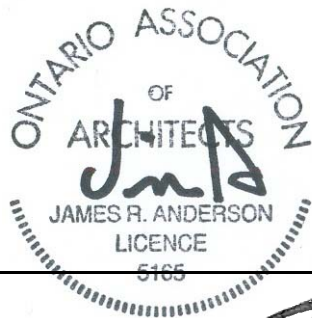


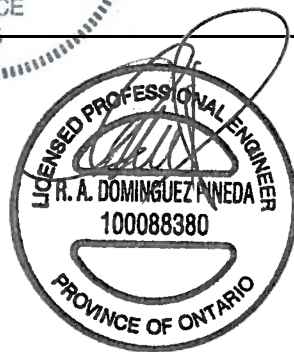
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   457 RICHMOND STREET  
   LONDON, ONTARIO  
   6TH FLOOR TENANT RELOCATION & OFFICE FIT UP

PROJECT NUMBER                      R.079143.042

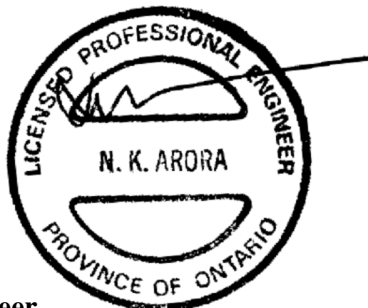
PROJECT DATE                          2016-09-02



Architect



Mechanical Engineer



Electrical Engineer

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**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section 02 81 16 – Hazardous Materials

**1.2 DEFINITIONS**

- .1 Hazardous Materials Information: Information prepared by a specialist consultant hired directly by the Departmental Representative, and is included as information documents related to Project and identified in the Appendices as such, and only as specifically referenced in the Appendices.
- .2 Contract Documents: All documents and information of any type and in any form, specifically prepared for use of Contract and as defined in Contractor's Agreement Form.

**1.3 ADMINISTRATIVE REQUIREMENTS**

- .1 Status of Hazardous Materials Information: Hazardous Materials Information identified in the Appendices; or any part thereof, are not part of Contract Documents prepared by the Departmental Representative and are made available to Bidder for the purpose of providing Bidder with access to information available to Departmental Representative under the following conditions:
  - .1 Hazardous Materials Information shall not be considered a representation or warranty that information contained therein is accurate, complete, or appropriate.
  - .2 Bidder shall interpret and draw conclusions about Hazardous Materials Information and are encouraged to obtain specialist advice with regards to this information.
  - .3 Departmental Representative assumes no responsibility for such interpretations and conclusions.
  - .4 Information contained in Hazardous Materials Information may be time sensitive and dates shall be considered when interpreting Hazardous Materials Report.
  - .5 Bidder may rely upon data contained in Hazardous Materials Report; or parts thereof, which are specifically incorporated into Contract Documents by means of copying, transcribing or referencing, but shall draw their own conclusions from such data and shall not rely on opinions or interpretations contained therein.
- .2 Asbestos Product Survey: An Asbestos Product Survey was prepared for this project and is attached as an Appendix, but is not incorporated into the Contract Documents:
  - .1 Title: ASBESTOS PRODUCT SURVEY, REASSESSMENT 2011, GOVERNMENT OF CANADA BUILDING, 457 Richmond Street, London, Ontario, Complex #500249
  - .2 Report File Number: 11-5577
  - .3 Preparation Date: December 7, 2011
  - .4 Prepared By: Exp
  - .5 Number of Pages: 154
- .3 Designated Substances Assessment: A Designated Substances Assessment was prepared for this project and is attached as an Appendices, but is not incorporated into the Contract Documents:

- .1 Title: DESIGNATED SUBSTANCES ASSESSMENT, GOVERNMENT OF CANADA BUILDING, 457 Richmond Street, London, Ontario, Building #5520114
- .2 Report File Number: 12-030
- .3 Preparation Date: December 20th, 2012
- .4 Prepared By: OH Solutions Inc.
- .5 Number of Pages: 29
- .4 Direct inquiries during Bid period to person identified within the Contracting Authority to receive inquiries; the Departmental Representative will not accept direct enquiries with regards to hazardous materials removal.

**Part 2 Products**

**2.1 USE OF HAZARDOUS MATERIALS INFORMATION**

- .1 Information presented in the Hazardous Materials Information was commissioned by the Departmental Representative; recommendations contained in the Hazardous Materials Information were used by the Departmental Representative to assess relative risk of exposure to hazardous materials and the level of involvement of all parties contributing to the Contract Documents.
- .2 Information contained in the Hazardous Materials Information may be useful to the Contractor, and is made available for review with no implied or express warranty from the Departmental Representative as to the accuracy or completeness of this Document.

**Part 3 Execution**

**3.1 HAZARDOUS MATERIALS INFORMATION**

- .1 A copy of the Hazardous Materials Information is included in the Appendix.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 SECTION INCLUDES**

- .1 Title and description of Work.
- .2 Contract Method.
- .3 Contractor use of premises.
- .4 Phasing
- .5 Owner occupancy.
- .6 Owner furnished items.
- .7 Alterations to existing building.

**1.2 PRECEDENCE**

- .1 For Federal Government projects, Division 01 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

**1.3 RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.

**1.4 WORK COVERED BY CONTRACT DOCUMENTS**

- .1 Work of this Contract comprises interior renovation of existing 6<sup>th</sup> floor office space located at 457 Richmond Street, London, Ontario N6A 3E3.

**1.5 CONTRACT METHOD**

- .1 Construct work under lump sum contract.
- .2 Relations and responsibilities between Contractor and subcontractors as defined in Conditions of Contract. Assigned Subcontractors must, in addition:
  - .1 Furnish to Contractor, bonds covering faithful performance of subcontracted work and payment of obligations thereunder when Contractor is required to furnish such bonds to Departmental Representative.
  - .2 Purchase and maintain liability insurance to protect Contractor from claims for not less than limits of liability which Contractor is required to provide to Departmental Representative.

**1.6 COST BREAKDOWN**

- .1 Within 48 hours of notification of acceptance of bid furnish a cost breakdown by Section aggregating contract amount.
  - .2 Show separately cost of equipment purchased exempt from Ontario Retail Sales Tax under your Ontario Sales Tax license number.
  - .3 Within 48 hours of acceptance of bid submit a list of subcontractors.
-

## **1.7 WORK SEQUENCE**

- .1 Contractor shall prepare a proposed phasing plan based on proposed Work Sequence Plan indicated below:
  - .1 Submit proposed phasing plan in accordance with Section 01 32 16.
- .2 Project comprises two (2) phases of Work that include, but are not limited to, the following:
  - .1 Phase 1: East Phase – noted by Drawing Number Suffix “EAST,” to be completed prior to commencement of Phase 2.
  - .2 Phase 2: West Phase – noted by Drawing Number Suffix “WEST,” to begin upon completion of Phase 1.
- .3 Allow for five (5) days decanting time between phases for user group occupying the West Phase site to relocate and occupy the completed East Phase site.

## **1.8 WORK BY OTHERS**

- .1 The Contractor shall for the purpose of the Ontario Occupational Health and Safety Act and Regulations for Construction Projects, and for the duration of the Work of the Contract:
  - .1 Assume the role of Constructor in accordance with the Authority Having Jurisdictions.
  - .2 Agree, in the event of two or more Contractors working at the same time and space at the work site, without limiting the General Conditions GC3.7, to the Departmental Representative's order to:
    - .1 Assume, as the Constructor, the responsibility for the Departmental Representative's other Contractors;

## **1.9 CONTRACTOR USE OF PREMISES**

- .1 Contractor shall limit use of premises for Work, for storage, and for access, to allow;
  - .1 Partial owner occupancy of the remainder of the building.
  - .2 Public usage.
- .2 Coordinate use of premises under direction of Departmental Representative.
- .3 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.

## **1.10 OWNER OCCUPANCY**

- .1 Owner will occupy remainder of building outside of area of the Work as indicated on Drawings during entire construction period for execution of normal operations.
- .2 Cooperate with Departmental Representative in scheduling operations to minimize conflict and to facilitate Owner usage.

## **1.11 OWNER FURNISHED ITEMS**

- .1 Owner Responsibilities:
-

- .1 Arrange for delivery of shop drawings, product data, samples, manufacturer's instructions, and certificates to Contractor.
- .2 Deliver supplier's bill of materials to Contractor.
- .3 Arrange and pay for delivery to site in accordance with Progress Schedule.
- .4 Inspect deliveries jointly with Contractor.
- .5 Submit claims for transportation damage.
- .6 Arrange for replacement of damaged, defective or missing items.
- .7 Arrange for manufacturer's field services; arrange for and deliver manufacturer's warranties and bonds to Contractor.
- .2 Contractor Responsibilities:
  - .1 Designate submittals and delivery date for each product in progress schedule.
  - .2 Review shop drawings, product data, samples, and other submittals. Submit to Departmental Representative notification of any observed discrepancies or problems anticipated due to non-conformance with Contract Documents.
  - .3 Receive and unload products at site.
  - .4 Inspect deliveries jointly with Departmental Representative; record shortages, and damaged or defective items.
  - .5 Handle products at site, including uncrating and storage.
  - .6 Protect products from damage, and from exposure to elements.
  - .7 Assemble, install, connect, adjust, and finish products.
  - .8 Provide installation inspections required by public authorities.
  - .9 Repair or replace items damaged by Contractor or subcontractor on site (under his control).
- .3 Schedule of Owner furnished items.
  - .1 Office Furniture.

## **1.12 ALTERATIONS TO EXISTING BUILDING**

- .1 457 Richmond Street is a recognized Heritage Building. All construction activities must be managed, sequenced, planned and executed in order to ensure the preservation of its specific characteristics as indicated.
  - .2 Perform work in accordance with established procedures in The Standards and Guidelines for the Conservation of Historic Places in Canada, published by Parks Canada.
  - .3 Remove and recycle, compost, anaerobic digest, sell material for reuse or dispose of:
    - .1 All demolition waste resulting from demolition activities as indicated on Drawings that are not designated for reinstallation or turnover to Departmental Representative in accordance with Section 01 74 20.
  - .4 Provide new openings required in existing construction.
  - .5 Block in openings where items removed with material and finish to match existing adjoining construction.
-

**Part 2 PRODUCTS**

**2.1 NOT USED**

.1 Not used.

**Part 3 EXECUTION**

**3.1 NOT USED**

.1 Not used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 ACCESS AND EGRESS**

- .1 Design, construct and maintain temporary "access to" and "egress from" work areas, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

**1.2 USE OF SITE AND FACILITIES**

- .1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.
- .2 Maintain existing services to building and provide for personnel and vehicle access.
- .3 Where security is reduced by work provide temporary means to maintain security.
- .4 Departmental Representative will assign sanitary facilities for use by Contractor's personnel. Keep facilities clean.
- .5 Use only freight elevators existing in building for moving workers and material.
  - .1 Accept liability for damage, safety of equipment and overloading of existing equipment.
- .6 Closures: protect work temporarily until permanent enclosures are completed.

**1.3 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING**

- .1 Execute work with least possible interference or disturbance to building operations, occupants, public and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.

**1.4 EXISTING SERVICES**

- .1 Notify, Departmental Representative utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.
- .3 Provide for pedestrian and vehicular traffic.
- .4 Construct barriers in accordance with Section 01 56 00.

**1.5 SPECIAL REQUIREMENTS**

- .1 Paint and carpet public or Departmental Representative occupied areas Monday to Friday from 18:00 to 07:00 hours only and on Saturdays, Sundays, and statutory holidays.
  - .2 Carry out noise generating Work Monday to Friday from 18:00 to 07:00 hours and on Saturdays, Sundays, and statutory holidays.
-

- .3 Submit schedule in accordance with Section 01 32 16; submit changes to schedule 72 hours or greater for Departmental Representative approval.
- .4 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .5 Keep within limits of work and avenues of ingress and egress.
- .6 Ingress and egress of Contractor vehicles at site is limited to outside of peak traffic hours 17:00 to 07:00 and 13:00 to 15:00 unless otherwise approved by Departmental Representative.
- .7 Deliver materials outside of peak traffic hours 17:00 to 07:00 and 13:00 to 15:00 unless otherwise approved by Departmental Representative.
- .8 Prior to cutting or drilling horizontal or vertical surfaces including concrete, concrete block or other structural substrate, determine location of reinforcing, service lines, pipes, conduits or other items by x-ray, ground penetrating radar or other appropriate method. Submit findings to Departmental Representative prior to cutting or drilling.

## 1.6 SECURITY

- .1 Where security has been reduced by Work of Contract, provide temporary means to maintain security.
- .2 Security clearances:
  - .1 Obtain requisite clearance subject to validation from Departmental Representative's security services, as instructed, for each individual required to enter premises.
  - .2 Personnel will be checked daily at start of work shift and provided with pass which must be worn at all times. Pass must be returned at end of work shift and personnel checked out.
- .3 Security escort:
  - .1 Personnel employed on this project must be escorted when executing work in non-public areas during normal working hours. Personnel must be escorted in all areas after normal working hours.
  - .2 Submit an escort request to Departmental Representative at least 14 days before service is needed. For requests submitted within time noted above, costs of security escort will be paid for by Departmental Representative. Cost incurred by late request will be Contractor's responsibility.
  - .3 Any escort request may be cancelled free of charge if notification of cancellation is given at least 48 hours before scheduled time of escort. Cost incurred by late request will be Contractor's responsibility.
  - .4 Calculation of costs will be based on average hourly rate of security officer for minimum of 8 hours per day for late service request and of 24 hours for late cancellations.

## 1.7 BUILDING SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions. Smoking is not permitted.

**Part 2 PRODUCTS**

**2.1 NOT USED**

.1 Not Used.

**Part 3 EXECUTION**

**3.1 NOT USED**

.1 Not Used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 ADMINISTRATIVE**

- .1 Schedule and administer project meetings throughout the progress of the work at the call of Departmental Representative.
- .2 Prepare agenda for meetings.
- .3 Distribute written notice of each meeting 4 days in advance of meeting date to Departmental Representative.
- .4 Provide physical space and make arrangements for meetings.
- .5 Preside at meetings.
- .6 Reproduce and distribute copies of minutes within three days after meetings and transmit to Departmental Representative, meeting participants and affected parties not in attendance.
- .7 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

**1.2 PRECONSTRUCTION MEETING**

- .1 Within 15 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Departmental Representative, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.
- .3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.
- .4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .5 Agenda to include:
  - .1 Appointment of official representative of participants in the Work.
  - .2 Schedule of Work: in accordance with Section 01 32 16.
  - .3 Schedule of submission of shop drawings, samples, mock-ups, colour chips. Submit submittals in accordance with Section 01 33 00.
  - .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00.
  - .5 Site security in accordance with Section 01 56 00.
  - .6 Health and safety in accordance with Section 01 35 29.
  - .7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
  - .8 Owner provided products.
  - .9 Record drawings and specifications in accordance with Sections 01 33 00 and 01 78 00.

- .10 Maintenance manuals in accordance with Section 01 78 00.
- .11 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00.
- .12 Monthly progress claims, administrative procedures, photographs, hold backs.
- .13 Appointment of inspection and testing agencies or firms.
- .14 Insurances, transcript of policies.

### 1.3 PROGRESS MEETINGS

- .1 During course of Work and 2 weeks prior to project completion, schedule progress meetings bi-weekly.
- .2 Contractor, major Subcontractors involved in Work and Departmental Representative are to be in attendance.
- .3 Notify parties minimum 4 days prior to meetings.
- .4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within 3 days after meeting.
- .5 Agenda to include the following:
  - .1 Review, approval of minutes of previous meeting.
  - .2 Review of Work progress since previous meeting.
  - .3 Field observations, problems, conflicts.
  - .4 Problems which impede construction schedule.
  - .5 Review of off-site fabrication delivery schedules.
  - .6 Corrective measures and procedures to regain projected schedule.
  - .7 Revision to construction schedule.
  - .8 Progress schedule, during succeeding work period.
  - .9 Review submittal schedules: expedite as required.
  - .10 Maintenance of quality standards.
  - .11 Review proposed changes for affect on construction schedule and on completion date.
  - .12 Other business.

## Part 2 PRODUCTS

### 2.1 NOT USED

- .1 Not Used.

## Part 3 EXECUTION

### 3.1 NOT USED

- .1 Not Used.

**END OF SECTION**

---

**Part 1            GENERAL**

**1.1            RELATED SECTIONS**

- .1        Section 01 78 00 - Closeout Submittals

**1.2            ELECTRONIC COPY**

- .1        Submit electronic copy of colour digital photography in jpg format, fine resolution.
- .2        Submit colour hard copy of digital photographs arranged on 215 mm x 279 mm paper and as follows:
  - .1        Project Identification: name and number of project and date of exposure indicated in header of each sheet.
  - .2        Photograph Identification: typewritten room number and description of photograph (i.e. "Office 124, at doorway looking northeast").
  - .3        Photograph Size: 100 mm x 150 mm.
- .3        Number of viewpoints: minimum twenty-four (24) viewpoints. Locations of viewpoints determined by Departmental Representative.
- .4        Frequency: monthly with progress statement and at completion of framing and services before concealment as directed by Departmental Representative.

**Part 2            PRODUCTS**

**2.1            NOT USED**

- .1        Not Used.

**Part 3            EXECUTION**

**3.1            NOT USED**

- .1        Not Used.

**END OF SECTION**

---

**Part 1 GENERAL**

**1.1 DEFINITIONS**

- .1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.
- .2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally Bar Chart should be derived from commercially available computerized project management system.
- .3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.
- .4 Construction Work Week: Monday to Friday, inclusive, will provide five day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.
- .5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.
- .6 Master Plan: summary-level schedule that identifies major activities and key milestones.
- .7 Milestone: significant event in project, usually completion of major deliverable.
- .8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.
- .9 Project Planning, Monitoring and Control System: overall system operated by Departmental Representative to enable monitoring of project work in relation to established milestones.

**1.2 REQUIREMENTS**

- .1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
- .2 Plan to complete Work in accordance with prescribed milestones and time frame.
- .3 Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting.
- .4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Certificate of Substantial Performance and Certificate of Completion as defined times of completion are of essence of this contract.

**1.3 SUBMITTALS**

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

- .2 Submit to Departmental Representative within 10 working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.
- .3 Submit Project Schedule to Departmental Representative within 5 working days of receipt of acceptance of Master Plan.

#### **1.4 MASTER PLAN**

- .1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).
- .2 Departmental Representative will review and return revised schedules within 5 working days.
- .3 Revise impractical schedule and resubmit within 5 working days.
- .4 Accepted revised schedule will become Master Plan and be used as baseline for updates.

