the results of laboratory analyses for the bulk paint and surface coating samples collected during the survey.

Table 45 - Summary of Lead Concentrations in Bulk Paint Samples

<table>
<thead>
<tr>
<th>MATERIAL DESCRIPTION</th>
<th>ASSESSMENT</th>
<th>ACTION</th>
</tr>
</thead>
</table>
| Light blue paint observed on the wall throughout the Exercise Room (Room B0135-A) in the basement of the building. | Sample ID: Pb-01  
Concentration: <0.0082%  
Condition: Good to Fair | This material does not contain detectable concentrations of lead. Therefore, no further action is required. |
<table>
<thead>
<tr>
<th>MATERIAL DESCRIPTION</th>
<th>ASSESSMENT</th>
<th>ACTION</th>
</tr>
</thead>
</table>
| Grey paint observed on the floor throughout the LAN Room (Room B0117-A) in the basement of the building. | Sample ID: Pb-02  
Concentration: 0.026%  
Condition: Good | In general, the following procedures are recommended if/when removing lead-containing materials, coatings and paint applications:  
— Follow Type 1 – if the coating is to be removed with a chemical gel or paste;  
— Follow Type 2a – if the coating is to be removed by scraping or sanding using non-powered hand tools, or manual demolition of lead-painted building components by striking with sledgehammer or similar tool;  
— Follow Type 3a – if the coating is to be removed using power tools; or,  
— Follow Type 3b – if the coating is to be removed by abrasive blasting.  
If lead-containing paint applications and surface coatings are not removed prior to demolition, ensure that demolition waste complies with the requirements of General – Waste Management Regulation, R.R.O. 1990, Regulation 347. |
| Beige paint observed on the walls throughout the Evidence Storage Area (Room B0059) in the basement of the building. | Sample ID: Pb-03  
Concentration: <0.011%  
Condition: Good | This material does not contain detectable concentrations of lead. Therefore, no further action is required. |
| Light teal paint observed on walls throughout the basement corridor of the building. | Sample ID: Pb-04  
Concentration: <0.0081%  
Condition: Good | This material does not contain detectable concentrations of lead. Therefore, no further action is required. |
| Off-white paint observed on walls throughout the Garage Area (Room 1064-A) on the 1st floor of the building. | Sample ID: Pb-05  
Concentration: <0.0080%  
Condition: Good | This material does not contain detectable concentrations of lead. Therefore, no further action is required. |
| Light teal paint observed on walls throughout the Boardroom (Room 3076) on the 3rd floor of the building. | Sample ID: Pb-06  
Concentration: <0.0081  
Condition: Good to Poor | This material does not contain detectable concentrations of lead. Therefore, no further action is required. |

1 For sample ID and concentration levels refer to Appendix A: Analytical Results – Asbestos & Lead.

Lead is also expected to be present in the following building components:

— painted surfaces visually similar to the above noted lead-containing paint;
— in lead acid batteries in emergency lighting throughout the building;
— as a component in ceramic building products such as tiles and bricks;
— as a component of the solder on sweated joints between copper pipe and fittings;
— as a component of the solder on wire connections of electric components;
— as a component of solder used to seal the bell fitting of cast iron rain water leader pipes; and
— as a malleable metal sheeting/flashing around roof edges, vent stacks, HVAC fixtures, etc.

Work that will disrupt and/or pulverize (including drilling, cutting, grinding or abrading) confirmed or suspected lead-containing materials must follow the recommendations provided in the EACO Lead Abatement Guidelines (dated 2014) or Ministry of Labour Guideline for Lead on Construction Projects, dated September 2004 (Revised April 2011). In addition, the aforementioned painted surfaces (containing lead) should be handled with appropriate health and safety precautions so as to comply with requirements of the Designated Substances regulation, O. Reg. 490/09, and disposal of these materials must also comply with the requirements of O. Reg. 347 – General – Waste Management.

### 5.3 OTHER DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS

The following table summarizes other Designated Substances and hazardous materials which were also included in the survey. Identification of these materials and substances were based on visual observations only, and where appropriate, recommendations and necessary actions have been provided.

All designated substances must be handled in accordance with the appropriate guidelines and regulations. Designated Substance and Hazardous Material information will require updating as corrective measures are instituted and materials have been removed from various sections of the building.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>DESCRIPTION</th>
<th>FINDINGS</th>
<th>ACTION</th>
</tr>
</thead>
</table>
| Mercury  | Mercury is used in thermometers, batteries and some electrical switches. It is also used in dental fillings and in latex paint to protect against fungal attack and mildew. Mercury vapour is also present as a vapour in fluorescent lights, metal halide lights and mercury vapour lights. | Although no samples were analyzed for mercury, it is presumed to be present in the following building components:  
— Sump pump level switches;  
— as a gas in fluorescent light tubes; and  
— as a bactericide or stabilizer in paints. | The presence of mercury within assembled units (e.g. fluorescent light bulbs and piping thermometers) should not be considered a hazard provided that the assembled units remain sealed and intact. Avoid direct skin contact with mercury and avoid inhalation of mercury vapour. Dispose of mercury following applicable legislative requirements. |
<p>| Polychlorinated Biphenyls (PCBs) | The federal Regulation SOR/2008-273 (September 5, 2008) states that any solid material containing 50 parts per million (ppm) or more of PCBs must be handled as a PCB-containing material in accordance with all applicable regulations. | Given the age of the building, PCB-containing ballasts aren’t expected to be present within the building. | N/A |</p>
<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>DESCRIPTION</th>
<th>FINDINGS</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ozone Depleting Substances (ODSs)</td>
<td>It is the intention of the federal government to phase out the use of ODSs by the year 2030 in order to protect the upper atmosphere. The MOE has issued Regulation 356 regarding the use, disposal and recycling of ODSs. Recapturing of ODSs during servicing must be done by licensed personnel.</td>
<td>Equipment such as HVAC units and refrigerators containing ozone depleting substances (R-12/22) were observed in select areas throughout the building.</td>
<td>In the event of removal, the units should be recycled following Ontario Regulation 189/94, Refrigerants (O. Reg. 189/94), as amended. All equipment containing ODSs must be serviced by an individual holding a valid Ozone Depletion Prevention (ODP) Card, issued by the MOE and the refrigerant drained from the unit and collected for recycling or disposal in accordance with all applicable legislation. It is understood the current property owner, First Capital, will removed and dispose of any refrigerant onsite. However, confirmation should be provided and reviewed upon completion of this removal.</td>
</tr>
<tr>
<td>Silica</td>
<td>Silica, or silicon dioxide (SiO2), is the basic component of sand, quartz and granite rock. Crystalline Silica (the designated substance) is encountered in industry in three forms: quartz, tridymite, and cristobalite.</td>
<td>Crystalline Silica should be assumed to be present in brick, concrete, asphalt, cement and mortar.</td>
<td>O. Reg. 490/09 regarding silica as a designated substance applies to areas where airborne silica is present and where workers are likely to inhale, ingest or absorb silica. Every precaution and procedure should be taken during demolition or renovation activities to control the time-weighted exposure of a worker to airborne silica and exposure should not exceed 0.05 milligrams Cristobalite per cubic meters of air, or 0.1 milligrams Quartz or Tripoli per cubic meters of air. Coring, sawing, or breaking up the materials containing silica should be completed only with appropriate dust suppression methods, proper respiratory protection and general worker safety precautions as outlined in the MOL Guidance document and in the Occupational Health and Safety Act.</td>
</tr>
<tr>
<td>MATERIAL</td>
<td>DESCRIPTION</td>
<td>FINDINGS</td>
<td>ACTION</td>
</tr>
<tr>
<td>----------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Radioactive Materials</td>
<td>Smoke/heat detectors may contain a radioactive power source.</td>
<td>Smoke/heat detectors were observed throughout the surveyed building.</td>
<td>In accordance with the Canadian Nuclear Safety Commission (CNSC), if smoke alarms contain radium or if more than 10 units have to be disposed of, then the smoke detectors must be disposed of at a low-level radioactive waste management facility. Smoke detectors containing Am-241 isotope source of less than 5.0 μCi can be disposed of at a regular landfill site.</td>
</tr>
</tbody>
</table>
| Mould                | Mould is a group of various species of simple, microscopic organisms found in every ecological niche, indoors and outdoors. Moulds are necessary for recycling of organic materials in nature. To grow, mould needs:  
  - A mould spore  
  - An organic food source (i.e. paper, drywall, wood, dirt, paint, etc.)  
  - Moisture  
  - Time (this will vary depending on the site-specific conditions, including the cleanliness of the water source) | Water-stained ceiling tiles were observed in select areas throughout the building. | Mould contaminated materials should be removed/handled in accordance with the Canadian Construction Association document CCA 82/2004. Contractors should be warned of the presence of mould and every precaution should be taken to prevent airborne exposure to workers where mould is present and where workers are likely to inhale or ingest mould. |
<p>| Arsenic              | Arsenic is used with other metals (chiefly copper, lead and zinc) to make alloys. Arsenic compounds are also used in pigments, animal poisons, insecticides, paints, wallpaper, ceramics, and poison gases for chemical warfare, glass making, in calico and indigo printing, pyrotechnics, integrated circuits and transistors. Arsenic is also a major waste material from the gold mining industry. | Arsenic may be present as an additive in lead-containing paints.           | N/A                                                                                              |</p>
<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>DESCRIPTION</th>
<th>FINDINGS</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vinyl Chloride</td>
<td>Vinyl chloride is the parent compound of polyvinyl chloride (PVC) which is a widely used plastic. Vinyl chloride is also used in various resins (e.g. plastic food wrap), and in the glass, rubber, and paper industries. Vinyl chloride is also formed by the degradation of the chlorinated solvents trichloroethylene (TCE), 1,1,1-trichloroethane (111TCA) and tetrachloroethylene (also known as perchloroethylene or dry-cleaning solvent), especially in soil or groundwater that has been contaminated with these solvents.</td>
<td>No solvents, tanks or process operations that use vinyl chloride were observed or appear to have been present in the building. Vinyl chloride could be present within plastic components of the plumbing system, vinyl flooring and countertops, etc.</td>
<td>N/A</td>
</tr>
<tr>
<td>Acrylonitrile</td>
<td>Acrylonitrile is mostly used as a feedstock or chemical aid in the production of nitrile-butadiene rubber and in acrylonitrile-butadiene-styrene and styrene-acrylonitrile polymers. Acrylonitrile is also used to make other chemicals such as plastics, synthetic rubber, and acrylic fibre (e.g. clothing, blankets, carpeting) and nitrile rubber for oil-resistant hoses.</td>
<td>Acrylonitrile is not expected to be present in the surveyed areas.</td>
<td>N/A</td>
</tr>
<tr>
<td>Benzene</td>
<td>Benzene is widely used in the chemical industry as a starting material and solvent. Benzene occurs naturally in crude oil and is present in all gasoline products, automobile emissions and cigarette smoke. Benzene is highly volatile, and will release into the atmosphere over a short time.</td>
<td>Since the building stores automobiles belonging to Peel Regional Police, benzene may be present in oil traps within the Garage Areas.</td>
<td>It is recommended that a soil and groundwater investigation be completed to evaluate subsurface environmental conditions.</td>
</tr>
<tr>
<td>Coke Oven Emissions</td>
<td>Coke oven emissions are complex mixtures of coal and coke particles, various vapors, gases and tars emitted during carbonization of coal to produce coke. The primary use of coke (pure carbon) is in the manufacture of iron and steel. Coke is also used to synthesize calcium carbide and to manufacture graphite and electrodes.</td>
<td>Coke oven emissions are not expected to be present in the surveyed areas.</td>
<td>N/A</td>
</tr>
<tr>
<td>MATERIAL</td>
<td>DESCRIPTION</td>
<td>FINDINGS</td>
<td>ACTION</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Ethylene Oxide</td>
<td>Ethylene Oxide is an extremely flammable gas used in the manufacture of several industrial chemicals including textiles, detergents, polyurethane foam, antifreeze (especially ethylene glycol), solvents, medicinal products, adhesives, and other related products. It is also used as a fumigant and as a sterilizing agent for food (spices), cosmetics, and surgical tool and plastic devices in hospitals as an alternative to steam.</td>
<td>Ethylene Oxide is not expected to be present in the surveyed areas.</td>
<td>N/A</td>
</tr>
<tr>
<td>Isocyanates</td>
<td>Isocyanates are the raw materials from which all polyurethane products are made. Isocyanates are widely used in the manufacture of flexible and rigid foams, fibres, coatings such as paints and varnishes, elastomers, and also in materials used in auto body repair and building insulation.</td>
<td>Isocyanates are not expected to be present in the surveyed areas.</td>
<td>N/A</td>
</tr>
<tr>
<td>Radon</td>
<td>Radon is a radioactive gas naturally emitted from the earth through the breakdown of uranium in soil. It enters buildings by seeping in through cracks, pipes, windows and the foundation etc.</td>
<td>No testing for radon was conducted as part of this assessment.</td>
<td>Air testing is the only method to determine if Radon is present within the building. It is recommended that the building be tested for Radon.</td>
</tr>
<tr>
<td>Aboveground Storage Tanks (ASTs)</td>
<td>Storage tanks used to store fuel for older heating systems may be found above grade, or may be underground.</td>
<td>One (1) steel aboveground storage tank (AST) for fuel oil were observed in the Mechanical Room (Room B0121) in the basement of the building. The tank was observed in good condition at the time of the site investigation.</td>
<td>This tank must be removed and disposed of by an authorized TSSA-certified contractor prior to the scheduled demolition of the building.</td>
</tr>
</tbody>
</table>
6 LIMITATIONS

As this survey was generally non-destructive in nature, asbestos could be present in areas not accessible to the surveyors for identification. Contractors and maintenance personnel should be warned of the possibility of unidentified materials when breaking into enclosed areas. Suspect friable and non-friable building materials discovered in these areas should be treated as asbestos until proven otherwise.

This report is prepared for the sole use of Peel Regional Police, who are responsible for its distribution to any third parties. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of the third party. The conclusions and recommendations contained in this assessment report are based upon professional opinions with regard to the subject matter. These opinions are in accordance with currently accepted industry practices for asbestos surveys and regulatory requirements for sampling and identifying asbestos and are subject to the following inherent limitations:

1. The data and findings presented in this report are valid as of the date(s) of the investigation only. The passage of time, manifestation of latent conditions or occurrence of future events may warrant further exploration of the Site, analysis of the data, and re-evaluation of the findings, observations, and conclusions expressed in this report.

2. The findings, observations, conclusions, and recommendations expressed by WSP Canada Inc. in this report do not represent an opinion concerning compliance of any past or present owner or operator of the Site with any federal, provincial or local laws or regulations.

3. WSP Canada Inc.’s assessment presents professional opinions and findings of a scientific and technical nature. While attempts were made to relate the data and findings to applicable environmental and occupational health & safety laws and regulations, the report shall not be construed to offer legal opinion or representations as to the requirements of, nor compliance with, environmental and occupational health and safety laws, rules, regulations or policies of federal, provincial, or local governmental agencies. WSP Canada Inc. liability extends only to its client and not to other parties who may obtain this assessment report. Issues raised by the report should be reviewed by appropriate legal counsel.
APPENDIX

A

ANALYTICAL RESULTS – ASBESTOS & LEAD
### Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

<table>
<thead>
<tr>
<th>Client Sample ID</th>
<th>Lab Sample ID</th>
<th>Sample Description</th>
<th>Tested</th>
<th>Date</th>
<th>Color</th>
<th>Fibrous</th>
<th>Non-Fibrous</th>
<th>Asbestos</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS1-1-Floor Tile</td>
<td>551809546-0001</td>
<td>Basement room B0136 (Cardio Room) - VFT-12 x 12 - Light Blue w/ White Flecks</td>
<td>PLM Grav. Reduction</td>
<td>8/22/2018</td>
<td>Blue</td>
<td>0.0%</td>
<td>100%</td>
<td>None Detected</td>
<td></td>
</tr>
<tr>
<td>AS1-1-Mastic</td>
<td>551809546-0001A</td>
<td>Basement room B0136 (Cardio Room) - VFT-12 x 12 - Light Blue w/ White Flecks</td>
<td>PLM Grav. Reduction</td>
<td>8/22/2018</td>
<td>Yellow</td>
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<td>100%</td>
<td>None Detected</td>
<td></td>
</tr>
<tr>
<td>AS1-2-Floor Tile</td>
<td>551809546-0002</td>
<td>Basement room B0136 (Cardio Room) - VFT-12 x 12 - Light Blue w/ White Flecks</td>
<td>PLM Grav. Reduction</td>
<td>8/22/2018</td>
<td>Blue</td>
<td>0.0%</td>
<td>100%</td>
<td>None Detected</td>
<td></td>
</tr>
<tr>
<td>AS1-2-Mastic</td>
<td>551809546-0002A</td>
<td>Basement room B0136 (Cardio Room) - VFT-12 x 12 - Light Blue w/ White Flecks</td>
<td>PLM Grav. Reduction</td>
<td>8/22/2018</td>
<td>Yellow</td>
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<td>None Detected</td>
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<tr>
<td>AS1-3-Floor Tile</td>
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<td>Basement room B0136 (Cardio Room) - VFT-12 x 12 - Light Blue w/ White Flecks</td>
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<td>AS1-3-Mastic</td>
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<tr>
<td>AS2-1</td>
<td>551809546-0004</td>
<td>Basement room Corridor adj. stairwell (B0125) - VFT-12 x 12 - Charcoal w/ Grey Flakes</td>
<td>PLM Grav. Reduction</td>
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<td>100%</td>
<td>None Detected</td>
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</table>
# Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

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<td>AS2-2</td>
<td>Basement room Corridor adj. stairwell (B0125) - VFT-12 x 12 - Charcoal w/ Grey Flakes</td>
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<td>Basement room Corridor adj. stairwell (B0125) - VFT-12 x 12 - Charcoal w/ Grey Flakes</td>
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<thead>
<tr>
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<tbody>
<tr>
<td>AS3-1-Floor Tile</td>
<td>Basement room Corridor adj. Rm B0103A - VFT-12 x 12 - Beige w/ Light Beige Flecks</td>
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<td>PLM Grav. Reduction</td>
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<table>
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<tbody>
<tr>
<td>AS3-1-Mastic</td>
<td>Basement room Corridor adj. Rm B0103A - VFT-12 x 12 - Beige w/ Light Beige Flecks</td>
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<td>PLM Grav. Reduction</td>
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<tbody>
<tr>
<td>AS3-2-Floor Tile</td>
<td>Basement room Corridor adj. Rm B0103A - VFT-12 x 12 - Beige w/ Light Beige Flecks</td>
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<thead>
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<tr>
<td>AS3-2-Mastic</td>
<td>Basement room Corridor adj. Rm B0103A - VFT-12 x 12 - Beige w/ Light Beige Flecks</td>
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<tr>
<th>Client Sample ID</th>
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<tbody>
<tr>
<td>AS3-3</td>
<td>Basement room Corridor adj. Rm B0103A - VFT-12 x 12 - Beige w/ Light Beige Flecks</td>
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<tr>
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<table>
<thead>
<tr>
<th>Client Sample ID</th>
<th>Sample Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS4-1</td>
<td>Basement - Mississauga room (B0088-B) - VFT-2 x 2 - Blue Grey w/ White &amp; Blue Streaks</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Analyzed</th>
<th>Non-Asbestos</th>
<th>Asbestos</th>
<th>Comment</th>
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<tbody>
<tr>
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</table>
## Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

### Client Sample ID: AS4-2

**Sample Description:** Basement - Mississauga room (B0088-B) - VFT-2 x 2 - Blue Grey w/ White & Blue Streaks

<table>
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<tr>
<th>TEST</th>
<th>Analyzed Date</th>
<th>Color</th>
<th>Non-Asbestos Fibrous</th>
<th>Non-Asbestos Non-Fibrous</th>
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### Client Sample ID: AS4-3

**Sample Description:** Basement - Mississauga room (B0088-B) - VFT-2 x 2 - Blue Grey w/ White & Blue Streaks

<table>
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<tr>
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<td>0.0%</td>
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</table>

### Client Sample ID: AS5-1

**Sample Description:** Basement - Women's locker RM (BS-0134) VFT-12 x 12 - Grey w/ White Specks

<table>
<thead>
<tr>
<th>TEST</th>
<th>Analyzed Date</th>
<th>Color</th>
<th>Non-Asbestos Fibrous</th>
<th>Non-Asbestos Non-Fibrous</th>
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### Client Sample ID: AS5-2

**Sample Description:** Basement - Women's locker RM (BS-0134) VFT-12 x 12 - Grey w/ White Specks

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### Client Sample ID: AS5-3

**Sample Description:** Basement - Women's locker RM (BS-0134) VFT-12 x 12 - Grey w/ White Specks

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### Client Sample ID: AS6-1

**Sample Description:** Basement - Communications Rm (B0142) - Wall Caulking (White)

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### Client Sample ID: AS6-2

**Sample Description:** Basement - Communications Rm (B0142) - Wall Caulking (White)

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### Client Sample ID: AS6-3

**Sample Description:** Basement - Communications Rm (B0142) - Wall Caulking (White)

<table>
<thead>
<tr>
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<th>Non-Asbestos Non-Fibrous</th>
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<td>100%</td>
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# Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

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<td>Basement - Corridor (B0076) - Drywall Joint Compound</td>
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<td><strong>COLOR</strong></td>
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<td>2nd Floor - Street Level Crime Unit (2031) - Drywall Joint Compound</td>
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<tr>
<td>Sample Description:</td>
<td>2nd Floor Storage Room (2085) - Drywall Joint Compound</td>
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<tr>
<td>Sample Description:</td>
<td>3rd Floor - Board Room (3076) - Drywall Joint Compound</td>
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<tr>
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<tr>
<td>Sample Description:</td>
<td>1st Floor - Bell Room (1090) - Firestop Caulking (Grey)</td>
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<tr>
<td><strong>TEST</strong></td>
<td><strong>ANALYZED</strong></td>
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<td>PLM Grav. Reduction</td>
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**Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method**

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<td><strong>TEST</strong></td>
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<tr>
<td>Analyzed Date</td>
<td>Color</td>
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<tr>
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<th>551809546-0029</th>
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<tr>
<td>Sample Description:</td>
<td>1st Floor - Gymnasium (1135 - B) - Baseboard Mastic (yellow)</td>
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</tr>
<tr>
<td><strong>TEST</strong></td>
<td><strong>TEST</strong></td>
<td></td>
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<tr>
<td>Analyzed Date</td>
<td>Color</td>
<td>Non-Asbestos Fibrous</td>
<td>Non-Asbestos Non-Fibrous</td>
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<td><strong>TEST</strong></td>
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<td>Non-Asbestos Non-Fibrous</td>
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<tr>
<td><strong>TEST</strong></td>
<td><strong>TEST</strong></td>
<td></td>
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</tr>
<tr>
<td>Analyzed Date</td>
<td>Color</td>
<td>Non-Asbestos Fibrous</td>
<td>Non-Asbestos Non-Fibrous</td>
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<th>AS10-1-Floor Tile</th>
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<th>551809546-0032</th>
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<tr>
<td>Sample Description:</td>
<td>1st Floor - Lunch Room (1096) - VFT - 12x12 Red with Dark Red Flecks</td>
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</tr>
<tr>
<td><strong>TEST</strong></td>
<td><strong>TEST</strong></td>
<td></td>
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<tr>
<td>Analyzed Date</td>
<td>Color</td>
<td>Non-Asbestos Fibrous</td>
<td>Non-Asbestos Non-Fibrous</td>
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<td><strong>TEST</strong></td>
<td><strong>TEST</strong></td>
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<tr>
<td>Analyzed Date</td>
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<th>Client Sample ID:</th>
<th>AS10-2-Floor Tile</th>
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<tr>
<td><strong>TEST</strong></td>
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# Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

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<th>Color</th>
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<td>100%</td>
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<td>AS10-3-3-Floor Tile</td>
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<td>None Detected</td>
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<tr>
<td>AS11-1</td>
<td>551809546-0035</td>
<td>2nd Floor - Victims Support (2180) Reception VSF - Light Brown</td>
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<td>100%</td>
<td>None Detected</td>
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*Test Report: EPAMultiTests-7.32.2.D Printed: 8/22/2018 05:15PM*
Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

Analyst(s):

Caroline Allen  PLM (4)
PLM Grav. Reduction (23)
Kira Ramphal  PLM (2)
Michelle Lung  PLM (5)
PLM Grav. Reduction (11)

Reviewed and approved by:

Matthew Davis or other approved signatory
or Other Approved Signatory

None Detected = <0.1%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0
Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

<table>
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<th>Client Sample Description</th>
<th>Collected</th>
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<th>RDL</th>
<th>Lead Concentration</th>
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<td>Pb-01</td>
<td>8/17/2018</td>
<td>Site: Basement - Exercise Rm (B0135A) - Light Blue Wall Paint</td>
<td>0.2451 g</td>
<td>0.0082 % wt</td>
<td>&lt;0.0082 % wt</td>
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<tr>
<td>Pb-02</td>
<td>8/17/2018</td>
<td>Site: Basement - LAN Room (B0117A) - Grey Floor Paint</td>
<td>0.2361 g</td>
<td>0.0085 % wt</td>
<td>0.026 % wt</td>
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<tr>
<td>Pb-03</td>
<td>8/17/2018</td>
<td>Site: Basement- Evidence Storage (B0059) - Beige Wall Paint Insufficient sample to reach reporting limit.</td>
<td>0.1874 g</td>
<td>0.011 % wt</td>
<td>&lt;0.011 % wt</td>
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<td>Pb-04</td>
<td>8/17/2018</td>
<td>Site: Basement - Corridor adj Rm B0008 - Light Teal Wall Paint</td>
<td>0.2458 g</td>
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<td>Pb-05</td>
<td>8/17/2018</td>
<td>Site: 1st Floor - Garage (1064A) - Off-White Wall Paint</td>
<td>0.2485 g</td>
<td>0.0080 % wt</td>
<td>&lt;0.0080 % wt</td>
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<tr>
<td>Pb-06</td>
<td>8/17/2018</td>
<td>Site: 3rd Floor - Boardroom (3076) - Light Teal Wall Paint</td>
<td>0.2477 g</td>
<td>0.0081 % wt</td>
<td>&lt;0.0081 % wt</td>
</tr>
</tbody>
</table>

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements unless specifically indicated otherwise. Definitions of modifications are available upon request.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Rowena Fanto, Lead Supervisor or other approved signatory

Initial report from 08/22/2018 08:42:21

Test Report PB w/RDL-7.32.3  Printed: 8/22/2018 8:42:21 AM
<table>
<thead>
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<th>PHOTO NO.</th>
<th>MATERIAL DESCRIPTION &amp; LOCATION</th>
<th>PHOTO</th>
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<tbody>
<tr>
<td>1</td>
<td>Exterior view of the surveyed building (180 Derry Road East, Mississauga, ON)</td>
<td><img src="image1.jpg" alt="Exterior View" /></td>
</tr>
<tr>
<td>2</td>
<td>Floor paint (Grey) observed throughout the LAN Room (Room B0117A) in the basement of the building (Pb-02).</td>
<td><img src="image2.jpg" alt="Floor Paint" /></td>
</tr>
<tr>
<td>PHOTO NO.</td>
<td>MATERIAL DESCRIPTION &amp; LOCATION</td>
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<tr>
<td>-----------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Refrigerator observed in the Exercise Room (Room B0135-A) in the basement of the building contains R-12 refrigerant.</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Refrigerator observed in the Main Telecom Room (Facilities Management) in the basement of the building contains R-12 refrigerant.</td>
<td></td>
</tr>
<tr>
<td>PHOTO NO.</td>
<td>DESCRIPTION &amp; LOCATION</td>
<td>PHOTO</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>5</td>
<td>Refrigerator observed in the Lunch Room (Room 1096) on the 1st floor of the building contains R-12 refrigerant.</td>
<td><img src="image1.jpg" alt="Image of refrigerator in Lunch Room" /></td>
</tr>
<tr>
<td>6</td>
<td>Refrigerator observed in Room 2056 on the 2nd floor of the building contains R-12 refrigerant.</td>
<td><img src="image2.jpg" alt="Image of refrigerator in Room 2056" /></td>
</tr>
<tr>
<td>PHOTO NO.</td>
<td>MATERIAL DESCRIPTION &amp; LOCATION</td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Refrigerator observed in the Lunch Room (Room 2069-A) on the 2nd floor of the building contains R-12 refrigerant.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Air conditioning unit observed in the Diversity Relations Office (Room 2092-B) on the 2nd Floor of the building contains R-22 refrigerant.</td>
<td></td>
</tr>
<tr>
<td>PHOTO NO.</td>
<td>MATERIAL DESCRIPTION &amp; LOCATION</td>
<td>PHOTO</td>
</tr>
<tr>
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<td>-------</td>
</tr>
<tr>
<td>9</td>
<td>Refrigerator observed in the Storage Room (Room 3025) on the 3rd floor of the building contains R-12 refrigerant.</td>
<td>![Photo of Refrigerator]</td>
</tr>
<tr>
<td>10</td>
<td>Representative photo of smoke detectors observed throughout the surveyed area. These smoke detectors contain radioactive materials.</td>
<td>![Photo of Smoke Detector]</td>
</tr>
<tr>
<td>PHOTO NO.</td>
<td>MATERIAL DESCRIPTION &amp; LOCATION</td>
<td></td>
</tr>
<tr>
<td>-----------</td>
<td>-------------------------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Representative photo of water-stained ceiling tiles observed throughout the surveyed area.</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>One (1) aboveground storage tank (AST) for fuel oil was observed in the Mechanical Room (Room B0121) in the basement of the building.</td>
<td></td>
</tr>
</tbody>
</table>
A description of the criteria used in evaluating the condition, accessibility and exposure risk of asbestos-containing materials (ACM) is provided below.