#### **1.5 PROJECT SCHEDULE**

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
  - .1 Award.
  - .2 Shop Drawings, Samples.
  - .3 Permits.
  - .4 Mobilization.
  - .5 Interior Architecture (Walls, Floors and Ceiling).
  - .6 Plumbing.
  - .7 Lighting.
  - .8 Electrical.
  - .9 Piping.
  - .10 Controls.
  - .11 Heating, Ventilating, and Air Conditioning.
  - .12 Millwork.
  - .13 Fire Systems.
  - .14 Testing and Commissioning.
  - .15 Supplied equipment long delivery items.
  - .16 Departmental Representative supplied equipment required dates.

#### **1.6 PROJECT SCHEDULE REPORTING**

- .1 Update Project Schedule on bi-weekly basis reflecting activity changes and completions, as well as activities in progress.
  - .2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.
-

**1.7 PROJECT MEETINGS**

- .1 Discuss Project Schedule at regular site meetings specified in Section 01 31 19, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.
- .2 Weather related delays with their remedial measures will be discussed and negotiated.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not used.

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 ADMINISTRATIVE**

- .1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are co-ordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.
- .10 Keep one reviewed copy of each submission on site.
- .11 Submit number of hard copies specified for each type and format of submittal and also submit in electronic format as pdf files. Forward pdf, MS Word, MS Excel, MS Project and Autocad dwg files on USB compatible with PWGSC encryption requirements or through email or alternate electronic file sharing service such as ftp, as directed by Departmental Representative.

**1.2 SHOP DRAWINGS AND PRODUCT DATA**

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
  - .2 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario of Canada.
-

- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow 10 working days for Departmental Representative's review of each submission.
- .5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Amount. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
- .7 Accompany submissions with transmittal letter, in duplicate, containing:
  - .1 Date.
  - .2 Project title and number.
  - .3 Contractor's name and address.
  - .4 Identification and quantity of each shop drawing, product data and sample.
  - .5 Other pertinent data.
- .8 Submissions shall include:
  - .1 Date and revision dates.
  - .2 Project title and number.
  - .3 Name and address of:
    - .1 Subcontractor.
    - .2 Supplier.
    - .3 Manufacturer.
  - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
  - .5 Details of appropriate portions of Work as applicable:
    - .1 Fabrication.
    - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
    - .3 Setting or erection details.
    - .4 Capacities.
    - .5 Performance characteristics.
    - .6 Standards.
    - .7 Operating weight.
    - .8 Wiring diagrams.
    - .9 Single line and schematic diagrams.
    - .10 Relationship to adjacent work.

- .9 After Departmental Representative's review, distribute copies.
  - .10 Submit one (1) electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
  - .11 Submit one (1) electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
  - .12 Submit one (1) electronic copy of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
    - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accordance with specified requirements.
    - .2 Testing must have been within 3 years of date of contract award for project.
  - .13 Submit one (1) electronic copy of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
    - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
    - .2 Certificates must be dated after award of project contract complete with project name.
  - .14 Submit one (1) electronic copy of manufacturer's instructions for requirements requested in specification Sections and as requested by Departmental Representative.
    - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
  - .15 Submit one (1) electronic copy of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
  - .16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
  - .17 Submit one (1) electronic copy of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
  - .18 Delete information not applicable to project.
  - .19 Supplement standard information to provide details applicable to project.
  - .20 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
-

- .21 The review of shop drawings by Public Works and Government Services Canada (PWGSC) is for sole purpose of ascertaining conformance with general concept.
  - .1 This review shall not mean that PWGSC approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
  - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

### **1.3 SAMPLES**

- .1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Departmental Representative's business address.
- .3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern or texture is criterion, submit full range of samples.
- .5 Adjustments made on samples by Departmental Representative are not intended to change Contract Amount. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

### **1.4 MOCK-UPS**

- .1 Erect mock-ups in accordance with Section 01 45 00.

### **1.5 CERTIFICATES AND TRANSCRIPTS**

- .1 Immediately after award of Contract, submit Workers' Safety and Insurance Board Experience Report.

### **1.6 FEES, PERMITS AND CERTIFICATES**

- .1 Provide authorities having jurisdiction with information requested.
  - .2 Pay fees and obtain certificates and permits required.
  - .3 Furnish certificates and permits.
  - .4 Submit acceptable certificate stating that suspended ceiling systems provide adequate support for electrical fixtures, as required by current bulletin of Electrical Safety Authority (ESA).
-

**Part 2 PRODUCTS**

**2.1 NOT USED**

.1 Not Used.

**Part 3 EXECUTION**

**3.1 NOT USED**

.1 Not Used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 INTENT**

- .1 The intent of Delegated Design Submittals required by this Section is to account for professional engineering responsibility for design, review and acceptance of components of Work forming a part of permanent Work in accordance with Building Code, and that has been assigned to a design entity other than Departmental Representative including, but not limited to, the following:
  - .1 Design requiring structural analysis of load bearing components and connections.
  - .2 Design requiring compliance with fire safety regulations.
  - .3 Design requiring compliance with life or health safety regulations.
- .2 This Section provides standard forms for submittal of Commitment to General Reviews by Architects and Engineers and Letter of General Conformance required complying with requirements of Building Code and design delegated to a professional engineer within technical Specifications Sections.
- .3 Delegated Design Submittals are not required for components of Work requiring engineering for temporary Work (for example: crane hoisting, engineered lifts, false Work, shoring, concrete formwork) that would normally form a part of Contractor's scope of Work.
- .4 The requirements of this Section are in general conformance with recommended Responsibilities for Engineering Services for Building Projects published by Professional Engineers of Ontario (PEO), with regards to duties of specialty professionals appointed during construction period.
- .5 The requirements of this Section do not diminish responsibilities of Departmental Representative's role as Registered Professional of Record; submittals will be used by Departmental Representative to establish that Work is substantially performed and allow declaration for Assurance of Professional Review and Compliance required by the Building Code by the Registered Professional of Record.

**1.2 RELATED REQUIREMENTS**

- .1 Section 01 33 00 – Submittal Procedures: Submission of required supporting documentation by Delegated Design Professional Engineers.
- .2 Section 01 41 00 – Reference Standards: Requirements for governing Building Codes and Standards.
- .3 Section 01 45 00 – Quality Control: Quality control and assurance responsibilities for design of shop and site fabricated components.
- .4 Section 07 05 53 – Fire and Smoke Assembly Design Requirements and Identification: Quality control and assurance responsibilities for preparation of Engineered Judgements of fire resistive materials required for the project.
- .5 Technical Specifications Sections make specific reference to delegated design requirements described in this Section.

### 1.3 DEFINITIONS

- .1 Delegated Design Professional Engineer: The professional engineer hired or contracted to the fabricator or manufacturer to design specialty elements, produce delegated design submittals and Shop Drawings to meet the requirements of the Project; who is registered in the province of the Work; and who is not the Departmental Representative.
- .2 Commitment to General Reviews by Architects and Engineers and Letter of General Conformance: Documents prepared by the delegated design professional engineer as recommended by PEO guidelines for providing general review of construction by the professional engineer.
- .3 Engineered Judgement for Fire Rated Assembly Components: A written proposal submitted by manufacturer to the Authority Having Jurisdiction arising from a variation that modifies the manufacturer's standard listed assemblies and details to account for actual site conditions and as follows:
  - .1 Engineered Judgements are prepared by a certified specialist that has completed a sanctioned examination and has professional accreditation in the assemblies affected by site conditions different than those forming standard listed assemblies and details.
  - .2 Person issuing Engineered Judgement must be directly employed by the manufacturer and have direct experience in the preparation of Engineered Judgements required for the Project.
  - .3 Person signing the Engineered Judgement must be a Certified Fire Protection Specialist; Engineered Judgements do not require signature and seal of a professional engineer unless required by the Authority Having Jurisdiction.

### 1.4 REFERENCE STANDARDS

- .1 Professional Engineers of Ontario (PEO):
  - .1 PEO Professional Engineers Reviewing Work Prepared by another Professional Engineer
  - .2 PEO Use of the Professional Engineer's Seal

### 1.5 SUBMITTALS

- .1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Informational Submittals: Provide the following submittals during the course of the Work:
  - .1 Commitment to General Reviews by Architects and Engineers: Submit a signed and completed Engineers, Architects and Building Officials (EABO) standard form Commitment to General Review by Architects and Engineers to Departmental Representative for submission to Authority Having Jurisdiction prior to starting Work requiring design and seal of a professional engineer.

## **1.6 PROJECT CLOSEOUT SUBMISSIONS**

- .1 Record Documentation: Submit the following required information in accordance with Section 01 78 00 – Closeout Submittals before application for Substantial Performance of the Work:
  - .1 Letter of General Conformance: Submit a signed and sealed Letter of General Conformance on company letterhead addressed to Departmental Representative in accordance with format in Appendix A attached to the end of this Section on completion of Work requiring design and seal of a professional engineer.
  - .2 Engineered Judgements: Submit Product literature and compliance certificates as required by Section 07 84 00, and include any required Engineered Judgements that became necessary to account for installation conditions that are different than tested assemblies.

## **Part 2 PRODUCTS**

### **2.1 DELEGATED DESIGN**

- .1 Performance and Design Criteria: Provide Products and systems complying with specific performance and design criteria indicated where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents.
- .2 Submit a written request for additional information to Departmental Representative if criteria indicated within documents are not sufficient for the Contractor to perform services or certification required.
- .3 Delegated design will be required for elements designed by a specialty professional, which may include:
  - .1 Elements normally fabricated off-site
  - .2 Elements that require specialized fabrication equipment or a proprietary fabrication process not usually available at job site (for example: open web steel joists, wood trusses, combination wood and metal or plywood joists, prefabricated wood or metal buildings, noise and vibration isolation devices, elevators).
  - .3 Elements requiring civil engineering, not normally a part of scope of services performed by architectural; structural; mechanical; electrical; or geotechnical disciplines of Departmental Representative (for example: structural steel connection design, steel deck design).

## **1 Execution**

### **2.2 IMPLEMENTATION**

- .1 Include Summary of Work described in technical specification section as a part of the required Commitment to General Reviews by Architects and Engineers.
- .2 Prepare required submittals and present to Departmental Representative within sufficient time to allow for Departmental Representative's detailed review and acceptance.

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**APPENDIX A**

**LETTER OF GENERAL CONFORMANCE - ONTARIO**

[Date]

DIALOG®  
2 Bloor Street East, Suite 1000  
Toronto, Ontario M4W 1A8

Attention: [Registered Professional of Record]

Re: Letter of General Conformance for Delegated Design of [System of Component  
of Work]

[Name of Project]  
[Project Number]  
[City, Province]

I hereby give assurance that I have fulfilled my obligations for field review as outlined by previously submitted Engineers, Architects and Building Officials (EABO) standard form Commitment to General Review by Architects and Engineers and as required by the Ontario Building Code.

During the course of construction of this project, personnel from our firm visited the site in order to carry out general review in accordance with the performance standards of the Professional Engineers of Ontario and the requirements of the Ontario Building Code. On the basis of our review, we have determined that the construction has been carried out in general conformity with the [specify description as appropriate to define area of review for delegated design undertaken] as required by the Contract Documents which formed the basis for the issuance of the building permit.

**Retained Professional Engineer**

Signature

Date

(Apply seal)

**END OF SECTION**

**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 Canadian Standards Association (CSA): Canada
  - .1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.
- .2 National Building Code 2010 (NBC):
  - .1 NBC 2010, Division B, Part 8 Safety Measures at Construction and Demolition Sites.
- .3 National Fire Code 2010 (NFC):
  - .1 NFC 2010, Division B, Part 5 Hazardous Processes and Operations, subsection 5.6.1.3 Fire Safety Plan.
- .4 Province of Ontario:
  - .1 Occupational Health and Safety Act Revised Statutes of Ontario 1990, Chapter O.1 as amended, and Regulations for Construction Projects, O. Reg. 213/91 as amended.
  - .2 O. Reg. 490/09, Designated Substances.
  - .3 Workplace Safety and Insurance Act, 1997.
  - .4 Municipal statutes and authorities.
- .5 Treasury Board of Canada Secretariat (TBS):
  - .1 Treasury Board, Fire Protection Standard April 1, 2010 [www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=17316&section=text](http://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=17316&section=text).

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
  - .1 Results of site specific safety hazard assessment.
  - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
  - .3 Measures and controls to be implemented to address identified safety hazards and risks.
- .3 Provide a Fire Safety Plan, specific to the work location, in accordance with NBC, Division B, Article 8.1.1.3 prior to commencement of work. The plan shall be coordinated with, and integrated into, the existing Building, Facility, Tenant's Emergency Procedures and Evacuation Plan in place at the site. Departmental Representative will provide Building, Facility, Tenant's Emergency Procedures and Evacuation Plan. Deliver two copies of the Fire Safety Plan to the Departmental Representative not later than 14 days before commencing work.

- .4 Contractor's and Sub-contractors' Safety Communication Plan.
- .5 Contingency and Emergency Response Plan addressing standard operating procedures specific to the project site to be implemented during emergency situations. Coordinate plan with existing Building, Facility, Tenant's Emergency Response requirements and procedures provided by Departmental Representative.
- .6 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 10 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 5 days after receipt of comments from Departmental Representative.
- .7 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .8 Submit names of personnel and alternates responsible for site safety and health.
- .9 Submit records of Contractor's Health and Safety meetings when requested.
- .10 Submit one (1) electronic copy of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative weekly.
- .11 Submit copies of orders, directions or reports issued by health and safety inspectors of the authorities having jurisdiction.
- .12 Submit copies of incident and accident reports within 72 hours of incident.
- .13 Submit Material Safety Data Sheets (MSDS).
- .14 Submit Workplace Safety and Insurance Board (WSIB) - Experience Rating Report.

### **1.3 FILING OF NOTICE**

- .1 File Notice of Project with Provincial authorities prior to commencement of Work.
- .2 Contractor shall agree to install proper site separation and identification in order to maintain time and space at all times throughout life of project.

### **1.4 WORK PERMIT**

- .1 Obtain Hot Work Permit from Property Manager.

### **1.5 SAFETY ASSESSMENT**

- .1 Perform site specific safety hazard assessment related to project.

### **1.6 MEETINGS**

- .1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.

### **1.7 REGULATORY REQUIREMENTS**

- .1 Comply with the Acts and regulations of the Province of Ontario.
  - .2 Comply with specified standards and regulations to ensure safe operations at site.
-

## **1.8 PROJECT/SITE CONDITIONS**

- .1 Work at site may involve contact with:
  - .1 Silica in concrete and concrete block.
  - .2 Mercury in fluorescent light tubes, boiler and air handling unit control equipment and laboratory drain pipes.
  - .3 Asbestos in pipe covering, vinyl sheet flooring, vinyl composition tiles, gypsum board joint compound, plaster and parging cement.
  - .4 Lead in paint, solder caulking in ball fittings of cast iron pipes, lead acid batteries and solder used on domestic water lines.

## **1.9 GENERAL REQUIREMENTS**

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns either accepting or requesting improvements.
- .3 Relief from or substitution for any portion or provision of minimum Health and Safety standards specified herein or reviewed site-specific Health and Safety Plan shall be submitted to Departmental Representative in writing.

## **1.10 COMPLIANCE REQUIREMENTS**

- .1 Comply with Ontario Occupational Health and Safety Act, R.S.O. 1990 Chapter 0.1, as amended.

## **1.11 RESPONSIBILITY**

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.
- .3 Where applicable the Contractor shall be designated "Constructor", as defined by Occupational Health and Safety Act and Regulations for Construction Projects for the Province of Ontario.

## **1.12 UNFORSEEN HAZARDS**

- .1 Should any unforeseen or peculiar safety-related factor, hazard, or condition become evident during performance of Work, immediately stop work and advise Departmental Representative verbally and in writing.
  - .2 Follow procedures in place for Employees Right to Refuse Work as specified in the Occupational Health and Safety Act for the Province of Ontario.
-

### 1.13 HEALTH AND SAFETY CO-ORDINATOR

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
  - .1 Have site-related working experience specific to activities associated with hazardous materials.
  - .2 Have working knowledge of occupational safety and health regulations.
  - .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
  - .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
  - .5 Be on site during execution of Work and report directly to and be under direction of site supervisor.

### 1.14 POSTING OF DOCUMENTS

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province of Ontario, and in consultation with Departmental Representative.
  - .1 Contractor's Safety Policy.
  - .2 Constructor's Name.
  - .3 Notice of Project.
  - .4 Name, trade, and employer of Health and Safety Representative or Joint Health and Safety Committee members (if applicable).
  - .5 Ministry of Labour Orders and reports.
  - .6 Occupational Health and Safety Act and Regulations for Construction Projects for Province of Ontario.
  - .7 Address and phone number of nearest Ministry of Labour office.
  - .8 Material Safety Data Sheets.
  - .9 Written Emergency Response Plan.
  - .10 Site Specific Safety Plan.
  - .11 Valid certificate of first aider on duty.
  - .12 WSIB "In Case of Injury At Work" poster.
  - .13 Location of toilet and cleanup facilities.

### 1.15 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.
  - .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
  - .3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.
-

**1.16 POWDER ACTUATED DEVICES**

- .1 Use powder actuated devices only after receipt of written permission from Departmental Representative.

**1.17 WORK STOPPAGE**

- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.
- .2 Assign responsibility and obligation to Health and Safety Coordinator or Competent Supervisor to stop or start Work when, at Health and Safety Coordinator's or Competent Supervisor's discretion, it is necessary or advisable for reasons of health or safety. Departmental Representative may also stop Work for health and safety considerations.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not used.

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 REFERENCES AND CODES**

- .1 Perform Work in accordance with National Building Code of Canada (NBC) 2010, National Fire Code of Canada (NFC) 2010 and Ontario Building Code (OBC) 2012, including all amendments up to bid closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply as directed by the Departmental Representative.
- .2 Meet or exceed requirements of:
  - .1 Contract documents.
  - .2 Specified standards, codes and referenced documents.

**1.2 HAZARDOUS MATERIAL DISCOVERY**

- .1 Stop work immediately and notify Departmental Representative if materials which may contain designated substances or PCB's, other than those identified in Section 01 35 29 are discovered in course of work.

**1.3 BUILDING SMOKING ENVIRONMENT**

- .1 Comply with smoking restrictions.

**1.4 IAQ - INDOOR AIR QUALITY**

- .1 Comply with CSA-Z204-94(R1999), Guideline for Managing Indoor Air Quality in Office Buildings and CSA B651-12 including Annex A.

**1.5 ACCESSIBLE DESIGN**

- .1 Comply with CSA B651-12, Accessible Design for the Built Environment, unless specified otherwise. In any case of conflict or discrepancy between the building codes and CSA B651, the requirements of CSA B651 shall apply.

**1.6 STATISTICAL INFORMATION**

- .1 Provide statistical information to Departmental Representative:
  - .1 Within ten working days after March 31 and September 30 occurring between commencement of work and final completion
  - .2 Within ten working days after final completion.
- .2 Include in statistical information:
  - .1 Statement of total person days of labour used on site in performance of contract, including labour provided under sub-contracts.
  - .2 Estimate of total value in dollars of material delivered to site and installed, including material provided and installed under sub-contracts.
- .3 This information is required by Government of Canada solely to provide statistics that will aid in assessing socio-economic benefits of this project.

**1.7 TAXES**

- .1 Pay applicable Federal, Provincial and Municipal taxes.

**1.8 EXAMINATION**

- .1 Examine existing conditions and determine conditions affecting work.
- .2 Conduct concrete floor moisture testing using Calcium Chloride moisture tests.
  - .1 Submit test results to Departmental Representative for approval prior to installing any flooring. Conduct one test per 100 m<sup>2</sup> of area being covered.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 SECTION INCLUDES**

- .1 Inspection and testing, administrative and enforcement requirements.
- .2 Tests and mix designs.
- .3 Mock-ups.
- .4 Mill tests.
- .5 Equipment and system adjust and balance.

**1.2 INSPECTION**

- .1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 Departmental Representative may order any part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.

**1.3 INDEPENDENT INSPECTION AGENCIES**

- .1 Independent Inspection/Testing Agencies may be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work under Section 01 29 83, above and beyond those required of the Contractor. Cost of such services will be borne by Departmental Representative.
- .2 Provide equipment required for executing inspection and testing by appointed agencies.
- .3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and reinspection.

**1.4 ACCESS TO WORK**

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

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

## **1.5 PROCEDURES**

- .1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in an orderly sequence so as not to cause delay in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

## **1.6 REJECTED WORK**

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.
- .3 If in opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Departmental Representative may deduct from Contract Amount difference in value between Work performed and that called for by Contract Documents, amount of which shall be determined by Departmental Representative.

## **1.7 REPORTS**

- .1 Submit one (1) electronic copy of inspection and test reports to Departmental Representative and Contractor.
- .2 Provide copies to Subcontractor of work being inspected or tested, manufacturer or fabricator of material being inspected or tested and to authorities having jurisdiction as required by authority having jurisdiction.

## **1.8 TESTS AND MIX DESIGNS**

- .1 Furnish test results and mix designs as may be requested.
- .2 The cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work shall be appraised by Departmental Representative and may be authorized as recoverable.

## **1.9 MOCK-UPS**

- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of all Sections required to provide mock-ups.
  - .2 Construct in all locations as specified in specific Section.
  - .3 Prepare mock-ups for Departmental Representative's review with reasonable promptness and in an orderly sequence, so as not to cause any delay in Work.
-

- .4 Failure to prepare mock-ups in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .5 If requested, Departmental Representative will assist in preparing a schedule fixing dates for preparation.
- .6 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

**1.10 MILL TESTS**

- .1 Submit mill test certificates as required of specification Sections.

**1.11 EQUIPMENT AND SYSTEMS**

- .1 Submit testing, adjusting and balancing reports for mechanical, electrical and building equipment systems.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 SECTION INCLUDES**

- .1 Temporary utilities.

**1.2 RELATED SECTIONS**

- .1 Section 01 52 00 - Construction Facilities.
- .2 Section 01 56 00 - Temporary Barriers and Enclosures.

**1.3 SUBMITTALS**

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

**1.4 INSTALLATION AND REMOVAL**

- .1 Provide temporary utilities controls in order to execute work expeditiously.
- .2 Remove from site all such work after use.

**1.5 WATER SUPPLY**

- .1 Departmental Representative will provide continuous supply of potable water for construction use.
- .2 Departmental Representative will pay for utility charges at prevailing rates.

**1.6 TEMPORARY HEATING AND VENTILATION**

- .1 Heating:
    - .1 Permanent heating system of building, may be used.
    - .2 Departmental Representative will pay utility charges.
  - .2 Ventilating:
    - .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction and to CSA B651, Annex A.
    - .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
    - .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
    - .4 Ventilate storage spaces containing hazardous or volatile materials.
    - .5 Ventilate temporary sanitary facilities.
    - .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
  - .3 Maintain strict supervision of operation of temporary ventilating equipment to:
    - .1 Conform with applicable codes and standards.
    - .2 Enforce safe practices.
-

- .3 Prevent abuse of services.
- .4 Prevent damage to finishes.
- .5 Vent direct-fired combustion units to outside.
- .4 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

## **1.7 TEMPORARY POWER AND LIGHT**

- .1 Departmental Representative will pay for temporary power during construction for temporary lighting and operating of power tools, to a maximum supply of 230 volts 30 amps.
- .2 Temporary power for equipment requiring in excess of above is responsibility of Contractor.
- .3 Provide and maintain temporary lighting throughout project to ensure level of illumination on all floors and stairs is not less than 162 lx.
- .4 Electrical power and lighting systems installed under this Contract may be used for construction requirements only with prior approval of Departmental Representative provided that guarantees are not affected. Make good damage to electrical system caused by use under this Contract. Replace lamps which have been used for more than 3 months.

## **1.8 FIRE PROTECTION**

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations and bylaws.
- .2 Burning rubbish and construction waste materials is not permitted on site.

## **Part 2 PRODUCTS**

### **2.1 NOT USED**

- .1 Not Used.

## **Part 3 EXECUTION**

### **3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

---

**Part 1 GENERAL**

**1.1 SECTION INCLUDES**

- .1 Construction aids.
- .2 Office and sheds.
- .3 Parking.
- .4 Project identification.

**1.2 REFERENCES**

- .1 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-1.189-2000, Exterior Alkyd Primer for Wood.
  - .2 CAN/CGSB-1.59-97, Alkyd Exterior Gloss Enamel.
- .2 Canadian Standards Association (CSA International)
  - .1 CSA A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
  - .2 CSA 0121-08(R2013), Douglas Fir Plywood.
  - .3 CAN/CSA-Z321-96(R2006), Signs and Symbols for the Occupational Environment, withdrawn but still available from CSA, CCOHS and Techstreet.

**1.3 SUBMITTALS**

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

**1.4 INSTALLATION AND REMOVAL**

- .1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.
- .2 Identify areas which have to be gravelled to prevent tracking of mud.
- .3 Indicate use of supplemental or other staging area.
- .4 Provide construction facilities in order to execute work expeditiously.
- .5 Remove from site all such work after use.

**1.5 ELEVATORS**

- .1 Designated existing elevators may be used by construction personnel and transporting of materials. Co-ordinate use with Departmental Representative.
- .2 Provide protective coverings for finish surfaces of cars and entrances.

**1.6 SITE STORAGE/LOADING**

- .1 Confine work and operations of employees to areas defined by Contract Documents. Do not unreasonably encumber premises with products.

- .2 Do not load or permit to load any part of Work with a weight or force that will endanger the Work.

#### **1.7 CONSTRUCTION PARKING**

- .1 Parking will not be permitted on site.

#### **1.8 EQUIPMENT, TOOL AND MATERIALS STORAGE**

- .1 Provide and maintain, in a clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.
- .2 Locate materials not required to be stored in weatherproof sheds on site in a manner to cause least interference with work activities.

#### **1.9 SANITARY FACILITIES**

- .1 Designated existing facilities in building may be used on approval of Departmental Representative.

#### **1.10 PROTECTION AND MAINTENANCE OF TRAFFIC**

- .1 Provide access and temporary relocated roads as necessary to maintain traffic.
- .2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.
- .3 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs
- .4 Protect travelling public from damage to person and property.
- .5 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
- .6 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.
- .7 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.

#### **1.11 CLEAN-UP**

- .1 Remove construction debris, waste materials, packaging material from work site daily.
  - .2 Clean dirt or mud tracked onto paved or surfaced roadways.
  - .3 Store materials resulting from demolition activities that are salvageable.
  - .4 Stack stored new or salvaged material.
-

**Part 2 PRODUCTS**

**2.1 NOT USED**

.1 Not Used.

**Part 3 EXECUTION**

**3.1 NOT USED**

.1 Not Used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 SECTION INCLUDES**

- .1 Barriers.
- .2 Environmental Controls.
- .3 Traffic Controls.
- .4 Fire Routes.

**1.2 REFERENCES**

- .1 Canadian General Standards Board (CGSB):
  - .1 CAN/CGSB-1.189-2000, Exterior Alkyd Primer for Wood.
  - .2 CAN/CGSB-1.59-97, Alkyd Exterior Gloss Enamel.
- .2 Canadian Standards Association (CSA):
  - .1 CSA O121-08(R2013), Douglas Fir Plywood.

**1.3 INSTALLATION AND REMOVAL**

- .1 Provide temporary controls in order to execute Work expeditiously.
- .2 Remove from site all such work after use.

**1.4 DUST TIGHT SCREENS**

- .1 Provide dust tight screens or insulated partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.
- .2 Maintain and relocate protection until such work is complete.

**1.5 PUBLIC TRAFFIC FLOW**

- .1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect the public.

**1.6 FIRE ROUTES**

- .1 Maintain access to property including overhead clearances for use by emergency response vehicles.

**1.7 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY**

- .1 Protect surrounding private and public property from damage during performance of Work.
  - .2 Be responsible for damage incurred.
-

**1.8 PROTECTION OF BUILDING FINISHES**

- .1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.
- .2 Provide necessary screens, covers, and hoardings.
- .3 Confirm with Departmental Representative locations and installation schedule 3 days prior to installation.
- .4 Be responsible for damage incurred due to lack of or improper protection.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 SECTION INCLUDES**

- .1 Product quality, availability, storage, handling, protection, and transportation.
- .2 Manufacturer's instructions.
- .3 Quality of Work, coordination and fastenings.
- .4 Existing facilities.

**1.2 RELATED SECTIONS**

- .1 Section 01 45 00 - Quality Control.

**1.3 REFERENCES**

- .1 Within text of specifications, reference may be made to reference standards.
- .2 Conform to these standards, in whole or in part as specifically requested in specifications.
- .3 If there is question as to whether any product or system is in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.
- .4 The cost for such testing will be born by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.
- .5 Conform to latest date of issue of referenced standards in effect on date of submission of Bids, except where specific date or issue is specifically noted.

**1.4 QUALITY**

- .1 Products, materials, equipment and articles (referred to as products throughout specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source and quality of Products provided.
  - .2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
  - .3 Should any dispute arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
  - .4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
  - .5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.
-

**1.5 AVAILABILITY**

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of products are foreseeable, notify Departmental Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
- .2 In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Amount or Contract Time.

**1.6 METRIC SIZED MATERIALS**

- .1 SI metric units of measurement are used exclusively on the drawings and in the specifications for this project.
- .2 The Contractor is required to provide metric products in the sizes called for in the Contract Documents except where a valid claim can be made that a particular product is not available on the Canadian market.
- .3 Claims for exemptions from use of metric sized products shall be in writing and fully substantiated with supportive documentation. Promptly submit application to Departmental Representative for consideration and ruling. Non-metric sized products may not be used unless Contractor's application has been approved in writing by the Departmental Representative.
- .4 Difficulties caused by the Contractor's lack of planning and effort to obtain modular metric sized products which are available on the Canadian market will not be considered sufficient reasons for claiming that they cannot be provided.
- .5 Claims for additional costs due to provision of specified modular metric sized products will not be considered.

**1.7 STORAGE, HANDLING AND PROTECTION**

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
  - .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
  - .3 Store products subject to damage from weather in weatherproof enclosures.
  - .4 Store cementitious products clear of earth or concrete floors, and away from walls.
  - .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
  - .6 Store sheet materials and lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.
  - .7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
-

- .8 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.
- .9 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

**1.8 TRANSPORTATION**

- .1 Pay costs of transportation of products required in performance of Work.
- .2 Transportation cost of products supplied by Owner will be paid for by Departmental Representative. Unload, handle and store such products.

**1.9 MANUFACTURER'S INSTRUCTIONS**

- .1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Departmental Representative may establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Amount or Contract Time.

**1.10 QUALITY OF WORK**

- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

**1.11 CO-ORDINATION**

- .1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.

**1.12 CONCEALMENT**

- .1 In finished areas, conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
  - .2 Before installation, inform Departmental Representative if there is interference. Install as directed by Departmental Representative.
-

**1.13 REMEDIAL WORK**

- .1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Coordinate adjacent affected Work as required.
- .2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

**1.14 LOCATION OF FIXTURES**

- .1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.
- .2 Inform Departmental Representative of conflicting installation. Install as directed.

**1.15 FASTENINGS**

- .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
- .2 Prevent electrolytic action between dissimilar metals and materials.
- .3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.
- .4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
- .5 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

**1.16 FASTENINGS - EQUIPMENT**

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No.304 stainless steel for exterior areas.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

**1.17 PROTECTION OF WORK IN PROGRESS**

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

**1.18 EXISTING UTILITIES**

- .1 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00.
- .2 Submit written request in advance of cutting or alteration which affects:
  - .1 Structural integrity of elements of project.
  - .2 Integrity of weather-exposed or moisture-resistant elements.
  - .3 Efficiency, maintenance, or safety of operational elements.
  - .4 Visual qualities of sight-exposed elements.
  - .5 Work of Owner or separate contractor.
- .3 Include in request:
  - .1 Identification of project.
  - .2 Location and description of affected Work.
  - .3 Statement on necessity for cutting or alteration.
  - .4 Description of proposed Work, and products to be used.
  - .5 Alternatives to cutting and patching.
  - .6 Effect on Work of Owner or separate contractor.
  - .7 Written permission of affected separate contractor.
  - .8 Date and time work will be executed.

**1.2 MATERIALS**

- .1 Required for original installation.
- .2 Change in Materials: Submit request for substitution in accordance with Section 01 33 00.

**1.3 PREPARATION**

- .1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- .2 After uncovering, inspect conditions affecting performance of Work.
- .3 Beginning of cutting or patching means acceptance of existing conditions.
- .4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.
- .5 Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water.

**1.4 EXECUTION**

- .1 Execute cutting, fitting, and patching to complete Work.
  - .2 Fit several parts together, to integrate with other Work.
-

- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.
- .5 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .7 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .8 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .9 Restore work with new products in accordance with requirements of Contract Documents.
- .10 Submit proposed materials, finishes and installation method for patching to Departmental Representative for approval, prior to patching.
- .11 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
- .12 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .13 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material in accordance with Section 07 84 00, full thickness of the construction element.
- .14 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

**1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse, recycling, composting and anaerobic digestion in accordance with Section 01 74 20.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 SECTION INCLUDES**

- .1 Progressive cleaning.
- .2 Final cleaning.

**1.2 PROJECT CLEANLINESS**

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by Owner or other Contractors.
- .2 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .3 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .4 Provide on-site containers for collection of waste materials and debris.
- .5 Provide and use clearly marked separate bins for recycling. Refer to Section 01 74 20.
- .6 Remove waste material and debris from site and deposit in waste container at end of each working day.
- .7 Dispose of waste materials and debris off site.
- .8 Clean interior areas prior to start of finish work, and maintain areas free of dust and other contaminants during finishing operations.
- .9 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .10 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .11 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .12 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

**1.3 FINAL CLEANING**

- .1 When Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
  - .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
  - .3 Prior to final review, remove surplus products, tools, construction machinery and equipment.
  - .4 Remove waste products and debris other than that caused by Owner or other Contractors.
  - .5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
-

- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.
- .8 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors.
- .9 Clean lighting reflectors, lenses, and other lighting surfaces.
- .10 HEPA vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .11 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.
- .12 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .13 Clean equipment and fixtures to a sanitary condition; clean or replace filters of mechanical equipment.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 CONSTRUCTION & DEMOLITION WASTE**

- .1 Carefully deconstruct and source separate materials/equipment and divert, from D&C waste destined for landfill to maximum extent possible. Target for this project is 75% diversion from landfill. Reuse, recycle, compost, anaerobic digest or sell material for reuse except where indicated otherwise. On site sales are not permitted.
- .2 Source separate waste and maintain waste audits in accordance with the Environmental Protection Act, Ontario Regulation 102/94 and Ontario Regulation 103/94.
  - .1 Provide facilities for collection, handling and storage of source separated wastes.
  - .2 Source separate the following waste:
    - .1 Brick and portland cement concrete.
    - .2 Corrugated cardboard.
    - .3 Wood, not including painted or treated wood or laminated wood.
    - .4 Gypsum board, unpainted.
    - .5 Steel.
- .3 Submit a waste reduction workplan indicating the materials and quantities of material that will be recycled and diverted from landfill.
  - .1 Indicate how material being removed from the site will be reused, recycled, composted or anaerobically digested.
- .4 Submit proof that all waste is being disposed of at a licensed land fill site or waste transfer site. A copy of the disposal/waste transfer site's license and a letter verifying that said landfill site will accept the waste must be supplied to Departmental Representative prior to removal of waste from the demolition site.

**1.2 WASTE PROCESSING SITES**

- .1 Province of: Ontario.
    - .1 Ministry of Environment and Energy, 135 St. Clair Avenue West, Toronto, ON, M4V 1P5.
    - .2 Telephone: 800-565-4923 or 416-323-4321.
    - .3 Fax: 416-323-4682.
  - .2 Recycling Council of Ontario: 215 Spadina Avenue, #225, Toronto, ON, M5T 2C7.
    - .1 Telephone: 416-657-2797.
    - .2 Fax: 416-960-8053.
    - .3 Email: [rco@rco.on.ca](mailto:rco@rco.on.ca).
    - .4 Internet: <http://www.rco.on.ca/>.
    - .5
-

**Part 2 PRODUCTS**

**2.1 NOT USED**

.1 Not Used.

**Part 3 EXECUTION**

**3.1 CANADIAN GOVERNMENTAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT**

.1 Government Chief Responsibility for the Environment.