**Assessment of Condition**

**Spray-Applied Fireproofing, Insulation and Textured Finishes**

In evaluating the condition of ACM spray applied as fireproofing, thermal insulation or texture, decorative or acoustic finishes, the following criteria apply:

**Good**
Surface of material shows no significant signs of damage, deterioration or delamination. Up to one percent visible damage to surface is allowed within range of GOOD. Evaluation of sprayed fireproofing requires the Assessor to be familiar with the irregular surface texture typical of sprayed asbestos products. GOOD condition includes unencapsulated or unpainted fireproofing or texture finishes, where no delamination or damage is observed, and encapsulated fireproofing or texture finishes where the encapsulation has been applied after the damage or fallout occurred.

**Poor**
Sprayed materials show signs of damage, delamination or deterioration. More than one percent damage to surface of ACM spray.

In observation areas, where damage exists in isolated locations, both GOOD and POOR condition may be reported. The extent or percentage of each condition will be recorded on the Assessor reassessment form.

FAIR condition is not utilized or considered as a valid criterion in the evaluation of sprayed fireproofing, sprayed insulation, or texture coat finishes.

The evaluation of ACM spray applied as fireproofing, non-mechanical thermal insulation, or texture, decorative or acoustic finishes which are present above ceilings, may be limited by the number of observations made, and by building components such as ducts or full height walls that obstruct the above ceiling observations. Persons entering the ceiling area are advised to be watchful for ACM DEBRIS prior to accessing or working above ceilings in areas of building with ACM, regardless of the reported condition.

**Other ACM**

In evaluating the condition of mechanical insulation (on boilers, breaching, ductwork, piping, tanks, equipment etc.) the following criteria are used:

**Good**
Insulation is completely covered in jacketing and exhibits no evidence of damage or deterioration. No insulation is exposed. Includes conditions where the jacketing has minor surface damage (i.e., scuffs or stains), but the jacketing is not penetrated.

**Fair**
Minor penetration damage to jacketed insulation (cuts, tears, nicks, deterioration or delamination) or undamaged insulation that has never been jacketed. Insulation is exposed but not showing surface disintegration. The extent of missing insulation ranges should be minor to none.

**Poor**
Original insulation jacket is missing, damaged, deteriorated or delaminated. Insulation is exposed and significant areas have been dislodged. Damage cannot be readily repaired. The evaluation of mechanical insulation may be limited by the number of observations made and building components such as ducts or full height walls that obstruct observations. In these circumstances, it is not possible to observe each foot of mechanical insulation from all angles.
Non-Friable and Potentially Friable Materials

Non-friable materials generally have little potential to release airborne fibres, even when damaged by mechanical breakage. However, some non-friable materials, i.e., exterior asbestos cement products, may have deteriorated so that the binder no longer effectively contains the asbestos fibres. In such cases of significantly deteriorated non-friable material, the material will be treated as a friable product.

Evaluation of Accessibility

The accessibility of building materials known or suspected of being ACM is rated according to the following criteria:

Access (A)
Areas of the building within reach of all building users. Includes areas such as gymnasiums, workshops, and storage areas where activities of the building users may result in disturbance of ACM not normally within reach from floor level.

Access (B)
Frequently entered maintenance areas within reach of maintenance staff, without the need for a ladder. Includes: frequently entered pipe chases, tunnels and service areas or areas within reach from a fixed ladder or catwalk, i.e., tops of equipment, mezzanines.

Access (C) Exposed
Areas of the building above 8'0" where use of a ladder is required to reach the ACM. Only refers to ACM materials that are exposed to view, from the floor or ladder, without removing or opening other building components such as ceiling tiles, or service access doors or hatches. Does not include infrequently accessed service areas of the building.

Access (C) Concealed
Areas of the building which require the removal of a building component, including lay-in ceilings and access panels into solid ceiling systems. Includes rarely entered crawl spaces, attic spaces, etc. Observations are limited to the extent visible from the access points.

Access (D)
Areas of the building behind inaccessible solid ceiling systems, walls, or mechanical equipment, etc. where demolition of the ceiling, wall or equipment, etc., is required to reach the ACM. Evaluation of the condition and extent of ACM is limited or impossible, depending on the Assessor’s ability to visually examine the materials in Access D.

Definition of Action Levels

Based on the results of the inspection and bulk sample analysis of samples collected and submitted for testing, recommendations were provided for compliance with regulation. These include assigned “Action Levels” to assist in the prioritization of corrective measures. The measures that are to be taken for each “Action Level” are described in full in the following table:

<table>
<thead>
<tr>
<th>Action Level</th>
<th>Required Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Action 1”</td>
<td>Immediate Clean-Up of Debris that is Likely to Be Disturbed</td>
</tr>
<tr>
<td></td>
<td>Restrict access that is likely to cause a disturbance of the ACM DEBRIS and clean up ACM DEBRIS immediately. Utilize correct asbestos procedures. This action is required for compliance with regulatory requirements. The surveyor will immediately notify the owner of this condition.</td>
</tr>
</tbody>
</table>
### Appendix C – Asbestos-Containing Material Evaluation Criteria

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>“Action 2”</strong></td>
<td><strong>Type 2 Precautions for Entry into Areas with ACM DEBRIS</strong>&lt;br&gt;At locations where ACM DEBRIS can be isolated in lieu of removal or cleaned up, use appropriate means to limit entry to the area. Restrict access to the area to persons utilizing Type 2 asbestos precautions. The precautions will be required until the ACM DEBRIS has been cleaned up, and the source of the DEBRIS has been stabilized or removed.</td>
</tr>
<tr>
<td><strong>“Action 3”</strong></td>
<td><strong>ACM Removal Required for Compliance</strong>&lt;br&gt;Remove ACM for compliance with regulatory requirements. Utilize asbestos procedures appropriate to the scope of the removal work.</td>
</tr>
<tr>
<td><strong>“Action 4”</strong></td>
<td><strong>Type 2 Precautions for Access into Areas Where ACM is Present and Likely to be Disturbed by Access</strong>&lt;br&gt;Use Type 2 asbestos precautions when entry or access into an area is likely to disturb the ACM. ACTION 4 must be used until the ACM is removed (Use ACTION 1 or 2 if DEBRIS is present).</td>
</tr>
<tr>
<td><strong>“Action 5”</strong></td>
<td><strong>Proactive ACM Removal</strong>&lt;br&gt;Remove ACM in lieu of repair, or at locations where the presence of asbestos in GOOD condition is not desirable.</td>
</tr>
<tr>
<td><strong>“Action 6”</strong></td>
<td><strong>ACM Repair</strong>&lt;br&gt;Repair ACM found in FAIR condition, and not likely to be damaged again or disturbed by normal use of the area or room. Upon completion of the repair work, treat ACM as material in GOOD condition and implement ACTION 7. If ACM is likely to be damaged or disturbed, during normal use of the area or room, implement ACTION 5.</td>
</tr>
<tr>
<td><strong>“Action 7”</strong></td>
<td><strong>Asbestos Management Program with Routine Surveillance</strong>&lt;br&gt;Implement an Asbestos Management Program, including routine surveillance of ACM. Trained workers or contractors must use appropriate asbestos precautions (Type 1, Type 2 or Type 3) during disturbance of the remaining ACM.</td>
</tr>
</tbody>
</table>
**Accessibility:** The terms easily accessible, less accessible, and inaccessible are used to describe the ease with which asbestos can be accessed by tenants, the public, employees, and contractors in the building. **Easily accessible** indicates that ACM is visible from the floor and can be touched by building occupants, and therefore has a potential for significant damage. **Less accessible** indicates that ACM is not visible from the floor, or if it is visible, it is high enough not to be touched by building occupants, and has a potential for damage. **Inaccessible** indicates that ACM is located behind masonry, drywall, or other types of solid enclosures and is only accessible after destruction of the enclosure, and has a low potential for damage.

**ACM:** Asbestos-Containing Material. A material that contains greater than 0.5% asbestos by dry weight as per Ontario Regulation 278/05 and is used to refer to the vastly different types of such material.

**Amosite:** The technical name for ‘brown’ asbestos.

**AMP:** Asbestos Management Plan

**Asbestos:** A mineral fiber that can pollute air or water and cause cancer or asbestosis when inhaled.

**Asbestos Abatement:** Procedures to control fiber release from asbestos-containing materials in a building or to remove them entirely, including removal, encapsulation, repair, enclosure, encasement, and operations and maintenance programs.

**Asbestos Cement:** A hard product that contains up to 15% asbestos fibres which can be any of the three main types. This is a relatively safe material provided it remains intact as the cement binds the asbestos fibres; breakage will lead to fibre release. When used for roofing the risks to operatives are far greater from falls than asbestos exposure.

**Asbestos Control:** Minimizing the generation of airborne asbestos fibres until a permanent solution is developed.

**Asbestos Debris:** Pieces of an ACM that can be identified by color, texture, or composition, or means dust, if the dust is determined by an accredited inspector to be ACM.

**Asbestos Fibres:** Fibres with their length being greater than five microns (length to width ratio of 3:1), generated from an asbestos-containing material.

**BAS:** Building Asbestos Supervisor.

**Bulk Sample:** A sample of material such as boarding, insulation or debris taken by an accredited surveyor to be tested for asbestos fibre content by an accredited laboratory.

**Chrysotile:** The technical name for ‘white’ asbestos.

**Condition:** The condition of ACM is described using the designations: good, fair and poor. **Good** refers to ACM with no visible damage or deterioration, or showing only very limited damage or deterioration. **Fair** refers to ACM with some damage or deterioration (less than 10% of the material). **Poor** refer to ACM that is significantly damaged or deteriorated (at least 10% of the material).

**CRD:** Construction, Renovation and/or Demolition related activities.

**Crocidolite:** The technical name for ‘blue’ asbestos.

**Designated Substances Regulations:** A series of Regulations made by the Ministry of Labour under the Occupational Health and Safety Act. The regulations provide management protocols and guidelines to the following eleven substances: acrylonitrile, arsenic, asbestos, benzene, coke oven emissions, ethylene oxide, isocyanates, lead, mercury, silica and vinyl chloride.

**Demolition:** Complete dismantling or the complete or partial destruction of a building, structure, ship or plant such that it cannot be used in that form again.

**Friable ACM:** Any material that contains more than 0.5% asbestos by weight and can be crumbled, pulverized, or reduced to powder by the pressure of an ordinary human hand.

**HEPA Filter:** High Efficiency Particulate Air Filter.

**Homogeneous Area:** Defined by the US EPA as containing material that is uniform in texture and appearance, was installed at one time and is unlikely to consist of more than one type or formulation of material.
**Major Action:** All response actions requiring Type 3 ACM Removal Procedures, or Type 2 Removal Procedures involving the removal of friable ACM and provisions of an enclosure.

**Management Survey:** A survey carried out without disturbing any part of the fabric, components or finishes. Samples may be taken.

**MOL:** Ministry of Labour.

**O&M:** Operations and Maintenance Program.

**O. Reg.:** Ontario Regulations.

**Non-Friable ACM:** Any material that contains more than 0.5% asbestos by weight but cannot be pulverized under hand pressure.

**PACM:** Presumed Asbestos-Containing Materials. All thermal system insulation, surfacing material and asphalt/vinyl flooring in a building constructed prior to 1981 that has not been appropriately tested are presumed asbestos containing materials.

**PPE:** Personal Protective Equipment such as overalls, masks, gloves etc.

**Pre-Demolition Survey:** A survey similar to the Refurbishment Survey but also taking core samples from partitions, lifting floorboards and investigating back to the structure where possible.

**Refurbishment Survey:** A survey similar to the Management Survey but also involves entering into accessible ducts, suspended ceilings and other accessible voids. Samples are almost always taken.

**RPE:** Respiratory Protective Equipment. The different types of face masks worn appropriate to the risk. Where the risk assessment shows that the Control Limit will be exceeded RPE must be worn.

**Surveyor:** Any person who contracts to provide professional health and safety services relating to asbestos-containing construction material. The activities of a surveyor include building inspection, abatement project design, contract administration, sample collection, preparation of asbestos management plans, clearance monitoring, and supervision of site surveillance technicians.

**Type 1:** Asbestos Abatement Operation with ACM as an operation described by O. Reg. 278/05 in subsection 12 (2), generally an operation that does not cause asbestos fibres to become airborne.

**Type 2:** Asbestos Abatement Operation with ACM as an operation described by O. Reg. 278/05 in subsection 12 (3), generally a major operation with limited scope of work.

**Type 3:** Asbestos Abatement Operation with ACM as an operation described by O. Reg. 278/05 in subsection 12 (4), generally a major operation.
APPENDIX E

DRAWINGS
Notes:
1. This drawing must be read in conjunction with associated report.
2. Drawings provided by Peel Regional Police.

Legend:
- ✱ Negative Asbestos Result
- ✱ Negative Lead Result
- ✱ Positive Lead Result
- 🔴 Area Not Accessible/Not Included in Project Scope
Notes:
1. This drawing must be read in conjunction with associated report.
2. Drawings provided by Peel Regional Police.

Legend:
- • Negative Asbestos Result
- • Positive Lead Result
- • Negative Lead Result
- ☢️ Area Not Accessible/Not Included in Project Scope

Client: Peel Regional Police
Project No.: 181-10995-00
Drawing No.: 2

Ground Floor - Sampling Locations
Designated Substance & Hazardous Materials Survey
180 Derry Road East, Mississauga, ON

Legend:
- • Negative Asbestos Result
- • Positive Lead Result
- • Negative Lead Result

Notes:
1. This drawing must be read in conjunction with associated report.
2. Drawings provided by Peel Regional Police.

Legend:
- • Negative Asbestos Result
- • Positive Lead Result
- • Negative Lead Result

Notes:
1. This drawing must be read in conjunction with associated report.
2. Drawings provided by Peel Regional Police.
Notes:
1. This drawing must be read in conjunction with associated report.
2. Drawings provided by Peel Regional Police.

Legend:
- Negative Asbestos Result
- Negative Lead Result
- Positive Lead Result
- Area Not Accessible/Not Included in Project Scope

Client: Peel Regional Police
Project No.: 181-10995-00
Drawing No.: 3

Drawn: JB
Approved: EK
Date: August 2018
Scale: NTS
Project: Designated Substance & Hazardous Materials Survey
180 Derry Road East, Mississauga, ON

Original Size: Letter
Rev: N/A
Notes:
1. This drawing must be read in conjunction with associated report.
2. Drawings provided by Peel Regional Police.
PEEL REGIONAL POLICE

DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS SURVEY
7750 HURONTARIO STREET, BRAMPTON, ONTARIO

JULY 8, 2018
DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS SURVEY

7750 HURONTARIO STREET, BRAMPTON, ONTARIO

PEEL REGIONAL POLICE

VERSION 2

PROJECT NO.: 191-08416-00
DATE: JULY 2018

WSP
WSP.COM
July 8, 2018

PEEL REGIONAL POLICE  
Facilities Management  
7750 Hurontario Street  
Brampton, Ontario  
L6V 3W6

Attention: Mr. Jaison John

Dear Sir:

Subject: Designated Substances and Hazardous Materials Survey, 7750 Hurontario Street, Brampton, Ontario

WSP Canada Inc. (WSP) was retained by Peel Regional Police to update the original Designated Substances & Hazardous Materials Survey (DSS) Report of the occupied law enforcement building located at 7750 Hurontario Street, Brampton, Ontario.

The purpose of this survey is to determine the presence/absence of Designated Substances within areas of the building scheduled for upcoming renovations, and to provide Designated Substances information to contractors and/or maintenance personnel to ensure complete and correct procedures are followed prior to any scheduled renovations.

The following report discusses the methodologies and findings of this survey.

We trust that the attached report is satisfactory for your purposes at this time. Please contact the undersigned should you have any questions or concerns.

Yours sincerely,

Erin Kennealy, CIH  
Manager, Hazardous Materials.

EK/JB

WSP ref.: 191-08416-00
<table>
<thead>
<tr>
<th>ISSUE/REVISION</th>
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<th>REVISION 1</th>
<th>REVISION 2</th>
<th>REVISION 3</th>
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<td>DSS Report</td>
<td>DSS Report</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date</td>
<td>08/27/2018</td>
<td>07/08/2019</td>
<td></td>
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<tr>
<td>Prepared by</td>
<td>Josip Bosnjak</td>
<td>Josip Bosnjak</td>
<td></td>
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<tr>
<td>Reviewed by</td>
<td>Erin Kennealy</td>
<td>Erin Kennealy</td>
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<tr>
<td>Project number</td>
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<td>191-08416-00</td>
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<td>Hurontario Street, Brampton, Ontario</td>
<td>Hurontario Street, Brampton, Ontario</td>
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</tr>
</tbody>
</table>
SIGNATURES

PREPARED BY

Josip Bosnjak, B.Sc.
Project Manager, Hazardous Materials

REVIEWED BY

Erin Kennealy, CIH
Manager, Hazardous Materials

This report was prepared by WSP Canada Inc for the account of PEEL REGIONAL POLICE, in accordance with the professional services agreement. The disclosure of any information contained in this report is the sole responsibility of the intended recipient. The material in it reflects PEEL REGIONAL POLICE’s best judgement in light of the information available to it at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. PEEL REGIONAL POLICE accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. This limitations statement is considered part of this report.

The original of the technology-based document sent herewith has been authenticated and will be retained by WSP for a minimum of ten years. Since the file transmitted is now out of WSP’s control and its integrity can no longer be ensured, no guarantee may be given with regards to any modifications made to this document.
PRODUCTION TEAM

CLIENT

Project Manager  Jaison John

WSP

Manager  Erin Kennealy

Project Manager  Josip Bosnjak

Field Technician  Shelby McCullough
EXECUTIVE SUMMARY

WSP Canada Inc. (WSP) was retained by Peel Regional Police to prepare a Designated Substances & Hazardous Materials Survey (DSS) Report of the occupied law enforcement building located at 7750 Hurontario Street, Brampton, Ontario. In July 2019, WSP was requested to update the DSS report to include select areas of the exterior of the building that will be affected by planned renovations.

The subject site is a multi-storey law enforcement building located approximately seven hundred and fifty (750) metres south of the main intersection of Hurontario Street and Steeles Avenue West in Brampton, Ontario. The site has one (1) basement level that spans approximately half of the building’s footprint. The building is currently occupied by Peel Regional Police.

The purpose of this survey is to determine the presence/absence of Designated Substances within areas of the building scheduled for upcoming renovations, and to provide Designated Substances information to contractors and/or maintenance personnel to ensure complete and correct procedures are followed prior to any scheduled renovations.

A summary of the results of WSP’s site inspection and bulk sampling is presented below:

**Table 1 – Designated Substances & Hazardous Materials Survey Findings at 7750 Hurontario Street, Brampton, Ontario**

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SURVEY FINDINGS</th>
</tr>
</thead>
</table>
| Asbestos                        | Based on the laboratory results, five (5) of the thirty-one (31) homogeneous building material samples collected and analyzed are considered to be asbestos-containing (defined as material that contains 0.5% or more asbestos by dry weight). The following asbestos-containing materials are present within the building:  
  Non-Friable  
  — Vinyl floor tiles (12” x 12” Navy Blue with White Streaks) observed in the R.I.M.S Storage Room and Telecom Room (Room 4022) in the basement of the building.  
  — 4.1% Chrysotile; Sample Number AS1  
  — Vinyl floor tiles (12” x 12” Red with White Lines) observed in the IT Storage Room in the basement of the building.  
  — 4.1% Chrysotile; Sample Number AS4  
  — Firestop caulking (White) observed in the southeast stairwell in the basement level.  
  — 1.4% Chrysotile; Sample Number AS11  
  — HVAC duct mastic (Brown) observed in select areas throughout the building.  
  — 4.5% Chrysotile; Sample Number AS13  
  — Vinyl floor tiles (12” x 12” Beige with Brown & White Lines) and the associated mastic (Black) observed in Room 4023 (File Room) in the basement of the building.  
  — 3.4% Chrysotile; Sample Number AS14  
  — Asbestos cement (Transite®) pipes observed in select locations throughout the building.  
Notes:  
— Asbestos-containing materials may be present in inaccessible areas throughout the building (i.e. wall/ceiling cavities, electrical/mechanical equipment, etc.)  
— Asbestos cement pipes (Transite®) were not sampled in order to prevent compromising the integrity of the pipes. This material was visually determined to be asbestos-containing.
<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>SURVEY FINDINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roofing material and associated tar and caulking materials were not sampled during the survey in order to prevent water penetration into the building. Therefore, roofing material and any associated tar and caulking should be treated as asbestos-containing until sampling confirms otherwise.</td>
<td></td>
</tr>
<tr>
<td>The original investigation was non-intrusive in nature and as such, select materials that may compromise the integrity of the structure, or cause significant damage to property were not sampled (i.e. exterior caulking materials). Exterior caulking materials were sampled within the proposed renovation locations (please refer to Table 4 for details regarding the materials and locations). Materials not included in Tables 3 and 4 below are presumed to contain asbestos until additional testing confirms otherwise.</td>
<td></td>
</tr>
<tr>
<td>Lead</td>
<td>Based on the laboratory results, four (4) of the seventeen (17) paint samples collected and analyzed have detectable concentrations of lead. The following materials are considered lead-containing:</td>
</tr>
<tr>
<td></td>
<td>- Floor paint (Grey) observed throughout the southwest Maintenance Room adjacent to the R.I.M.S. offices (0.020%);</td>
</tr>
<tr>
<td></td>
<td>- Floor paint (Grey) observed throughout the Shared Garage/Sallyport in the basement level (0.0092%);</td>
</tr>
<tr>
<td></td>
<td>- Door frame paint (Sky Blue) observed on the exterior of the building (0.44%);</td>
</tr>
<tr>
<td></td>
<td>- Door paint (Grey) observed on the exterior of the building (0.039%).</td>
</tr>
<tr>
<td>Notes:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lead is also expected to be present in the following building components:</td>
</tr>
<tr>
<td></td>
<td>- painted surfaces visually similar to the above noted lead-containing paints;</td>
</tr>
<tr>
<td></td>
<td>- in lead acid batteries in emergency lighting throughout the surveyed area;</td>
</tr>
<tr>
<td></td>
<td>- as a component in ceramic building products such as tiles and bricks;</td>
</tr>
<tr>
<td></td>
<td>- as a component of the solder on sweated joints between copper pipe and fittings;</td>
</tr>
<tr>
<td></td>
<td>- as a component of the solder on wire connections of electric components;</td>
</tr>
<tr>
<td></td>
<td>- as a component of solder used to seal the bell fitting of cast iron rain water leader pipes;</td>
</tr>
<tr>
<td></td>
<td>- as a malleable metal sheeting/flashing around roof edges, vent stacks, HVAC fixtures, etc.</td>
</tr>
<tr>
<td>Mercury</td>
<td>Although no samples were analyzed for mercury, it is presumed to be present as a gas in fluorescent and CFL light tubes, as well as in liquid form in thermostat switches observed throughout the surveyed area.</td>
</tr>
<tr>
<td>Silica</td>
<td>Building materials and components known to contain silica such as glass, concrete, masonry, stone and mortar etc., were observed throughout the surveyed area.</td>
</tr>
<tr>
<td>PCBs</td>
<td>Individual fluorescent light ballasts were not inspected for the presence of PCBs as they were operational at the time of the site visit and therefore inaccessible to the surveyor. Fluorescent light ballasts may contain PCBs. Transformers potentially containing PCBs were not observed in the surveyed areas.</td>
</tr>
<tr>
<td>Radioactive Materials</td>
<td>Smoke detectors were observed throughout the building at the time of the assessment. It should be noted that smoke detectors may contain radioactive materials (Amerecium-7).</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>MATERIAL</td>
<td>SURVEY FINDINGS</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Ozone Depleting Substances (ODS)</td>
<td>The following equipment containing ozone depleting substances (ODS) was observed within the surveyed area:</td>
</tr>
<tr>
<td></td>
<td>— One (1) refrigerator containing R-12 refrigerant observed in Room B-30 (Basement);</td>
</tr>
<tr>
<td></td>
<td>— Two (2) air conditioning units containing R-22 refrigerant observed in the Shared Garage/Sallyport (basement);</td>
</tr>
<tr>
<td></td>
<td>— One (1) refrigerator containing R-12 refrigerant observed in the Garage Area adjacent to the Tactical Training Area (1st Floor);</td>
</tr>
<tr>
<td></td>
<td>— One (1) air conditioning unit containing R-22 refrigerant observed in the Garage Area adjacent to the Tactical Training Area (1st Floor);</td>
</tr>
<tr>
<td></td>
<td>— One (1) refrigerator containing R-12 refrigerant observed in the northeast office area of the 22 Division building (1st Floor);</td>
</tr>
<tr>
<td></td>
<td>— One (1) refrigerator containing R-12 refrigerant observed in the kitchenette adjacent to the Former Finance Office Area (2nd Floor); and</td>
</tr>
<tr>
<td></td>
<td>— One (1) vending machine containing R-12 refrigerant observed adjacent to the Lunch Room in the Communications Area (2nd Floor);</td>
</tr>
<tr>
<td>Mould</td>
<td>Water-stained ceiling tiles were observed in select areas throughout the building. Additionally, water-damaged drywall was observed throughout the 1st Floor office area within 22 Division.</td>
</tr>
<tr>
<td>Radon</td>
<td>A radioactive gas naturally emitted from the earth through the breakdown of uranium in soil. It enters buildings by seeping in through cracks, pipes, windows and the foundation etc.</td>
</tr>
<tr>
<td>Aboveground Storage Tanks (ASTs)</td>
<td>Two (2) steel aboveground storage tanks (ASTs) for fuel oil were observed in the Generator Room (Room B-32) in the basement of the building. The tanks were observed in good condition at the time of the site investigation.</td>
</tr>
</tbody>
</table>

**RECOMMENDATIONS**

Removal of all asbestos-containing materials (ACMs) (non-friable) must be conducted before any work that may damage these materials. Removal must be conducted in accordance with the Occupational Health and Safety Act (OSHA) regarding worker protection, to avoid the inhalation or ingestion of asbestos fibres. Non-friable ACM identified can be removed using Type 1 removal procedures, depending on removal procedures used by the contractor as specified in Ontario Regulation 278/05. Confirmation that the asbestos removal has been conducted in accordance with the OHSA is recommended prior to any contract work in areas proposed for demolition.