Province	Address	General	Fax	Inquiries
Ontario	Ministry of		(416)	(416)
	Environment		323-4321	323-4682
	and Energy		(800)	
	135 St Clair		565-4923	
	Avenue West			
	Toronto, ON			
	M4V 1P5			
	Environment		(416)	
	Canada		734-4494	
	Toronto, ON			

**END OF SECTION**

**Part 1 GENERAL**

**1.1 INSPECTION AND DECLARATION**

- .1 Contractor's Inspection: Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.
  - .1 Notify Departmental Representative in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
  - .2 Request Departmental Representative's Inspection.
- .2 Departmental Representative's Inspection: Departmental Representative and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor to correct Work accordingly.
- .3 Completion: submit written certificate that following have been performed:
  - .1 Work has been completed and inspected for compliance with Contract Documents.
  - .2 Defects have been corrected and deficiencies have been completed.
  - .3 Equipment and systems have been tested, adjusted and balanced and are fully operational.
  - .4 Certificates required by PWGSC Fire Protection Engineer have been submitted.
  - .5 Operation of systems have been demonstrated to Owner's personnel.
  - .6 Work is complete and ready for final inspection.
- .4 Final Inspection: when items noted above are completed, request final inspection of Work by Departmental Representative and Contractor. If Work is deemed incomplete by Departmental Representative, complete outstanding items and request reinspection.

**1.2 CLEANING**

- .1 In accordance with Section 01 74 11.
- .2 Remove waste and surplus materials, rubbish and construction facilities from the site in accordance with Section 01 74 20.

**Part 2 PRODUCTS**

**2.1 NOT USED**

**Part 3 EXECUTION**

**3.1 NOT USED**

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 SECTION INCLUDES**

- .1 As-built, samples, and specifications.
- .2 Equipment and systems.
- .3 Product data, materials and finishes, and related information.
- .4 Operation and maintenance data.
- .5 Spare parts, special tools and maintenance materials.
- .6 Warranties and bonds.
- .7 Final site survey.

**1.2 SUBMISSION**

- .1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .2 Copy will be returned after final inspection, with Departmental Representative's comments.
- .3 Revise content of documents as required prior to final submittal.
- .4 Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, four final copies of maintenance manuals and commissioning documentation in English.
- .5 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
- .6 If requested, furnish evidence as to type, source and quality of products provided.
- .7 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .8 Pay costs of transportation.

**1.3 FORMAT**

- .1 Organize data in the form of an instructional manual.
  - .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
  - .3 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.
  - .4 Cover: Identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
  - .5 Arrange content by systems, under Section numbers and sequence of Table of Contents.
-

- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: Manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
- .9 Provide 1:1 scaled CAD files in dwg format on CD-ROM or DVD-ROM.

#### **1.4 CONTENTS - EACH VOLUME**

- .1 Table of Contents: provide title of project;
  - .1 Date of submission; names,
  - .2 Addresses, and telephone numbers of Contractor with name of responsible parties;
  - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
  - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00.
- .6 Training: Refer to Section 01 79 00.

#### **1.5 AS-BUILTS AND SAMPLES**

- .1 In addition to requirements in General Conditions, maintain at the site for Departmental Representative review and reference throughout the progress of the Work one record copy of:
    - .1 Contract Drawings.
    - .2 Specifications.
    - .3 Amendments and addenda.
    - .4 Change Orders and other modifications to the Contract.
    - .5 Reviewed shop drawings, product data, and samples.
    - .6 Field test records.
    - .7 Inspection certificates.
    - .8 Manufacturer's certificates.
  - .2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.
-

- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Departmental Representative.
- .6 Turn one set, paper copy and electronic copy, of AS-BUILT drawings and specifications over to Departmental Representative on completion of work. Submit files on USB compatible with PWGSC encryption requirements or through email or alternate electronic file sharing service such as ftp, as directed by Departmental Representative.
- .7 If project is completed without significant deviations from Contract drawings and specifications submit to Departmental Representative one set of drawings and specifications marked "AS-BUILT".

#### **1.6 RECORDING ACTUAL SITE CONDITIONS**

- .1 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by Departmental Representative.
  - .2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.
  - .3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
  - .4 Contract Drawings and shop drawings: legibly mark each item to record actual construction, including:
    - .1 Measured depths of elements of foundation in relation to finish first floor datum.
    - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
    - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
    - .4 Field changes of dimension and detail.
    - .5 Changes made by change orders.
    - .6 Details not on original Contract Drawings.
    - .7 References to related shop drawings and modifications.
  - .5 Specifications: legibly mark each item to record actual construction, including:
    - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
    - .2 Changes made by Amendments and change orders.
  - .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.
-

## 1.7 EQUIPMENT AND SYSTEMS

- .1 Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer's printed operation and maintenance instructions.
- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide Contractor's coordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include test and balancing reports as specified in Section 01 45 00.
- .15 Additional requirements: As specified in individual specification sections.

## 1.8 MATERIALS AND FINISHES

- .1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.
  - .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
  - .3 Moisture-protection and Weather-exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
  - .4 Additional Requirements: as specified in individual specifications sections.
-

**1.9 SPARE PARTS**

- .1 Provide spare parts, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Deliver to site as directed; place and store.
- .4 Receive and catalogue all items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

**1.10 MAINTENANCE MATERIALS**

- .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Deliver to site as directed; place and store.
- .4 Receive and catalogue all items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

**1.11 SPECIAL TOOLS**

- .1 Provide special tools, in quantities specified in individual specification section.
- .2 Provide items with tags identifying their associated function and equipment.
- .3 Deliver to site as directed; place and store.
- .4 Receive and catalogue all items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.

**1.12 STORAGE, HANDLING AND PROTECTION**

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Store paints and freezable materials in a heated and ventilated room.
- .5 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

**1.13 WARRANTIES AND BONDS**

- .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
  - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
  - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work.
-

- .4 Except for items put into use with Departmental Representative's permission, leave date of beginning of time of warranty until the Date of Certificate of Substantial Performance is determined.
- .5 Verify that documents are in proper form, contain full information, and are notarized.
- .6 Co-execute submittals when required.
- .7 Retain warranties and bonds until time specified for submittal.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 SUMMARY**

- .1 Section Includes:
  - .1 General requirements relating to commissioning of project's components and systems, specifying general requirements to PV of components, equipment, sub-systems, systems, and integrated systems.
- .2 Acronyms:
  - .1 AFD - Alternate Forms of Delivery, service provider.
  - .2 BMM - Building Management Manual.
  - .3 Cx - Commissioning.
  - .4 EMCS - Energy Monitoring and Control Systems.
  - .5 O&M - Operation and Maintenance.
  - .6 PI - Product Information.
  - .7 PV - Performance Verification.
  - .8 TAB - Testing, Adjusting and Balancing.

**1.2 GENERAL**

- .1 Cx is a planned program of tests, procedures and checks carried out systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:
    - .1 Verify installed equipment, systems and integrated systems operate in accordance with contract documents and design criteria and intent.
    - .2 Ensure appropriate documentation is compiled into the BMM.
    - .3 Effectively train O&M staff.
  - .2 Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required.
    - .1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be interactively with each other as intended in accordance with Contract Documents and design criteria.
    - .2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.
  - .3 Design Criteria: as per client's requirements or determined by designer. To meet Project functional and operational requirements.
  - .4 AFD managed projects the term Departmental Representative in Cx specifications to be interpreted as AFD Service Provider.
-

### 1.3 COMMISSIONING OVERVIEW

- .1 For Cx responsibilities refer to Section 01 91 31.
- .2 Cx to be a line item of Contractor's cost breakdown.
- .3 Cx activities supplement field quality and testing procedures described in relevant technical sections.
- .4 Cx is conducted in concert with activities performed during stage of project delivery. Cx identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the Work is constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities includes transfer of critical knowledge to facility operational personnel.
- .5 Departmental Representative will issue Certificate of Substantial Performance when:
  - .1 Completed Cx documentation has been received, reviewed for suitability and approved by Departmental Representative.
  - .2 Equipment, components and systems have been commissioned.
  - .3 O&M training has been completed.

### 1.4 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

- .1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, correct deficiencies, re-verify equipment and components within the unfunctional system, including related systems as deemed required by Departmental Representative, to ensure effective performance.
- .2 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor. Above costs to be in form of progress payment reductions or hold-back assessments.

### 1.5 PRE-CX REVIEW

- .1 Before Construction:
  - .1 Review contract documents, confirm by writing to Departmental Representative.
    - .1 Adequacy of provisions for Cx.
    - .2 Aspects of design and installation pertinent to success of Cx.
- .2 During Construction:
  - .1 Co-ordinate provision, location and installation of provisions for Cx.
- .3 Before start of Cx:
  - .1 Have completed Cx Plan up-to-date.
  - .2 Ensure installation of related components, equipment, sub-systems, systems is complete.
  - .3 Fully understand Cx requirements and procedures.
  - .4 Have Cx documentation shelf-ready.
  - .5 Understand completely design criteria and intent and special features.

- .6 Submit complete start-up documentation to Departmental Representative.
- .7 Have Cx schedules up-to-date.
- .8 Ensure systems have been cleaned thoroughly.
- .9 Complete TAB procedures on systems, submit TAB reports to Departmental Representative for review and approval.
- .10 Ensure "As-Built" system schematics are available.
- .4 Inform Departmental Representative in writing of discrepancies and deficiencies on finished works.

## **1.6 CONFLICTS**

- .1 Report conflicts between requirements of this section and other sections to Departmental Representative before start-up and obtain clarification.
- .2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

## **1.7 SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00.
  - .1 Submit no later than 4 weeks after award of Contract:
    - .1 Name of Contractor's Cx agent.
    - .2 Draft Cx documentation.
    - .3 Preliminary Cx schedule.
  - .2 Request in writing to Departmental Representative for changes to submittals and obtain written approval at least 8 weeks prior to start of Cx.
  - .3 Submit proposed Cx procedures to Departmental Representative where not specified and obtain written approval at least 8 weeks prior to start of Cx.
  - .4 Provide additional documentation relating to Cx process required by Departmental Representative.

## **1.8 COMMISSIONING DOCUMENTATION**

- .1 Refer to Section 01 91 33.
- .2 Departmental Representative to review and approve Cx documentation.
- .3 Provide completed and approved Cx documentation to Departmental Representative.

## **1.9 COMMISSIONING SCHEDULE**

- .1 Provide detailed Cx schedule as part of construction schedule in accordance with Section 01 32 16
- .2 Provide adequate time for Cx activities prescribed in technical sections and commissioning sections including:
  - .1 Approval of Cx reports.
  - .2 Verification of reported results.
  - .3 Repairs, retesting, re-commissioning, re-verification.

- .4 Training.

#### **1.10 COMMISSIONING MEETINGS**

- .1 Convene Cx meetings following project meetings: Section 01 32 16 and as specified herein.
- .2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.
- .3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.
- .4 At 60% construction completion stage, Departmental Representative to call a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities and prepare for Cx. Issues at meeting to include:
  - .1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.
  - .2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.
- .5 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.
- .6 Meeting will be chaired by Departmental Representative, who will record and distribute minutes.
- .7 Ensure subcontractors and relevant manufacturer representatives are present at 60% and subsequent Cx meetings and as required.

#### **1.11 STARTING AND TESTING**

- .1 Contractor assumes liabilities and costs for inspections. Including disassembly and re-assembly after approval, starting, testing and adjusting, including supply of testing equipment.

#### **1.12 WITNESSING OF STARTING AND TESTING**

- .1 Provide 14 days notice prior to commencement.
- .2 Departmental Representative to witness of start-up and testing.
- .3 Contractor's Cx Agent to be present at tests performed and documented by sub-trades, suppliers and equipment manufacturers.

#### **1.13 MANUFACTURER'S INVOLVEMENT**

- .1 Factory testing: manufacturer to:
  - .1 Coordinate time and location of testing.
  - .2 Provide testing documentation for approval by Departmental Representative.
  - .3 Arrange for Departmental Representative to witness tests.
  - .4 Obtain written approval of test results and documentation from Departmental Representative before delivery to site.

- .2 Obtain manufacturers installation, start-up and operations instructions prior to start-up of components, equipment and systems and review with Departmental Representative.
  - .1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.
  - .2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.
- .3 Integrity of warranties:
  - .1 Use manufacturer's trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.
  - .2 Verify with manufacturer that testing as specified will not void warranties.
- .4 Qualifications of manufacturer's personnel:
  - .1 Experienced in design, installation and operation of equipment and systems.
  - .2 Ability to interpret test results accurately.
  - .3 To report results in clear, concise, logical manner.

#### **1.14 PROCEDURES**

- .1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.
- .2 Conduct start-up and testing in following distinct phases:
  - .1 Included in delivery and installation:
    - .1 Verification of conformity to specification, approved shop drawings and completion of PI report forms.
    - .2 Visual inspection of quality of installation.
  - .2 Start-up: follow accepted start-up procedures.
  - .3 Operational testing: document equipment performance.
  - .4 System PV: include repetition of tests after correcting deficiencies.
  - .5 Post-substantial performance verification: to include fine-tuning.
- .3 Correct deficiencies and obtain approval from Departmental Representative after distinct phases have been completed and before commencing next phase.
- .4 Document require tests on approved PV forms.
- .5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by Departmental Representative. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:
  - .1 Minor equipment/systems: implement corrective measures approved by Departmental Representative.
  - .2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by Departmental Representative.
  - .3 If evaluation report concludes that major damage has occurred, Departmental Representative shall reject equipment.
    - .1 Rejected equipment to be remove from site and replace with new.

- .2 Subject new equipment/systems to specified start-up procedures.

#### **1.15 START-UP DOCUMENTATION**

- .1 Assemble start-up documentation and submit to Departmental Representative for approval before commencement of commissioning.
- .2 Start-up documentation to include:
  - .1 Factory and on-site test certificates for specified equipment.
  - .2 Pre-start-up inspection reports.
  - .3 Signed installation/start-up check lists.
  - .4 Start-up reports,
  - .5 Step-by-step description of complete start-up procedures, to permit Departmental Representative to repeat start-up at any time.

#### **1.16 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS**

- .1 After start-up, operate and maintain equipment and systems as directed by equipment/system manufacturer.
- .2 With assistance of manufacturer develop written maintenance program and submit Departmental Representative for approval before implementation.
- .3 Operate and maintain systems for length of time required for commissioning to be completed.
- .4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

#### **1.17 TEST RESULTS**

- .1 If start-up, testing and/or PV produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.
- .2 Provide manpower and materials, assume costs for re-commissioning.

#### **1.18 START OF COMMISSIONING**

- .1 Notify Departmental Representative at least 21 days prior to start of Cx.
- .2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

#### **1.19 INSTRUMENTS / EQUIPMENT**

- .1 Submit to Departmental Representative for review and approval:
  - .1 Complete list of instruments proposed to be used.
  - .2 Listed data including, serial number, current calibration certificate, calibration date, calibration expiry date and calibration accuracy.
- .2 Provide the following equipment as required:
  - .1 2-way radios.
  - .2 Ladders.

- .3 Equipment as required to complete work.

## **1.20 COMMISSIONING PERFORMANCE VERIFICATION**

- .1 Carry out Cx:
  - .1 Under actual operating conditions, over entire operating range, in all modes.
  - .2 On independent systems and interacting systems.
- .2 Cx procedures to be repeatable and reported results are to be verifiable.
- .3 Follow equipment manufacturer's operating instructions.
- .4 EMCS trending to be available as supporting documentation for performance verification.

## **1.21 WITNESSING COMMISSIONING**

- .1 Departmental Representative to witness activities and verify results.

## **1.22 AUTHORITIES HAVING JURISDICTION**

- .1 Where specified start-up, testing or commissioning procedures duplicate verification requirements of authority having jurisdiction, arrange for authority to witness procedures so as to avoid duplication of tests and to facilitate expedient acceptance of facility.
- .2 Obtain certificates of approval, acceptance and compliance with rules and regulation of authority having jurisdiction.
- .3 Provide copies to Departmental Representative within 5 days of test and with Cx report.

## **1.23 COMMISSIONING CONSTRAINTS**

- .1 Since access into secure or sensitive areas will be very difficult after occupancy, it is necessary to complete Cx of occupancy, weather, and seasonal sensitive equipment and systems before issuance of the Certificate of Substantial Performance, using, if necessary, simulated thermal loads.

## **1.24 EXTRAPOLATION OF RESULTS**

- .1 Where Cx of weather, occupancy, or seasonal-sensitive equipment or systems cannot be conducted under near-rated or near-design conditions, extrapolate part-load results to design conditions when approved by Departmental Representative in accordance with equipment manufacturer's instructions, using manufacturer's data, with manufacturer's assistance and using approved formulae.

## **1.25 EXTENT OF VERIFICATION**

- .1 Laboratory areas:
  - .1 Provide manpower and instrumentation to verify up to 100% of reported results.
- .2 Elsewhere:
  - .1 Provide manpower and instrumentation to verify up to 30% of reported results, unless specified otherwise in other sections.
- .3 Number and location to be at discretion of Departmental Representative.

- .4 Conduct tests repeated during verification under same conditions as original tests, using same test equipment, instrumentation.
- .5 Review and repeat commissioning of systems if inconsistencies found in more than 20% of reported results.
- .6 Perform additional commissioning until results are acceptable to Departmental Representative.

#### **1.26 REPEAT VERIFICATIONS**

- .1 Assume costs incurred by Departmental Representative for third and subsequent verifications where:
  - .1 Verification of reported results fail to receive Departmental Representative's approval.
  - .2 Repetition of second verification again fails to receive approval.
  - .3 Departmental Representative deems Contractor's request for second verification was premature.

#### **1.27 SUNDRY CHECKS AND ADJUSTMENTS**

- .1 Make adjustments and changes which become apparent as Cx proceeds.
- .2 Perform static and operational checks as applicable and as required.

#### **1.28 DEFICIENCIES, FAULTS, DEFECTS**

- .1 Correct deficiencies found during start-up and Cx to satisfaction of Departmental Representative.
- .2 Report problems, faults or defects affecting Cx to Departmental Representative in writing. Stop Cx until problems are rectified. Proceed with written approval from Departmental Representative.

#### **1.29 COMPLETION OF COMMISSIONING**

- .1 Upon completion of Cx leave systems in normal operating mode.
- .2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx prior to issuance of Interim Certificate of Completion.
- .3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Departmental Representative.

#### **1.30 ACTIVITIES UPON COMPLETION OF COMMISSIONING**

- .1 When changes are made to baseline components or system settings established during Cx process, provide updated Cx form for affected item.

#### **1.31 TRAINING**

- .1 In accordance with Section 01 91 41.

**1.32 MAINTENANCE MATERIALS, SPARE PARTS, SPECIAL TOOLS**

- .1 Supply, deliver, and document maintenance materials, spare parts, and special tools as specified in contract.

**1.33 OCCUPANCY**

- .1 Cooperate fully with Departmental Representative during stages of acceptance and occupancy of facility.

**1.34 INSTALLED INSTRUMENTATION**

- .1 Use instruments installed under Contract for TAB and PV if:
  - .1 Accuracy complies with these specifications.
  - .2 Calibration certificates have been deposited with Departmental Representative.
- .2 Calibrated EMCS sensors may be used to obtain performance data provided that sensor calibration has been completed and accepted.

**1.35 PERFORMANCE VERIFICATION TOLERANCES**

- .1 Application tolerances:
  - .1 Specified range of acceptable deviations of measured values from specified values or specified design criteria. Except for special areas, to be within +/-10% of specified values.
- .2 Instrument accuracy tolerances:
  - .1 To be of higher order of magnitude than equipment or system being tested.
- .3 Measurement tolerances during verification:
  - .1 Unless otherwise specified actual values to be within +/-2% of recorded values.

**1.36 OWNER'S PERFORMANCE TESTING**

- .1 Performance testing of equipment or system by Departmental Representative will not relieve Contractor from compliance with specified start-up and testing procedures.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 SUMMARY**

- .1 Section Includes:
  - .1 Commissioning forms to be completed for equipment, system and integrated system.

**1.2 INSTALLATION/START- UP CHECK LISTS**

- .1 Include the following data:
  - .1 Product manufacturer's installation instructions and recommended checks.
  - .2 Special procedures as specified in relevant technical sections.
  - .3 Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.
- .2 Equipment manufacturer's installation/start-up check lists are acceptable for use. As deemed necessary by Departmental Representative supplemental additional data lists will be required for specific project conditions.
- .3 Use check lists for equipment installation. Document check list verifying checks have been made, indicate deficiencies and corrective action taken.
- .4 Installer to sign check lists upon completion, certifying stated checks and inspections have been performed. Return completed check lists to Departmental Representative. Check lists will be required during Commissioning and will be included in Building Maintenance Manual (BMM) at completion of project.
- .5 Use of check lists will not be considered part of commissioning process but will be stringently used for equipment pre-start and start-up procedures.

**1.3 PRODUCT INFORMATION (PI) REPORT FORMS**

- .1 Product Information (PI) forms compiles gathered data on items of equipment produced by equipment manufacturer, includes nameplate information, parts list, operating instructions, maintenance guidelines and pertinent technical data and recommended checks that is necessary to prepare for start-up and functional testing and used during operation and maintenance of equipment. This documentation is included in the BMM at completion of work.
- .2 Prior to Performance Verification (PV) of systems complete items on PI forms related to systems and obtain Departmental Representative's approval.

**1.4 PERFORMANCE VERIFICATION (PV) FORMS**

- .1 PV forms to be used for checks, running dynamic tests and adjustments carried out on equipment and systems to ensure correct operation, efficiently and function independently and interactively with other systems as intended with project requirements.
  - .2 PV report forms include those developed by Contractor records measured data and readings taken during functional testing and Performance Verification procedures.
-

- .3 Prior to PV of integrated system, complete PV forms of related systems and obtain Departmental Representative's approval.

## **1.5 CHANGES AND DEVELOPMENT OF NEW REPORT FORMS**

- .1 When additional forms are required, but are not available from Departmental Representative develop appropriate verification forms and submit to Departmental Representative for approval prior to use.
  - .1 Additional commissioning forms to be in same format as provided by Departmental Representative.

## **1.6 COMMISSIONING FORMS**

- .1 Use Commissioning forms to verify installation and record performance when starting equipment and systems.
- .2 Strategy for Use:
  - .1 Departmental Representative provides Contractor project-specific Commissioning forms with Specification data included.
  - .2 Contractor will provide required shop drawings information and verify correct installation and operation of items indicated on these forms.
  - .3 Confirm operation as per design criteria and intent.
  - .4 Identify variances between design and operation and reasons for variances.
  - .5 Verify operation in specified normal and emergency modes and under specified load conditions.
  - .6 Record analytical and substantiating data.
  - .7 Verify reported results.
  - .8 Form to bear signatures of recording technician and reviewed and signed off by Departmental Representative.
  - .9 Submit immediately after tests are performed.
  - .10 Reported results in true measured SI unit values.
  - .11 Provide Departmental Representative with originals of completed forms.
  - .12 Maintain copy on site during start-up, testing and commissioning period.

## **1.7 LANGUAGE**

- .1 To suit the language profile of the awarded contract.

## **Part 2 PRODUCTS**

### **2.1 NOT USED**

- .1 Not Used.
-

**Part 3 EXECUTION**

**3.1 NOT USED**

.1 Not Used.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 SUMMARY**

- .1 Section Includes:
  - .1 This Section specifies roles and responsibilities of Commissioning Training.

**1.2 TRAINEES**

- .1 Trainees: personnel selected for operating and maintaining this facility. Includes Facility Manager, building operators, maintenance staff, security staff, and technical specialists as required.
- .2 Trainees will be available for training during later stages of construction for purposes of familiarization with systems.

**1.3 INSTRUCTORS**

- .1 Departmental Representative will provide:
  - .1 Descriptions of systems.
  - .2 Instruction on design philosophy, design criteria, and design intent.
- .2 Contractor and certified factory-trained manufacturers' personnel: to provide instruction on the following:
  - .1 Start-Up, operation, shut-down of equipment, components and systems.
  - .2 Control features, reasons for, results of, implications on associated systems of, adjustment of set points of control and safety devices.
  - .3 Instructions on servicing, maintenance and adjustment of systems, equipment and components.
- .3 Contractor and equipment manufacturer to provide instruction on:
  - .1 Start-up, operation, maintenance and shut-down of equipment they have certified installation, started up and carried out PV tests.

**1.4 TRAINING OBJECTIVES**

- .1 Training to be detailed and duration to ensure:
  - .1 Safe, reliable, cost-effective, energy-efficient operation of systems in normal and emergency modes under all conditions.
  - .2 Effective on-going inspection, measurements of system performance.
  - .3 Proper preventive maintenance, diagnosis and trouble-shooting.
  - .4 Ability to update documentation.
  - .5 Ability to operate equipment and systems under emergency conditions until appropriate qualified assistance arrives.

**1.5 TRAINING MATERIALS**

- .1 Instructors to be responsible for content and quality.
-

- .2 Training materials to include:
  - .1 "As-Built" Contract Documents.
  - .2 Operating Manual.
  - .3 Maintenance Manual.
  - .4 Management Manual.
  - .5 TAB and PV Reports.
- .3 Commissioning Manager and Departmental Representative will review training manuals.
- .4 Training materials to be in a format that permits future training procedures to same degree of detail.
- .5 Supplement training materials:
  - .1 Transparencies for overhead projectors.
  - .2 Multimedia presentations.
  - .3 Manufacturer's training videos.
  - .4 Equipment models.

## **1.6 SCHEDULING**

- .1 Include in Commissioning Schedule time for training.
- .2 Deliver training during regular working hours, training sessions to be 3 hours in length.
- .3 Training to be completed prior to acceptance of facility.

## **1.7 RESPONSIBILITIES**

- .1 Be responsible for:
  - .1 Implementation of training activities,
  - .2 Coordination among instructors,
  - .3 Quality of training, training materials,
- .2 Departmental Representative will evaluate training and materials.
- .3 Upon completion of training, provide written report, signed by Instructors, witnessed by Departmental Representative.

## **1.8 TRAINING CONTENT**

- .1 Training to include demonstrations by Instructors using the installed equipment and systems.
  - .2 Content includes:
    - .1 Review of facility and occupancy profile.
    - .2 Functional requirements.
    - .3 System philosophy, limitations of systems and emergency procedures.
    - .4 Review of system layout, equipment, components and controls.
    - .5 Equipment and system start-up, operation, monitoring, servicing, maintenance and shut-down procedures.
-

- .6 System operating sequences, including step-by-step directions for starting up, shut-down, operation of valves, dampers, switches, adjustment of control settings and emergency procedures.
- .7 Maintenance and servicing.
- .8 Trouble-shooting diagnosis.
- .9 Inter-action among systems during integrated operation.
- .10 Review of O&M documentation.
- .3 Provide specialized training as specified in relevant Technical Sections of the construction specifications.

## **1.9 VIDEO-BASED TRAINING**

- .1 Manufacturer's videotapes/DVDs/Blu-ray to be used as training tool with Departmental Representative's review and written approval 3 months prior to commencement of scheduled training.
- .2 On-Site training videos:
  - .1 Videotape or record training sessions for use during future training.
  - .2 To be performed after systems are fully commissioned.
  - .3 Organize into several short modules to permit incorporation of changes.
- .3 Production methods to be high quality.

## **Part 2 PRODUCTS**

### **2.1 NOT USED**

- .1 Not Used.

## **Part 3 EXECUTION**

### **3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 CSA International
  - .1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.
- .2 U.S. Environmental Protection Agency (EPA)/Office of Water
  - .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Submit demolition drawings:
  - .1 Submit for review and approval by Departmental Representative shoring and underpinning drawings stamped and signed by professional engineer registered or licensed in the Province of Ontario Canada, showing proposed method.
- .3 If material resembling spray or trowel-applied asbestos or other designated substance listed be encountered, stop work, take preventative measures, and notify Departmental Representative immediately.
  - .1 Proceed only after receipt of written instructions have been received from Departmental Representative.
- .4 Notify Departmental Representative before disrupting building access or services.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not used.

**Part 3 EXECUTION**

**3.1 EXAMINATION**

- .1 Inspect building with Departmental Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.
  - .2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.
  - .3 Notify and obtain approval of utility companies before starting demolition.
-

- .4 Disconnect, cap, plug or divert, as required, existing public utilities within the property where they interfere with the execution of the work, in conformity with the requirements of the authorities having jurisdiction. Mark the location of these and previously capped or plugged services on the site and indicate location (horizontal and vertical) on the record drawings. Support, shore up and maintain pipes and conduits encountered.
  - .1 Immediately notify Departmental Representative and utility company concerned in case of damage to any utility or service, designated to remain in place.
  - .2 Immediately notify the Departmental Representative should uncharted utility or service be encountered, and await instruction in writing regarding remedial action.

### 3.2 PROTECTION

- .1 Prevent movement, settlement, or damage to adjacent parts of building to remain in place. Provide bracing and shoring required.
- .2 Keep noise, dust, and inconvenience to occupants to minimum.
- .3 Protect building systems, services and equipment.
- .4 Provide temporary dust screens, covers, railings, supports and other protection as required.

### 3.3 PREPARATION

- .1 Protection of In-Place Conditions:
  - .1 Prevent movement, settlement, or damage to adjacent parts of building to remain in place. Provide bracing and shoring required.
  - .2 Keep noise, dust, and inconvenience to occupants to minimum.
  - .3 Protect building systems, services and equipment.
  - .4 Provide temporary dust screens, covers, railings, supports and other protection as required.
  - .5 Do Work in accordance with Section 01 35 29.
- .2 Demolition/Removal:
  - .1 Remove items as indicated.
  - .2 Remove parts of existing building to permit new construction.
  - .3 Trim edges of partially demolished building elements to tolerances as defined by Departmental Representative to suit future use.

### 3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
    - .1 Leave Work area clean at end of each day.
  - .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
  - .3 Refer to demolition drawings and specifications for items to be salvaged for reuse.
-

- .4 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

## **1.1 REFERENCES**

- .1 CSA International
  - .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
  - .2 CSA O121-08 (R2013) Douglas Fir Plywood.
  - .3 CAN/CSA-O141-05(R2014), Softwood Lumber.
  - .4 CAN/CSA-O325-07(R2012), Construction Sheathing.
  - .5 CSA-Z809-16 (R2013), Sustainable Forest Management.
  - .6 CSA T530-99, Commercial Building Standard for Telecommunications Pathways and Spaces
- .2 American Society for Testing and Materials International (ASTM)
  - .1 ASTM A123/A123M-15, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .3 National Lumber Grades Authority (NLGA)
  - .1 Standard Grading Rules for Canadian Lumber 2014.
- .4 National Building Code of Canada (NBC) 2010.

## **1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for rough carpentry work and include product characteristics, performance criteria, physical size, finish and limitations.

## **1.3 MAINTENANCE MATERIALS SUBMITTALS**

- .1 Extra Stock Materials:
  - .1 Provide electrical equipment backboards for mounting electrical equipment as indicated. Use 19 mm thick plywood on 19 x 38 mm furring around spacing, perimeter and at maximum 300 mm intermediate

## **1.4 QUALITY ASSURANCE**

- .1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .2 Plywood identification: by grade mark in accordance with applicable CSA standards.
- .3 Plywood, OSB and wood based composite panel construction sheathing identification: by grademark in accordance with applicable CSA standards.

## **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
-

- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect wood from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

## **Part 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Lumber: unless specified otherwise, softwood, S4S, S-DRY graded and stamped, in accordance with following standards:
  - .1 CAN/CSA-O141.
  - .2 NLGA Standard Grading Rules for Canadian Lumber.
  - .3 CAN/CSA-Z809, SFI or Forestry Stewardship Council (FSC) certified.
- .2 Furring, blocking, nailing strips, grounds, backing and sleepers:
  - .1 Board sizes: "Standard" or better grade.
  - .2 Dimension sizes: "Standard" light framing or better grade.
  - .3 Post and timbers sizes: "Standard" or better grade.
- .3 Panel Materials: CAN/CSA-Z809, SFI or Forestry Stewardship Council (FSC) certified.
  - .1 Douglas fir plywood (DFP): to CSA O121, standard construction. Urea-formaldehyde free.
  - .2 Canadian softwood plywood (CSP): to CSA O151, standard construction. Urea-formaldehyde free.
  - .3 Plywood, OSB and wood based composite panels: to CAN/CSA-O325. Urea-formaldehyde free.
- .4 Telecommunications and Data Panel Boards:
  - .1 Install 19 mm DFP plywood on all walls in telephone and data rooms receiving wiring and equipment; minimum 1220 mm x 2440 mm panels on periphery walls over 300 mm wide, mounted 150 mm off of finished floor; coordinate installation and locations with Electrical Drawings and as follows:
    - .1 Paint panels with 2 coats of light coloured fire retardant paint finish; coat all sides of panels (back, front and sides) to meet the intent of fire rated panel requirements listed in CSA T530 requirements.

### **2.2 ACCESSORIES**

- .1 Fasteners: to ASTM A123/A123M, for exterior work and pressure- preservative treated lumber.
  - .2 Nails, spikes and staples: to CSA B111.
-

- .3 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.
- .4 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, recommended for purpose by manufacturer.

### **Part 3 EXECUTION**

#### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for rough carpentry installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

#### **3.2 PREPARATION**

- .1 Treat surfaces of material with wood preservative, before installation.
- .2 Apply preservative by dipping, or by brush to completely saturate and maintain wet film on surface for minimum 3 minute soak on lumber and 1 minute soak on plywood.
- .3 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.

#### **3.3 INSTALLATION**

- .1 Comply with requirements of NBC, supplemented by the following paragraphs.
- .2 Install furring and blocking as required to space-out and support casework, cabinets, wall mounted equipment, wall and ceiling finishes, and other work as required.
- .3 Align and plumb faces of furring and blocking to tolerance of 1:600.
- .4 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.
- .5 Install sleepers as indicated.
- .6 Use caution when working with particle board. Use dust collectors and high quality respirator masks.
- .7 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .8 Countersink bolts where necessary to provide clearance for other work.

#### **3.4 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
  - .1 Leave Work area clean at end of each day.

- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 American National Standards Institute (ANSI)
  - .1 ANSI/HPVA HP-1-09, Standard for Hardwood and Decorative Plywood.
- .2 Architectural Woodwork Manufacturers Association of Canada (AWMAC), Architectural Woodwork Institute (AWI) and Woodwork Institute (WI).
  - .1 AWI/AWMAC/WI Architectural Woodwork Standards, AWS Edition 2-2014.
- .3 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-71.20-M88, Adhesive, Contact, Brushable.
- .4 CSA International
  - .1 CSA B111-74(R2003), Wire Nails, Spikes and Staples.
  - .2 CSA O121-08(R2013), Douglas Fir Plywood.
  - .3 CSA O151-09(R2014), Canadian Softwood Plywood.
- .5 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .6 National Electrical Manufacturers Association (NEMA)
  - .1 ANSI/NEMA LD-3-05, High-Pressure Decorative Laminates (HPDL).
- .7 National Hardwood Lumber Association (NHLA)
  - .1 Rules for the Measurement and Inspection of Hardwood and Cypress 1998.
- .8 National Lumber Grades Authority (NLGA)
  - .1 Standard Grading Rules for Canadian Lumber 2014.
- .9 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
  - .1 SCAQMD Rule 1113-A2007, Architectural Coatings.
  - .2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.
- .10 Sustainable Forestry Initiative (SFI).

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for architectural woodwork and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit two copies of WHMIS MSDS.

- .3 Shop Drawings:
    - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
    - .2 Indicate details of construction, profiles, jointing, fastening and other related details.
      - .1 Scales: profiles full size, details half full size.
    - .3 Indicate materials, thicknesses, finishes and hardware.
    - .4 Indicate locations of service outlets in casework, typical and special installation conditions, and connections, attachments, anchorage and location of exposed fastenings.
  - .4 Samples:
    - .1 Submit for review and acceptance of each unit.
    - .2 Samples will be returned for inclusion into work.
    - .3 Submit duplicate samples of plywood: sample size 300 x 300 mm.
    - .4 Submit duplicate samples of laminated plastic for colour selection.
    - .5 Submit duplicate samples of laminated plastic joints, edging, cutouts and postformed profiles.
  - .5 Certifications: submit AWMAC GIS certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
    - .1 Architectural woodwork shall be manufactured and/or installed to the current AWMAC Architectural Woodwork Standards and shall be subject to an inspection at the plant and/or site by an appointed AWMAC Certified Inspector.
    - .2 Inspection costs shall be included in the bid price for this project. Contact your local AWMAC Chapter for details of inspection costs.
    - .3 Shop drawings shall be submitted to the AWMAC Chapter office for review before work commences.
    - .4 Work that does not meet the AWMAC Architectural Woodwork Standards, as specified, shall be replaced, reworked and/or refinished by the architectural woodwork contractor, to the approval of AWMAC, at no additional cost to the Departmental Representative.
    - .5 If the woodwork contractor is an AWMAC Manufacturer member in good standing, a two (2) year AWMAC Guarantee Certificate will be issued.
    - .6 The AWMAC Guarantee shall cover replacing, reworking and/or refinishing any deficient architectural woodwork due to faulty workmanship or defective materials supplied by the woodwork contractor, which may appear during a two (2) year period following the date of issuance.
    - .7 If the woodwork contractor is not an AWMAC Manufacturer member they shall provide the Departmental Representative with a two (2) year maintenance bond, in lieu of the AWMAC Guarantee Certificate, to the full value of the architectural woodwork contract.
-

### 1.3 QUALITY ASSURANCE

- .1 Lumber by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .2 Plywood, particleboard, OSB and wood based composite panels to CSA and ANSI standards.