All designated substances must be handled in accordance with the appropriate guidelines and regulations. Designated Substance and Hazardous Material information will require updating if corrective measures have been instituted and materials have been removed from the building.

Special precautions should be taken when disturbing any concrete or painted surfaces given the presence of silica, lead and potentially arsenic. All designated substances must be handled in accordance with the appropriate guidelines and regulations. The Ministry of Labour (MOL) has published guidelines for handling and controlling lead and silica in construction and it is recommended that these guidelines be followed when removing and cutting into the concrete. Coring, sawing or breaking up the materials containing silica, lead and potentially arsenic should be completed only with appropriate dust suppression methods, proper respiratory protection and general worker safety precautions as outlined in the MOL Guidance documents and in the Occupational Health and Safety Act.
The presence of mercury within assembled units (e.g., fluorescent light bulbs and thermostat switches) should not be considered a hazard provided that the assembled units remain sealed and intact. Avoid direct skin contact with mercury and avoid inhalation of mercury vapour. Dispose of mercury following applicable legislative requirements.

It is the intention of the federal government to phase out the use of ODSs by the year 2030 in order to protect the upper atmosphere. The MOE has issued Regulation 356 regarding the use, disposal and recycling of ODS’s. Recapturing of ODS’s during servicing must be done by licensed personnel.

Equipment containing ODSs (i.e. R-12/22) were observed in select areas throughout the building at the time of the site investigation. If other equipment is discovered and observed to contain ODSs (i.e. R-22 or R-12) the units should be recycled following Ontario Regulation 189/94, Refrigerants (O. Reg. 189/94), as amended. All equipment containing ODSs must be serviced by an individual holding a valid Ozone Depletion Prevention (ODP) Card, issued by the MOE and the refrigerant drained from the unit and collected for recycling or disposal in accordance with all applicable legislation.

If mould is discovered during demolition and/or renovation, mould contaminated materials should be removed/handled in accordance with the Canadian Construction Association document CCA 82/2004. Contractors should be warned of the potential presence of mould and every precaution should be taken to prevent airborne exposure to workers where mould is present and where workers are likely to inhale or ingest mould.

In accordance with the Canadian Nuclear Safety Commission (CNSC), if smoke alarms contains radium or if more than 10 units have to be disposed of, then the smoke detectors must be disposed of at a low-level radioactive waste management facility. Smoke detectors containing Am-241 isotope source of less than 5.0 µCi can be disposed of at a regular landfill site.

Radon is a radioactive gas naturally emitted from the earth through the breakdown of uranium in soil. It enters buildings by seeping in through cracks, pipes, windows and the foundation etc. As such, it is recommended that air sampling be conducted to determine radon levels within the building.

If during renovation or demolition, additional materials suspected of containing asbestos are encountered, they must be handled in accordance with the appropriate guidelines and regulations. It should be noted that asbestos may be present in the enclosed spaces not accessible at the time of the site visit.

Complete commentary on each of the designated substances in the project area will be discussed in the report to follow. This executive summary is not intended to substitute for the complete report, nor does it discuss certain specific issues documented within the report.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXECUTIVE SUMMARY</td>
<td>VI</td>
</tr>
<tr>
<td><strong>1</strong> INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>1.1 BACKGROUND</td>
<td>1</td>
</tr>
<tr>
<td>1.2 SURVEY OBJECTIVES</td>
<td>1</td>
</tr>
<tr>
<td>1.3 SCOPE OF WORK</td>
<td>2</td>
</tr>
<tr>
<td><strong>2</strong> METHODOLOGY</td>
<td>3</td>
</tr>
<tr>
<td>2.1 GENERAL SURVEY METHODOLOGY</td>
<td>3</td>
</tr>
<tr>
<td>2.2 ASBESTOS SURVEY METHODOLOGY</td>
<td>3</td>
</tr>
<tr>
<td>2.3 LEAD SURVEY METHODOLOGY</td>
<td>4</td>
</tr>
<tr>
<td>2.4 SILICA</td>
<td>5</td>
</tr>
<tr>
<td>2.5 MERCURY</td>
<td>5</td>
</tr>
<tr>
<td>2.6 POLYCHLORINATED BIPHENYLS (PCB)</td>
<td>5</td>
</tr>
<tr>
<td>2.7 MOULD</td>
<td>5</td>
</tr>
<tr>
<td><strong>3</strong> SITE OVERVIEW</td>
<td>5</td>
</tr>
<tr>
<td>3.1 SITE DESCRIPTION</td>
<td>5</td>
</tr>
<tr>
<td>3.2 RECORDS REVIEW</td>
<td>6</td>
</tr>
<tr>
<td>3.3 HEATING/MECHANICAL SYSTEM</td>
<td>6</td>
</tr>
<tr>
<td>3.4 SITE INSPECTION</td>
<td>6</td>
</tr>
<tr>
<td><strong>4</strong> REGULATORY CONTEXT</td>
<td>7</td>
</tr>
<tr>
<td>4.1 DESIGNATED SUBSTANCES</td>
<td>7</td>
</tr>
<tr>
<td>4.2 ADDITIONAL REGULATORY REQUIREMENTS FOR ASBESTOS</td>
<td>7</td>
</tr>
<tr>
<td>4.3 ADDITIONAL REGULATORY REQUIREMENTS FOR LEAD</td>
<td>7</td>
</tr>
<tr>
<td>4.4 ADDITIONAL REGULATORY REQUIREMENTS FOR WASTE MANAGEMENT</td>
<td>8</td>
</tr>
</tbody>
</table>
4.5 OTHER APPLICABLE REGULATIONS AND GUIDELINES .... 8

5 OBSERVATIONS AND RESULTS................................. 9

5.1 ASBESTOS ........................................................................................................... 9

5.1.1 ASBESTOS-CONTAINING MATERIALS ................................................................ 9

5.1.2 SUSPECTED ASBESTOS-CONTAINING MATERIALS ........................................... 11

5.1.3 SUMMARY OF BULK SAMPLES IDENTIFIED AS 'NON-ASBESTOS' ............... 12

5.2 LEAD ................................................................................................................. 13

5.3 OTHER DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS ............ 17

6 LIMITATIONS ........................................................................................................ 23

TABLES

TABLE 1 – DESIGNATED SUBSTANCES & HAZARDOUS MATERIALS SURVEY FINDINGS AT 7750 HURONTARIO STREET, BRAMPTON, ONTARIO ........................................................................................ VI

TABLE 2 - MINIMUM NUMBER OF BULK SAMPLES TO BE COLLECTED UNDER O. REG. 278/05 ACCORDING TO MATERIAL AREA, APPLICATION AND FRIABILITY ............................................. 4

TABLE 3 - ASBESTOS-CONTAINING MATERIALS ....................................................... 9

TABLE 4 - SUMMARY OF BULK SAMPLES IDENTIFIED AS "NON-ASBESTOS" .............................................. 12

TABLE 5 - SUMMARY OF LEAD CONCENTRATIONS IN BULK PAINT SAMPLES .............................................................................................................. 14

APPENDICES

A ANALYTICAL RESULTS – ASBESTOS & LEAD

B SITE PHOTOGRAPHS

C EVALUATION CRITERIA

D GLOSSARY OF TERMS

E DRAWINGS
DRAWINGS

DRAWING 1  BASEMENT LEVEL – SAMPLING LOCATIONS
DRAWING 2  1ST FLOOR – SAMPLING LOCATIONS
DRAWING 3  2ND FLOOR – SAMPLING LOCATIONS
DRAWING 4  3RD FLOOR – SAMPLING LOCATIONS
1 INTRODUCTION

1.1 BACKGROUND

WSP Canada Inc. (WSP) was retained by Peel Regional Police to prepare a Designated Substances & Hazardous Materials Survey (DSS) Report of the occupied law enforcement building located at 7750 Hurontario Street, Brampton, Ontario. In July 2019, WSP was requested to update the DSS report to include select areas of the exterior of the building that will be affected by planned renovations.

The subject site is a multi-storey law enforcement building located approximately seven hundred and fifty (750) metres south of the main intersection of Hurontario Street and Steeles Avenue West in Brampton, Ontario. The site has one (1) basement level that spans approximately half of the buildings footprint. The building is currently occupied by Peel Regional Police.

The purpose of this survey is to determine the presence/absence of Designated Substances within areas of the building scheduled for upcoming renovations, and to provide Designated Substances information to contractors and/or maintenance personnel to ensure complete and correct procedures are followed prior to any scheduled renovations.

1.2 SURVEY OBJECTIVES

This survey is required to satisfy a building owner’s requirements under Section 30 of the Ontario Occupational Health & Safety Act (OHSA) which requires building owners to determine if there are any Designated Substances present, prior to commencement of a project, which may involve construction, renovation or demolition related activities. This information allows workers to take appropriate steps to prevent accidental exposure to these harmful substances. This report should be provided to all maintenance workers, prospective contractors (and in turn to their sub-trades) who are likely to handle, come into contact with, or disturb building materials. Contractors who may work in close proximity to the identified materials and who may also disturb the materials should also be notified.

The primary objectives of the survey were to:

— Develop an up-to-date inventory, and gain a better understanding of the Designated Substances and/or hazardous materials that are present in the building;
— Document their locations, applications, concentrations, quantities, and conditions in the surveyed areas in order to provide workers, and prospective contractors, with adequate information to prevent accidental exposures; and
— Provide recommendations for the safe removal, handling and disposal of the identified Designated Substances and hazardous materials as necessary.

The asbestos information in this survey report complies with the requirements of the Occupational Health & Safety Act, Ontario Regulation 278/05: Designated Substance - Asbestos on Construction Projects and in Building and Repair Operations with respect to asbestos-containing materials for the structures.

Regulation 490/09 states that all necessary measures and procedures are to be taken to ensure the time-weighted average exposure of a worker to any form of airborne asbestos does not exceed 0.1 fibres per cubic centimeter of air, averaged over an 8-hour work period. In order to abide by this regulation, contractors specializing in asbestos removal are required to remove all asbestos-containing building materials from the buildings prior to any renovation or demolition that will disturb these materials.
1.3 Scope of Work

The scope of this work program was to sample and analyze materials considered to be suspect or possible designated substances or asbestos-containing materials. This Designated Substances and Hazardous Materials Survey entailed:

— A room by room visual inspection of the accessible areas of the building for Designated Substances and hazardous materials;
— Collection of bulk samples of materials suspected to contain asbestos according to the requirements stipulated in O. Reg. 278/05 (see Table 2);
— Assessment of the condition of the asbestos-containing materials;
— Collection of a representative number of bulk paint samples;
— Inventory of (visibly) evident sources of mercury (e.g. light tubes and thermostats);
— Assessment of the likelihood of exposure to designated substances with recommendations for appropriate corrective action where required;
— Visual identification of suspected and/or obvious signs of mould; and
— Visual identification of other Designated Substances and hazardous materials including equipment containing ODS, fuel, oil and/or waste oil storage, chemical storage, and/or radioactive materials. Where possible name plate/label information and quantities were recorded.

The survey did not involve destructive sampling (i.e. inspection within drywall (false) walls or ceilings, mechanical equipment such as boilers, furnaces, HVAC systems, or within electrical equipment). These areas are considered not accessible to the surveyor and as such materials suspected to contain asbestos and other Designated Substances and hazardous materials may be present within these inaccessible areas.

The survey included the identification of potential friable and non-friable asbestos-containing materials within the building. Asbestos means any of the following fibrous silicates: actinolite, amosite, anthophyllite, chrysotile, crocidolite or tremolite. According to the above-mentioned Ontario Regulation 278/05, the term ‘friable material’ is applied to a material that when dry, can be crumbled, pulverized or powdered with moderate hand pressure. Asbestos materials that are friable have a greater potential to release airborne asbestos fibres when disturbed. Common friable asbestos-containing buildings materials used in the past include sprayed fireproofing, stucco texture coat, and thermal pipe and jacket insulation.

Common non-friable asbestos containing materials include vinyl floor tiles, gasket materials, asbestos cement (Transite™) pipe, Transite™ board and asbestos textiles. If these materials do however release fine dust due to deterioration or during removal, the free dust is considered friable.
2 METHODOLOGY

2.1 GENERAL SURVEY METHODOLOGY

WSP’s survey sought to identify those substances defined as Designated Substances under the Ontario Occupational Health and Safety Act including: asbestos (friable and non-friable), lead, mercury, silica, benzene, acrylonitrile, arsenic, coke oven emissions, ethylene oxide, isocyanates, and vinyl chloride. In addition, other hazardous materials, such as PCBs, ozone-depleting substances (ODS), Radioactive Materials and other stored chemicals and wastes were included in the survey scope.

WSP’s surveyors performed a systematic survey of the building for the purposes of identifying Designated Substances and hazardous materials and documenting observations made about their locations, estimated quantities and respective conditions. These observations form the basis for developing the recommendations provided within this report.

The survey of the structure for designated substances consisted of a walk through and physical examination of suspected materials in accessible areas of the building. A physical examination was completed to assess the condition of materials and to examine for underlying layers. In situations where asbestos-containing materials or other Designated Substances extended into a non-accessible area, such as asbestos cement pipes (Transite™), it would be assumed that the asbestos-containing materials were also present in these areas and were reported as such.

2.2 ASBESTOS SURVEY METHODOLOGY

The surveyors inspected the building for the presence of friable and non-friable asbestos-containing materials (ACM). Examples of ACM commonly found in buildings may include:

- Sprayed insulation
- Acoustic/texture plaster
- Drywall joint compound
- Mechanical insulation
- Asbestos cement
- Pipe insulation
- Acoustic ceiling tiles
- Vinyl floor tiles and vinyl sheet flooring
- Plaster

Bulk samples were collected from suspect materials (i.e. materials known as having the potential to be asbestos-containing) and analyzed to identify or confirm the presence/absence of asbestos. Asbestos samples are collected by taking a small volume of material (approximately two square centimeters in size) from either intact material or preferably from a damaged section. The collected samples were placed in zipper storage plastic bags, sealed and forwarded to an analytical laboratory.

The bulk samples collected were then submitted to an accredited, independent laboratory for analysis (accompanied by a chain of custody form) of asbestos content via US EPA Method EPA/600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials in accordance with the requirements of O. Reg.
The laboratory was instructed to use “stop-positive” analysis when asbestos is identified via Polarized Light Microscopy (PLM) analysis.

The number of bulk samples required, in order to establish whether a material is asbestos-containing according to O. Reg. 278/05, is summarized in Table 2.

**Table 2 - Minimum Number of Bulk Samples to be collected under O. Reg. 278/05 According to Material Area, Application and Friability**

<table>
<thead>
<tr>
<th>TYPE OF MATERIAL</th>
<th>SIZE OF HOMOGENEOUS MATERIAL</th>
<th>MINIMUM NUMBER OF BULK SAMPLES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surfacing material, including without limitation material that is applied to surfaces by spraying, by troweling or otherwise, such as acoustical plaster on ceilings, fireproofing materials on structural members and plaster</td>
<td>Less than 90 m²</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>90 m² or more, but less than 450 m²</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>450 m² or more</td>
<td>7</td>
</tr>
<tr>
<td>Thermal insulation, except as described below</td>
<td>Any size</td>
<td>3</td>
</tr>
<tr>
<td>Thermal insulation patch</td>
<td>Less than 2m or 0.5 m²</td>
<td>1</td>
</tr>
<tr>
<td>Other material</td>
<td>Any size</td>
<td>3</td>
</tr>
</tbody>
</table>

As per the requirements set out in Table 1 of O. Reg. 278/05, a total of ninety-six (96) samples were collected and submitted for asbestos analysis as part of this survey. Fibreglass insulation was not submitted for analysis as it can be identified visually and was never manufactured with asbestos.

In accordance with the analysis techniques required by O. Reg. 278/05:

— for layered materials, subsamples are taken from each individual or discrete layer and each subsample is then treated as a discrete sample; and

— if a material is found to contain greater than 0.5% asbestos, additional bulk material samples taken from the same homogeneous material are not required to be analyzed.

As per these requirements, a total of one-hundred and one-hundred and eight (108) samples were analyzed by the laboratory for this assessment.

### 2.3 LEAD SURVEY METHODOLOGY

Bulk paint samples (paint chips) were collected from each distinct colour of paint observed within the surveyed area. Samples were collected with the aid of a thin-bladed knife, which was cleaned prior to each sampling event. WSP’s surveyor selected sample locations where it appeared that the paint application was most representative of all areas on which it was applied. Each paint chip sample was placed in a clear bag with a tight closure, uniquely labelled and then placed in a second, similar bag. A chain of custody form was completed and accompanied the bulk samples to an accredited, independent laboratory for analysis of lead.
2.4  SILICA

The surveyor inspected the building for the presence of materials known to contain silica. Silica is present in materials such as such as glass, concrete, masonry, stone and mortar which are prevalent materials in building construction. No samples were collected or analyzed.

2.5  MERCURY

The surveyor inspected the building for equipment which is likely to contain mercury. Pertinent information of the suspected equipment including: manufacturer, dates, model and serial numbers, and quantities were recorded when available. No samples were collected or analyzed.

2.6  POLYCHLORINATED BIPHENYLS (PCB)

The surveyor inspected the building for equipment which may contain PCBs. Equipment that is generally suspected of containing PCBs includes lamp ballasts, transformers, hydraulic fluid, compressors, switchgears, capacitors and other electric equipment. Pertinent information of the suspected equipment including: manufacturer, dates, model and serial numbers, and quantities were recorded when available. No samples were collected or analyzed.

2.7  MOULD

The surveyor inspected the building for the presence of mould. This included a non-intrusive visual assessment of exterior and interior building material surfaces and components for evidence of obvious visible mould, and/or areas conducive to mould growth (i.e. demonstrating significant moisture saturation and water damage). No samples were collected or analyzed.

2.8  RADON

Radon is a radioactive gas naturally emitted from the earth through the breakdown of uranium in soil. It enters buildings by seeping in through cracks, pipes, windows and the foundation etc. As such, it is recommended that air sampling be conducted to determine Radon levels within the building.

3  SITE OVERVIEW

3.1  SITE DESCRIPTION

The subject site is a multi-storey law enforcement building located approximately seven hundred and fifty (750) metres south of the main intersection of Hurontario Street and Steeles Avenue West in Brampton,
Ontario. The site has one (1) basement level that spans approximately half of the building's footprint. The building is currently occupied by Peel Regional Police.

The floors within the building generally consist of concrete finished with carpet, terrazzo, ceramic tile, rubber tile, vinyl floor tiles and vinyl sheet flooring. Walls were generally constructed of concrete block, concrete, ceramic tile, glass brick and drywall. Ceilings were either open to the steel structure or finished with drywall and suspended ceiling tiles. The exterior of the building was finished with glass brick and pre-cast concrete panels.

### 3.2 RECORDS REVIEW

No previous asbestos related or designated substance reports were provided for review during this study.

### 3.3 HEATING/MECHANICAL SYSTEM

The structure was heated via furnace units with associated ductwork. Furthermore, wall mounted floor radiators were also identified in select locations throughout the building.

Mechanical pipe straights observed during the site reconnaissance were either not insulated or insulated with non-asbestos pipe insulation.

### 3.4 SITE INSPECTION

The original survey was inspected by WSP representative Mr. Josip Bosnjak on July 31st and August 1st, 2018. The supplemental sampling was completed by WSP representative Ms. Shelby McCullough on June 25th, 2019.
4 REGULATORY CONTEXT

4.1 DESIGNATED SUBSTANCES

Section 30 of the Occupational Health and Safety Act (the Act) stipulates that prior to the commencement of a project a list shall be prepared of all Designated Substances that are present at the project site (i.e. a Designated Substances survey). In accordance with the Act, the locations of Designated Substances must be identified in writing to all prospective constructors, contractors and sub-contractors who may work, disturb or come into contact with this type of material, at the same time as, or prior to, project tendering.

The term “Designated Substance” refers to the eleven chemical or physical agents specifically identified within the Act. Each of these substances is governed by a consolidated regulation, Designated Substances - Ontario Regulation 490/09 (O. Reg. 490/09) that defines the minimum health and safety requirements for assuring safe worker-substance interaction as well as the obligations of employers and workers in workplaces containing these substances. O. Reg. 490/09 further stipulates the maximum concentrations of each of the respective substance to which a worker may be exposed, according to short-term exposure values and time-weighted average exposure values.

4.2 ADDITIONAL REGULATORY REQUIREMENTS FOR ASBESTOS

Among the Designated Substances, asbestos is unique in that it is governed by two regulations under the Act - one for the general mining and processing operations of asbestos and one for asbestos on construction projects and in buildings and repair operations.

Ontario Regulation 278/05 (O. Reg. 278/05), made under the Act, entitled “Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations” came into effect on November 1, 2005, with some sections contained therein becoming effective on November 1, 2007. This regulation revoked and replaced the previous asbestos regulation, O. Reg. 838/90.

4.3 ADDITIONAL REGULATORY REQUIREMENTS FOR LEAD

The Ontario Ministry of Labour (MOL) has not prescribed specific criteria for classification of lead-containing paints or other surface coatings and construction materials. The Surface Coating Materials Regulation (SOR/2005-109) made under the federal Hazardous Products Act (HPA) prescribes an acceptable level of 0.009% (90 ppm) lead by dry weight or less, as determined by bulk chemical analysis in accordance with good laboratory practises. Under the Surface Coating Materials Regulation (SOR/2005-109) Section 4.2, the following paints and surface coatings are excluded from the above noted acceptable lead level:

1. as an anti-corrosive or an anti-weathering coating applied on the interior or exterior surface of any building or equipment that is used for an agricultural or industrial purpose;
2. as an anti-corrosive or an anti-weathering coating applied on any structure other than a building, that is used for an agricultural, industrial or public purpose;
3. as a touch-up coating for metal surfaces;
4. on traffic signs;
5. for graphic art on billboards or similar displays;
for identification marks in industrial buildings; or
as materials for the purposes of arts, crafts or hobbies, other than material for use by children.

However, based on a recent publication (EACO Lead Guideline For Construction, Renovation, Maintenance or Repair dated October 2014) from the Environmental Abatement Council of Ontario (EACO), an industry group representing consultants and contractors in the Ontario abatement industry, various occupational and workplace safety authorities and agencies consider that any detectable amount of lead in paint and similar materials has the potential to produce an airborne hazard to workers and building occupants when these materials are disturbed.

As such, for the purpose of this survey, WSP has classified any material containing detectable/measurable amounts of lead as “lead-containing” materials and recommends that all disturbances to these materials be conducted in accordance with the EACO or MOL document Guidelines, Lead on Construction Projects.

### 4.4 ADDITIONAL REGULATORY REQUIREMENTS FOR WASTE MANAGEMENT

The disposal of Designated Substances is regulated under the Ontario Environmental Protection Act, specifically R.R.O. 1990, Regulation 347, General – Waste Management (most recently amended by O. Reg. 334/13). The regulation details the minimum requirements for the appropriate transport and disposal of wastes.

### 4.5 OTHER APPLICABLE REGULATIONS AND GUIDELINES

The following regulations and guidance documents may also apply to this survey:

- Guideline for Lead on Construction Projects (MOL, September 2004, as amended)
- Guideline for Silica on Construction Projects (MOL, September 2004, as amended)
- The United States Department of Housing and Urban Development (HUD) Guidelines for the Evaluation and Control of Lead-Based Paint in Housing
- Canadian PCB Regulations (SOR/2008-273)
- O. Reg. 362 Waste Management – PCBs
- Mercury-Containing Products Pollution Prevention Fact Sheet #21 (Ministry of Environment (MOE), September 2001, as amended)
- O. Reg. 347/90 General Waste Management
- Canadian Construction Association document CCA 82/2004
- Canadian Chlorofluorocarbon Regulations (SOR/90-127), Ozone-depleting, Substances Regulation (SOR/94-408) and Ozone Depleting Substances Products Regulations (SOR/90-584)
- O. Reg. 463/10 ODS and Other Halocarbons
- Lead Guideline For Construction, Renovation, Maintenance or Repair (Environmental Abatement Council of Ontario – October 2014)
- EACO Lead Guideline for Construction, Renovation, Maintenance and Repair, October 2014.
- EACO Mould Abatement Guidelines, 2010
5 OBSERVATIONS AND RESULTS

Information in this section of the report should be provided to all prospective contractors, tenants, and/or workers who are likely to handle, come into contact with, or disturb asbestos or other designated substances. Detailed specifications that outline specific abatement procedures are recommended when tendering any potential renovation/demolition work.

This information may require updating upon the removal of Designated Substances upon completion of the renovations or demolition. A close out report stating that the materials are no longer present is also required once the materials are removed. If ACM is to remain in place, O. Reg. 278/05 requires the preparation and establishment of an Asbestos Management Plan for the building.

Contractors and maintenance personnel should be warned of the possibility of undisclosed materials when breaking into enclosed areas. Friable and Non-Friable building materials discovered in enclosed areas should be treated as asbestos until proven otherwise and other substances, self-evident as designated substances, should be handled in a likewise fashion.

5.1 ASBESTOS

5.1.1 ASBESTOS-CONTAINING MATERIALS

In accordance with the requirements of O. Reg. 278/05, homogenous materials (i.e. materials uniform in color and texture) must be considered to be asbestos-containing, if any sample which is collected from that homogeneous material, is identified to have an asbestos concentration of 0.5% or greater.

A total of one-hundred and eight (108) building material samples were collected from thirty-one (31) homogeneous building materials and submitted for laboratory analysis of asbestos content. The table below summarizes only those materials which were identified or presumed to be asbestos-containing materials and are presented along with recommended remedial actions for each respective material.

Recommended actions for management, repair or removal of these materials, are based on the requirements and procedures specified by O. Reg. 278/05 and have been suggested based on the type of disturbance which is anticipated or likely. Alternate handling, repair and removal procedures must comply with the requirements of O. Reg. 278/05 (as amended). Refer to Appendix C for condition, accessibility and action definitions.