### 1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
  - .1 Protect millwork against dampness and damage during and after delivery.
  - .2 Store millwork in ventilated areas, protected from extreme changes of temperature or humidity.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect architectural woodwork from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

## Part 2 PRODUCTS

### 2.1 MATERIALS

- .1 Wood Mouldings: Provide interior millwork in accordance with AWS Section 6 for profiles and configurations required for the project and as follows:
  - .1 Hardwood Trim: Selected to meet AWS Custom Grade, kiln dried; species white oak finished lumber (S4S), selected for compatible grain and colour, edge grain (vertical), suitable for clear stained finish and in profile to match existing for the following:
    - .1 Wall base
  - .2 Douglas fir plywood (DFP): to CSA O121, standard construction, FSC certified.
    - .1 Plywood resin to contain no added urea-formaldehyde.
  - .3 Industrial Particleboard: Meeting ANSI 208.1 Grade M-2 for interior use, minimum 720 kg/m<sup>3</sup> density and Grade M-3, minimum 750 kg/m<sup>3</sup> particleboard for shelves; clearly mark panels with grade mark in visible location; extruded particleboard having loose cores with voids will not be permitted.
    - .1 Particleboard to contain no added urea formaldehyde.
  - .4 Laminated plastic for flatwork (PL-1 and PL-2): to NEMA LD3, Grade VGL, Type HD, pattern, colour, finish as selected by Departmental Representative.

- .5 Laminated plastic for postforming work (PL-1 and PL-2): to NEMA LD3, Grade VGL, Type HD, pattern, colour, finish as selected by Departmental Representative.
- .6 Thermofused Melamine: to NEMA LD3 Grade VGL.
  - .1 High wear resistant thermofused melamine: equal or exceed 400 cycles (Minimum standard for HPL abrasion test).
- .7 Nails and staples: to CSA B111.
- .8 Wood screws: type and size to suit application.
- .9 Splines: metal.
- .10 Sealant: in accordance with Section 07 92 00.
  - .1 Sealants: VOC limit 250 g/L maximum to SCAQMD Rule 1168.
- .11 Laminated plastic adhesive:
  - .1 Adhesive: contact adhesive to CAN/CGSB-71.20.
  - .2 Adhesives: VOC limit 120 g/L maximum to SCAQMD Rule 1168 and GS-36.
  - .3 Clear Wood Finishes: VOC limit 550 g/L maximum to SCAQMD Rule 1113

## 2.2 MANUFACTURED UNITS

- .1 Casework:
  - .1 Fabricate caseworks to AWI/AWMAC/WI AWS premium quality grade.
  - .2 Furring, blocking, nailing strips, grounds and rough bucks and sleepers.
    - .1 Board sizes: "standard" or better grade.
    - .2 Dimension sizes: "standard" light framing or better grade.
    - .3 Urea-formaldehyde free.
  - .3 Framing NLGA Grade No.1.
  - .4 Countertops:
    - .1 Softwood plywood meeting CSA O121 or CSA O151, cross-banded, sanded G2S, square edge, thickness as indicated on Drawings.
  - .5 Case bodies (ends, divisions and bottoms).
    - .1 Grade M-2 for interior use, minimum 720 kg/m<sup>3</sup> density and Grade M-3, minimum 750 kg/m<sup>3</sup> particleboard for countertops and shelves, thickness as indicated on Drawings. Backs:
      - .1 Grade M-2 for interior use, minimum 720 kg/m<sup>3</sup> density. Interiors: Thermofused Melamine: to NEMA LD3 Grade VGL.
  - .8 Shelving:
    - .1 Grade M-3, minimum 750 kg/m<sup>3</sup> particleboard, thickness as indicated on Drawings. Edge banding: High Pressure Decorative Laminate for HPDL Finished Surfaces; colour to match with surface finish
  - .10 Drawers:
    - .1 Fabricate drawers to AWI/AWMAC/WI Architectural Woodwork Standards premium grade supplemented as follows:
    - .2 Sides and Backs.

- .1 Grade M-2 for interior use, minimum 720 kg/m<sup>3</sup> density, thickness as indicated on Drawings.Bottoms:
  - .1 Grade M-2 for interior use, minimum 720 kg/m<sup>3</sup> density, thickness as indicated on Drawings.Fronts:
  - .1 Grade M-2 for interior use, minimum 720 kg/m<sup>3</sup> density, thickness as indicated on Drawings.Casework Doors:
  - .1 Grade M-2 for interior use, minimum 720 kg/m<sup>3</sup> density, thickness as indicated on Drawings.**HARDWARE**
- .1 Cabinet hinge: to ANSI/BHMA-A156.9-2015, type B81602 or type B81612.
  - .2 Piano hinge: to ANSI/BHMA-A156.9-2015, type B81491, reversible.
  - .3 Magnetic catch: to ANSI/BHMA-A156.9-2015, type B13171, heavy duty.
  - .4 Gate latch: hidden type, single acting, bolt activated by pressing button concealed on bottom of latch case, brushed nickel finish.
  - .5 Cabinet pull: to ANSI/BHMA-A156.9-2015, type B32011, and CSA B651-12, finish 628, satin aluminum, 76.2 mm centres, back mounted.
  - .6 Adjustable shelf standard: to ANSI/BHMA- A156.9-2015, type B84061, surface application, open shelf rest type B84091.
  - .7 Drawer slide set: heavy duty to ANSI/BHMA- A156.9-2015, type B05051, with zinc plate finish.
    - .1 Progressive full extension: 'Model 8500' manufactured by knape and Vogt.
  - .8 Cam locks: to ANSI/BHMA-A156.11-2014, key removable in locked and unlocked position, cam attached with screw or nut, type E07261, Grade 1. Keyed alike.
  - .9 Closet bar: to ANSI/BHMA-A156.16-2013, attached by surface screws, round type L03131.
  - .10 Draw bolts: type recommended by laminated plastic manufacturer.

## 2.4 FABRICATION

- .1 Set nails and countersink screws apply stained wood filler to indentations, sand smooth and leave ready to receive finish.
  - .2 Shop install cabinet hardware for doors, shelves and drawers. Recess shelf standards unless noted otherwise.
  - .3 Shelving to cabinetwork to be adjustable unless otherwise noted.
  - .4 Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes and other fixtures.
  - .5 Shop assemble work for delivery to site in size easily handled and to ensure passage through building openings.
  - .6 Obtain governing dimensions before fabricating items which are to accommodate or abut appliances, equipment and other materials.
  - .7 Ensure adjacent parts of continuous laminate work match in colour and pattern.
-

- .8 Veneer laminated plastic to core material in accordance with adhesive manufacturer's instructions. Ensure core and laminate profiles coincide to provide continuous support and bond over entire surface. Use continuous lengths up to 2400 mm. Keep joints 600 mm from sink cutouts.
- .9 Form shaped profiles and bends as indicated, using postforming grade laminate to laminate manufacturer's instructions.
- .10 Use straight self-edging laminate strip for flatwork to cover exposed edge of core material. Chamfer exposed edges uniformly at approximately 20 degrees. Do not mitre laminate edges.
- .11 Apply laminate backing sheet to reverse side of core of plastic laminate work.
- .12 Apply laminated plastic liner sheet where indicated.
- .13 Fabricate standing and running trim rigid, plumb and square, as detailed, with tight, bevelled, hairline joints; sand work smooth; set nails and screws, and fill with matching patching compounds and as follows:
  - .1 Butt and dowel joints for wall base.
  - .2 Build-in millwork as required to receive reinforcing, bracing, anchors
  - .3 Countersink bolts and washers; fill holes with matching wood plugs
  - .4 Fabricate straight run millwork accurately; provide over length to allow for site trimming to proper fit
  - .5 Plane sides and back, sand exposed faces, surfaces; hollow out backs 3 mm round-off edges
  - .6 Finish: Factory finished to match existing in accordance with requirements of Section 5 of AWS.

## **2.5 FINISHING**

- .1 Finish in accordance with Section 09 91 23.

## **Part 3 EXECUTION**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for architectural woodwork installation in accordance with manufacturer's instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

### **3.2 INSTALLATION**

- .1 Do architectural woodwork to AWI/AWMAC/WI Architectural Woodwork Standards.

- .2 Install prefinished millwork at locations shown on drawings.
  - .1 Position accurately, level, plumb straight.
- .3 Fasten and anchor millwork securely.
  - .1 Supply and install heavy duty fixture attachments for wall mounted cabinets.
- .4 Use draw bolts in countertop joints.
- .5 Scribe and cut as required to fit abutting walls and to fit properly into recesses and to accommodate piping, columns, fixtures, outlets or other projecting, intersecting or penetrating objects.
- .6 At junction of plastic laminate counter back splash and adjacent wall finish, apply small bead of sealant in accordance with Section 07 92 00.
- .7 Apply water resistant building paper over wood framing members in contact with masonry or cementitious construction.
- .8 Fit hardware accurately and securely in accordance with manufacturer's written instructions.
- .9 Site apply laminated plastic to units as indicated.
  - .1 Adhere laminated plastic over entire surface.
  - .2 Make corners with hairline joints.
  - .3 Use full sized laminate sheets.
  - .4 Make joints only where approved by Departmental Representative.
  - .5 Slightly bevel arises.
- .10 For site application, offset joints in plastic laminate facing from joints in core.
- .11 Install wall base to walls, anchoring securely with proper hardware:
  - .1 Fasten pieces together in runs to provide a rigid rail construction, true, level and properly aligned.
  - .2 Apply 13 mm wide x 3 mm thick medium density adhesive backed tape gasket continuous along top and bottom edge where mounted snug to wall or cabinet work to close variation gaps.

### 3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
    - .1 Leave Work area clean at end of each day.
  - .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
    - .1 Clean millwork and cabinet work inside cupboards and outside surfaces.
    - .2 Remove excess glue from surfaces.
  - .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
    - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
-

- .4 Sand smooth, fill and retouch nicks, chips and scratches; replace damaged items that cannot be repaired.

**3.4 PROTECTION**

- .1 Protect millwork and cabinet work from damage until final inspection.
- .2 Protect installed products and components from damage during construction.
- .3 Repair damage to adjacent materials caused by architectural woodwork installation.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 SECTION INCLUDES**

- .1 Materials, preparation and application for caulking and sealants.
- .2 Text to complete other various Sections containing sealant or caulking specifications, including Section 07 52 00.

**1.2 REFERENCES**

- .1 American Society for Testing and Materials International, (ASTM)
  - .1 ASTM C919-12, Standard Practice for Use of Sealants in Acoustical Applications.
  - .2 ASTM C920-14a, Standard Specification for Elastomeric Joint Sealants.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-19.13-M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.
  - .2 CAN/CGSB-19.17-M90, One-Component Acrylic Emulsion Base Sealing Compound.
  - .3 CAN/CGSB-19.24-M90, Multi-component, Chemical Curing Sealing Compound.
- .3 Department of Justice Canada (Jus)
  - .1 Canadian Environmental Protection Act, 1999 (CEPA).
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .5 Transport Canada (TC)
  - .1 Transportation of Dangerous Goods Act, 1992 (TDGA).

**1.3 SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Manufacturer's product data: Submit manufacturer's printed product data to describe:
  - .1 Caulking compound.
  - .2 Primers.
  - .3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.
- .3 Samples: Submit duplicate samples of each type of material and colour.
  - .1 Submit cured samples of exposed sealants for each color where required to match adjacent material.
- .4 Manufacturer's Installation Instructions: Instructions to include installation instructions for each product used.

#### **1.4 DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver, handle, store and protect materials in accordance with Section 01 61 00.
- .2 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor.

#### **1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling.
- .4 Place materials defined as hazardous or toxic in designated containers.
- .5 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.
- .6 Unused sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
- .7 Divert unused joint sealing material from landfill to official hazardous material collections site approved by Departmental Representative.
- .8 Empty plastic joint sealer containers are not recyclable. Do not dispose of empty containers with plastic materials destined for recycling.
- .9 Fold up metal banding, flatten, and place in designated area for recycling.

#### **1.6 PROJECT CONDITIONS**

- .1 Environmental Limitations:
  - .1 Do not proceed with installation of joint sealants under following conditions:
    - .1 When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4°C.
    - .2 When joint substrates are wet.
- .2 Joint-Width Conditions:
  - .1 Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- .3 Joint-Substrate Conditions:
  - .1 Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

#### **1.7 ENVIRONMENTAL REQUIREMENTS**

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Labour Canada.

- .2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.
- .3 Ventilate area of work as directed by Departmental Representative by use of approved portable supply and exhaust fans.

## **Part 2 PRODUCTS**

### **2.1 SEALANT MATERIALS**

- .1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.
  - .1 When low toxicity caulks are not possible, confine usage to areas which offgas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize offgas time.
  - .2 Where sealants are qualified with primers use only these primers.

### **2.2 SEALANT MATERIAL DESIGNATIONS**

- .1 Polyurethane:
  - .1 Type S-1: One component, non-sag, for general construction, Shore A Hardness 15+, conforming to CAN/CGSB-19.13, Type 2, MCG-2-25-A-N and ASTM C920, Type S, Grade NS, Class 25, Use NT, M, and A, colour to be selected by Departmental Representative from manufacturer's standard range.
- .2 Silicone:
  - .1 Type S-2: Mould and mildew resistant, Shore A Hardness 15-25, one component conforming to CAN/CGSB-19.13 and ASTM C920, primerless, Type S, Grade NS, Class 25, use NT, G, and A, SWRI validated.
- .3 Acoustical Sealant:
  - .1 Type S-5: Non-skinning, non-hardening, single component synthetic rubber sealant, conforming to ASTM C919, primerless, Type S, Grade NS, Class 25, SWRI validated.
- .4 Multi-Component:
  - .1 Type S-6: Saw cut sealant, multi-component, self levelling, conforming to ASTM D2240.
- .5 Preformed Compressible and Non-Compressible back-up materials.
  - .1 Polyethylene, Urethane, Neoprene or Vinyl Foam.
    - .1 Extruded open or closed cell foam backer rod.
    - .2 Size: oversize 30 to 50%.
  - .2 Neoprene or Butyl Rubber.
    - .1 Round solid rod, Shore A hardness 70.

- .3 High Density Foam.
  - .1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m<sup>3</sup> density, or neoprene foam backer, size as recommended by manufacturer.
- .4 Bond Breaker Tape.
  - .1 Polyethylene bond breaker tape which will not bond to sealant.

## **2.3 SEALANT SELECTION**

- .1 Where no specified type of sealant is shown or specified choose one of the sealants specified in this Section applicable to that intended application, and consistent with manufacturer's recommendations.
- .2 Seal interior perimeters of exterior openings as detailed on drawings: Sealant type: S-4.
- .3 Interior control and expansion joints in floor surfaces: Sealant Type S-6.
- .4 Perimeters of interior frames, as detailed and itemized: Sealant Type S-4.
- .5 Exposed interior control joints in drywall: Sealant Type S-1.

## **2.4 JOINT CLEANER**

- .1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant recommended by sealant manufacturer.
- .2 Primer: as recommended by manufacturer.

## **Part 3 EXECUTION**

### **3.1 PROTECTION**

- .1 Protect installed Work of other trades from staining or contamination.

### **3.2 SURFACE PREPARATION**

- .1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.
- .2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work.
- .3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.
- .4 Ensure joint surfaces are dry and frost free.
- .5 Prepare surfaces in accordance with manufacturer's directions.

### **3.3 PRIMING**

- .1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.

- .2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

### 3.4 BACKUP MATERIAL

- .1 Apply bond breaker tape where required to manufacturer's instructions.
- .2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

### 3.5 MIXING

- .1 Mix materials in strict accordance with sealant manufacturer's instructions.

### 3.6 APPLICATION

- .1 Sealant.
  - .1 Apply sealant in accordance with manufacturer's written instructions.
  - .2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.
  - .3 Apply sealant in continuous beads.
  - .4 Apply sealant using gun with proper size nozzle.
  - .5 Use sufficient pressure to fill voids and joints solid.
  - .6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
  - .7 Tool exposed surfaces before skinning begins to give slightly concave shape.
  - .8 Remove excess compound promptly as work progresses and upon completion.
- .2 Curing.
  - .1 Cure sealants in accordance with sealant manufacturer's instructions.
  - .2 Do not cover up sealants until proper curing has taken place.
- .3 Cleanup.
  - .1 Clean adjacent surfaces immediately and leave Work neat and clean.
  - .2 Remove excess and droppings, using recommended cleaners as work progresses.
  - .3 Remove masking tape after initial set of sealant.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM A653/A653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
  - .2 CGSB 41-GP-19Ma-84, Rigid Vinyl Extrusions for Windows and Doors.
- .3 Canadian Standards Association (CSA International)
  - .1 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2 CSA W59-13, Welded Steel Construction (Metal Arc Welding).
- .4 Canadian Steel Door Manufacturers' Association (CSDMA)
  - .1 CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, 2006.
  - .2 CSDMA, Selection and Usage Guide for Commercial Steel Door and Frame Products, 2009.
- .5 National Fire Protection Association (NFPA)
  - .1 NFPA 80-2016, Standard for Fire Doors and Other Opening Protectives.
  - .2 NFPA 252-2012, Standard Methods of Fire Tests of Door Assemblies.
- .6 Underwriters' Laboratories of Canada (ULC)
  - .1 CAN/ULC-S104-10, Standard Method for Fire Tests of Door Assemblies.
  - .2 CAN/ULC-S105-09, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN/ULC-S104.

**1.2 SYSTEM DESCRIPTION**

- .1 Design Requirements:
  - .1 Steel fire rated doors and frames: labelled and listed by an organization accredited by Standards Council of Canada in conformance with CAN/ULC-S104 for ratings specified or indicated.
  - .2 Provide fire labelled frames for openings requiring fire protection ratings. Test products in conformance with CAN/ULC-S104, ASTM E152 or NFPA 252 and listed by nationally recognized agency having factory inspection services.

**1.3 SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00.
  - .2 Provide product data: in accordance with Section 01 33 00.
-

- .3 Provide shop drawings: in accordance with Section 01 33 00.
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
  - .2 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, glazed, arrangement of hardware and fire rating and finishes.
  - .3 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings and reinforcing fire rating finishes.
  - .4 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.

#### **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00.
- .2 Waste Management and Disposal:
  - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 11.

### **Part 2 PRODUCTS**

#### **2.1 MATERIALS**

- .1 Hot dipped galvanized steel sheet: to ASTM A653/A653M, ZF75, minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts, minimum 30% recycled content.
- .2 Reinforcement channel: to CSA G40.20/G40.21, Type 44W, coating designation to ASTM A653/A653M, ZF75, minimum 30% recycled content.

#### **2.2 DOOR CORE MATERIALS**

- .1 Honeycomb construction:
  - .1 Structural small cell, 24.5 mm maximum kraft paper 'honeycomb', weight: 36.3 kg per ream minimum, density: 16.5 kg/m<sup>3</sup> minimum sanded to required thickness.

#### **2.3 ADHESIVES**

- .1 Honeycomb cores and steel components: heat resistant, spray grade, resin reinforced neoprene/rubber (polychloroprene) based, low viscosity, contact cement.
  - .2 Lock-seam doors: fire resistant, resin reinforced polychloroprene, high viscosity, sealant/adhesive.
-

**2.4 PRIMER**

- .1 Touch-up prime CAN/CGSB-1.181.

**2.5 PAINT**

- .1 Field paint steel doors and frames in accordance with Section 09 91 23. Protect weatherstrips from paint. Provide final finish free of scratches or other blemishes.

**2.6 ACCESSORIES**

- .1 Door silencers: single stud rubber/neoprene type.
- .2 Top and bottom caps: rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19Ma.
- .3 Fabricate glazing stops as formed channel, minimum 16 mm height, accurately fitted, butted at corners and fastened to frame sections with counter-sunk oval head sheet metal screws.
- .4 Door bottom seal: As specified in Section 08 71 11.
- .5 Metallic paste filler: to manufacturer's standard.
- .6 Fire labels: metal riveted.
- .7 Sealant: As specified in Section 07 92 00.
- .8 Glazing: As specified in Section 08 80 50.
- .9 Make provisions for glazing as indicated and provide necessary glazing stops.
  - .1 Provide removable stainless steel glazing beads for use with glazing tapes and compounds and secured with countersunk stainless steel screws.
  - .2 Design exterior glazing stops to be tamperproof.

**2.7 FRAMES FABRICATION GENERAL**

- .1 Fabricate frames in accordance with CSDMA specifications.
  - .2 Fabricate frames to profiles and maximum face sizes as indicated.
  - .3 Interior frames: 1.6 mm welded type construction.
  - .4 Blank, reinforce, drill and tap frames for mortised, templated hardware, and electronic hardware using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.
  - .5 Protect mortised cutouts with steel guard boxes.
  - .6 Prepare frame for door silencers, 3 for single door, 2 at head for double door.
  - .7 Manufacturer's nameplates on frames and screens are not permitted.
  - .8 Conceal fastenings except where exposed fastenings are indicated.
  - .9 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.
-

**2.8 FRAME ANCHORAGE**

- .1 Provide appropriate anchorage to floor and wall construction.
- .2 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.
- .3 Provide 2 anchors for rebate opening heights up to 1520 mm and 1 additional anchor for each additional 760 mm of height or fraction thereof.
- .4 Locate anchors for frames in existing openings not more than 150 mm from top and bottom of each jambs and intermediate at 660 mm on centre maximum.

**2.9 FRAMES: WELDED TYPE**

- .1 Welding in accordance with CSA W59.
- .2 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.
- .3 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails and sills.
- .4 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.
- .5 Securely attach floor anchors to inside of each jamb profile.
- .6 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.

**2.10 DOOR FABRICATION GENERAL**

- .1 Doors: swing type, flush, with provision for glass and/or louvre openings as indicated.
  - .2 Interior doors: honeycomb construction.
  - .3 Fabricate doors with longitudinal edges locked seam. Seams: visible.
  - .4 Blank, reinforce, drill doors and tap for mortised, templated hardware and electronic hardware.
  - .5 Factory prepare holes 12.7 mm diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.
  - .6 Reinforce doors where required, for surface mounted hardware. Provide flush steel top caps to exterior doors. Provide inverted, recessed, spot welded channels to top and bottom of interior doors.
  - .7 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.
  - .8 Provide fire labelled doors for those openings requiring fire protection ratings, as scheduled. Test such products in conformance with CAN/ULC-S104 list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.
  - .9 Manufacturer's nameplates on doors are not permitted.
-

**2.11 DOORS: HONEYCOMB CORE CONSTRUCTION**

- .1 Form face sheets for interior doors from 1.6 mm sheet steel with honeycomb core laminated under pressure to face sheets.

**Part 3 EXECUTION**

**3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

**3.2 INSTALLATION GENERAL**

- .1 Install labelled steel fire rated doors and frames to NFPA 80 except where specified otherwise.
- .2 Install doors and frames to CSDMA Installation Guide.

**3.3 FRAME INSTALLATION**

- .1 Set frames plumb, square, level and at correct elevation.
- .2 Secure anchorages and connections to adjacent construction.
- .3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.
- .4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.
- .5 Caulk perimeter of frames between frame and adjacent material.
- .6 Maintain continuity of air barrier and vapour retarder where required.

**3.4 DOOR INSTALLATION**

- .1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 00.
- .2 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows.
  - .1 Hinge side: 1.0 mm.
  - .2 Latchside and head: 1.5 mm.
  - .3 Finished floor, noncombustible sill, and thresholds: 13 mm.
- .3 Adjust operable parts for correct function.
- .4 Install louvres.

**3.5 FINISH REPAIRS**

- .1 Touch up with primer finishes damaged during installation.

- .2 Fill exposed frame anchors and surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

### 3.6 GLAZING

- .1 Install glazing for doors and frames in accordance with Section 08 80 50.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 SUMMARY**

- .1 This section includes requirements for flush wood doors including the following:
  - .1 Solid core doors with wood veneer finished faces.
  - .2 Factory finishing flush wood doors.
  - .3 Factory fitting flush wood doors to frames and factory machining for hardware.
  - .4 Factory machining existing solid core wood doors for new hardware.
  - .5 Repair and touch up of existing wood doors and frames receiving new hardware.

**1.2 REFERENCES**

- .1 American National Standards Institute (ANSI) / Hardwood Plywood & Veneer Association (HPVA):
  - .1 ANSI/HPVA HP-1-2009, American National Standard for Hardwood and Decorative Plywood.
- .2 Architectural Woodwork Institute/Architectural Woodwork Manufacturers Association of Canada/ Woodwork Institute (AWI/AWMAC/WI):
  - .1 AWI/AWMAC/WI Architectural Woodwork Standards, AWS Edition 2-2014.
- .3 Canadian Standards Association (CSA International).
  - .1 CAN/CSA-O132.2 Series-90(R2003), Wood Flush Doors.
  - .2 CSA Certification Program for Windows and Doors 00.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00.
  - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets. Indicate VOC's:
    - .1 For caulking materials during application and curing.
    - .2 For door materials and adhesives.
- .2 Shop Drawings:
  - .1 Submit shop drawings in accordance with Section 01 33 00.
  - .2 Indicate door types and sizes, core construction, transom panel construction and cutouts.

**1.4 SAMPLES**

- .1 Submit samples in accordance with Section 01 33 00.
  - .2 Submit one 300 x 300 mm corner sample of each type wood door.
-

- .3 Show door construction, core, and faces.
- .4 Manufacturer's Instructions:
  - .1 Submit manufacturer's installation instructions.

## **1.5 QUALITY ASSURANCE**

- .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

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

- .1 Storage and Protection:
  - .1 Protect doors from dampness. Arrange for delivery after work causing abnormal humidity has been completed.
  - .2 Store doors in well ventilated room, off floor, in accordance with manufacturer's recommendations.
  - .3 Protect doors from scratches, handling marks and other damage. Crate doors.
  - .4 Store doors away from direct sunlight.

## **1.7 WASTE MANAGEMENT AND DISPOSAL**

- .1 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .2 Dispose of corrugated cardboard, polystyrene and plastic packaging material in appropriate on-site bin for recycling in accordance with site waste management program.
- .3 Divert unused adhesive material from landfill to official hazardous material collections site approved by Departmental Representative.
- .4 Do not dispose of unused paint materials into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

## **Part 2 PRODUCTS**

### **2.1 WOOD FLUSH DOORS**

- .1 Solid core: to CAN/CSA-O132.2.1.
  - .1 Construction:
    - .1 Solid particleboard core: stile and rail frame bonded to particleboard core with wood lock blocks, 5-ply construction.
  - .2 Face Panels:
    - .1 Hardwood; veneer grades: Grade I (Premium), maple species.
  - .3 Blocking: Hardwood lum ber, kiln dried to an average moisture content of between 6% and 12% maximum at time of manufacture, sized and located as required to eliminate through bolting hardware.
  - .4 Adhesive: Type II (water resistant) for interior doors.

- .5 Reveal Trim: 1.6 mm thick type 304 stainless steel u-shaped moulding, 1.6 mm thick.

## 2.2 FABRICATION

- .1 Vertical edge strips to match face veneer.
- .2 Bevel vertical edges of single acting doors 3 mm in 50 mm on lock side and 1.5 mm in 50 mm on hinge side.
- .3 Radius vertical edges of double acting doors to 60 mm radius.
- .4 Machine doors to accept recessed hardware; locate hardware in accordance with requirements listed in Section 08 71 00 and templates provided by hardware supplier.
- .5 Coordinate with hardware mortises in metal frames to verify dimensions and alignment before machining.
- .6 Openings: no cut-outs permitted within 125 mm of sides and top of door or 250 mm from bottom of door.
- .7 Patch and repair damage to existing doors due to removal of existing hardware; use blocking where required to accommodate new hardware installation.

## 2.3 FACTORY FINISHING

- .1 Complete fabrication of doors before applying factory finishes including, but not limited to fitting doors for openings and machining for recessed hardware.
- .2 Factory finish all four edges, edges of cut outs, and mortises the same as for faces, except that stains and fillers may be omitted on bottom edges, edges of cut outs, and mortises.
- .3 Steam out deep scratches and ease sharp edges by sanding before starting factory finishing; block sand using 150/180 grit in direction of grain on all surfaces to remove handling marks and fingerprints.
- .4 Perform filling, sanding and finishing in horizontal position wherever possible.
- .5 Do not use water based primers, stains or combination stain sealers as they raise natural wood grain and may cause veneer splitting and highlighting of veneer joints.
- .6 Transparent Finish:
  - .1 Grade: Premium
  - .2 Finish: TR-4 Conversion Varnish finish designation from AWMAC Manual.
  - .3 Staining: As selected by Departmental Representative from manufacturer's full range to match existing.
  - .4 Effect: Open-grain finish
  - .5 Sheen: Semi-gloss.

**2.4 SHOP FINISHING**

- .1 Repair damage to finish of existing doors caused by removal and reinstallation of hardware; match existing finish.

**Part 3 EXECUTION**

**3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

**3.2 PREPARATION**

- .1 Carefully remove existing wood doors as indicated in Door Schedule to be prepared for new hardware and installation in new frames; protect and transport to shop for machining, repair, and touch up.

**3.3 INSTALLATION**

- .1 Unwrap and protect doors in accordance with CAN/CSA-O132.2 Series, Appendix A.
- .2 Install doors and hardware in accordance with manufacturer's printed instructions and CAN/CSA-O132.2 Series, Appendix A.
- .3 Trim doors as required for proper fit and function; refinish all cut or planed surfaces immediately to match factory finish.
- .4 Do not impair structural strength of door by the application of hardware, cutting and altering the door for lights, louvres or other special details.
- .5 Install stops ready to receive finish.
- .6 Adjust hardware for correct function.

**3.4 ADJUSTMENT**

- .1 Re-adjust doors and hardware just prior to completion of building to function freely and properly.

**3.5 CLEANING**

- .1 Perform cleaning as soon as possible after installation to remove construction and accumulated environmental dirt.
- .2 Remove traces of primer, caulking; clean doors and frames.
- .3 On completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 08 11 00 – Metal Doors And Frames
- .2 Section 08 14 16 – Flush Wood Doors

**1.2 REFERENCES**

- .1 American National Standards Institute (ANSI) / Builders Hardware Manufacturers Association (BHMA)
  - .1 ANSI/ICC A117.1-2009, Standard for Accessible and Usable Buildings and Facilities
  - .2 ANSI/BHMA A156.1-2013, American National Standard for Butts and Hinges.
  - .3 ANSI/BHMA A156.2-2011, Bored and Preamsembled Locks and Latches.
  - .4 ANSI/BHMA A156.3-2014, Exit Devices.
  - .5 ANSI/BHMA A156.4-2013, Door Controls - Closers.
  - .6 ANSI/BHMA A156.5-2014, Auxiliary Locks and Associated Products.
  - .7 ANSI/BHMA A156.6-2010, Architectural Door Trim.
  - .8 ANSI/BHMA A156.10-2011, Power Operated Pedestrian Doors.
  - .9 ANSI/BHMA A156.13-2012, Mortise Locks and Latches Series 1000.
  - .10 ANSI/BHMA A156.15-2015, Release Devices - Closer Holder, Electromagnetic and Electromechanical.
  - .11 ANSI/BHMA A156.16-2016, Auxiliary Hardware.
  - .12 ANSI/BHMA A156.18-2012, Materials and Finishes.
  - .13 ANSI/BHMA A156.19-2013, Power Assist and Low Energy Power - Operated Doors.
  - .14 ANSI/BHMA A156.25-2013, Electrified Locking Devices.
  - .15 ANSI/BHMA-A156.115-2014, Hardware Preparation in Steel Doors or Steel Frames.
- .2 Canadian Steel Door Manufacturers' Association (CSDMA)
  - .1 CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames - 2009.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Submit printed product literature and data sheets for door hardware and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
  - .1 Submit for review and acceptance of each unit.

- .2 Samples will be returned for inclusion into work.
- .3 Identify each sample by label indicating applicable specification paragraph number, brand name and number, finish and hardware package number.
- .4 After approval samples will be returned for incorporation in Work.
- .4 Hardware List:
  - .1 Submit contract hardware list.
  - .2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.
- .5 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .6 Manufacturer's Instructions: submit manufacturer's installation instructions.

#### **1.4 ADMINISTRATION**

- .1 Coordinate with Section 08 03 11 for hardware requirements for Historical Wood Doors.

#### **1.5 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00.
- .2 Operation and Maintenance Data: submit operation and maintenance data for door hardware for incorporation into manual.

#### **1.6 MAINTENANCE MATERIALS SUBMITTALS**

- .1 Extra Stock Materials:
  - .1 Supply maintenance materials in accordance with Section 01 78 00.
  - .2 Tools:
    - .1 Supply 2 sets of wrenches for door closers, locksets and exit hardware.

#### **1.7 QUALITY ASSURANCE**

- .1 Regulatory Requirements:
  - .1 Hardware for doors in fire separations and exit doors certified by a Canadian Certification Organization accredited by Standards Council of Canada.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

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

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
  - .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
  - .3 Package items of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.
-

- .4 Storage and Handling Requirements:
  - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect door hardware from nicks, scratches, and blemishes.
  - .3 Protect prefinished surfaces with wrapping.
  - .4 Replace defective or damaged materials with new.

## **Part 2 PRODUCTS**

### **2.1 HARDWARE ITEMS**

- .1 Use one manufacturer's products only for similar items.

### **2.2 DOOR HARDWARE**

- .1 Locks and latches:
  - .1 Bored and preassembled locks and latches: to ANSI/BHMA A156.2, series 4000 bored lock, grade 1, designed for function as stated in Hardware Schedule.
  - .2 Mortise locks and latches: to ANSI/BHMA A156.13, series 1000 mortise lock, grade 1, designed for function and keyed as stated in Hardware Schedule.
  - .3 Lever handles: plain design.
  - .4 Roses and Escutcheons: round.
  - .5 Normal strikes: box type, lip projection not beyond jamb.
  - .6 Cylinders: key into keying system as directed.
  - .7 Finished to C26D.
- .2 Butts and hinges:
  - .1 Butts and hinges: to ANSI/BHMA A156.1, designated by letter A and numeral identifiers, followed by size and finish, listed in Hardware Schedule.
- .3 Exit devices: to ANSI/BHMA A156.3, type low profile push pad style, function nightlatch, grade 1, conventional design, finished to 32D.
- .4 Door Closers and Accessories:
  - .1 Door controls (closers): to ANSI/BHMA A156.4, designated by letter C and numeral identifiers listed in Hardware Schedule, size in accordance with ANSI/BHMA A156.4, table A1, finished to 689.
- .5 Auxiliary locks and associated products: to ANSI/BHMA A156.5, designated by letter E and numeral identifiers as listed below:
  - .1 Dead bolt, type mortise, finished to 626 or 26D. Key into keying system as directed.
  - .2 Cylinders: type high security, finished to 626 or 26D, for installation in deadlocks provided with special doors as listed in Hardware Schedule. Key into keying system as directed.

- .6 Architectural door trim: to ANSI/BHMA A156.6, designated by letter J and numeral identifiers as listed below:
  - .1 Door protection plates: kick plate type B4E-bevelled edge, 1.27 mm thick stainless steel, size 200 mm high x door width less 76 mm, finished to 630.
- .7 Auxiliary hardware: to ANSI/BHMA A156.16, designated by letter L and numeral identifiers as listed below:
  - .1 Door Stop: wall mounted: type dome, finished to 26D.
- .8 Door bottom seal: heavy duty, door seal of extruded aluminum frame and solid closed cell neoprene seal, surface mounted with drip cap, closed ends, adjustable, automatic retract mechanism when door is open, clear anodized finish.
- .9 Thresholds: full width of door opening, stainless steel mill finish, serrated surface.
- .10 Weatherstripping:
  - .1 Head and jamb seal:
    - .1 Extruded aluminum frame and solid closed cell neoprene insert, clear anodized finish.
    - .2 Adhesive backed neoprene material.
  - .2 Door bottom seal:
    - .1 Extruded aluminum frame and nylon brush sweep, clear anodized finish.
- .11 Astragal: overlapping, extruded aluminum frame with pile insert, finished to match doors.

## **2.3 MISCELLANEOUS HARDWARE**

- .1 Indexed key control system: to ANSI/BHMA A156.5, designated by letter E and numeral identifiers, wall mounted, key clip type, gray colour enamel paint finish.