Table 3 - Asbestos-Containing Materials

<table>
<thead>
<tr>
<th>MATERIAL DESCRIPTION &amp; LOCATION</th>
<th>ASSESSMENT</th>
<th>ACTION</th>
<th>PHOTO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vinyl floor tiles (12” x 12” Navy Blue with White Streaks) observed in select areas within the basement of the building.</td>
<td>Sample ID: AS1&lt;br&gt;Concentration: 4.1% Chrysotile&lt;br&gt;Material: Non-Friable&lt;br&gt;Accessibility: A (Areas of the building within reach of all users).&lt;br&gt;Condition: Good</td>
<td>Prior to renovation/demolition activities which may disturb this material, remove the material following Type 1 asbestos abatement procedures, if non-powered hand-held tools are utilized.</td>
<td>2 &amp; 3</td>
</tr>
<tr>
<td>MATERIAL DESCRIPTION &amp; LOCATION</td>
<td>ASSESSMENT</td>
<td>ACTION</td>
<td>PHOTO</td>
</tr>
<tr>
<td>--------------------------------</td>
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<td>-------</td>
</tr>
</tbody>
</table>
| Vinyl floor tiles (12” x 12” Red with White Lines) observed in the IT Storage Room in the basement. | Sample ID: AS4  
Concentration: 4.1% Chrysotile  
Material: Non-Friable  
Accessibility: A (Areas of the building within reach of all users).  
Condition: Good | Prior to renovation/demolition activities which may disturb this material, remove the material following Type 1 asbestos abatement procedures, if non-powered hand-held tools are utilized. | 4 |
| Firestop caulking material (White) observed in the southeast stairwell in the basement. | Sample ID: AS11  
Concentration: 1.4% Chrysotile  
Material: Non-Friable  
Accessibility: A (Areas of the building within reach of all users).  
Condition: Good | Prior to renovation/demolition activities which may disturb this material, remove the material following Type 1 asbestos abatement procedures, if non-powered hand-held tools are utilized. | 5 |
| HVAC duct mastic (Brown) observed on ventilation ducts in select areas of the building. | Sample ID: AS13  
Concentration: 4.5% Chrysotile  
Material: Non-Friable  
Accessibility: C (Area of the building above 8 feet where use of a ladder is required to reach the material).  
Condition: Good | Prior to renovation/demolition activities which may disturb this material, remove the material following Type 1 asbestos abatement procedures, if non-powered hand-held tools are utilized. | 6 |
| Vinyl floor tiles (12” x 12 Beige with Brown & White Lines) and tile mastic (Black) observed in Room 4023 (File Room) in the basement of the building. | Sample ID: AS14  
Concentration: 3.4% Chrysotile  
Material: Non-Friable  
Accessibility: A (Areas of the building within reach of all users).  
Condition: Good | Prior to renovation/demolition activities which may disturb this material, remove the material following Type 1 asbestos abatement procedures, if non-powered hand-held tools are utilized. | 7 |
| Transite cement (Transite™) pipe observed in select locations throughout the building. | Sample ID: N/A  
Concentration: Known to contain Asbestos  
Material: Non-Friable  
Accessibility: A – C (Areas of the building within reach of all users and areas of the building above 8 feet where use of a ladder is required to reach the material).  
Condition: Good | Prior to renovation/demolition activities which may disturb this material, remove the material following Type 1 asbestos abatement procedures, if non-powered hand-held tools are utilized. | 8-11 |
| Roofing material observed on the roof of the building. | Sample ID: N/A  
Concentration: Presumed to be ACM  
Material: Friable/Non-Friable | This material requires additional testing. If this material is identified as asbestos-containing then it must be removed following Type 1/2 asbestos abatement procedures. | N/A |
5.1.2 SUSPECTED ASBESTOS-CONTAINING MATERIALS

Certain building materials which have historically contained asbestos were not included in the survey since they were inaccessible, are used in a random fashion, or have a low risk of asbestos fibre release.

These materials include:

- Buried services such as underground piping; these pipes were commonly manufactured from a non-friable form of asbestos cement but are inaccessible for sampling without excavation work. Site drawings should be consulted and reviewed to ascertain the presence or absence of such structures.
- Floor levelling compounds; these materials were used in a random fashion, may or may not contain asbestos, and require demolition of floor finishes to access for sample collection. Floor levelling compounds were not observed but may be present.
- Fire rated doors with asbestos-containing insulation within may be present but are inaccessible without damaging the integrity of the door. The interior of these door should be inspected prior to disposal and/or significant disturbance (i.e. cutting or breaking).
- Vermiculite insulation within wall cavities may be present but inaccessible without demolition.
- Packing materials in valves, fittings, etc., may be present but are inaccessible without demolition activities (e.g. within concealed areas behind bulkheads).

In addition, inspection of mechanical equipment such as furnaces, HVAC systems, chimneys or within electrical equipment was not conducted due to safety limitations. These areas are considered not accessible to the surveyor and as such materials suspected to contain asbestos may be present within these inaccessible areas, including:

- electrical wiring insulation,
- electrical conductors,
— high temperature gaskets,
— incandescent light fixture backing,
— ductwork connections,
— thermal insulator around electrical elements around baseboard heaters,
— interior of chimneys,
— interior of boilers.

Once services are decommissioned, these areas should be inspected and/or sampled for presence or absence of asbestos.

If renovation or demolition activities are likely to disturb the materials, it is required that all identified asbestos-containing materials be removed in accordance with O. Reg. 278/05. If any potential asbestos-containing materials are encountered unexpectedly, WSP should be contacted to sample, monitor and/or document the removal of asbestos-containing materials, and to ensure that appropriate procedures are being followed.

5.1.3 SUMMARY OF BULK SAMPLES IDENTIFIED AS “NON-ASBESTOS”

The table below summarizes the results of bulk material samples collected from suspect materials during the original survey and the supplementary survey, which had either no detectable concentrations of asbestos, or had asbestos concentrations less than the regulated threshold limit of 0.5% (by weight), and therefore can be considered as “non-asbestos” in accordance with O. Reg. 278/05.

**Table 4 - Summary of Bulk Samples Identified as "Non-Asbestos"**

<table>
<thead>
<tr>
<th>MATERIAL DESCRIPTION / LOCATION</th>
<th>SAMPLE ID1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vinyl floor tiles (12” x 12” Light Blue with Blue &amp; White Flakes) observed in the R.I.M.S. office area in the basement of the building.</td>
<td>AS 2-1 to AS 2-3</td>
</tr>
<tr>
<td>Vinyl floor tiles (12” x 12” Charcoal with Grey Flakes) and associated mastic (Black) observed in the R.I.M.S. file room in the basement of the building.</td>
<td>AS 3-1 to AS 3-3</td>
</tr>
<tr>
<td>HVAC duct mastic (Green) observed in select areas of the building.</td>
<td>AS 5-1 to AS 5-3</td>
</tr>
<tr>
<td>Drywall joint compound observed throughout the building.</td>
<td>AS 6-1 to AS 6-7</td>
</tr>
<tr>
<td>Wall caulking (Brown) observed in the north stairwell on the basement level.</td>
<td>AS 7-1 to AS 7-3</td>
</tr>
<tr>
<td>HVAC duct mastic (Grey) observed in select areas of the building.</td>
<td>AS 8-1 to AS 8-3</td>
</tr>
<tr>
<td>Vinyl floor tiles (12” x 12” Brown with Beige Flakes) and associated mastic (Clear) observed in the Communications kitchenette in the basement of the building.</td>
<td>AS 9-1 to AS 9-3</td>
</tr>
<tr>
<td>Vinyl floor tiles (12” x 12” White) and associated mastic (Yellow) observed in Room 4022 (Telecom Room) in the basement of the building.</td>
<td>AS 10-1 to AS 10-3</td>
</tr>
<tr>
<td>Wall caulking (Light beige) observed in Room 4023 (File Room) in the basement of the building.</td>
<td>AS 12-1 to AS 12-3</td>
</tr>
<tr>
<td>Firestop caulking material (Red) observed in Room 4023 (File Room) in the basement of the building.</td>
<td>AS 15-1 to AS 15-3</td>
</tr>
<tr>
<td>Spray fireproofing material (Dry-Applied) observed on steel structural components throughout the building.</td>
<td>AS 16-1 to AS 16-7</td>
</tr>
</tbody>
</table>
### MATERIAL DESCRIPTION / LOCATION

<table>
<thead>
<tr>
<th>MATERIAL DESCRIPTION / LOCATION</th>
<th>SAMPLE ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vinyl sheeting flooring (Grey with Flecks) and the associated mastic (Yellow) observed in select areas throughout the building.</td>
<td>AS 17-1 to AS 17-3</td>
</tr>
<tr>
<td>Vinyl sheeving flooring (White with Flecks) and the associated mastic (Yellow) observed in select areas throughout the building.</td>
<td>AS 18-1 to AS 18-3</td>
</tr>
<tr>
<td>Vinyl sheeting flooring (Charcoal with Flecks) and the associated mastic (Yellow) observed in select areas throughout the building.</td>
<td>AS 19-1 to AS 19-3</td>
</tr>
<tr>
<td>Vinyl floor tiles (12” x 12” Light Beige with Beige Flakes) observed in Room 1039 (IT/Server Room) in the basement of the building.</td>
<td>AS 20-1 AS 20-3</td>
</tr>
<tr>
<td>Vinyl floor tiles (2’ x 2’ Black) and associated mastic (Beige) observed in Room 1038 (Configuration Lab) on the 1st floor of the building.</td>
<td>AS 21-1 AS 21-3</td>
</tr>
<tr>
<td>Vinyl floor tiles (2’ x 2’ Grey) observed in the corridor adjacent to the Tactical Training Warehouse. Drywall joint compound observed throughout the building.</td>
<td>AS 22-1 AS 22-3</td>
</tr>
<tr>
<td>Spray fireproofing material (Cementitious) observed on steel structural components throughout the building.</td>
<td>AS 23-1 to AS 23-7</td>
</tr>
<tr>
<td>Vinyl floor tiles (12” x 12” White with Blue Flecks) and associated mastic (Black) observed in the VCOM Project Office Area on the 1st floor of the building.</td>
<td>AS 24-1 to AS 24-5</td>
</tr>
<tr>
<td>Vinyl floor tiles (12” x 12” Charcoal with Black/White Flecks) observed in the F.I.S. Lunch Room on the 1st floor of the building. Concrete block mortar observed throughout the building.</td>
<td>AS 25-1 to AS 25-3</td>
</tr>
<tr>
<td>Vinyl floor tiles (12” x 12” Light Beige with Beige Flakes) observed in Room 1039 (IT/Server Room) in the basement of the building.</td>
<td>AS 26-1 to AS 26-3</td>
</tr>
<tr>
<td>Caulking (grey) observed around select door frames throughout the exterior of the building.</td>
<td>AS 27-1 to AS 27-3</td>
</tr>
</tbody>
</table>

### Additional Samples Collected on June 25th, 2019

<table>
<thead>
<tr>
<th>MATERIAL DESCRIPTION / LOCATION</th>
<th>SAMPLE ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caulking (grey) observed at the base of the exterior wall throughout the exterior of the building.</td>
<td>AS 28-1 to AS 28-3</td>
</tr>
<tr>
<td>Caulking (grey) observed at the base of the exterior wall throughout the exterior of the building.</td>
<td>AS 29-1 to AS 29-3</td>
</tr>
<tr>
<td>Vinyl sheet flooring (Marble Pattern) observed throughout the Communications Area.</td>
<td>AS 30-1 to AS 30-3</td>
</tr>
<tr>
<td>Drywall joint compound observed in the Garage Area adjacent to the Tactical Training Warehouse.</td>
<td>AS 31-1 to AS 31-3</td>
</tr>
</tbody>
</table>

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1 – Laboratory confirmation of non-asbestos-containing material is provided in the laboratory results found within Laboratory Certificates of Analysis.

2 – For sample locations refer to Appendix E: Drawings.

### 5.2 LEAD

A total of seventeen (17) paint samples were collected and analyzed at the time of the investigations. The table below summarizes the results of laboratory analyses for the bulk paint and surface coating samples collected during the survey.
Table 5 - Summary of Lead Concentrations in Bulk Paint Samples

<table>
<thead>
<tr>
<th>MATERIAL DESCRIPTION</th>
<th>ASSESSMENT</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grey paint observed on the floor within the southwest Maintenance Room adjacent to the R.I.M.S. office area.</td>
<td>Sample ID: Pb-01&lt;br&gt;Concentration: &lt;0.020%&lt;br&gt;Condition: Good to Fair</td>
<td>In general, the following procedures are recommended if/when removing lead-containing materials, coatings and paint applications:&lt;br&gt;— Follow Type 1 – if the coating is to be removed with a chemical gel or paste;&lt;br&gt;— Follow Type 2a – if the coating is to be removed by scraping or sanding using non-powered hand tools, or manual demolition of lead-painted building components by striking with sledgehammer or similar tool;&lt;br&gt;— Follow Type 3a – if the coating is to be removed using power tools; or,&lt;br&gt;— Follow Type 3b – if the coating is to be removed by abrasive blasting.&lt;br&gt;If lead-containing paint applications and surface coatings are not removed prior to demolition, ensure that demolition waste complies with the requirements of General – Waste Management Regulation, R.R.O. 1990, Regulation 347.</td>
</tr>
<tr>
<td>Off-white paint observed on walls throughout the Weight Room in the basement of the building.</td>
<td>Sample ID: Pb-02&lt;br&gt;Concentration: &lt;0.0081%&lt;br&gt;Condition: Good to Fair</td>
<td>This material does not contain detectable concentrations of lead. Therefore, no further action is required.</td>
</tr>
<tr>
<td>Orange paint observed on walls throughout the north stairwell in the basement of the building.</td>
<td>Sample ID: Pb-03&lt;br&gt;Concentration: &lt;0.0081&lt;br&gt;Condition: Good</td>
<td>This material does not contain detectable concentrations of lead. Therefore, no further action is required.</td>
</tr>
<tr>
<td>White paint observed on pipes throughout Room 4022 (Telecom Room) in the basement of the building.</td>
<td>Sample ID: Pb-04&lt;br&gt;Concentration: &lt;0.0083%&lt;br&gt;Condition: Good</td>
<td>This material does not contain detectable concentrations of lead. Therefore, no further action is required.</td>
</tr>
<tr>
<td>Brown paint observed on walls throughout Room 3014 (Office) on the 3rd floor of the building.</td>
<td>Sample ID: Pb-05&lt;br&gt;Concentration: &lt;0.0083%&lt;br&gt;Condition: Good</td>
<td>This material does not contain detectable concentrations of lead. Therefore, no further action is required.</td>
</tr>
<tr>
<td>Grey paint observed on the ground throughout the Shared Garage/Sallyport in the basement of the building.</td>
<td>Sample ID: Pb-06&lt;br&gt;Concentration: 0.0092%&lt;br&gt;Condition: Good</td>
<td>In general, the following procedures are recommended if/when removing lead-containing materials, coatings and paint applications:</td>
</tr>
<tr>
<td>MATERIAL DESCRIPTION</td>
<td>ASSESSMENT</td>
<td>ACTION</td>
</tr>
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<td>----------------------</td>
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</tr>
<tr>
<td>Condition: Good to Poor</td>
<td>— Follow Type 1 – if the coating is to be removed with a chemical gel or paste; — Follow Type 2a – if the coating is to be removed by scraping or sanding using non-powered hand tools, or manual demolition of lead-painted building components by striking with sledgehammer or similar tool; — Follow Type 3a – if the coating is to be removed using power tools; or, — Follow Type 3b – if the coating is to be removed by abrasive blasting. If lead-containing paint applications and surface coatings are not removed prior to demolition, ensure that demolition waste complies with the requirements of General – Waste Management Regulation, R.R.O. 1990, Regulation 347.</td>
<td></td>
</tr>
<tr>
<td>White paint observed on walls throughout the 22 Division northeast open office area on the 1st floor of the building.</td>
<td>Sample ID: Pb-07 Concentration: &lt;0.0081% Condition: Good to Poor</td>
<td>This material does not contain detectable concentrations of lead. Therefore, no further action is required.</td>
</tr>
<tr>
<td>White paint observed on walls throughout the main public lobby.</td>
<td>Sample ID: Pb-08 Concentration: &lt;0.0082% Condition: Good</td>
<td>This material does not contain detectable concentrations of lead. Therefore, no further action is required.</td>
</tr>
<tr>
<td>Beige paint observed on walls throughout Room R-1-130 (Storage Room) on the 1st floor of the building.</td>
<td>Sample ID: Pb-09 Concentration: &lt;0.0081% Condition: Good</td>
<td>This material does not contain detectable concentrations of lead. Therefore, no further action is required.</td>
</tr>
<tr>
<td>Off-white paint observed on walls throughout the Corporate Communications open office area on the 1st floor of the building.</td>
<td>Sample ID: Pb-10 Concentration: &lt;0.0080% Condition: Good</td>
<td>This material does not contain detectable concentrations of lead. Therefore, no further action is required.</td>
</tr>
<tr>
<td>Beige paint observed on walls throughout the VCOM Bay Area on the 1st floor of the building.</td>
<td>Sample ID: Pb-11 Concentration: &lt;0.0083% Condition: Good</td>
<td>This material does not contain detectable concentrations of lead. Therefore, no further action is required.</td>
</tr>
<tr>
<td>Light beige paint observed on walls throughout Room 226 in</td>
<td>Sample ID: Pb-12 Concentration: &lt;0.0081%</td>
<td>This material does not contain detectable concentrations of lead. Therefore, no further action is required.</td>
</tr>
</tbody>
</table>
### MATERIAL DESCRIPTION

<table>
<thead>
<tr>
<th>Material Description</th>
<th>Assessment</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>the Fire Department area on the 2nd Floor of the building.</td>
<td>Condition: Good</td>
<td></td>
</tr>
</tbody>
</table>
| White paint observed on walls throughout Room 2043 (IT Services Meeting Room) on the 2nd Floor of the building. | Sample ID: Pb-13  
Concentration: <0.0080%  
Condition: Good to Poor | This material does not contain detectable concentrations of lead. Therefore, no further action is required. |
| Blue paint observed on walls throughout the 3rd floor corridor of the building. | Sample ID: Pb-14  
Concentration: <0.0082%  
Condition: Good | This material does not contain detectable concentrations of lead. Therefore, no further action is required. |
| White paint observed on the exterior façade of the building. | Sample ID: Pb-15  
Concentration: <0.0083%  
Condition: Good | This material does not contain detectable concentrations of lead. Therefore, no further action is required. |
| Sky blue paint observed on the door frames throughout the exterior of the building. | Sample ID: Pb-16  
Concentration: 0.44%  
Condition: Good | In general, the following procedures are recommended if/when removing lead-containing materials, coatings and paint applications:  
— Follow Type 1 – if the coating is to be removed with a chemical gel or paste;  
— Follow Type 2a – if the coating is to be removed by scraping or sanding using non-powered hand tools, or manual demolition of lead-painted building components by striking with sledgehammer or similar tool;  
— Follow Type 3a – if the coating is to be removed using power tools; or,  
— Follow Type 3b – if the coating is to be removed by abrasive blasting.  
If lead-containing paint applications and surface coatings are not removed prior to demolition, ensure that demolition waste complies with the requirements of General – Waste Management Regulation, R.R.O. 1990, Regulation 347. |
| Grey paint observed on the doors throughout the exterior of the building. | Sample ID: Pb-17  
Concentration: 0.039%  
Condition: Good | |

1 For sample ID and concentration levels refer to Appendix A: Analytical Results – Asbestos & Lead.

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Lead is also expected to be present in the following building components:

— painted surfaces visually similar to the above noted lead-containing paints;
— in lead acid batteries in emergency lighting throughout the building;
— as a component in ceramic building products such as tiles and bricks;
— as a component of the solder on sweated joints between copper pipe and fittings;
— as a component of the solder on wire connections of electric components;
— as a component of solder used to seal the bell fitting of cast iron rain water leader pipes; and
— as a malleable metal sheeting/flashing around roof edges, vent stacks, HVAC fixtures, etc.

Work that will disrupt and/or pulverize (including drilling, cutting, grinding or abrading) confirmed or suspected lead-containing materials must follow the recommendations provided in the EACO Lead Abatement Guidelines (dated 2014) or Ministry of Labour Guideline for Lead on Construction Projects, dated September 2004 (Revised April 2011). In addition, the aforementioned painted surfaces (containing lead) should be handled with appropriate health and safety precautions so as to comply with requirements of the Designated Substances regulation, O. Reg. 490/09, and disposal of these materials must also comply with the requirements of O. Reg. 347 – General – Waste Management.

### 5.3 OTHER DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS

The following table summarizes other Designated Substances and hazardous materials which were also included in the survey. Identification of these materials and substances were based on visual observations only, and where appropriate, recommendations and necessary actions have been provided.

All designated substances must be handled in accordance with the appropriate guidelines and regulations. Designated Substance and Hazardous Material information will require updating as corrective measures are instituted and materials have been removed from various sections of the building.

<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>DESCRIPTION</th>
<th>FINDINGS</th>
<th>ACTION</th>
</tr>
</thead>
</table>
| Mercury  | Mercury is used in thermometers, batteries and some electrical switches. It is also used in dental fillings and in latex paint to protect against fungal attack and mildew. Mercury vapour is also present as a vapour in fluorescent lights, metal halide lights and mercury vapour lights. | Although no samples were analyzed for mercury, it is presumed to be present in the following building components:  
— in liquid filled reservoirs in thermostats and sump pump level switches;  
— as a gas in fluorescent light tubes; and  
— as a bactericide or stabilizer in paints. | The presence of mercury within assembled units (e.g. fluorescent light bulbs, piping thermometers, and thermostat bulbs) should not be considered a hazard provided that the assembled units remain sealed and intact. Avoid direct skin contact with mercury and avoid inhalation of mercury vapour. Dispose of mercury following applicable legislative requirements. |
<table>
<thead>
<tr>
<th>MATERIAL</th>
<th>DESCRIPTION</th>
<th>FINDINGS</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polychlorinated Biphenyls (PCBs)</td>
<td>The federal Regulation SOR/2008-273 (September 5, 2008) states that any solid material containing 50 parts per million (ppm) or more of PCBs must be handled as a PCB-containing material in accordance with all applicable regulations.</td>
<td>Fluorescent light ballasts were observed within select surveyed areas. The light ballasts throughout the surveyed areas were energized at the time of the survey and therefore could not be safely examined to determine the presence/absence of PCBs. Ballasts should be investigated prior to disposal.</td>
<td>When decommissioned, ballasts which do not have a “No PCBs” indicator on the label, manufacturer’s codes should be compared with Environment Canada’s Identification of Lamp Ballasts Containing PCBs EPS 2/CC/2 (revised). Handle, store and dispose of PCB-containing materials in accordance with Federal PCB Regulation SOR/92-507 and R.R.O. 1990 – Reg. 347 – General – Waste Management regulations.</td>
</tr>
<tr>
<td>Ozone Depleting Substances (ODSs)</td>
<td>It is the intention of the federal government to phase out the use of ODSs by the year 2030 in order to protect the upper atmosphere. The MOE has issued Regulation 356 regarding the use, disposal and recycling of ODSs. Recapturing of ODSs during servicing must be done by licensed personnel.</td>
<td>Equipment such as HVAC units, refrigerators and vending machines containing ozone depleting substances (R-12/22) were observed in select areas throughout the building.</td>
<td>In the event of removal, the units should be recycled following Ontario Regulation 189/94, Refrigerants (O. Reg. 189/94), as amended. All equipment containing ODSs must be serviced by an individual holding a valid Ozone Depletion Prevention (ODP) Card, issued by the MOE and the refrigerant drained from the unit and collected for recycling or disposal in accordance with all applicable legislation. It is understood the current property owner, First Capital, will removed and dispose of any refrigerant onsite. However, confirmation should be provided and reviewed upon completion of this removal.</td>
</tr>
<tr>
<td>MATERIAL</td>
<td>DESCRIPTION</td>
<td>FINDINGS</td>
<td>ACTION</td>
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<td>-----------------------------------------------------------------------------</td>
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<td>----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Silica</td>
<td>Silica, or silicon dioxide (SiO₂), is the basic component of sand, quartz and granite rock. Crystalline Silica (the designated substance) is encountered in industry in three forms: quartz, tridymite, and cristobalite.</td>
<td>Crystalline Silica should be assumed to be present in brick, concrete, asphalt, cement and mortar.</td>
<td>0. Reg. 490/09 regarding silica as a designated substance applies to areas where airborne silica is present and where workers are likely to inhale, ingest or absorb silica. Every precaution and procedure should be taken during demolition or renovation activities to control the time-weighted exposure of a worker to airborne silica and exposure should not exceed 0.05 milligrams Cristobalite per cubic meters of air, or 0.1 milligrams Quartz or Tripoli per cubic meters of air. Coring, sawing, or breaking up the materials containing silica should be completed only with appropriate dust suppression methods, proper respiratory protection and general worker safety precautions as outlined in the MOL Guidance document and in the Occupational Health and Safety Act.</td>
</tr>
<tr>
<td>Radioactive Materials</td>
<td>Smoke/heat detectors may contain a radioactive power source.</td>
<td>Smoke/heat detectors were observed throughout the surveyed building.</td>
<td>In accordance with the Canadian Nuclear Safety Commission (CNSC), if smoke alarms contain radium or if more than 10 units have to be disposed of, then the smoke detectors must be disposed of at a low-level radioactive waste management facility. Smoke detectors containing Am-241 isotope source of less than 5.0 µCi can be disposed of at a regular landfill site.</td>
</tr>
<tr>
<td>MATERIAL</td>
<td>DESCRIPTION</td>
<td>FINDINGS</td>
<td>ACTION</td>
</tr>
<tr>
<td>---------------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Mould</td>
<td>Mould is a group of various species of simple, microscopic organisms found in every ecological niche, indoors and outdoors. Moulds are necessary for recycling of organic materials in nature. To grow, mould needs: — A mould spore — An organic food source (i.e. paper, drywall, wood, dirt, paint, etc.) — Moisture — Time (this will vary depending on the site-specific conditions, including the cleanliness of the water source)</td>
<td>Water-stained ceiling tiles were observed in select areas throughout the building. Additionally, water-damaged drywall was observed throughout the 1st Floor office area within 22 Division.</td>
<td>Mould contaminated materials should be removed/handled in accordance with the Canadian Construction Association document CCA 82/2004. Contractors should be warned of the presence of mould and every precaution should be taken to prevent airborne exposure to workers where mould is present and where workers are likely to inhale or ingest mould.</td>
</tr>
<tr>
<td>Arsenic</td>
<td>Arsenic is used with other metals (chiefly copper, lead and zinc) to make alloys. Arsenic compounds are also used in pigments, animal poisons, insecticides, paints, wallpaper, ceramics, and poison gases for chemical warfare, glass making, in calico and indigo printing, pyrotechnics, integrated circuits and transistors. Arsenic is also a major waste material from the gold mining industry.</td>
<td>Arsenic may be present as an additive in lead-containing paints.</td>
<td>N/A</td>
</tr>
<tr>
<td>Vinyl Chloride</td>
<td>Vinyl chloride is the parent compound of polyvinyl chloride (PVC) which is a widely used plastic. Vinyl chloride is also used in various resins (e.g. plastic food wrap), and in the glass, rubber, and paper industries. Vinyl chloride is also formed by the degradation of the chlorinated solvents trichloroethylene (TCE), 1,1,1-trichloroethane (111TCA) and tetrachloroethylene (also known as perchloroethylene or dry-cleaning solvent), especially in soil or groundwater that has been contaminated with these solvents.</td>
<td>No solvents, tanks or process operations that use vinyl chloride were observed or appear to have been present in the building. Vinyl chloride could be present within plastic components of the plumbing system, vinyl flooring and countertops, etc.</td>
<td>N/A</td>
</tr>
<tr>
<td>MATERIAL</td>
<td>DESCRIPTION</td>
<td>FINDINGS</td>
<td>ACTION</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Acrylonitrile</td>
<td>Acrylonitrile is mostly used as a feedstock or chemical aid in the production of nitrile-butadiene rubber and in acrylonitrile-butadiene-styrene and styrene-acrylonitrile polymers. Acrylonitrile is also used to make other chemicals such as plastics, synthetic rubber, and acrylic fibre (e.g. clothing, blankets, carpeting) and nitrile rubber for oil-resistant hoses.</td>
<td>Acrylonitrile is not expected to be present in the surveyed areas.</td>
<td>N/A</td>
</tr>
<tr>
<td>Benzene</td>
<td>Benzene is widely used in the chemical industry as a starting material and solvent. Benzene occurs naturally in crude oil and is present in all gasoline products, automobile emissions and cigarette smoke. Benzene is highly volatile, and will release into the atmosphere over a short time.</td>
<td>Since the building stores automobiles belonging to Peel Regional Police, benzene may be present in oil traps within the Garage Areas.</td>
<td>It is recommended that a soil and groundwater investigation be completed to evaluate subsurface environmental conditions.</td>
</tr>
<tr>
<td>Coke Oven Emissions</td>
<td>Coke oven emissions are complex mixtures of coal and coke particles, various vapors, gases and tars emitted during carbonization of coal to produce coke. The primary use of coke (pure carbon) is in the manufacture of iron and steel. Coke is also used to synthesize calcium carbide and to manufacture graphite and electrodes.</td>
<td>Coke oven emissions are not expected to be present in the surveyed areas.</td>
<td>N/A</td>
</tr>
<tr>
<td>Ethylene Oxide</td>
<td>Ethylene Oxide is an extremely flammable gas used in the manufacture of several industrial chemicals including textiles, detergents, polyurethane foam, antifreeze (especially ethylene glycol), solvents, medicinal products, adhesives, and other related products. It is also used as a fumigant and as a sterilizing agent for food (spices), cosmetics, and surgical tool and plastic devices in hospitals as an alternative to steam.</td>
<td>Ethylene Oxide is not expected to be present in the surveyed areas.</td>
<td>N/A</td>
</tr>
<tr>
<td>MATERIAL</td>
<td>DESCRIPTION</td>
<td>FINDINGS</td>
<td>ACTION</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Isocyanates</td>
<td>Isocyanates are the raw materials from which all polyurethane products are made. Isocyanates are widely used in the manufacture of flexible and rigid foams, fibres, coatings such as paints and varnishes, elastomers, and also in materials used in auto body repair and building insulation.</td>
<td>Isocyanates are not expected to be present in the surveyed areas.</td>
<td>N/A</td>
</tr>
<tr>
<td>Radon</td>
<td>Radon is a radioactive gas naturally emitted from the earth through the breakdown of uranium in soil. It enters buildings by seeping in through cracks, pipes, windows and the foundation etc.</td>
<td>No testing for radon was conducted as part of this assessment.</td>
<td>Air testing is the only method to determine if Radon is present within the building. It is recommended that the building be tested for Radon.</td>
</tr>
<tr>
<td>Aboveground Storage Tanks (ASTs)</td>
<td>Storage tanks used to store fuel for older heating systems may be found above grade, or may be underground.</td>
<td>Two (2) steel aboveground storage tanks (ASTs) for fuel oil were observed in the Generator Room in the basement of the building. The tanks were observed in good condition at the time of the site investigation.</td>
<td>These tanks must be removed and disposed of by an authorized TSSA-certified contractor prior to any renovation or demolition activities that may disturb the tanks.</td>
</tr>
</tbody>
</table>
6 LIMITATIONS

As this survey was generally non-destructive in nature, asbestos could be present in areas not accessible to the surveyors for identification. Contractors and maintenance personnel should be warned of the possibility of unidentified materials when breaking into enclosed areas. Suspect friable and non-friable building materials discovered in these areas should be treated as asbestos until proven otherwise. Materials equivalent or identical in description to those listed in Table 3, should be considered to be ACM and handled appropriately.

This report is prepared for the sole use of Peel Regional Police, who are responsible for its distribution to any third parties. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of the third party. The conclusions and recommendations contained in this assessment report are based upon professional opinions with regard to the subject matter. These opinions are in accordance with currently accepted industry practices for asbestos surveys and regulatory requirements for sampling and identifying asbestos and are subject to the following inherent limitations:

1. The data and findings presented in this report are valid as of the date(s) of the investigation only. The passage of time, manifestation of latent conditions or occurrence of future events may warrant further exploration of the Site, analysis of the data, and re-evaluation of the findings, observations, and conclusions expressed in this report.

2. The findings, observations, conclusions, and recommendations expressed by WSP Canada Inc. in this report do not represent an opinion concerning compliance of any past or present owner or operator of the Site with any federal, provincial or local laws or regulations.

3. WSP Canada Inc.’s assessment presents professional opinions and findings of a scientific and technical nature. While attempts were made to relate the data and findings to applicable environmental and occupational health & safety laws and regulations, the report shall not be construed to offer legal opinion or representations as to the requirements of, nor compliance with, environmental and occupational health and safety laws, rules, regulations or policies of federal, provincial, or local governmental agencies. WSP Canada Inc. liability extends only to its client and not to other parties who may obtain this assessment report. Issues raised by the report should be reviewed by appropriate legal counsel.
APPENDIX

A

ANALYTICAL RESULTS – ASBESTOS & LEAD
<table>
<thead>
<tr>
<th>Client Sample ID</th>
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<tbody>
<tr>
<td>AS 1-1-Floor Tile</td>
<td>551809012-0001</td>
</tr>
<tr>
<td>AS 1-1-Mastic</td>
<td>551809012-0001A</td>
</tr>
<tr>
<td>AS 1-2-Floor Tile</td>
<td>551809012-0002</td>
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<tr>
<td>AS 1-2-Mastic</td>
<td>551809012-0002A</td>
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<td>AS 1-3-Floor Tile</td>
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<td>AS 1-3-Mastic</td>
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<td>AS 2-1</td>
<td>551809012-0004</td>
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**Sample Description:** Basement - R.I.M.S- Storage Room, VFT - 12"x12" Navy Blue with White Streaks

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<th>Analyzed Date</th>
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<th>Non-Asbestos Fibrous</th>
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<td>4.1% Chrysotile</td>
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Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

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<tr>
<td>AS 2-2</td>
<td>551809012-0005</td>
<td>Basement - R.I.M.S.- Office Area, VFT - 12&quot;x12&quot; Light Blue with Blue/White Flakes</td>
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<tr>
<td>AS 3-2</td>
<td>551809012-0008</td>
<td>Basement - R.I.M.S.- File Room - VFT - 12&quot;x12&quot; Charcoal with Grey Flakes</td>
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<td>AS 3-2-Mastic</td>
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<tr>
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<tbody>
<tr>
<td>AS 3-3</td>
<td>551809012-0009</td>
<td>Basement - R.I.M.S.- File Room - VFT - 12&quot;x12&quot; Charcoal with Grey Flakes</td>
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<tr>
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<td>None Detected</td>
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<tr>
<td>AS 3-3-Mastic</td>
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<td>Basement - R.I.M.S.- File Room - VFT - 12&quot;x12&quot; Charcoal with Grey Flakes</td>
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<td>PLM Grav. Reduction</td>
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</table>
## Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

### Analyzed for Asbestos According to EPA Method 600/R-93/116

<table>
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<tr>
<th>Client Sample ID</th>
<th>Lab Sample ID</th>
<th>Sample Description:</th>
<th>Analyzed Date</th>
<th>Color</th>
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<th>Asbestos Fibrous</th>
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<th>Comment</th>
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<tbody>
<tr>
<td>AS 4-1</td>
<td>551809012-0010</td>
<td>Basement - IT Storage Room - VFT - 12&quot;x12&quot; Red with White Lines</td>
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<td>Red</td>
<td>0.0%</td>
<td>0.0%</td>
<td>4.1%</td>
<td>95.9%</td>
<td>Chrysotile</td>
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<tr>
<td>AS 4-2</td>
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<td>Basement - IT Storage Room - VFT - 12&quot;x12&quot; Red with White Lines</td>
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<tr>
<td>AS 5-1</td>
<td>551809012-0013</td>
<td>Basement - Cardio Room - HVAC Duct Mastic (Green)</td>
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<tr>
<td>AS 6-1</td>
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<td>Basement - Cardio Room - Drywall Joint Compound</td>
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</table>
# Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

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<tbody>
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<td>1st Floor - NE Maintenance Room - Drywall Joint Compound</td>
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<tbody>
<tr>
<td>AS 6-4</td>
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<td>1st Floor - Corporate Communications - Reception - Drywall Joint Compound</td>
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<tbody>
<tr>
<td>AS 6-5</td>
<td>551809012-0020</td>
<td>2nd Floor - Former Finance Area - Open Office Area - Drywall Joint Compound</td>
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<tr>
<td>AS 6-6</td>
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<td>2nd Floor - Corridor adj. Lunch Room - Drywall Joint Compound</td>
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<th>Fibrous</th>
<th>Non-Fibrous</th>
<th>Asbestos</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLM</td>
<td>8/08/2018</td>
<td>White</td>
<td>0%</td>
<td>100%</td>
<td>None Detected</td>
<td></td>
<td></td>
</tr>
</tbody>
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<table>
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<th>Sample Description</th>
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<tbody>
<tr>
<td>AS 6-7</td>
<td>551809012-0022</td>
<td>3rd Floor - C.M.G - Open Office Area - Drywall Joint Compound</td>
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<table>
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<th>Non-Fibrous</th>
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<th>Comment</th>
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<tbody>
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<td>0%</td>
<td>100%</td>
<td>None Detected</td>
<td></td>
<td></td>
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<table>
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<tr>
<th>Client Sample ID</th>
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<th>Sample Description</th>
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<tbody>
<tr>
<td>AS 7-1</td>
<td>551809012-0023</td>
<td>Basement - Stairwell (North) - Wall Caulking (Brown)</td>
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</table>

<table>
<thead>
<tr>
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<th>Color</th>
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<th>Fibrous</th>
<th>Non-Fibrous</th>
<th>Asbestos</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLM</td>
<td>8/07/2018</td>
<td>Brown</td>
<td>0.0%</td>
<td>100%</td>
<td>None Detected</td>
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<table>
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<th>Client Sample ID</th>
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<th>Sample Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS 7-2</td>
<td>551809012-0024</td>
<td>Basement - Stairwell (North) - Wall Caulking (Brown)</td>
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</table>

<table>
<thead>
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<th>Color</th>
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<th>Fibrous</th>
<th>Non-Fibrous</th>
<th>Asbestos</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLM</td>
<td>8/07/2018</td>
<td>Brown</td>
<td>0.0%</td>
<td>100%</td>
<td>None Detected</td>
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<td></td>
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<table>
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<th>Lab Sample ID</th>
<th>Sample Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS 7-3</td>
<td>551809012-0025</td>
<td>Basement - Stairwell (North) - Wall Caulking (Brown)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
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<th>Color</th>
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<th>Fibrous</th>
<th>Non-Fibrous</th>
<th>Asbestos</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLM</td>
<td>8/07/2018</td>
<td>Brown</td>
<td>0.0%</td>
<td>100%</td>
<td>None Detected</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

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<tbody>
<tr>
<td>AS 8-1</td>
<td>551809012-0026</td>
</tr>
<tr>
<td>AS 8-2</td>
<td>551809012-0027</td>
</tr>
<tr>
<td>AS 8-3</td>
<td>551809012-0028</td>
</tr>
<tr>
<td>AS 9-1-Floor Tile</td>
<td>551809012-0029</td>
</tr>
<tr>
<td>AS 9-1-Mastic</td>
<td>551809012-0029A</td>
</tr>
<tr>
<td>AS 9-2-Floor Tile</td>
<td>551809012-0030</td>
</tr>
<tr>
<td>AS 9-2-Mastic</td>
<td>551809012-0030A</td>
</tr>
<tr>
<td>AS 9-3-Floor Tile</td>
<td>551809012-0031</td>
</tr>
</tbody>
</table>

## Sample Description:
Basement - Gun Range Mechanical Room - HVAC Duct Mastic (Grey)

## Analysis
<table>
<thead>
<tr>
<th>Date</th>
<th>Color</th>
<th>Non-Asbestos Fibrous (%)</th>
<th>Non-Asbestos Non-Fibrous (%)</th>
<th>Asbestos</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/07/2018</td>
<td>Gray</td>
<td>0.0%</td>
<td>100%</td>
<td>None</td>
<td>Detected</td>
</tr>
<tr>
<td>8/07/2018</td>
<td>Gray</td>
<td>0.0%</td>
<td>100%</td>
<td>None</td>
<td>Detected</td>
</tr>
<tr>
<td>8/07/2018</td>
<td>Gray</td>
<td>0.0%</td>
<td>100%</td>
<td>None</td>
<td>Detected</td>
</tr>
<tr>
<td>8/07/2018</td>
<td>Brown/Beige</td>
<td>0.0%</td>
<td>100%</td>
<td>None</td>
<td>Detected</td>
</tr>
<tr>
<td>Insufficient Material</td>
<td>Brown/Beige</td>
<td>0.0%</td>
<td>100%</td>
<td>None</td>
<td>Detected</td>
</tr>
<tr>
<td>8/07/2018</td>
<td>Brown/Beige</td>
<td>0.0%</td>
<td>100%</td>
<td>None</td>
<td>Detected</td>
</tr>
<tr>
<td>8/07/2018</td>
<td>Clear</td>
<td>0.0%</td>
<td>100%</td>
<td>None</td>
<td>Detected</td>
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</tbody>
</table>


APPENDIX 5.18
# Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

<table>
<thead>
<tr>
<th>Client Sample ID:</th>
<th>Lab Sample ID:</th>
<th>Sample Description:</th>
<th>Analyzed Non-Asbestos Fibrous</th>
<th>Non-Fibrous</th>
<th>Asbestos</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS 9-3-Mastic</td>
<td>551809012-0031A</td>
<td>Basement - Communications - Kitchenette - VFT - 12'x12&quot; Brown with Beige Flakes</td>
<td>8/07/2018 Clear 0.0% 100%</td>
<td>None Detected</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AS 10-1-Floor Tile</td>
<td>551809012-0032</td>
<td>Basement - Room 4022 - Telecom Room - VFT - 12'x12&quot; White</td>
<td>8/07/2018 White 0.0% 100%</td>
<td>None Detected</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AS 10-1-Mastic</td>
<td>551809012-0032A</td>
<td>Basement - Room 4022 - Telecom Room - VFT - 12'x12&quot; White</td>
<td>8/07/2018 Yellow 0.0% 100%</td>
<td>None Detected</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AS 10-2-Floor Tile</td>
<td>551809012-0033</td>
<td>Basement - Room 4022 - Telecom Room - VFT - 12'x12&quot; White</td>
<td>8/07/2018 White 0.0% 100%</td>
<td>None Detected</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AS 10-2-Mastic</td>
<td>551809012-0033A</td>
<td>Basement - Room 4022 - Telecom Room - VFT - 12'x12&quot; White</td>
<td>8/07/2018 White 0.0% 100%</td>
<td>None Detected</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AS 10-3-Floor Tile</td>
<td>551809012-0034</td>
<td>Basement - Room 4022 - Telecom Room - VFT - 12'x12&quot; White</td>
<td>8/07/2018 White 0.0% 98.6% 1.4% Chrysotile</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AS 10-3-Mastic</td>
<td>551809012-0034A</td>
<td>Basement - Room 4022 - Telecom Room - VFT - 12'x12&quot; White</td>
<td>8/07/2018 Yellow 0.0% 100%</td>
<td>None Detected</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AS 11-1</td>
<td>551809012-0035</td>
<td>Basement - Stairwell (SE) - Firestop Caulking (White)</td>
<td>8/07/2018 White 0.0% 98.6% 1.4% Chrysotile</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

### Client Sample ID: AS 11-2
**Sample Description:** Basement - Stairwell (SE) - Firestop Caulking (White)

<table>
<thead>
<tr>
<th>TEST</th>
<th>Analyzed Date</th>
<th>Color</th>
<th>Non-Asbestos</th>
<th>Fibrous</th>
<th>Non-Fibrous</th>
<th>Asbestos</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLM Grav. Reduction</td>
<td>8/07/2018</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Positive Stop (Not Analyzed)</td>
<td></td>
</tr>
</tbody>
</table>

### Client Sample ID: AS 11-3
**Sample Description:** Basement - Stairwell (SE) - Firestop Caulking (White)

<table>
<thead>
<tr>
<th>TEST</th>
<th>Analyzed Date</th>
<th>Color</th>
<th>Non-Asbestos</th>
<th>Fibrous</th>
<th>Non-Fibrous</th>
<th>Asbestos</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLM Grav. Reduction</td>
<td>8/07/2018</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Positive Stop (Not Analyzed)</td>
<td></td>
</tr>
</tbody>
</table>

### Client Sample ID: AS 12-1
**Sample Description:** Basement - Room 4023 - File Room - Wall Caulking (Light Beige)

<table>
<thead>
<tr>
<th>TEST</th>
<th>Analyzed Date</th>
<th>Color</th>
<th>Non-Asbestos</th>
<th>Fibrous</th>
<th>Non-Fibrous</th>
<th>Asbestos</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLM Grav. Reduction</td>
<td>8/07/2018</td>
<td>Beige</td>
<td>0.0%</td>
<td>100%</td>
<td></td>
<td></td>
<td>None Detected</td>
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### Client Sample ID: AS 12-2
**Sample Description:** Basement - Room 4023 - File Room - Wall Caulking (Light Beige)

<table>
<thead>
<tr>
<th>TEST</th>
<th>Analyzed Date</th>
<th>Color</th>
<th>Non-Asbestos</th>
<th>Fibrous</th>
<th>Non-Fibrous</th>
<th>Asbestos</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLM Grav. Reduction</td>
<td>8/07/2018</td>
<td>Beige</td>
<td>0.0%</td>
<td>100%</td>
<td></td>
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<td>None Detected</td>
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### Client Sample ID: AS 12-3
**Sample Description:** Basement - Room 4023 - File Room - Wall Caulking (Light Beige)

<table>
<thead>
<tr>
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<th>Analyzed Date</th>
<th>Color</th>
<th>Non-Asbestos</th>
<th>Fibrous</th>
<th>Non-Fibrous</th>
<th>Asbestos</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLM Grav. Reduction</td>
<td>8/07/2018</td>
<td>Beige</td>
<td>0.0%</td>
<td>100%</td>
<td></td>
<td></td>
<td>None Detected</td>
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</table>

### Client Sample ID: AS 13-1
**Sample Description:** Basement - Room 4023 - File Room - HVAC Duct Mastic (Brown)

<table>
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<tr>
<th>TEST</th>
<th>Analyzed Date</th>
<th>Color</th>
<th>Non-Asbestos</th>
<th>Fibrous</th>
<th>Non-Fibrous</th>
<th>Asbestos</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLM Grav. Reduction</td>
<td>8/07/2018</td>
<td>Brown</td>
<td>0.0%</td>
<td>95.5%</td>
<td>4.5%</td>
<td>Chrysotile</td>
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### Client Sample ID: AS 13-2
**Sample Description:** Basement - Room 4023 - File Room - HVAC Duct Mastic (Brown)

<table>
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<th>Non-Asbestos</th>
<th>Fibrous</th>
<th>Non-Fibrous</th>
<th>Asbestos</th>
<th>Comment</th>
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<tbody>
<tr>
<td>PLM Grav. Reduction</td>
<td>8/07/2018</td>
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<td></td>
<td></td>
<td></td>
<td>Positive Stop (Not Analyzed)</td>
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### Client Sample ID: AS 13-3
**Sample Description:** Basement - Room 4023 - File Room - HVAC Duct Mastic (Brown)

<table>
<thead>
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<th>Fibrous</th>
<th>Non-Fibrous</th>
<th>Asbestos</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLM Grav. Reduction</td>
<td>8/07/2018</td>
<td></td>
<td></td>
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<td></td>
<td>Positive Stop (Not Analyzed)</td>
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## Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

<table>
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<tr>
<th>Client Sample ID</th>
<th>Sample Description</th>
<th>Lab Sample ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS 14-1-Floor Tile</td>
<td>Basement - Room 4023 - File Room - VFT - 12&quot;x12&quot; Beige with Brown &amp; White Lines</td>
<td>551809012-0044</td>
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### PLM Grav. Reduction Test Results

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<th>Non-Asbestos Non-Fibrous</th>
<th>Asbestos Comment</th>
<th>Lab Sample ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/07/2018</td>
<td>Beige</td>
<td>0.0%</td>
<td>96.6%</td>
<td>3.4% Chrysotile</td>
<td>551809012-0044</td>
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<table>
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<tr>
<th>Client Sample ID</th>
<th>Sample Description</th>
<th>Lab Sample ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS 14-1-Mastic</td>
<td>Basement - Room 4023 - File Room - VFT - 12&quot;x12&quot; Beige with Brown &amp; White Lines</td>
<td>551809012-0044A</td>
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### PLM Grav. Reduction Test Results

<table>
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<th>Color</th>
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<th>Non-Asbestos Non-Fibrous</th>
<th>Asbestos Comment</th>
<th>Lab Sample ID</th>
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<tbody>
<tr>
<td>8/07/2018</td>
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<td>0.0%</td>
<td>99.7%</td>
<td>0.3% Chrysotile</td>
<td>551809012-0044A</td>
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<table>
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<tr>
<th>Client Sample ID</th>
<th>Sample Description</th>
<th>Lab Sample ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS 14-2-Floor Tile</td>
<td>Basement - Room 4023 - File Room - VFT - 12&quot;x12&quot; Beige with Brown &amp; White Lines</td>
<td>551809012-0045</td>
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### PLM Grav. Reduction Test Results

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<th>Non-Asbestos Non-Fibrous</th>
<th>Asbestos Comment</th>
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<tbody>
<tr>
<td>8/07/2018</td>
<td>Black</td>
<td>0.0%</td>
<td>99.5%</td>
<td>0.5% Chrysotile</td>
<td>551809012-0045</td>
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</tbody>
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<table>
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<tr>
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<th>Sample Description</th>
<th>Lab Sample ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS 14-3</td>
<td>Basement - Room 4023 - File Room - VFT - 12&quot;x12&quot; Beige with Brown &amp; White Lines</td>
<td>551809012-0046</td>
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### PLM Grav. Reduction Test Results

<table>
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<th>Asbestos Comment</th>
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<tbody>
<tr>
<td>8/07/2018</td>
<td>Black</td>
<td>0.0%</td>
<td>99.5%</td>
<td>0.5% Chrysotile</td>
<td>551809012-0046</td>
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</tbody>
</table>

<table>
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<tr>
<th>Client Sample ID</th>
<th>Sample Description</th>
<th>Lab Sample ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS 15-1</td>
<td>Basement - Room 4023 - File Room - Firestop Caulking (Red)</td>
<td>551809012-0047</td>
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</tbody>
</table>

### PLM Grav. Reduction Test Results

<table>
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<th>Date</th>
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<th>Non-Asbestos Non-Fibrous</th>
<th>Asbestos Comment</th>
<th>Lab Sample ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/08/2018</td>
<td>Red</td>
<td>4.8%</td>
<td>95.2%</td>
<td>None Detected</td>
<td>551809012-0047</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Client Sample ID</th>
<th>Sample Description</th>
<th>Lab Sample ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS 15-2</td>
<td>Basement - Room 4023 - File Room - Firestop Caulking (Red)</td>
<td>551809012-0048</td>
</tr>
</tbody>
</table>

### PLM Grav. Reduction Test Results

<table>
<thead>
<tr>
<th>Date</th>
<th>Color</th>
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<th>Non-Asbestos Non-Fibrous</th>
<th>Asbestos Comment</th>
<th>Lab Sample ID</th>
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<tbody>
<tr>
<td>8/08/2018</td>
<td>Red</td>
<td>0.0%</td>
<td>100%</td>
<td>None Detected</td>
<td>551809012-0048</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Client Sample ID</th>
<th>Sample Description</th>
<th>Lab Sample ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS 15-3</td>
<td>Basement - Room 4023 - File Room - Firestop Caulking (Red)</td>
<td>551809012-0049</td>
</tr>
</tbody>
</table>

### PLM Grav. Reduction Test Results

<table>
<thead>
<tr>
<th>Date</th>
<th>Color</th>
<th>Non-Asbestos Fibrous</th>
<th>Non-Asbestos Non-Fibrous</th>
<th>Asbestos Comment</th>
<th>Lab Sample ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>8/08/2018</td>
<td>Red</td>
<td>5.0%</td>
<td>95.0%</td>
<td>None Detected</td>
<td>551809012-0049</td>
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## Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

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<th>Lab Sample ID</th>
<th>Sample Description</th>
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<th>Asbestos</th>
<th>Comment</th>
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<tbody>
<tr>
<td>AS 16-1</td>
<td>551809012-0050</td>
<td>Basement - Room B32-Generator Room - Spray Fireproofing Material (Dry-Applied)</td>
<td>8/08/2018</td>
<td>Gray</td>
<td>60%</td>
<td>40%</td>
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<tr>
<td>AS 16-2</td>
<td>551809012-0051</td>
<td>Basement - Room B32-Generator Room - Spray Fireproofing Material (Dry-Applied)</td>
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<td>40%</td>
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<td>AS 16-3</td>
<td>551809012-0052</td>
<td>Basement - Room B32-Generator Room - Spray Fireproofing Material (Dry-Applied)</td>
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<td>Beige</td>
<td>75%</td>
<td>25%</td>
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<td>AS 16-4</td>
<td>551809012-0053</td>
<td>1st Floor - 22 Division - Open Office Area (North) - Spray Fireproofing Material (Dry-Applied)</td>
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<td>Beige</td>
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<td>AS 16-5</td>
<td>551809012-0054</td>
<td>1st Floor - Loading Dock- Spray Fireproofing Material (Dry-Applied)</td>
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<td>AS 16-6</td>
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<td>2nd Floor - Former Finance Area - Open Office Area - Spray Fireproofing Material (Dry-Applied)</td>
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<td>AS 16-7</td>
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<td>AS 17-1-Floor Tile</td>
<td>551809012-0057</td>
<td>Basement - Corridor adj.Cell Area - VSF - Grey with Flecks</td>
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## Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

### Client Sample ID: AS 17-1-Mastic
#### Sample Description:
Basement - Corridor adj.Cell Area - VSF - Grey with Flecks

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### Client Sample ID: AS 17-2-Floor Tile
#### Sample Description:
Basement - Corridor adj.Cell Area - VSF - Grey with Flecks

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### Client Sample ID: AS 17-2-Mastic
#### Sample Description:
Basement - Corridor adj.Cell Area - VSF - Grey with Flecks

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### Client Sample ID: AS 17-3-Floor Tile
#### Sample Description:
Basement - Corridor adj.Cell Area - VSF - Grey with Flecks

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### Client Sample ID: AS 17-3-Mastic
#### Sample Description:
Basement - Corridor adj.Cell Area - VSF - Grey with Flecks

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### Client Sample ID: AS 18-1-Floor Tile
#### Sample Description:
Basement - Corridor adj.Cell Area - VSF - White with Flecks

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### Client Sample ID: AS 18-1-Mastic
#### Sample Description:
Basement - Corridor adj.Cell Area - VSF - White with Flecks

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### Client Sample ID: AS 18-2-Floor Tile
#### Sample Description:
Basement - Corridor adj.Cell Area - VSF - White with Flecks

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<tbody>
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## Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

**Client Sample ID:** AS 18-2-Mastic  
**Sample Description:** Basement - Corridor adj.Cell Area - VSF - White with Flecks  
**Lab Sample ID:** 551809012-0061A

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**Client Sample ID:** AS 18-3-Floor Tile  
**Sample Description:** Basement - Corridor adj.Cell Area - VSF - White with Flecks  
**Lab Sample ID:** 551809012-0062

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**Client Sample ID:** AS 18-3-Mastic  
**Sample Description:** Basement - Corridor adj.Cell Area - VSF - White with Flecks  
**Lab Sample ID:** 551809012-0062A

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**Client Sample ID:** AS 19-1-Floor Tile  
**Sample Description:** Basement - Corridor adj.Cell Area - VSF - Charcoal with Flecks  
**Lab Sample ID:** 551809012-0063

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**Client Sample ID:** AS 19-1-Mastic  
**Sample Description:** Basement - Corridor adj.Cell Area - VSF - Charcoal with Flecks  
**Lab Sample ID:** 551809012-0063A

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**Client Sample ID:** AS 19-2-Floor Tile  
**Sample Description:** Basement - Corridor adj.Cell Area - VSF - Charcoal with Flecks  
**Lab Sample ID:** 551809012-0064

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**Client Sample ID:** AS 19-2-Mastic  
**Sample Description:** Basement - Corridor adj.Cell Area - VSF - Charcoal with Flecks  
**Lab Sample ID:** 551809012-0064A

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**Client Sample ID:** AS 19-3-Floor Tile  
**Sample Description:** Basement - Corridor adj.Cell Area - VSF - Charcoal with Flecks  
**Lab Sample ID:** 551809012-0065

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Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

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<td>551809012-0066</td>
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<tr>
<td>AS 21-1-Floor Tile</td>
<td>551809012-0069</td>
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# Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

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<td>551809012-0072</td>
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<td><strong>Sample Description:</strong></td>
<td>1st Floor - Corridor adj. Men's Changeroom adj. Tactical Training Warehouse - VFT - 2'x2' Grey with Streaks</td>
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<tr>
<td><strong>TEST</strong></td>
<td><strong>Date</strong></td>
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<tr>
<td>PLM Grav. Reduction</td>
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<tr>
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<td><strong>Sample Description:</strong></td>
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<td>PLM</td>
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<tr>
<td>AS 23-2</td>
<td>551809012-0076</td>
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<tr>
<td><strong>Sample Description:</strong></td>
<td>1st Floor - Entrance adj. Room 100A - Drywall Joint Compound</td>
</tr>
<tr>
<td><strong>TEST</strong></td>
<td><strong>Date</strong></td>
</tr>
<tr>
<td>PLM</td>
<td>8/08/2018</td>
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<tr>
<td>AS 23-3</td>
<td>551809012-0077</td>
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<tr>
<td><strong>Sample Description:</strong></td>
<td>1st Floor - F.I.S. - Corridor adj. Parking Bay - Drywall Joint Compound</td>
</tr>
<tr>
<td><strong>TEST</strong></td>
<td><strong>Date</strong></td>
</tr>
<tr>
<td>PLM</td>
<td>8/08/2018</td>
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<tr>
<td>AS 23-4</td>
<td>551809012-0078</td>
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<tr>
<td><strong>Sample Description:</strong></td>
<td>1st Floor - F.I.S. - Open Office Area - Drywall Joint Compound</td>
</tr>
<tr>
<td><strong>TEST</strong></td>
<td><strong>Date</strong></td>
</tr>
<tr>
<td>PLM</td>
<td>8/08/2018</td>
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<tbody>
<tr>
<td>AS 23-5</td>
<td>551809012-0079</td>
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<tr>
<td><strong>Sample Description:</strong></td>
<td>2nd Floor - Communications - Lunch Room - Drywall Joint Compound</td>
</tr>
<tr>
<td><strong>TEST</strong></td>
<td><strong>Date</strong></td>
</tr>
<tr>
<td>PLM</td>
<td>8/08/2018</td>
</tr>
</tbody>
</table>
# Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

## Client Sample ID: AS 23-6
### Sample Description:
2nd Floor - Communications - Dispatch Call Centre - Corridor - Drywall Joint Compound

<table>
<thead>
<tr>
<th>TEST</th>
<th>Analyzed Date</th>
<th>Color</th>
<th>Non-Asbestos Fibrous</th>
<th>Non-Asbestos Non-Fibrous</th>
<th>Asbestos</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLM</td>
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<td>White</td>
<td>0%</td>
<td>100%</td>
<td>None Detected</td>
<td></td>
</tr>
</tbody>
</table>

## Client Sample ID: AS 23-7
### Sample Description:
2nd Floor - Fire Dept. Communications Centre - Corridor - Drywall Joint Compound

<table>
<thead>
<tr>
<th>TEST</th>
<th>Analyzed Date</th>
<th>Color</th>
<th>Non-Asbestos Fibrous</th>
<th>Non-Asbestos Non-Fibrous</th>
<th>Asbestos</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLM</td>
<td>8/08/2018</td>
<td>White</td>
<td>0%</td>
<td>100%</td>
<td>None Detected</td>
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</table>

## Client Sample ID: AS 24-1
### Sample Description:
1st Floor - VCOM Bay Area - Spray Fireproofing Material (Cementitious)

<table>
<thead>
<tr>
<th>TEST</th>
<th>Analyzed Date</th>
<th>Color</th>
<th>Non-Asbestos Fibrous</th>
<th>Non-Asbestos Non-Fibrous</th>
<th>Asbestos</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLM</td>
<td>8/08/2018</td>
<td>Tan</td>
<td>60%</td>
<td>40%</td>
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## Client Sample ID: AS 24-2
### Sample Description:
1st Floor - VCOM Bay Area - Spray Fireproofing Material (Cementitious)

<table>
<thead>
<tr>
<th>TEST</th>
<th>Analyzed Date</th>
<th>Color</th>
<th>Non-Asbestos Fibrous</th>
<th>Non-Asbestos Non-Fibrous</th>
<th>Asbestos</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLM</td>
<td>8/08/2018</td>
<td>Tan</td>
<td>75%</td>
<td>25%</td>
<td>None Detected</td>
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## Client Sample ID: AS 24-3
### Sample Description:
1st Floor - VCOM Bay Area - Spray Fireproofing Material (Cementitious)

<table>
<thead>
<tr>
<th>TEST</th>
<th>Analyzed Date</th>
<th>Color</th>
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<th>Non-Asbestos Non-Fibrous</th>
<th>Asbestos</th>
<th>Comment</th>
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<tbody>
<tr>
<td>PLM</td>
<td>8/08/2018</td>
<td>Tan</td>
<td>75%</td>
<td>25%</td>
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## Client Sample ID: AS 24-4
### Sample Description:
1st Floor - VCOM Bay Area - Spray Fireproofing Material (Cementitious)

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<tr>
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<th>Analyzed Date</th>
<th>Color</th>
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<th>Non-Asbestos Non-Fibrous</th>
<th>Asbestos</th>
<th>Comment</th>
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<tbody>
<tr>
<td>PLM</td>
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<td>Tan</td>
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<td>30%</td>
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## Client Sample ID: AS 24-5
### Sample Description:
1st Floor - VCOM Bay Area - Spray Fireproofing Material (Cementitious)

<table>
<thead>
<tr>
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<th>Analyzed Date</th>
<th>Color</th>
<th>Non-Asbestos Fibrous</th>
<th>Non-Asbestos Non-Fibrous</th>
<th>Asbestos</th>
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<td>8/08/2018</td>
<td>Tan</td>
<td>70%</td>
<td>30%</td>
<td>None Detected</td>
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## Client Sample ID: AS 25-1 Floor Tile
### Sample Description:
1st Floor - VCOM Project Office Area - VFT - 12"x12" White with Blue Flecks

<table>
<thead>
<tr>
<th>TEST</th>
<th>Analyzed Date</th>
<th>Color</th>
<th>Non-Asbestos Fibrous</th>
<th>Non-Asbestos Non-Fibrous</th>
<th>Asbestos</th>
<th>Comment</th>
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<tbody>
<tr>
<td>PLM</td>
<td>8/08/2018</td>
<td>White</td>
<td>0.0%</td>
<td>100%</td>
<td>None Detected</td>
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</table>
## Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

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<tr>
<th>Client Sample ID</th>
<th>Sample Description</th>
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<tbody>
<tr>
<td>AS 25-1-Mastic</td>
<td>1st Floor - VCOM Project Office Area - VFT - 12&quot;x12&quot; White with Blue Flecks</td>
<td>551809012-0087A</td>
</tr>
<tr>
<td>AS 25-2</td>
<td>1st Floor - VCOM Project Office Area - VFT - 12&quot;x12&quot; White with Blue Flecks</td>
<td>551809012-0088</td>
</tr>
<tr>
<td>AS 25-3-Floor Tile</td>
<td>1st Floor - VCOM Project Office Area - VFT - 12&quot;x12&quot; White with Blue Flecks</td>
<td>551809012-0089</td>
</tr>
<tr>
<td>AS 25-3-Mastic</td>
<td>1st Floor - VCOM Project Office Area - VFT - 12&quot;x12&quot; White with Blue Flecks</td>
<td>551809012-0089A</td>
</tr>
<tr>
<td>AS 26-1</td>
<td>1st Floor - F.I.S. - Lunch Room - VFT - 12&quot;x12&quot; Charcoal with Black/White Flecks</td>
<td>551809012-0090</td>
</tr>
<tr>
<td>AS 26-2</td>
<td>1st Floor - F.I.S. - Lunch Room - VFT - 12&quot;x12&quot; Charcoal with Black/White Flecks</td>
<td>551809012-0091</td>
</tr>
<tr>
<td>AS 26-3</td>
<td>1st Floor - F.I.S. - Lunch Room - VFT - 12&quot;x12&quot; Charcoal with Black/White Flecks</td>
<td>551809012-0092</td>
</tr>
<tr>
<td>AS 27-1</td>
<td>2nd Floor - Room 2042 - Mechanical Room - Concrete Block Mortar</td>
<td>551809012-0093</td>
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</table>

<table>
<thead>
<tr>
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<th>Non-Asbestos Non-Fibrous</th>
<th>Asbestos</th>
<th>Comment</th>
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<tbody>
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<tr>
<td>8/08/2018</td>
<td>White</td>
<td>0.0%</td>
<td>100%</td>
<td>None</td>
<td>Detected</td>
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<tr>
<td>8/08/2018</td>
<td>White</td>
<td>0.0%</td>
<td>100%</td>
<td>None</td>
<td>Detected</td>
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<tr>
<td>8/08/2018</td>
<td>White</td>
<td>0.0%</td>
<td>100%</td>
<td>None</td>
<td>Insufficient Material</td>
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<tr>
<td>8/08/2018</td>
<td>Gray</td>
<td>0.0%</td>
<td>100%</td>
<td>None</td>
<td>Detected</td>
</tr>
<tr>
<td>8/08/2018</td>
<td>Gray</td>
<td>0.0%</td>
<td>100%</td>
<td>None</td>
<td>Detected</td>
</tr>
<tr>
<td>8/08/2018</td>
<td>Gray</td>
<td>0.0%</td>
<td>100%</td>
<td>None</td>
<td>Detected</td>
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<tr>
<td>8/08/2018</td>
<td>Gray</td>
<td>0.0%</td>
<td>100%</td>
<td>None</td>
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Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

**Client Sample ID:** AS 27-2

**Sample Description:** 2nd Floor - Room 2042 - Mechanical Room - Concrete Block Mortar

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<tr>
<th>TEST</th>
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<th>Asbestos</th>
<th>Comment</th>
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<tbody>
<tr>
<td>PLM</td>
<td>8/08/2018</td>
<td>Gray</td>
<td>0%</td>
<td>100%</td>
<td>None Detected</td>
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**Client Sample ID:** AS 27-3

**Sample Description:** 2nd Floor - Room 2042 - Mechanical Room - Concrete Block Mortar

<table>
<thead>
<tr>
<th>TEST</th>
<th>Analyzed Date</th>
<th>Color</th>
<th>Non-Asbestos</th>
<th>Asbestos</th>
<th>Comment</th>
</tr>
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<tbody>
<tr>
<td>PLM</td>
<td>8/08/2018</td>
<td>Gray</td>
<td>0%</td>
<td>100%</td>
<td>None Detected</td>
</tr>
</tbody>
</table>

**Analyst(s):**

- Andrew Burke  PLM Grav. Reduction (7)
- Christina Maiorana  PLM Grav. Reduction (26)
- Daniel Fricker  PLM (1)
- Ebony Miller  PLM Grav. Reduction (5)
- Edward Zambrano  PLM (17)
- Jonathan Blanfort  PLM Grav. Reduction (12)

**Reviewed and approved by:**

Matthew Davis or other approved signatory

or Other Approved Signatory

None Detected = <0.1%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Analytical, Inc. Cinnaminson, NJ NVLAP Lab Code 101048-0, AIHA-LAP, LLC-IHLAP Lab 100194, NYS ELAP 10872, NJ DEP 03036, PA ID# 68-00367

Initial report from: 08/09/201809:47:20


Page 16 of 16
# Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Description</th>
<th>Weight (g)</th>
<th>RDL (% wt)</th>
<th>Pb Concentration (% wt)</th>
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</thead>
<tbody>
<tr>
<td>Pb-1</td>
<td>551809017-0001 - Basement - SW Maintenance Room Adj. R.I.M.S - Grey Floor Paint</td>
<td>0.2417</td>
<td>0.0083</td>
<td>0.020</td>
</tr>
<tr>
<td>Pb-2</td>
<td>551809017-0002 - Basement - Weight Lifting Room - Off-White Wall Paint</td>
<td>0.2456</td>
<td>0.0081</td>
<td>&lt;0.0081</td>
</tr>
<tr>
<td>Pb-3</td>
<td>551809017-0003 - Basement - Stairwell (North) - Orange Wall Paint</td>
<td>0.2476</td>
<td>0.0081</td>
<td>&lt;0.0081</td>
</tr>
<tr>
<td>Pb-4</td>
<td>551809017-0004 - Basement - Room 4022 - Telecom Room - White Pipe Paint</td>
<td>0.2415</td>
<td>0.0083</td>
<td>&lt;0.0083</td>
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<tr>
<td>Pb-5</td>
<td>551809017-0005 - 3rd Floor - Room 3014 - Office - Brown Wall Paint</td>
<td>0.2416</td>
<td>0.0083</td>
<td>&lt;0.0083</td>
</tr>
<tr>
<td>Pb-6</td>
<td>551809017-0006 - Basement - Shared Garage/Sallyport - Grey Floor Paint</td>
<td>0.2449</td>
<td>0.0082</td>
<td>0.0092</td>
</tr>
<tr>
<td>Pb-7</td>
<td>551809017-0007 - 1st Floor - 22 Division - Open Office Area (Northeast) - White Wall Paint</td>
<td>0.2474</td>
<td>0.0081</td>
<td>&lt;0.0081</td>
</tr>
<tr>
<td>Pb-8</td>
<td>551809017-0008 - 1st Floor - Public Lobby adj. Washrooms - White Wall Paint</td>
<td>0.2451</td>
<td>0.0082</td>
<td>&lt;0.0082</td>
</tr>
<tr>
<td>Pb-9</td>
<td>551809017-0009 - 1st Floor - Room R-1-130 - Empy Storage Room - Beige Wall Paint</td>
<td>0.2476</td>
<td>0.0081</td>
<td>&lt;0.0081</td>
</tr>
</tbody>
</table>

*Rowena Fanto, Lead Supervisor or other approved signatory

---

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements unless specifically indicated otherwise. Definitions of modifications are available upon request.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08
### Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

<table>
<thead>
<tr>
<th>Client Sample Description</th>
<th>Collected</th>
<th>Analyzed</th>
<th>Weight</th>
<th>RDL</th>
<th>Lead Concentration</th>
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<tbody>
<tr>
<td>Pb-10</td>
<td>8/8/2018</td>
<td>551809017-0010</td>
<td>0.2520 g</td>
<td>0.0080 % wt</td>
<td>&lt;0.0080 % wt</td>
</tr>
<tr>
<td>Site: 1st Floor - Corporate Communications - Open Office Area</td>
<td>Desc: Off-White Wall Paint</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pb-11</td>
<td>8/8/2018</td>
<td>551809017-0011</td>
<td>0.2418 g</td>
<td>0.0083 % wt</td>
<td>&lt;0.0083 % wt</td>
</tr>
<tr>
<td>Site: 1st Floor - VCOM Bay Area</td>
<td>Desc: Beige Wall Paint</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Pb-12</td>
<td>8/8/2018</td>
<td>551809017-0012</td>
<td>0.2457 g</td>
<td>0.0081 % wt</td>
<td>&lt;0.0081 % wt</td>
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<tr>
<td>Site: 2nd Floor - Fire Dept. - Room 226</td>
<td>Desc: Light Beige Wall Paint</td>
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<tr>
<td>Pb-13</td>
<td>8/8/2018</td>
<td>551809017-0013</td>
<td>0.2490 g</td>
<td>0.0080 % wt</td>
<td>&lt;0.0080 % wt</td>
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<td>Site: 2nd Floor - Room 2043 - IT Services Meeting Room</td>
<td>Desc: White Wall Paint</td>
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<tr>
<td>Pb-14</td>
<td>8/8/2018</td>
<td>551809017-0014</td>
<td>0.2447 g</td>
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<tr>
<td>Site: 2nd Floor - Corridor (North)</td>
<td>Desc: Blue Wall Paint</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements unless specifically indicated otherwise. Definitions of modifications are available upon request.

---

Rowena Fanto, Lead Supervisor
or other approved signatory

---

*Sample analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08*
**Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method**

<table>
<thead>
<tr>
<th>Client Sample ID</th>
<th>Sample Description</th>
<th>Lab Sample ID</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS 28-1</td>
<td>Exterior/Grey Caulking Around Exterior Outlet Bank/Door Frame</td>
<td>551907738-0001</td>
</tr>
<tr>
<td>AS 28-2</td>
<td>Exterior/Grey Caulking Around Exterior Outlet Bank/Door Frame</td>
<td>551907738-0002</td>
</tr>
<tr>
<td>AS 28-3</td>
<td>Exterior/Grey Caulking Around Exterior Outlet Bank/Door Frame</td>
<td>551907738-0003</td>
</tr>
<tr>
<td>AS 29-1</td>
<td>Exterior/Grey Caulking at Base of Façade</td>
<td>551907738-0004</td>
</tr>
<tr>
<td>AS 29-2</td>
<td>Exterior/Grey Caulking at Base of Façade</td>
<td>551907738-0005</td>
</tr>
<tr>
<td>AS 29-3</td>
<td>Exterior/Grey Caulking at Base of Façade</td>
<td>551907738-0006</td>
</tr>
<tr>
<td>AS 30-1</td>
<td>Interior - Location #1/Vinyl Sheet Flooring - Marble Pattern</td>
<td>551907738-0007</td>
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</table>

<table>
<thead>
<tr>
<th>Test</th>
<th>Analyzed Date</th>
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<th>Non-Asbestos Non-Fibrous</th>
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<th>Comment</th>
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<tr>
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<td>0.0%</td>
<td>100%</td>
<td>None Detected</td>
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<tr>
<td>PLM Grav. Reduction</td>
<td>7/03/2019</td>
<td>Gray</td>
<td>0.0%</td>
<td>100%</td>
<td>None Detected</td>
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<tr>
<td>PLM Grav. Reduction</td>
<td>7/03/2019</td>
<td>Gray</td>
<td>0.0%</td>
<td>100%</td>
<td>None Detected</td>
<td></td>
</tr>
<tr>
<td>PLM Grav. Reduction</td>
<td>7/03/2019</td>
<td>Gray</td>
<td>0.0%</td>
<td>100%</td>
<td>None Detected</td>
<td></td>
</tr>
</tbody>
</table>
### Test Report: Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05 via EPA600/R-93/116 Method

**Lab Sample ID:** 551907738-0008

**Client Sample ID:** AS 30-2
**Sample Description:** Interior - Location #1/Vinyl Sheet Flooring - Marble Pattern

<table>
<thead>
<tr>
<th>TEST</th>
<th>Analyzed Date</th>
<th>Color</th>
<th>Non-Asbestos</th>
<th>Asbestos</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLM Grav. Reduction</td>
<td>7/03/2019</td>
<td>Gray</td>
<td>0.0%</td>
<td>100.0%</td>
<td>None Detected</td>
</tr>
</tbody>
</table>

**Lab Sample ID:** 551907738-0009

**Client Sample ID:** AS 30-3
**Sample Description:** Interior - Location #1/Vinyl Sheet Flooring - Marble Pattern

<table>
<thead>
<tr>
<th>TEST</th>
<th>Analyzed Date</th>
<th>Color</th>
<th>Non-Asbestos</th>
<th>Asbestos</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLM Grav. Reduction</td>
<td>7/03/2019</td>
<td>Gray</td>
<td>0.0%</td>
<td>100.0%</td>
<td>None Detected</td>
</tr>
</tbody>
</table>

**Lab Sample ID:** 551907738-0010

**Client Sample ID:** AS 31-1
**Sample Description:** Interior - Location #1/Drywall Joint Compound

<table>
<thead>
<tr>
<th>TEST</th>
<th>Analyzed Date</th>
<th>Color</th>
<th>Non-Asbestos</th>
<th>Asbestos</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLM</td>
<td>7/03/2019</td>
<td>White</td>
<td>0.0%</td>
<td>100.0%</td>
<td>None Detected</td>
</tr>
</tbody>
</table>

**Lab Sample ID:** 551907738-0011

**Client Sample ID:** AS 31-2
**Sample Description:** Interior - Location #1/Drywall Joint Compound

<table>
<thead>
<tr>
<th>TEST</th>
<th>Analyzed Date</th>
<th>Color</th>
<th>Non-Asbestos</th>
<th>Asbestos</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLM</td>
<td>7/03/2019</td>
<td>White</td>
<td>0.0%</td>
<td>100.0%</td>
<td>None Detected</td>
</tr>
</tbody>
</table>

**Lab Sample ID:** 551907738-0012

**Client Sample ID:** AS 31-3
**Sample Description:** Interior - Location #1/Drywall Joint Compound

<table>
<thead>
<tr>
<th>TEST</th>
<th>Analyzed Date</th>
<th>Color</th>
<th>Non-Asbestos</th>
<th>Asbestos</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLM</td>
<td>7/03/2019</td>
<td>White</td>
<td>0.0%</td>
<td>100.0%</td>
<td>None Detected</td>
</tr>
</tbody>
</table>

**Analyst(s):**
- Caroline Allen  PLM Grav. Reduction (3)
- Michelle Lung  PLM (3)
  PLM Grav. Reduction (6)

**Reviewed and approved by:**

Matthew Davis or other approved signatory  
or Other Approved Signatory

None Detected = <0.1%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency or the U.S. Government

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0


Page 2 of 2
## Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

<table>
<thead>
<tr>
<th>Client SampleDescription</th>
<th>Collected</th>
<th>Analyzed</th>
<th>Weight</th>
<th>RDL</th>
<th>Lead Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pb-15</td>
<td>6/27/2019</td>
<td></td>
<td>0.2423 g</td>
<td>0.0083 % wt</td>
<td>&lt;0.0083 % wt</td>
</tr>
<tr>
<td>551907735-0001</td>
<td>Site: Exterior</td>
<td>Desc: White Paint on Façade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pb-16</td>
<td>6/27/2019</td>
<td></td>
<td>0.2460 g</td>
<td>0.0081 % wt</td>
<td>0.44 % wt</td>
</tr>
<tr>
<td>551907735-0002</td>
<td>Site: Exterior</td>
<td>Desc: Sky Blue Door Frame Paint</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pb-17</td>
<td>6/27/2019</td>
<td></td>
<td>0.2286 g</td>
<td>0.0087 % wt</td>
<td>0.039 % wt</td>
</tr>
<tr>
<td>551907735-0003</td>
<td>Site: Location #2</td>
<td>Desc: Grey Door Paint</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements unless specifically indicated otherwise. Definitions of modifications are available upon request.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Cert #2845.08; AIHA-LAP, LLC - ELLAP #196142.

---

Rowena Fanto, Lead Supervisor or other approved signatory

---

APPENDIX 5.18
<table>
<thead>
<tr>
<th>PHOTO NO.</th>
<th>MATERIAL DESCRIPTION &amp; LOCATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Exterior view of the surveyed building (7750 Hurontario Street, Brampton, ON)</td>
</tr>
<tr>
<td>2</td>
<td>Vinyl floor tiles (12” x 12” Navy Blue with White Streaks) observed in select areas within the basement of the building.</td>
</tr>
<tr>
<td>PHOTO NO.</td>
<td>MATERIAL DESCRIPTION &amp; LOCATION</td>
</tr>
<tr>
<td>----------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>3</td>
<td>Vinyl floor tiles (12” x 12” Navy Blue with White Streaks) observed in select areas within the basement of the building.</td>
</tr>
<tr>
<td>4</td>
<td>Vinyl floor tiles (12” x 12” Navy Blue with White Lines) observed in the IT Storage Room in the basement of the building contain asbestos (AS4).</td>
</tr>
<tr>
<td>PHOTO NO.</td>
<td>MATERIAL DESCRIPTION &amp; LOCATION</td>
</tr>
<tr>
<td>-----------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>5</td>
<td>Firestop caulking (White) observed in the southeast stairwell in the basement of the building contains asbestos (AS11).</td>
</tr>
<tr>
<td>6</td>
<td>HVAC duct mastic (Brown) observed in select areas throughout the building contains asbestos (AS13).</td>
</tr>
<tr>
<td>PHOTO NO.</td>
<td>MATERIAL DESCRIPTION &amp; LOCATION</td>
</tr>
<tr>
<td>-----------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>7</td>
<td>Vinyl floor tiles (12” x 12” Beige with Brown &amp; White Lines) observed in Room 4023 (File Room) in the basement of the building contains asbestos (AS14).</td>
</tr>
<tr>
<td>8</td>
<td>Representative photo of asbestos-containing transite pipes observed throughout the building.</td>
</tr>
<tr>
<td>PHOTO NO.</td>
<td>MATERIAL DESCRIPTION &amp; LOCATION</td>
</tr>
<tr>
<td>-----------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>9</td>
<td>Representative photo of asbestos-containing transite pipes observed throughout the building.</td>
</tr>
<tr>
<td>10</td>
<td>Representative photo of asbestos-containing transite pipes observed throughout the building.</td>
</tr>
<tr>
<td>PHOTO NO.</td>
<td>MATERIAL DESCRIPTION &amp; LOCATION</td>
</tr>
<tr>
<td>-----------</td>
<td>-----------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>11</td>
<td>Representative photo of asbestos-containing transite pipes observed throughout the building.</td>
</tr>
<tr>
<td>12</td>
<td>Grey floor paint observed in the southwest Maintenance Room adjacent to the R.I.M.S. office area contains lead (Pb-01)</td>
</tr>
<tr>
<td>PHOTO NO.</td>
<td>MATERIAL DESCRIPTION &amp; LOCATION</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>13</td>
<td>Grey floor paint observed in throughout the shared garage/sallyport in the basement of the building contains lead (Pb-06).</td>
</tr>
<tr>
<td>14</td>
<td>Refrigerator observed in Room B-30 in the basement of the building contains R-12 refrigerant.</td>
</tr>
<tr>
<td>PHOTO NO.</td>
<td>DESCRIPTION &amp; LOCATION</td>
</tr>
<tr>
<td>-----------</td>
<td>------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>15</td>
<td>Two (2) air conditioning units observed in the Shared Garage/Sallyport contain R-22 refrigerant.</td>
</tr>
<tr>
<td>16</td>
<td>Refrigerator observed in the Garage Area adjacent to the Tactical Training Area (1st Floor) contains R-12 refrigerant.</td>
</tr>
<tr>
<td>PHOTO NO.</td>
<td>MATERIAL DESCRIPTION &amp; LOCATION</td>
</tr>
<tr>
<td>-----------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>17</td>
<td>Portable air conditioning unit observed in the Garage Area adjacent to the Tactical Training Area (1st Floor) contains R-22 refrigerant.</td>
</tr>
<tr>
<td>18</td>
<td>Refrigerator observed in the northeast office area of the 22 Division building (1st Floor) contains R-12 refrigerant.</td>
</tr>
<tr>
<td>PHOTO NO.</td>
<td>MATERIAL DESCRIPTION &amp; LOCATION</td>
</tr>
<tr>
<td>-----------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>19</td>
<td>Refrigerator observed in the kitchenette adjacent to the Former Finance Office (2nd Floor) contains R-12 refrigerant.</td>
</tr>
<tr>
<td>20</td>
<td>Vending machine observed adjacent to the Lunch Room in the Communications Area (2nd Floor) contains R-12 refrigerant.</td>
</tr>
<tr>
<td>PHOTO NO.</td>
<td>MATERIAL DESCRIPTION &amp; LOCATION</td>
</tr>
<tr>
<td>-----------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>21</td>
<td>Representative photo of thermostats containing mercury observed in select areas throughout the building.</td>
</tr>
<tr>
<td>22</td>
<td>Representative photo of smoke detectors containing radioactive materials observed throughout the building.</td>
</tr>
<tr>
<td>PHOTO NO.</td>
<td>MATERIAL DESCRIPTION &amp; LOCATION</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>23</td>
<td>Water-damaged drywall was observed in select areas throughout the northeast office area on the 1st floor of the 22 Division building.</td>
</tr>
<tr>
<td>24</td>
<td>Representative photo of water-stained ceiling tiles observed in select areas throughout the building.</td>
</tr>
<tr>
<td>PHOTO NO.</td>
<td>MATERIAL DESCRIPTION &amp; LOCATION</td>
</tr>
<tr>
<td>----------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>25</td>
<td>Representative photo of the two (2) above ground storage tanks observed in the Generator Room in the basement of the building.</td>
</tr>
<tr>
<td>26</td>
<td>Sky blue door frame paint observed on the exterior of the building contains lead (Pb-16).</td>
</tr>
<tr>
<td>PHOTO NO.</td>
<td>MATERIAL DESCRIPTION &amp; LOCATION</td>
</tr>
<tr>
<td>-----------</td>
<td>---------------------------------</td>
</tr>
<tr>
<td>27</td>
<td>Grey door paint observed on the exterior of the building contains lead (Pb-17).</td>
</tr>
</tbody>
</table>
APPENDIX C

EVALUATION CRITERIA
A description of the criteria used in evaluating the condition, accessibility and exposure risk of asbestos-containing materials (ACM) is provided below.

**Assessment of Condition**

**Spray-Applied Fireproofing, Insulation and Textured Finishes**

In evaluating the condition of ACM spray applied as fireproofing, thermal insulation or texture, decorative or acoustic finishes, the following criteria apply:

**Good**
Surface of material shows no significant signs of damage, deterioration or delamination. Up to one percent visible damage to surface is allowed within range of GOOD. Evaluation of sprayed fireproofing requires the Assessor to be familiar with the irregular surface texture typical of sprayed asbestos products. GOOD condition includes unencapsulated or unpainted fireproofing or texture finishes, where no delamination or damage is observed, and encapsulated fireproofing or texture finishes where the encapsulation has been applied after the damage or fallout occurred.

**Poor**
Sprayed materials show signs of damage, delamination or deterioration. More than one percent damage to surface of ACM spray.

In observation areas, where damage exists in isolated locations, both GOOD and POOR condition may be reported. The extent or percentage of each condition will be recorded on the Assessor reassessment form.

FAIR condition is not utilized or considered as a valid criterion in the evaluation of sprayed fireproofing, sprayed insulation, or texture coat finishes.

The evaluation of ACM spray applied as fireproofing, non-mechanical thermal insulation, or texture, decorative or acoustic finishes which are present above ceilings, may be limited by the number of observations made, and by building components such as ducts or full height walls that obstruct the above ceiling observations. Persons entering the ceiling area are advised to be watchful for ACM DEBRIS prior to accessing or working above ceilings in areas of building with ACM, regardless of the reported condition.

**Other ACM**

In evaluating the condition of mechanical insulation (on boilers, breaching, ductwork, piping, tanks, equipment etc.) the following criteria are used:

**Good**
Insulation is completely covered in jacketing and exhibits no evidence of damage or deterioration. No insulation is exposed. Includes conditions where the jacketing has minor surface damage (i.e., scuffs or stains), but the jacketing is not penetrated.

**Fair**
Minor penetration damage to jacketed insulation (cuts, tears, nicks, deterioration or delamination) or undamaged insulation that has never been jacketed. Insulation is exposed but not showing surface disintegration. The extent of missing insulation ranges should be minor to none.

**Poor**
Original insulation jacket is missing, damaged, deteriorated or delaminated. Insulation is exposed and significant areas have been dislodged. Damage cannot be readily repaired. The evaluation of mechanical insulation may be limited by the number of observations made and building components such as ducts or full height walls that obstruct observations. In these circumstances, it is not possible to observe each foot of mechanical insulation from all angles.
Non-Friable and Potentially Friable Materials

Non-friable materials generally have little potential to release airborne fibres, even when damaged by mechanical breakage. However, some non-friable materials, i.e., exterior asbestos cement products, may have deteriorated so that the binder no longer effectively contains the asbestos fibres. In such cases of significantly deteriorated non-friable material, the material will be treated as a friable product.

Evaluation of Accessibility

The accessibility of building materials known or suspected of being ACM is rated according to the following criteria:

**Access (A)**
Areas of the building within reach of all building users. Includes areas such as gymnasiums, workshops, and storage areas where activities of the building users may result in disturbance of ACM not normally within reach from floor level.

**Access (B)**
Frequently entered maintenance areas within reach of maintenance staff, without the need for a ladder. Includes: frequently entered pipe chases, tunnels and service areas or areas within reach from a fixed ladder or catwalk, i.e., tops of equipment, mezzanines.

**Access (C) Exposed**
Areas of the building above 8’0” where use of a ladder is required to reach the ACM. Only refers to ACM materials that are exposed to view, from the floor or ladder, without removing or opening other building components such as ceiling tiles, or service access doors or hatches. Does not include infrequently accessed service areas of the building.

**Access (C) Concealed**
Areas of the building which require the removal of a building component, including lay-in ceilings and access panels into solid ceiling systems. Includes rarely entered crawl spaces, attic spaces, etc. Observations are limited to the extent visible from the access points.

**Access (D)**
Areas of the building behind inaccessible solid ceiling systems, walls, or mechanical equipment, etc. where demolition of the ceiling, wall or equipment, etc., is required to reach the ACM. Evaluation of the condition and extent of ACM is limited or impossible, depending on the Assessor’s ability to visually examine the materials in Access D.

Definition of Action Levels

Based on the results of the inspection and bulk sample analysis of samples collected and submitted for testing, recommendations were provided for compliance with regulation. These include assigned “Action Levels” to assist in the prioritization of corrective measures. The measures that are to be taken for each “Action Level” are described in full in the following table:

<table>
<thead>
<tr>
<th>Action Level</th>
<th>Required Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Action 1”</td>
<td>Immediate Clean-Up of Debris that is Likely to Be Disturbed</td>
</tr>
<tr>
<td></td>
<td>Restrict access that is likely to cause a disturbance of the ACM DEBRIS and clean up ACM DEBRIS immediately. Utilize correct asbestos procedures. This action is required for compliance with regulatory requirements. The surveyor will immediately notify the owner of this condition.</td>
</tr>
<tr>
<td>“Action 2”</td>
<td>Type 2 Precautions for Entry into Areas with ACM DEBRIS</td>
</tr>
<tr>
<td>------------</td>
<td>--------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>At locations where ACM DEBRIS can be isolated in lieu of removal or cleaned up, use appropriate means to limit entry to the area. Restrict access to the area to persons utilizing Type 2 asbestos precautions. The precautions will be required until the ACM DEBRIS has been cleaned up, and the source of the DEBRIS has been stabilized or removed.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>“Action 3”</th>
<th>ACM Removal Required for Compliance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Remove ACM for compliance with regulatory requirements. Utilize asbestos procedures appropriate to the scope of the removal work.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>“Action 4”</th>
<th>Type 2 Precautions for Access into Areas Where ACM is Present and Likely to be Disturbed by Access</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Use Type 2 asbestos precautions when entry or access into an area is likely to disturb the ACM. ACTION 4 must be used until the ACM is removed (Use ACTION 1 or 2 if DEBRIS is present).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>“Action 5”</th>
<th>Proactive ACM Removal</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Remove ACM in lieu of repair, or at locations where the presence of asbestos in GOOD condition is not desirable.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>“Action 6”</th>
<th>ACM Repair</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Repair ACM found in FAIR condition, and not likely to be damaged again or disturbed by normal use of the area or room. Upon completion of the repair work, treat ACM as material in GOOD condition and implement ACTION 7. If ACM is likely to be damaged or disturbed, during normal use of the area or room, implement ACTION 5.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>“Action 7”</th>
<th>Asbestos Management Program with Routine Surveillance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Implement an Asbestos Management Program, including routine surveillance of ACM. Trained workers or contractors must use appropriate asbestos precautions (Type 1, Type 2 or Type 3) during disturbance of the remaining ACM.</td>
</tr>
</tbody>
</table>
Accessibility: The terms easily accessible, less accessible, and inaccessible are used to describe the ease with which asbestos can be accessed by tenants, the public, employees and contractors in the building. **Easily accessible** indicates that ACM is visible from the floor and can be touched by building occupants, and therefore has a potential for significant damage. **Less accessible** indicates that ACM is not visible from the floor, or if it is visible, it is high enough not to be touched by building occupants, and has a potential for damage. **Inaccessible** indicates that ACM is located behind masonry, drywall, or other types of solid enclosures and is only accessible after destruction of the enclosure, and has a low potential for damage.

**ACM:** Asbestos-Containing Material. A material that contains greater than 0.5% asbestos by dry weight as per Ontario Regulation 278/05 and is used to refer to the vastly different types of such material.

**Amosite:** The technical name for ‘brown’ asbestos.

**AMP:** Asbestos Management Plan

**Asbestos:** A mineral fiber that can pollute air or water and cause cancer or asbestosis when inhaled.

**Asbestos Abatement:** Procedures to control fiber release from asbestos-containing materials in a building or to remove them entirely, including removal, encapsulation, repair, enclosure, encasement, and operations and maintenance programs.

**Asbestos Cement:** A hard product that contains up to 15% asbestos fibres which can be any of the three main types. This is a relatively safe material provided it remains intact as the cement binds the asbestos fibres; breakage will lead to fibre release. When used for roofing the risks to operatives are far greater from falls than asbestos exposure.

**Asbestos Control:** Minimizing the generation of airborne asbestos fibres until a permanent solution is developed.

**Asbestos Debris:** Pieces of an ACM that can be identified by color, texture, or composition, or means dust, if the dust is determined by an accredited inspector to be ACM.

**Asbestos Fibres:** Fibres with their length being greater than five microns (length to width ratio of 3:1), generated from an asbestos-containing material.

**BAS:** Building Asbestos Supervisor.

**Bulk Sample:** A sample of material such as boarding, insulation or debris taken by an accredited surveyor to be tested for asbestos fibre content by an accredited laboratory.

**Chrysotile:** The technical name for ‘white’ asbestos.

**Condition:** The condition of ACM is described using the designations: good, fair and poor. **Good** refers to ACM with no visible damage or deterioration, or showing only very limited damage or deterioration. **Fair** refers to ACM with some damage or deterioration (less than 10% of the material). **Poor** refer to ACM that is significantly damaged or deteriorated (at least 10% of the material).

**CRD:** Construction, Renovation and/or Demolition related activities.

**Crocidolite:** The technical name for ‘blue’ asbestos.

**Designated Substances Regulations:** A series of Regulations made by the Ministry of Labour under the Occupational Health and Safety Act. The regulations provide management protocols and guidelines to the following eleven substances: acrylonitrile, arsenic, asbestos, benzene, coke oven emissions, ethylene oxide, isocyanates, lead, mercury, silica and vinyl chloride.

**Demolition:** Complete dismantling or the complete or partial destruction of a building, structure, ship or plant such that it cannot be used in that form again.

**Friable ACM:** Any material that contains more than 0.5% asbestos by weight and can be crumbled, pulverized, or reduced to powder by the pressure of an ordinary human hand.

**HEPA Filter:** High Efficiency Particulate Air Filter.

**Homogeneous Area:** Defined by the US EPA as containing material that is uniform in texture and appearance, was installed at one time and is unlikely to consist of more than one type or formulation of material.
**Major Action**: All response actions requiring Type 3 ACM Removal Procedures, or Type 2 Removal Procedures involving the removal of friable ACM and provisions of an enclosure.

**Management Survey**: A survey carried out without disturbing any part of the fabric, components or finishes. Samples may be taken.

**MOL**: Ministry of Labour.

**O&M**: Operations and Maintenance Program.

**O. Reg.**: Ontario Regulations.

**Non-Friable ACM**: Any material that contains more than 0.5% asbestos by weight but cannot be pulverized under hand pressure.

**PACM**: Presumed Asbestos-Containing Materials. All thermal system insulation, surfacing material and asphalt/vinyl flooring in a building constructed prior to 1981 that has not been appropriately tested are presumed asbestos containing materials.

**PPE**: Personal Protective Equipment such as overalls, masks, gloves etc.

**Pre-Demolition Survey**: A survey similar to the Refurbishment Survey but also taking core samples from partitions, lifting floorboards and investigating back to the structure where possible.

**Refurbishment Survey**: A survey similar to the Management Survey but also involves entering into accessible ducts, suspended ceilings and other accessible voids. Samples are almost always taken.

**RPE**: Respiratory Protective Equipment. The different types of face masks worn appropriate to the risk. Where the risk assessment shows that the Control Limit will be exceeded RPE must be worn.

**Surveyor**: Any person who provides professional health and safety services relating to asbestos-containing construction material. The activities of a surveyor include building inspection, abatement project design, project administration, sample collection, preparation of asbestos management plans, clearance monitoring, and supervision of site surveillance technicians.

**Type 1**: Asbestos Abatement Operation with ACM as an operation described by O. Reg. 278/05 in subsection 12 (2), generally an operation that does not cause asbestos fibres to become airborne.

**Type 2**: Asbestos Abatement Operation with ACM as an operation described by O. Reg. 278/05 in subsection 12 (3), generally a major operation with limited scope of work.

**Type 3**: Asbestos Abatement Operation with ACM as an operation described by O. Reg. 278/05 in subsection 12 (4), generally a major operation.
Notes:
1. This drawing must be read in conjunction with associated report.
2. Drawings provided by the client.
3. Asbestos-containing materials may be present in inaccessible areas throughout the building.

Legend:
- Positive Asbestos Result
- Negative Asbestos Result
- Positive Lead Result
- Negative Lead Result
- Location of asbestos-containing Transite Pipes
- Location of asbestos-containing Vinyl Floor Tiles

Client: Peel Regional Police  
Project No.: 181-10995-00  
Drawing No.: 1

Drawn: JB  
Approved: EK  
Title: Basement Level - Sampling Locations

Date: July 2019  
Scale: NTS  
Project: Designated Substance & Hazardous Materials Survey 7750 Hurontario Street, Brampton, ON

Original Size: Letter  
Rev: N/A
Notes:
1. This drawing must be read in conjunction with associated report.
2. Drawings provided by the client.
3. Asbestos-containing materials may be present in inaccessible areas throughout the building.

Legend:
- Positive Asbestos Result
- Negative Asbestos Result
- Positive Lead Result
- Negative Lead Result
- Location of asbestos-containing Transite Pipes
- Location of asbestos-containing Vinyl Floor Tiles

<table>
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<tr>
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<th>Project No.: 181-10995-00</th>
<th>Drawing No.: 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drawn: JB</td>
<td>Approved: EK</td>
<td>Title: Ground Floor - Sampling Locations</td>
</tr>
<tr>
<td>Date: July 2019</td>
<td>Scale: NTS</td>
<td>Project: Designated Substance &amp; Hazardous Materials Survey</td>
</tr>
<tr>
<td>Original Size: Letter</td>
<td>Rev: N/A</td>
<td>7750 Hurontario Street, Brampton, ON</td>
</tr>
</tbody>
</table>
Notes:
1. This drawing must be read in conjunction with associated report.
2. Drawings provided by the client.
3. Asbestos-containing materials may be present in inaccessible areas throughout the building.

Legend:
- Positive Asbestos Result
- Negative Asbestos Result
- Positive Lead Result
- Negative Lead Result
- Location of asbestos-containing Transite Pipes
- Location of asbestos-containing Vinyl Floor Tiles
Notes:
1. This drawing must be read in conjunction with associated report.
2. Drawings provided by the client.
3. Asbestos-containing materials may be present in inaccessible areas throughout the building.

Legend:
- Positive Asbestos Result
- Negative Asbestos Result
- Positive Lead Result
- Negative Lead Result
- Location of asbestos-containing Transite Pipes
- Location of asbestos-containing Vinyl Floor Tiles

Client: Peel Regional Police
Project No.: 181-10995-00
Drawing No.: 4

Title: 3rd Floor - Sampling Locations
Project: Designated Substance & Hazardous Materials Survey
7750 Hurontario Street, Brampton, ON

Drawn: JB
Approved: EK
Date: July 2019
Scale: NTS
Original Size: Letter
Rev: N/A
GEOTECHNICAL INVESTIGATION
PROPOSED CONCRETE SLAB
FOR NEW AIR HANDLING UNITS

180 DERRY ROAD EAST, MISSISSAUGA, ONTARIO

PROJECT NO.: 191-09786-00
DATE: OCTOBER 10, 2019

WSP
51 CONSTELLATION COURT
TORONTO, ON, CANADA, M9W 1K4

WSP.COM
# TABLE OF CONTENTS

1. INTRODUCTION ................................................................. 1
2. REVIEW OF REGIONAL GEOLOGY ............................. 2
3. FIELD AND LABORATORY INVESTIGATIONS ........... 2
   3.1 GEOTECHNICAL BOREHOLES AND FIELD TESTING ... 2
   3.2 GEOTECHNICAL LABORATORY TESTING ..................... 3
4. SUBSURFACE CONDITIONS ......................................... 3
   4.1 GENERAL .............................................................................................................. 3
   4.2 SUBSURFACE SOIL LAYERS .............................................................................. 3
      4.2.1 TOPSOIL ............................................................................................................ 3
      4.2.2 FILL ....................................................................................................................... 3
      4.2.3 SILTY CLAY TILL ................................................................................................. 4
4.3 GROUNDWATER LEVELS .............................................................................. 4
5. DISCUSSIONS AND RECOMMENDATIONS ................... 5
   5.1 GENERAL ............................................................................................................... 5
   5.2 SLAB-ON-GRADE .............................................................................................. 5
      5.2.1 HELICAL PILES .................................................................................................... 5
   5.3 EXCAVATION AND BACKFILL ....................................................................... 6
      5.3.1 EXCAVATION .................................................................................................... 6
      5.3.2 BACKFILL .......................................................................................................... 6
   5.4 Retaining wall ................................................................................................. 6
      5.4.1 Retaining Wall Design ..................................................................................... 6
      5.4.2 Lateral Earth Pressures ................................................................................. 7
      5.4.3 Static Lateral Earth Pressure ........................................................................ 7
      5.4.4 Retaining Wall Foundation ........................................................................... 7
      5.4.5 Retaining Wall Backfill and Drainage ......................................................... 7
   5.5 EARTHQUAKE CONSIDERATIONS .............................................. 8
   5.6 MODULUS OF VERTICAL SUBGRADE REACTION ................... 8

APPENDIX 5.19
TABLES

TABLE 3-1: SUMMARY OF BOREHOLE INFORMATION ..................................2
TABLE 4-1: SUMMARY OF FILL MATERIALS AND DEPTHS ......................3
TABLE 5-1: RECOMMENDED UNFACTORED DESIGN PARAMETERS ..............6

DRAWINGS

DRAWING 1 – BOREHOLE LOCATION PLAN
DRAWING 2 – BOREHOLE CROSS SECTION

APPENDICES

A NOTES ON SAMPLE DESCRIPTIONS
    BOREHOLE LOGS (BH19-01 TO BH1-03)
B GRAIN SIZE DISTRIBUTION CURVES AND ATTERBERG LIMIT TEST RESULTS
C ENGINEERED FILL GUIDELINES
1 INTRODUCTION

WSP Canada Inc. (WSP) was retained by Peel Regional Police to undertake a geotechnical investigation associated with construction of a concrete slab to support new Air Handling Unit’s (AHU’s) at 180 Derry Road in Mississauga, Ontario.

The site is located at the south-west side of the Peel Regional Police office in close proximity to the junction of Derry Road and Edwards Boulevard.

It is understood that the proposed construction at the subject site will include the construction of a concrete slab on grade for support of new AHU’s.

The scope of the geotechnical investigation was to determine the subsurface conditions at the borehole locations, and provide geotechnical recommendations on the following:

1. Foundations
2. Settlement
3. Slab and permanent drainage
4. Excavations and backfill
5. Trenching and bedding
6. Retaining wall

The site investigation and recommendations follow generally accepted practice for geotechnical consultants in Ontario. The format and contents are guided by client specific needs and economics and do not conform to generalized standards for services. Laboratory testing for most part follows ASTM or CSA Standards or modifications of these standards that have become standard practice.

This report has been prepared for Peel Regional Police. Third party use of this report without WSP Canada Inc. written consent is prohibited.
2 REVIEW OF REGIONAL GEOLOGY

180 Derry Road, according to the Ontario Geological Survey Map P. 2204, lies within the physiographic region of Southern Ontario known as the Iroquois Plain (Chapman & Putnam, 2007).

During the last retreat of the Laurentide Ice Sheet (12,000 years B.P.) lake levels in what was to become Lake Ontario were much higher due to ice blockage in the St. Lawrence Waterway. This created the glacial Lake Iroquois which was up to 60 m higher in elevation in the Toronto area than current Lake Ontario water levels. The Iroquois Shoreline that coincided with this elevated lake, terminated north of the study site. The old shoreline is represented as the contact between the Iroquois Plain and the South Slope physiographic regions. The study area is typically dominated by glacial deposits.

The Regional Geology of the immediate area around the Site consists of shallow clay Halton till deposits overlying bedrock.

Bedrock of the region corresponds to the Upper Ordovician Georgian Bay Formation which consists of shale, limestone, dolostone, and siltstone. According to bedrock mapping performed by the Ontario Geological Survey, the upper bedrock contact is located at an approximate elevation of ±88 m ASL across the Site (Gao, 2006).

3 FIELD AND LABORATORY INVESTIGATIONS

3.1 GEOTECHNICAL BOREHOLES AND FIELD TESTING

A total of three (3) boreholes (BH19-01 to BH19-03) were drilled at the site as shown on the attached Drawing 1. A summary of the borehole data is presented in Table 3-1.

<table>
<thead>
<tr>
<th>Borehole</th>
<th>Northing</th>
<th>Easting</th>
<th>Approximate Ground Elevation (m)</th>
<th>Depth of Borehole (m)</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>NAD83, UTM Zone 17</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BH19-01</td>
<td>4833755.3</td>
<td>604821.6</td>
<td>199.6</td>
<td>2.4</td>
<td>Terminated at refusal</td>
</tr>
<tr>
<td>BH19-02</td>
<td>4833765.5</td>
<td>604829.5</td>
<td>199.5</td>
<td>1.8</td>
<td>Terminated at refusal</td>
</tr>
<tr>
<td>BH19-03</td>
<td>4833758.3</td>
<td>604835.6</td>
<td>201.7</td>
<td>8.2</td>
<td>Increased from 6 to 8m</td>
</tr>
</tbody>
</table>

Prior to drilling operations, underground utilities were cleared at the borehole locations.

The field investigation work was undertaken on August 12, 2019 by a drilling sub-contractor under the direction and supervision of WSP personnel. Borehole logging services were provided by the engineering staff of WSP. The boreholes were advanced with manual hand drilling at BH19-01 and BH19-02 and by power auger drilling machine equipped with solid stem augers at BH19-03. The soil stratigraphy was recorded by observing the quality and changes of augered materials which were retrieved from the boreholes, and by sampling the soils at regular intervals of depth using a 50 mm O.D. split spoon sampler, in accordance with the Standard Penetration Test (ASTM D 1586) method. This sampling method recovers samples from the soil strata, and the number of blows (SPT ‘N’-values) required to drive the sampler 0.3 m depth into the undisturbed soil gives an indication of the compactness condition or consistency of the sampled soil material. The SPT ‘N’ values are indicated on the borehole log sheets (Appendix A). Soil samples were visually classified in the field and later re-evaluated in our laboratory.
Groundwater conditions in the boreholes were observed during drilling. The boreholes were sealed in accordance with provincial regulations on completion.

### 3.2 GEOTECHNICAL LABORATORY TESTING

The soil samples were taken to WSP’s laboratory where they were re-examined. Representative soil samples were selected for geotechnical index testing. The testing program consisted of the measurement of the natural moisture content of all available soil samples, grain size analysis of two (2) selected samples and Atterberg limits tests of two (2) selected sample taken from the boreholes. The laboratory test results are enclosed in Figures 1 to 4 of Appendix B and are also summarized in the borehole log sheets.

### 4 SUBSURFACE CONDITIONS

#### 4.1 GENERAL

The borehole location plan is attached as Drawing 1. Notes on soil sample descriptions are presented in Appendix A. The subsurface conditions in the boreholes are presented on individual borehole logs (Appendix A).

The general subsurface soil profile, at the borehole locations, consist of topsoil, underlain subsequently by fill material, followed by native silty clay till. The details of the subsurface soil layers are summarized in the following sections.

#### 4.2 SUBSURFACE SOIL LAYERS

##### 4.2.1 TOPSOIL

All boreholes were drilled through a topsoil layer of approximately 100 mm to 110 mm in thickness.

##### 4.2.2 FILL

Underlying the topsoil, fill was encountered in all of the boreholes. The fill depths and the type of fill materials encountered in the individual boreholes are presented in Table 4-1 below.

<table>
<thead>
<tr>
<th>Borehole</th>
<th>Approximate Depth to Bottom of Fill (m)</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>BH19-01</td>
<td>1.4</td>
<td>Silty clay, some sand, trace organics</td>
</tr>
<tr>
<td>BH19-02</td>
<td>0.9</td>
<td>Clayey silt, sandy, trace organics</td>
</tr>
<tr>
<td>BH19-03</td>
<td>2.6</td>
<td>Silty clay, some sand, trace organics</td>
</tr>
</tbody>
</table>

SPT ‘N’ values in the fill material generally ranged from 2 to 12 blows per 300 mm of penetration, typically corresponding to soft to stiff consistency state. These SPT ‘N’ values suggest that the fill was uncontrolled – i.e. it was not compacted to any engineered standard at the time of placement.
Water contents in the fill samples ranged from 12% to 34%. The tested water content of fill samples is well above the soils optimum water content.

### 4.2.3 Silty Clay Till

Beneath the fill, a native soil deposit of silty clay till was encountered in all of the boreholes, at depths ranging from 0.9 to 2.6 mbgs. These boreholes were all terminated in the till deposit.

SPT ‘N’ values in the silty clay till deposit ranged from 17 to greater than 50 blows per 300 mm of penetration, corresponding to a very stiff to hard consistency. Auger grinding and split spoon bouncing were encountered during drilling in the silty clay till deposit within some boreholes suggesting that cobbles or bedrock slabs are found within this deposit.

Water contents in the silty clay till deposit ranged from 11% to 13%.

Two (2) representative silty clay till samples was tested for grain size analysis. The gradation curves are presented in Appendix B and summarized below:

- Gravel: 4-5%
- Sand: 23-32%
- Silt: 43-47%
- Clay: 20-26%

Two (2) representative silty clay till samples was tested for Atterberg Limits test. The test results are presented in Appendix B and summarized below:

- Liquid limit: 23-31%
- Plastic Limit: 13-16%
- Plasticity Index: 10-15

Based on the Unified Soil Classification System, the soil is classified as low plasticity silty clay/clay (CL).

### 4.3 Groundwater Levels

No monitoring wells were installed; however, short-term groundwater observations were made during drilling. All boreholes were noted to be dry upon completion of drilling.
5 DISCUSSIONS AND RECOMMENDATIONS

5.1 GENERAL

As described in Section 1, the purpose of this geotechnical investigation is to support construction of a proposed concrete slab on-grade to house air handling units located at municipal address 180 Derry Road in the city of Mississauga, Ontario.

The scope of the geotechnical investigation is to determine the subsurface conditions at the borehole locations, and provide geotechnical recommendations for foundations, excavation and backfill.

5.2 SLAB-ON-GRADE

The proposed AHU’s can be set on a slab on grade; however, there is a considerable thickness of poorly compacted fill soil existing in the proposed pad area that must first be removed and replaced with engineered fill.

Engineered fill used to support the slab on grade can be designed for bearing capacities of 150 kPa at SLS and 225 kPa at ULS can be used, provided all requirements listed in Appendix C are adhered to. Prior to the placement of the engineered fill, all of the existing fill (to elevations listed in the table above) and superficially softened native soils must be removed and the exposed surface proof rolled. Any soft spots revealed during proof rolling must be sub-excavated and re-engineered. The engineered fill consisting of approved inorganic material must be compacted to 100% Standard Proctor Maximum Dry Density throughout. To reduce the risk of improperly placed engineered compacted fill, full-time supervision of the contractor by WSP geotechnical personnel is essential.

The removal depths of the existing fill are expected to range from 1m to 2.6m below the existing grade.

In order to reduce the differential settlements between the footings on native soil and the footings on engineered fill, the engineered fill should consist of Granular B material compacted to 100% of Standard Proctor Maximum Dry Density (SPMDD). Reuse of the excavated fill is not recommended due to its high water content and presence of organic inclusions.

A moisture barrier consisting of at least 200 mm of 19 mm clear crushed stone should be installed under the grade supported slab.

It is recommended to design grade supported slabs as floating slabs independent of foundations and grade beams in order to reduce the effect of differential movements, if any, between slabs and other components. Unheated grade supported slabs should be insulated in order to reduce the frost heave. Contact this office for detailing of the extruded polystyrene insulation below and adjacent to the slab-on-grade.

A perimeter sub drainage system is recommended to intercept water from entering into the backfill zone.

5.2.1 HELICAL PILES

If there is insufficient space to open cut the slab area to remove all of the existing unstable fill, helical piles can be installed to support the structure. Helical piles consist of helical bearing plates attached to a central steel shaft that are screwed into the ground. The capacity of helical piles is generally lower than micropiles and helical piles cannot be installed into the bedrock and require competent soil to found in. Given this helical piles must be founded in the hard silty clay till. Helical pile capacities depend on the helical pile configurations. The design of helical piles is generally carried out by specialty foundation contractors. Typical capacities of helical piles range from 100 to 200 kN in compression. Helical pile capacities should be confirmed on-site through a full-scale load test.
5.3 EXCAVATION AND BACKFILL

5.3.1 EXCAVATION

Based on the field observed groundwater levels, no major dewatering will be required during temporary excavation and backfilling.

All excavations must be carried out in accordance with the most recent Occupational Health and Safety Act (OHSA). In accordance with OHSA, the very stiff to hard clayey silt till can be generally classified as Type 2 Soil above ground water level. The onsite fill material can be classified as Type 3 Soil.

On site assessment of excavation by qualified geotechnical engineer is required to confirm the OHSA soil classification and stability of excavation slopes.

The potential impact to nearby structures and utilities needs to be assessed for the excavation up to 2.6m below grade. The excavation base must be flat and stepped up in areas where fill is shallower.

5.3.2 BACKFILL

On-site soils are not recommended for structural engineered fill. Engineered fill under structures should consist of Granular B Type II material compacted to at least 98% of Standard Proctor Maximum Dry Density (SPMDD).

5.4 RETAINING WALL

It is understood that new retaining wall is proposed along the south and east sides of the proposed AHU slab. The retaining wall at the south and east side of the embankment will be founded below the base of the concrete slab at the approximate elevation of 198 masl.

5.4.1 RETAINING WALL DESIGN

The proposed permanent retaining wall must be designed in accordance with the 4th Edition of CFEM by CGS (2006). The required soil design parameters for the design of retaining walls are provided in section 5 above and Table 5-1 below.

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Silty Clay Till</th>
<th>Granular Engineered Fill (Granular A or B Type II)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active Earth Pressure Coefficient, $k_a$</td>
<td>0.33</td>
<td>0.3</td>
</tr>
<tr>
<td>At-Rest Earth Pressure Coefficient, $k_o$</td>
<td>0.5</td>
<td>0.46</td>
</tr>
<tr>
<td>Passive Earth Pressure Coefficient, $k_p$</td>
<td>3.0</td>
<td>3.4</td>
</tr>
</tbody>
</table>

The retaining wall design must include the stability analysis against bearing capacity, overturning, horizontal sliding, and global stability. The following minimum factor of safety (FS) are recommended:

- $FS \geq 3.0$ for bearing capacity
- $FS \geq 2.0$ for overturning stability
- $FS \geq 1.5$ for horizontal sliding and global stability
The stability checks have to be completed at the base of the wall and at each layer of reinforcing (tie backs or geogrid).

### 5.4.2 LATERAL EARTH PRESSURES

Lateral earth pressures will need to be considered in the design of the retaining wall.

### 5.4.3 STATIC LATERAL EARTH PRESSURE

The static lateral earth pressure \( p \) acting at depth \( h \) can be calculated from the following expression:

\[
p = K(\gamma h + q)
\]

where,

\[
p = \text{Lateral earth pressure in kPa acting at depth } h
\]

\[
K = \text{Earth pressure coefficient, as provided in Table 5-1 for vertical walls and horizontal backfill (a minimum value of 0.5 for at-rest pressure coefficient } K_0 \text{ was considered)}
\]

\[
\gamma = \text{Unit weight of backfill}
\]

\[
h = \text{Depth to point of interest in meters}
\]

\[
q = \text{Equivalent value of surcharge on the ground surface in kPa}
\]

The above expression assumes that a perimeter drainage system has been engineered and constructed which will prevent the build-up of any hydrostatic pressure behind the wall. Where no drainage is provided behind the wall, water pressure must be added to the above expression for lateral earth pressure.

### 5.4.4 RETAINING WALL FOUNDATION

Due to the presence of weak subsurface soils, the retaining wall is recommended to be supported on the silty clay till or engineered fill.

As the retaining wall will be supported on shallow foundations, ground improvement of any existing weak subgrade soil is required to limit settlements.

The geotechnical recommendations for pile foundations and preliminary comments on ground improvement are provided in Section 5.3 of this report.

### 5.4.5 RETAINING WALL BACKFILL AND DRAINAGE

Backfill behind retaining wall should consist of non-frost susceptible, free draining granular material (OPSS Granular ‘A’ or ‘B Type II’). The backfill material should be placed in 200 mm thick loose lifts and compacted to at least 95% SPMDD at a placement moisture content within ±2% of optimum. If road or other structures are to be supported on top of the backfill, the compaction should be at least 98% SPMDD.

Where the above-noted degree of compaction of backfill material cannot be achieved, lean mix concrete or unshrinkable fill may be considered for backfill.

Permanent drainage system along the base of retaining wall is required to prevent the build-up of hydrostatic pressure on the retaining wall. The drainage system must be placed above the foundation levels to reduce the potential loss of fines from the foundation soils. In addition, the drainage system must be enveloped with geotextile filter to prevent the fine soil particles from entering into the drainage system. The hydrostatic pressure on the retaining wall should be considered if it is not appropriately controlled by installing permanent drainage.
Extruded, exterior grade rigid polystyrene insulation, such as DOW HI 40, is required behind the face of the retaining wall in order to mitigate frost pressure acting on the wall as well as to prevent slab-on-grade heaving. As indicated in section 5.2, sub-slab insulation is also required.

### 5.5 EARTHQUAKE CONSIDERATIONS

Based on the borehole information, the site for the proposed building founded on native soils can be classified as ‘Class D’ for seismic site response according to Table 4.1.8.4.A of OBC 2012.

### 5.6 MODULUS OF VERTICAL SUBGRADE REACTION

For the preliminary design, the modulus of subgrade reaction can be taken as 4 MN/m³ for engineered fill for the construction of the concrete slab. As previously mentioned it is a requirement that all existing fills removed and replaced with compacted granular fills.
6 GENERAL COMMENTS AND LIMITATIONS OF REPORT

This report is intended solely for the Client named. The material in it reflects our best judgment considering the information available to WSP Canada Inc. at the time of preparation. Unless otherwise agreed in writing by WSP Canada Inc., it shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. No portion of this report may be used as a separate entity, it is written to be read in its entirety.

The conclusions and recommendations given in this report are based on the information determined at the test hole locations. The information contained herein in no way reflects on the environment aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the test holes may differ from those encountered at the test hole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. The benchmark and elevations used in this report are primarily to establish relative elevation differences between the test hole locations and should not be used for other purposes, such as grading, excavating, planning, development, etc.

The design recommendations given in this report are applicable only to the project described in the text and then only if constructed substantially in accordance with the details stated in this report.

The comments made in this report on potential construction problems and possible methods are intended only for the guidance of the designer. The number of test holes may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the information presented and draw their own conclusions as to how the subsurface conditions may affect their work. This work has been undertaken in accordance with normally accepted geotechnical engineering practices.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. WSP Canada Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.
7 CLOSURE

Thank you for the opportunity to be of service to you. Should you have any questions or require further clarification on any aspect of this report, please do not hesitate to contact this office.

SIGNATURES

Liam Gilmour, P.Eng.
Geotechnical Engineer

Scott Peaker, M.A.Sc., P.Eng.
Principal Professional
NOTES ON SAMPLE DESCRIPTIONS
BOREHOLE LOGS (BH19-01 TO BH1-03)
Notes on Sample Descriptions

1. All sample descriptions included in this report generally follow the Unified Soil Classification. Laboratory grain size analyses provided by 4Transit also follow the same system. Different classification systems may be used by others, such as the system by the International Society for Soil Mechanics and Foundation Engineering (ISSMFE). Please note that, with the exception of those samples where a grain size analysis and/or Atterberg Limits testing have been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

<table>
<thead>
<tr>
<th>ISSMFE SOIL CLASSIFICATION</th>
<th>CLAY (PLASTIC) TO</th>
<th>FINE</th>
<th>MEDIUM</th>
<th>COARSE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CLAY (PLASTIC) TO</td>
<td>FINE</td>
<td>MEDIUM</td>
<td>COARSE</td>
</tr>
<tr>
<td></td>
<td>SILT (NONPLASTIC)</td>
<td>FINE</td>
<td>MEDIUM</td>
<td>CRS.</td>
</tr>
<tr>
<td></td>
<td>SAND</td>
<td>FINE</td>
<td>MEDIUM</td>
<td>COARSE</td>
</tr>
<tr>
<td></td>
<td>GRAVEL</td>
<td>FINE</td>
<td>MEDIUM</td>
<td>COARSE</td>
</tr>
<tr>
<td></td>
<td>COBBLES</td>
<td>FINE</td>
<td>MEDIUM</td>
<td>COARSE</td>
</tr>
<tr>
<td></td>
<td>BOULDERS</td>
<td>FINE</td>
<td>MEDIUM</td>
<td>COARSE</td>
</tr>
</tbody>
</table>

2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advice of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional preliminary geotechnical site investigation.

3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.
Explanation of Terms Used in the Record of Boreholes

**Sample Type**

- AS Auger sample
- BS Block sample
- CS Chunk sample
- DO Drive open
- DS Dimension type sample
- FS Foil sample
- RC Rock core
- SC Soil core
- SS Spoon sample
- ST Slotted tube
- TO Thin-walled, open
- TP Thin-walled, piston
- WS Wash sample

**Penetration Resistance**

**Standard Penetration Resistance (SPT), N:**
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in) required to drive a 50 mm (2 in) drive open sampler for a distance of 300 mm (12 in).

**Dynamic Cone Penetration Resistance, N_d:**
The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in) to drive uncased a 50 mm (2 in) diameter, 60° cone attached to “A” size drill rods for a distance of 300 mm (12 in).

**Textural Classification of Soils**

**Classification**

- Boulders >300 mm
- Cobbles 75 mm-300 mm
- Gravel 4.75 mm-75 mm
- Sand 0.075 mm-4.75 mm
- Silt 0.002 mm-0.075 mm
- Clay <0.002 mm

**Terminology**

- Trace 0-10%
- Some 10-20%
- Adjective (e.g. silty or sandy) 20-40%
- And (e.g. sand and gravel) 40-60%

**Soil Description**

**a) Cohesive Soils**

<table>
<thead>
<tr>
<th>Consistency</th>
<th>Undrained Shear Strength (kPa)</th>
<th>SPT “N” Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very soft</td>
<td>&lt;12</td>
<td>0-2</td>
</tr>
<tr>
<td>Soft</td>
<td>12-25</td>
<td>2-4</td>
</tr>
<tr>
<td>Firm</td>
<td>25-50</td>
<td>4-8</td>
</tr>
<tr>
<td>Stiff</td>
<td>50-100</td>
<td>8-15</td>
</tr>
<tr>
<td>Very stiff</td>
<td>100-200</td>
<td>15-30</td>
</tr>
<tr>
<td>Hard</td>
<td>&gt;200</td>
<td>&gt;30</td>
</tr>
</tbody>
</table>

**b) Cohesionless Soils**

<table>
<thead>
<tr>
<th>Density Index (Relative Density)</th>
<th>SPT “N” Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very loose</td>
<td>&lt;4</td>
</tr>
<tr>
<td>Loose</td>
<td>4-10</td>
</tr>
<tr>
<td>Compact</td>
<td>10-30</td>
</tr>
<tr>
<td>Dense</td>
<td>30-50</td>
</tr>
<tr>
<td>Very dense</td>
<td>&gt;50</td>
</tr>
</tbody>
</table>

**Soil Tests**

- w Water content
- w p Plastic limit
- w l Liquid limit
- C Consolidation (oedometer) test
- CID Consolidated isotropically drained triaxial test
- CIU consolidated isotropically undrained triaxial test with porewater pressure measurement
- Ds Relative density (specific gravity, Gs)
- DS Direct shear test
- ENV Environmental/ chemical analysis
- M Sieve analysis for particle size
- MH Combined sieve and hydrometer (H) analysis
- MPC Modified proctor compaction test
- SPC Standard proctor compaction test
- OC Organic content test
- U Unconsolidated Undrained Triaxial Test
- V Field vane (LV-laboratory vane test)
- γ Unit weight
# LOG OF BOREHOLE BH19-1

**PROJECT:** Geotechnical Investigation - Slab Review  
**CLIENT:** Peel Police Station  
**PROJECT LOCATION:** 180 Derry Road, Mississauga, ON  
**DATUM:** Geodetic  
**BH LOCATION:** N 4833755.3 E 604821.5

**SOIL PROFILE**

<table>
<thead>
<tr>
<th>ELEV (m)</th>
<th>DESCRIPTION</th>
<th>STRATA PLOT</th>
<th>NUMBER</th>
<th>TYPE</th>
<th>ELEVATION</th>
<th>SOIL PROPERTIES</th>
<th>DYNAMIC CONE PENETRATION RESISTANCE PLOT</th>
<th>FIELD VANE &amp; SENSITIVITY</th>
<th>LAB VANE</th>
<th>WATER CONTENT (%)</th>
<th>NATURAL UNIT WT</th>
<th>REMARKS AND GRAIN SIZE DISTRIBUTION (%)</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>199.60</td>
<td>Ground Surface</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>198.23</td>
<td>TOPSOIL: 100mm</td>
<td></td>
<td>1</td>
<td>SS</td>
<td>2</td>
<td>199</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PID:0ppm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>197.16</td>
<td>FILL: silty clay, some sand, trace gravel, trace organics, dark brown to brown, moist, soft to stiff.</td>
<td>brown</td>
<td>2</td>
<td>SS</td>
<td>12</td>
<td>199</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PID:0ppm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.37</td>
<td>SILTY CLAY TILL: some sand to sandy, trace gravel, brown, moist, hard.</td>
<td>cobbles/boulders(inferred) greyish brown</td>
<td>3</td>
<td>SS</td>
<td>50</td>
<td>199</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PID:0ppm 5 ppm bouncing</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.44</td>
<td>END OF BOREHOLE</td>
<td></td>
<td>4</td>
<td>SS</td>
<td>50/50mm</td>
<td>199</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>PID:0ppm 5 ppm bouncing</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**PROJECT:** Geotechnical Investigation - Slab Review  
**CLIENT:** Peel Police Station  
**PROJECT LOCATION:** 180 Derry Road, Mississauga, ON  
**DATUM:** Geodetic  
**BH LOCATION:** N 4833755.3 E 604821.5

**GROUNDWATER CONDITIONS**

- **0.3 m**
- **N BLOWS**
- **DESCRIPTION**
- **GROUNDFORCE PENETRATION**
- **DYNAMIC CONE PENETRATION RESISTANCE PLOT**
- **FIELD VANE & SENSITIVITY**
- **LAB VANE**
- **WATER CONTENT (%)**
- **NATURAL UNIT WT**
- **REMARKS AND GRAIN SIZE DISTRIBUTION (%)**

**NOTES:**

1. Drilling method from manual hand drilling change to solid stem auger below 2.1m.
2. Borehole backfilled with bentonite upon completion.
## LOG OF BOREHOLE BH19-2

<table>
<thead>
<tr>
<th>ELEV (m)</th>
<th>DESCRIPTION</th>
<th>STRATA PLOT</th>
<th>SAMPLES</th>
<th>SOIL PROFILE</th>
<th>GROUND WATER CONDITIONS</th>
<th>DYNAMIC CONE PENETRATION RESISTANCE PLOT</th>
<th>SHEAR STRENGTH (kPa)</th>
<th>PLASTIC LIMIT</th>
<th>NATURAL MOISTURE CONTENT</th>
<th>LIQUID LIMIT</th>
<th>REMARKS AND GRAIN SIZE DISTRIBUTION (%)</th>
<th>GR</th>
<th>SA</th>
<th>SI</th>
<th>CL</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.10</td>
<td>TOPSOIL: 100mm</td>
<td></td>
<td>1 SS 6</td>
<td></td>
<td></td>
<td></td>
<td>20 40 60 80 100</td>
<td></td>
<td>o</td>
<td></td>
<td>PID:0ppm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.91</td>
<td>FILL: clayey silt, sandy,</td>
<td></td>
<td>2 SS 28</td>
<td></td>
<td></td>
<td></td>
<td>20 40 60 80 100</td>
<td></td>
<td>o</td>
<td></td>
<td>PID:0ppm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>trace gravel, brown, moist,</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>o</td>
<td></td>
<td>PID:0ppm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>very stiff</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>o</td>
<td></td>
<td>PID:0ppm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.83</td>
<td>END OF BOREHOLE</td>
<td></td>
<td>3 SS 59</td>
<td></td>
<td></td>
<td></td>
<td>20 40 60 80 100</td>
<td></td>
<td>o</td>
<td></td>
<td>PID:0ppm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Notes:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>o</td>
<td></td>
<td>PID:0ppm (spoon tip fall out)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
1) Borehole caved to 1.5m upon completion.
2) Borehole backfilled with bentonite upon completion.
PROJECT: Geotechnical Investigation - Slab Review
CLIENT: Peel Police Station
PROJECT LOCATION: 180 Derry Road, Mississauga, ON
DATUM: Geodetic
BH LOCATION: N 4833758.3 E 604835.6

TOPSOIL: 110mm
- FILL: silty clay, some sand, trace to some organics, trace gravel, dark brown, moist, soft to stiff.
  - trace organics, brown
  - contains sand seams

SILTY CLAY TILL: some sand to sandy, trace gravel, brown, moist, very stiff to hard.
- greyish brown
- brown

END OF BOREHOLE
Note: 1) Borehole backfilled with bentonite upon completion.

GROUNDWATER CONDITIONS

Graph Notes: +/− x3: Numbers refer to Sensitivity; 0=3% Strain at Failure
APPENDIX

B

GRAIN SIZE DISTRIBUTION CURVES AND ATTERBERG LIMIT TEST RESULTS
### Particle Size Distribution Report

#### GRAIN SIZE - mm.

<table>
<thead>
<tr>
<th>% +3&quot;</th>
<th>% Gravel</th>
<th>% Sand</th>
<th>% Fines</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coarse</td>
<td>Fine</td>
<td>Coarse</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>

#### SIEVE SIZE | PERCENT FINER | SPEC. * PERCENT | PASS? (X=NO) |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>16.00</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.20</td>
<td>99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.50</td>
<td>98</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.75</td>
<td>95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00</td>
<td>89</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.85</td>
<td>85</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.425</td>
<td>81</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.250</td>
<td>77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.150</td>
<td>71</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.106</td>
<td>67</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.075</td>
<td>63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0406 mm.</td>
<td>55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0292 mm.</td>
<td>51</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0190 mm.</td>
<td>46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0112 mm.</td>
<td>39</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0081 mm.</td>
<td>35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0058 mm.</td>
<td>31</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0029 mm.</td>
<td>23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0012 mm.</td>
<td>18</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*(no specification provided)*

**Soil Description**

**Atterberg Limits**
- PL = 13
- LL = 23
- PI = 10

**Coefficients**
- D90 = 2.4025
- D85 = 0.8973
- D60 = 0.0600
- D50 = 0.0265
- D30 = 0.0053
- D10 = 0.0081
- Cb =
- Cc =

**Classification**
- USCS = CL
- AASHTO = A-4(3)

**Remarks**

**Source of Sample:** Site Drilling_R1230  **Depth:** 20 - 22 ft

**Sample Number:** 19-3_SS9  **Date:** Aug. 16, 2019

**Client:** Peel Region Police  **Project:** 180 Derry Road East

**Project No:** 191-09786-00  **Figure:** 19-3_SS9

**Tested By:** Bruce Shan
Particle Size Distribution Report

<table>
<thead>
<tr>
<th>SIEVE SIZE</th>
<th>PERCENT FINER</th>
<th>SPEC.* PERCENT</th>
<th>PASS? (X=NO)</th>
</tr>
</thead>
<tbody>
<tr>
<td>13.20</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.50</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.75</td>
<td>96</td>
<td></td>
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</tr>
<tr>
<td>2.00</td>
<td>90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.85</td>
<td>86</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.425</td>
<td>83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.250</td>
<td>81</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.150</td>
<td>78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.106</td>
<td>75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.075</td>
<td>73</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0379 mm.</td>
<td>69</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0273 mm.</td>
<td>66</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0178 mm.</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0107 mm.</td>
<td>52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0077 mm.</td>
<td>47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0056 mm.</td>
<td>41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0028 mm.</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0012 mm.</td>
<td>21</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* (no specification provided)

Soil Description

Atterberg Limits

PL= 16
LL= 31
Pl= 15

Coefficients

D90= 2.0928
D85= 0.6007
D60= 0.0180
D30= 0.0028
D15= Cw
C15= Cc

Classification

USCS= CL
AASHTO= A-6(9)

Remarks

Source of Sample: Site Drilling_R1230
Sample Number: 19-1_SS4
Depth: 6 - 7 ft
Date: Aug. 16, 2019

Client: Peel Region Police
Project: 180 Derry Road East
Project No: 191-09786-00
Figure 19-1_SS4

Tested By: Bruce Shan
<table>
<thead>
<tr>
<th>MATERIAL DESCRIPTION</th>
<th>LL</th>
<th>PL</th>
<th>PI</th>
<th>%&lt;#40</th>
<th>%&lt;#200</th>
<th>USCS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>23</td>
<td>13</td>
<td>10</td>
<td>81</td>
<td>63</td>
<td>CL</td>
</tr>
</tbody>
</table>

**Project No.:** 191-09786  **Client:** Peel Region Police  
**Project:** 180 Derry Road East  
**Source of Sample:** Site Drilling_R1230  
**Depth:** 20 - 22 ft  
**Sample Number:** 19-3_SS9  

**Remarks:**  
**Tested By:** LXQ
**LIQUID AND PLASTIC LIMITS TEST REPORT**

![Graph showing liquid and plastic limits](image)

**Dashed line indicates the approximate upper limit boundary for natural soils**

---

### MATERIAL DESCRIPTION

<table>
<thead>
<tr>
<th>MATERIAL DESCRIPTION</th>
<th>LL</th>
<th>PL</th>
<th>PI</th>
<th>%&lt;#40</th>
<th>%&lt;#200</th>
<th>USCS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>31</td>
<td>16</td>
<td>15</td>
<td>83</td>
<td>73</td>
<td>CL</td>
</tr>
</tbody>
</table>

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**Project No.:** 191-09786-  **Client:** Peel Region Police  
**Project:** 180 Derry Road East  
**Source of Sample:** Site Drilling_R1230  
**Depth:** 6 - 7 ft  
**Sample Number:** 19-1_SS4  
**Remarks:**

---

**Tested By:** LXQ

---

**APPENDIX 5.19**
GENERAL REQUIREMENTS FOR ENGINEERED FILL

Compacted imported soil that meets specific engineering requirements and is free of organics and debris and that has been continually monitored on a full-time basis by a qualified geotechnical representative is classified as engineered fill. Engineered fill that meets these requirements and is bearing on suitable native subsoil can be used for the support of foundations.

Imported soil used as engineered fill can be removed from other portions of a site or can be brought in from other sites. In general, most of Ontario soils are too wet to achieve the 100% Standard Proctor Maximum Dry Density (SPMDD) and will require drying and careful site management if they are to be considered for engineered fill. Imported non-cohesive granular soil is preferred for all engineered fill. For engineered fill, we recommend use of OPSS Granular ‘B’ sand and gravel fill material.

Adverse weather conditions such as rain make the placement of engineered fill to the required degree of density difficult or impossible; engineered fill cannot be placed during freezing conditions, i.e. normally not between December 15 and April 1 of each year.

The location of the foundations on the engineered fill pad is critical and certification by a qualified surveyor that the foundations are within the stipulated boundaries is mandatory. Since layout stakes are often damaged or removed during fill placement, offset stakes must be installed and maintained by the surveyors during the course of fill placement so that the contractor and engineering staff are continually aware of where the engineered fill limits lie. Excavations within the engineered fill pad must be backfilled with the same conditions and quality control as the original pad.

To perform satisfactorily, engineered fill requires the cooperation of the designers, engineers, contractors and all parties must be aware of the requirements. The minimum requirements are as follows, however, the geotechnical report must be reviewed for specific information and requirements.

1. Prior to site work involving engineered fill, a site meeting to discuss all aspects must be convened. The surveyor, contractor, design engineer and geotechnical engineer must attend the meeting. At this meeting, the limits of the engineered fill will be defined. The contractor must make known where all fill material will be obtained from and samples must be provided to the geotechnical engineer for review, and approval before filling begins.

2. Detailed drawings indicating the lower boundaries as well as the upper boundaries of the engineered fill must be available at the site meeting and be approved by the geotechnical engineer.

3. The building footprint and base of the pad, including basements, garages, etc. must be defined by offset stakes that remain in place until the footings and service connections are all constructed. Confirmation that the footings are within the pad, service lines are in place, and that the grade conforms to drawings, must be obtained by the owner in writing from the surveyor and WSP. Without this confirmation no responsibility for the performance of the structure can be accepted by WSP. Survey drawing of the pre and post fill location and elevations will also be required.

4. The area must be stripped of all topsoil and fill materials. Subgrade must be proof-rolled. Soft spots must be dug out. The stripped native subgrade must be examined and approved by a WSP engineer prior to placement of fill.
5. The approved engineered fill material must be compacted to 100% Standard Proctor Maximum Dry Density throughout. Engineered fill should not be placed during the winter months. Engineered fill compacted to 100% SPMDD will settle under its own weight approximately 0.5% of the fill height and the structural engineer must be aware of this settlement. In addition to the settlement of the fill, additional settlement due to consolidation of the underlying soils from the structural and fill loads will occur and should be evaluated prior to placing the fill.

6. Full-time geotechnical inspection by WSP during placement of engineered fill is required. Work cannot commence or continue without the presence of the WSP representative.

7. The fill must be placed such that the specified geometry is achieved. Refer to the attached sketches for minimum requirements. Take careful note that the projection of the compacted pad beyond the footing at footing level is a minimum of 2 m. The base of the compacted pad extends 2 m plus the depth of excavation beyond the edge of the footing.

8. A bearing capacity of 150 kPa at SLS (225 kPa at ULS) can be used provided that all conditions outlined above are adhered to. A minimum footing width of 500 mm (20 inches) is suggested and footings must be provided with nominal steel reinforcement.

9. All excavations must be done in accordance with the Occupational Health and Safety Regulations of Ontario.

10. After completion of the engineered fill pad a second contractor may be selected to install footings. The prepared footing bases must be evaluated by engineering staff from WSP prior to footing concrete placements. All excavations must be backfilled under full time supervision by WSP. to the same degree as the engineered fill pad. Surface water cannot be allowed to pond in excavations or to be trapped in clear stone backfill. Clear stone backfill can only be used with the approval of WSP.

11. After completion of compaction, the surface of the engineered fill pad must be protected from disturbance from traffic, rain and frost. During the course of fill placement, the engineered fill must be smooth-graded, proof-rolled and sloped/crowned at the end of each day, prior to weekends and any stoppage in work in order to promote rapid runoff of rainwater and to avoid any ponding surface water. Any stockpiles of fill intended for use as engineered fill must also be smooth-bladed to promote runoff and/or protected from excessive moisture take up.

12. If there is a delay in construction, the engineered fill pad must be inspected and accepted by the geotechnical engineer. The location of the structure must be reconfirmed that it remains within the pad.

13. The geometry of the engineered fill as illustrated in these General Requirements is general in nature. Each project will have its own unique requirements. For example, if perimeter sidewalks are to be constructed around the building, then the projection of the engineered fill beyond the foundation wall may need to be greater.

14. These guidelines are to be read in conjunction with WSP report attached.
* Backfill in this area to be as per the WSP report.