## **2.4 FASTENINGS**

- .1 Use only fasteners provided by manufacturer. Failure to comply may void warranties and applicable licensed labels.
- .2 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.
- .3 Exposed fastening devices to match finish of hardware.
- .4 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.
- .5 Use fasteners compatible with material through which they pass.

## **2.5 KEYING**

- .1 Doors to be grand master keyed as directed, to tie into new keying system. Prepare detailed keying schedule in conjunction with Departmental Representative.
  - .2 Supply keys in duplicate for every lock in this Contract.
  - .3 Supply 3 master keys for each master key or grand master key group.
-

- .4 Stamp keying code numbers and the words "DO NOT DUPLICATE" on keys and cylinders.
- .5 Supply construction cores.
- .6 Hand over permanent cores and keys to Departmental Representative.
- .7 Remainder of doors to have standard cylinders, keyed different on a master, supply 3 keys per lock and 3 master keys.

### **Part 3 EXECUTION**

#### **3.1 INSTALLATION**

- .1 Door prep: to ANSI/BHMA-A156.115-2014 for steel doors and frames and ANSI/BHMA-A156.115-W-2006 for wood doors and frames.
- .2 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- .3 Supply metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.
- .4 Supply manufacturers' instructions for proper installation of each hardware component.
- .5 Install hardware to standard hardware location dimensions in accordance with CSDMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction).
- .6 Where door stop contacts door pulls, mount stop to strike bottom of pull.
- .7 Use only manufacturer's supplied fasteners.
  - .1 Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.
- .8 Remove construction cores when directed by Departmental Representative.
  - .1 Install permanent cores and ensure locks operate correctly.

#### **3.2 ADJUSTING**

- .1 Adjust door hardware, operators, closures and controls for optimum, smooth operating condition, safety and for weather tight closure.
- .2 Lubricate hardware, operating equipment and other moving parts.
- .3 Adjust door hardware to ensure tight fit at contact points with frames.

#### **3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
  - .1 Leave Work area clean at end of each day.
  - .2 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacturer's instructions.
  - .3 Remove protective material from hardware items where present.

- .4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

### 3.4 DEMONSTRATION

- .1 Keying System Setup and Cabinet:
  - .1 Set up key control system with file key tags, duplicate key tags, numerical index, alphabetical index and key change index, label shields, control book and key receipt cards.
  - .2 Place file keys and duplicate keys in key cabinet on their respective hooks.
  - .3 Lock key cabinet and turn over key to Departmental Representative.
- .2 Maintenance Staff Briefing:
  - .1 Brief maintenance staff regarding:
    - .1 Proper care, cleaning, and general maintenance of projects complete hardware.
    - .2 Description, use, handling, and storage of keys.
    - .3 Use, application and storage of wrenches for door closers, locksets and fire exit hardware.
- .3 Demonstrate operation, operating components, adjustment features, and lubrication requirements.

### 3.5 PROTECTION

- .1 Protect installed products and components from damage during construction.
  - .2 Repair damage to adjacent materials caused by door hardware installation.
-

### **3.6 SCHEDULE**

#### **Hardware Group No. 01 - CARD ACCESS BY SECURITY**

For use on mark/door #(s):

DR617  
915x2135 SCW &  
PSF 45 Min FR

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	3CB1HW 114 X 114 NRP (A8111)	652	ANSI
1	EA	STOREROOM LOCK	L9080P 17L XL11-422 (F07)	630	ANSI
1	EA	ELECTRIC STRIKE	1006 KD-360	630	ANSI
1	EA	SURF. AUTO OPERATOR	9542 HL/D MS (C0 UNKNOWN)	ANCLR	ANSI
2	EA	ACTUATOR, WALL MOUNT	8310-852	630	LCN
1	EA	KICK PLATE	J102 200 X SIZE TO SUIT	630	CBH
1	EA	WALL STOP	WS407CVX (L52101)	630	ANSI
1	EA	DOOR CONTACT	679-05HM	BLK	SCE

#### **Hardware Group No. 02 - CARD ACCESS BY SECURITY**

For use on mark/door #(s):

DR618B  
915x2135 WD &  
PSF

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	STOREROOM LOCK	L9080P 17L XL11-422 (F07)	630	ANSI
1	EA	ELECTRIC STRIKE	1006 KD-360	630	ANSI
1	EA	H-SEC CLOSER - PULL SIDE	4511 T AVB (C0 UNKNOWN PT-4A, PT-4C, PT-4D, PT-4H, PT-4J)	689	ANSI
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	WEATHER SEAL	R3Y155 (2 X H, 1 X W)	AL	KNC

Prep existing Door & Frame to accommodate new lockset and electric strike.

#### **Hardware Group No. 03**

For use on mark/door #(s):

DR611A  
915x2135 HM &  
PSF

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
6	EA	HINGE	3CB1HW 114 X 114 NRP (A8111)	652	ANSI
2	EA	DUMMY LOCK	L9080P 17LXL11-422 (F07)	630	ANSI

Hardware Group No. 04

For use on mark/door #(s):

DR608  
915x2135 HM &  
PSF

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	3CB1HW 114 X 114 NRP (A8111)	652	ANSI
1	EA	STOREROOM LOCK	L9080P 17LXL11-422 (F07)	630	ANSI

Hardware Group No. 05

For use on mark/door #(s):

915x2135 SCW  
WF DR616 DR629 DR631

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
1	EA	FLOOR STOP	FS436 (L12141)	626	ANSI
1	EA	PUSHBUTTON LATCH SET	SIMPLEX 7102	BRASS	KABA

Hardware Group No. 06

For use on mark/door #(s):

DR632  
915x2135 SCW  
PSF  
60 min. FRR

Provide each SGL door(s) with the following:

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	3CB1 114 X 102 (A8112)	652	ANSI
1	EA	PASSAGE SET	L9050P 17L (F07)	630	ANSI
1	EA	FLOOR STOP	FS436 (L12141)	626	ANSI
1	EA	H-SEC DOOR CLOSER	4511T AVB	689	ANSI

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 08 11 00 - Metal Doors and Frames
- .2 Section 08 87 53 – Security Films

**1.2 REFERENCES**

- .1 ASTM International
  - .1 ASTM C542-15, Standard Specification for Lock-Strip Gaskets.
  - .2 ASTM D2240-05(2010), Standard Test Method for Rubber Property - Durometer Hardness.
  - .3 ASTM E330/E330M-14, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.
  - .2 CAN/CGSB-12.3-M91, Flat, Clear Float Glass.
- .3 Environmental Choice Program (ECP)
  - .1 CCD-045-95(R2005), Sealants and Caulking Compounds.
- .4 Glass Association of North American (GANA)
  - .1 GANA Glazing Manual 50th Anniversary Edition-2008.
  - .2 GANA Sealant Manual-2008.
  - .3 GANA/PGC International Protective Glazing Manual (2010).

**1.3 ADMINISTRATIVE REQUIREMENTS**

- .1 Arrange for site visit with Departmental Representative prior to start of Work to examine existing site conditions adjacent to demolition Work.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for glass, sealants, and glazing accessories and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

- .4 Samples:
  - .1 Submit for review and acceptance of each unit.
  - .2 Submit 300 mm x 300 mm size samples of glass types.
  - .3 Submit 300 mm x 300 mm size samples of glazing film mounted on clear glass.
- .5 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .6 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

#### **1.5 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00.
- .2 Operation and Maintenance Data: submit operation and maintenance data for glazing for incorporation into manual.

#### **1.6 QUALITY ASSURANCE**

- .1 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

#### **1.7 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect glazing and frames from nicks, scratches, and blemishes.
  - .3 Protect prefinished aluminum surfaces with wrapping or strippable coating.
  - .4 Replace defective or damaged materials with new.

#### **1.8 AMBIENT CONDITIONS**

- .1 Ambient Requirements:
  - .1 Install glazing when ambient temperature is 10 degrees C minimum. Maintain ventilated environment for 24 hours after application.
  - .2 Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

**Part 2 PRODUCTS**

**2.1 MATERIALS**

- .1 Design Criteria:
  - .1 Size glass to withstand, dead loads and positive and negative live loads to ASTM E330.
  - .2 Limit glass deflection to 1/200 with full recovery of glazing materials.
- .2 Flat Glass:
  - .1 Float glass: to CAN/CGSB-12.3, minimum 6 mm thick.
  - .2 Safety glass - tempered: to CAN/CGSB-12.1, transparent, minimum 6 mm thick.
    - .1 Type 2-tempered.
    - .2 Class B-float.
    - .3 Category II – fully tempered.
- .3 Sealant: in accordance with Section 07 92 00.

**2.2 ACCESSORIES**

- .1 Setting blocks: silicone, 90 Shore A durometer hardness to ASTM D2240, to suit glazing method, glass light weight and area.
- .2 Spacer shims: silicone, 50-60 Shore A durometer hardness to ASTM D2240, 75 mm long x one half height of glazing stop x thickness to suit application. Self adhesive on one face.
- .3 Glazing tape:
  - .1 100% polybutylene vehicle. Extruded in ribbon form with paper separator. Tape shall have an integral shim strip where required; black colour.
- .4 Glazing splines: resilient silicone, extruded shape to suit glazing channel retaining slot, colour black.
- .5 Privacy Film (GF-1): Single layer polyester, translucent, mat frosted pattern film with pressure sensitive ultraviolet resistant adhesive and scratch resistant coating and as follows:
  - .1 Visible Light Transmission: 34%
  - .2 Visible Light Reflectance: 31%
  - .3 Thickness: 0.07 mm
  - .4 Opacity: Translucent
  - .5 Film Colour: White
- .6 Security Film (GF-2): In accordance with Section 08 87 53.
- .7 Reflective Film (GF-3): Reflective, single layer polyester, adhesive applied, one-way mirror solar control film having the following properties:
  - .1 Visible Light Transmission: 5%
  - .2 Visible Light Reflectance - Interior: 14%
  - .3 Visible Light Reflectance - Exterior: 58%

- .4 Thickness: 0.06 mm
- .5 Film Colour: Gray

### Part 3 EXECUTION

#### 3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for glazing installation in accordance with manufacturer's written instructions.
  - .1 Verify that openings for glazing are correctly sized and within tolerance.
  - .2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.
  - .3 Visually inspect substrate in presence of Departmental Representative.
  - .4 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .5 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

#### 3.2 PREPARATION

- .1 Clean contact surfaces with solvent and wipe dry.
- .2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- .3 Prime surfaces scheduled to receive sealant.

#### 3.3 INSTALLATION: INTERIOR - DRY METHOD (TAPE AND TAPE)

- .1 Perform work in accordance with GANA Glazing Manual and GANA Laminated Glazing Reference Manual for glazing installation methods.
  - .2 Cut glazing tape to length and set against permanent stops, projecting 1.6 mm above sight line.
  - .3 Place setting blocks at ¼ points, with edge block maximum 150 mm from corners.
  - .4 Rest glazing on setting blocks and push against tape for full contact at perimeter of light or unit.
  - .5 Place glazing tape on free perimeter of glazing in same manner described.
  - .6 Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
  - .7 Removable stops on tenant side to be held in place with 6 mm diameter flat head security screws at 203 mm centre to centre. Form stops with minimum 2.5 mm thick cold-rolled sheet steel minimum 16 x 25 mm size.
  - .8 Knife trim protruding tape.
-

### 3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
  - .1 Leave Work area clean at end of each day.
    - .1 Remove traces of primer, caulking.
    - .2 Remove glazing materials from finish surfaces.
    - .3 Remove labels.
    - .4 Clean glass using approved non-abrasive cleaner in accordance with manufacturer's instructions.
  - .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

### 3.5 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 After installation, mark each light with an "X" by using removable plastic tape or paste.
  - .1 Do not mark reflective glass units or glazing with installed films.
- .3 Repair damage to adjacent materials caused by glazing installation.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 RELATED SECTIONS**

- .1 Section 08 80 50 - Glazing.

**1.2 REFERENCES**

- .1 American National Standards Institute (ANSI)
  - .1 ANSI Z97.1-2015, Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- .2 American Society for Testing and Materials (ASTM)
  - .1 ASTM D882-12, Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
  - .2 ASTM D1004-13, Standard Test Method for Tear Resistance (Graves Tear) of Plastic Film and Sheeting.
  - .3 ASTM D1044-13, Standard Test Method for Resistance of Transparent Plastics to Surface Abrasion.
  - .4 ASTM D2582-16, Standard Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.
  - .5 ASTM F1642-12, Standard Test Method for Glazing and Glazing Systems Subject to Air Blast Loadings.
- .3 Government of Canada
  - .1 Canada Labour Code, WHMIS data sheets.

**1.3 DEFINITIONS**

- .1 For the purposes of this specification applying definitions follow:
  - .1 Safety: Reduction of risk of injury, loss or death due to accidental, natural or unintentional causes.
  - .2 Security: Reduction of risk of injury, loss or death due to intentional actions of others.
- .2 Security and safety film types:
  - .1 Type 1: Areas of concern related to common residential or light commercial accidents.
  - .2 Type 2: Areas of concern related to seismographic upgrade, low end smash and grab break and entry and over pressure due to violent weather or low bomb blast.
  - .3 Type 3: Areas of concern related to bomb blast and small arms projectiles.

**1.4 SAMPLES**

- .1 Submit samples in accordance with Section 01 33 00.
  - .2 Submit one 500 x 500 mm sample of film installed on 7 mm thick clear plate glass.
-

**1.5 SHOP DRAWINGS**

- .1 Submit shop drawings in accordance with Section 01 33 00.

**1.6 TEST REPORTS**

- .1 Submit test reports from approved independent testing laboratories, certifying compliance with specifications, for film applied to glass.

**1.7 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with section 01 61 00.
- .2 Provide and maintain dry, off-ground weatherproof storage.
- .3 Store rolls of security film flat on cross supports. Do not stand rolls of film on end.
- .4 Remove only in quantities required for same day use.
- .5 Store materials in accordance with manufacturers written instructions.

**1.8 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 20, and with Waste Reduction Workplan.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

**1.9 ENVIRONMENTAL AND SAFETY REQUIREMENTS**

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of material safety data sheets acceptable to Canada Labour Code.

**1.10 WARRANTY**

- .1 Work of this Section 12 months warranty period prescribed in subsection GC3.13 of General Conditions is extended to 5 years.
- .2 Ensure warranty includes items as follows:
  - .1 Maintain adhesion properties without blistering, bubbling or delaminating from glass.
  - .2 Maintain appearance without discolouration.
  - .3 Remove, replace and reapply defective materials.
  - .4 In event of product failure under warranty terms, remove and re-apply film without glass replacement at no cost to Departmental Representative.

**1.11 MAINTENANCE DATA**

- .1 Provide operation and maintenance data for window film for incorporation into manual specified in Section 01 78 00.
-

**Part 2 PRODUCTS**

**2.1 MATERIALS**

- .1 Security Film – General (GF-2): Optically opaque polyester film with factory applied adhesive, abrasion resistant coating and release liner.
  - .1 Number of layers: 1
  - .2 Total thickness of installed film: 0.01 mm.
  - .3 Elongation: to ASTM D882.
  - .4 Break strength: to ASTM D882.
  - .5 Young's Modulus: to ASTM D882.
  - .6 Tear resistance: to ASTM D1004.
  - .7 Impact resistance: to ASTM F1642
  - .8 Abrasion resistance: ASTM D1044.
  - .9 Flammability: surface burn characteristics to ASTM E84.
  - .10 Adhesive: high mass pressure sensitive, acrylic base, peel strength: 2.5 - 3.5 kg/25 mm width to ANSI Z97.1.
  - .11 Tensile strength: minimum 172.25 MPa to ASTM D882.
  - .12 Type 1 Security Film:
    - .1 Puncture resistance: 0.8 kg to ASTM D2582.
    - .2 Colour: Acrylic, abrasion resistant coating, colour to be selected by Departmental Representative from manufacturer's full range.

**2.2 FABRICATION**

- .1 Shop installation of security film to glass windows:
  - .1 Remove window stops and window sealing device.
  - .2 Ensure no deleterious material adheres to glass by blading surface of glass using industrial razors.
  - .3 Ensure dust, grease, and chemical residue are removed from surface of glass before installation of film.
  - .4 Examine glass under natural daylight and identify cracks, blisters, bubbles, discolouration, edge defects or other anomalies that may cause film to delaminate, or cause vision transparency or distortion problems. Report findings to Departmental Representative before starting Work.
  - .5 Proceed with Work only after receipt of written approval from Departmental Representative.
  - .6 Install security film to glass windows ensuring no blisters, bubbles, scratches or distortions.
  - .7 Cut film edges straight and square.
- .2 Shop installation of security film to glass panels:
  - .1 Ensure dust, grease, and chemical residue are removed from surface of glass before installation of film.

- .2 Examine glass under natural daylight and identify cracks, blisters, bubbles, discolouration, edge defects or other anomalies that may cause film to delaminate, or cause vision transparency or distortion problems. View glass from 2.0 m minimum. Report findings to Departmental Representative.
- .3 Proceed with Work only after receipt of written approval from Departmental Representative.
- .4 Install security film to glass panels ensuring no blisters, bubbles, scratches, edge defects or distortions.
  - .1 Cut film edges straight and square to within 3 mm of edge of panel.
- .5 Deliver glass panels complete with security film installed to site in accordance with section 01 61 00.

### **Part 3 EXECUTION**

#### **3.1 INSPECTION**

- .1 Return to work place after 30 days but no longer than 40 days for final cleaning and inspection of installed film.
- .2 Ensure finished surface of film is vision free of blisters, bubbles, tears, scratches, edge defects, delaminating or vision distortion when viewed under natural daylight from 2.0 m minimum.
- .3 Remove and replace window unit that continues to show blisters, bubbles, tears, scratches, edge defects or vision distortion when viewed under natural daylight from 2.0m minimum after 30 day period.
- .4 Remove and replace without glass replacement, film that continues to show blisters, bubbles, tears, scratches, edge defects or vision distortion when viewed under natural daylight from 2.0 m minimum after 30 day period.

#### **3.2 FINAL CLEANING**

- .1 Wash interior and exterior of each glass panel and film using cleaning solution recommended by film manufacturer.

#### **3.3 MAINTENANCE**

- .1 Follow manufacturers written instructions for care and maintenance of security film.
- .2 Use only cleaning solution recommended by manufacturer for regularly scheduled cleaning of security film.

### **END OF SECTION**

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**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 07 92 00 - Joint Sealants
- .2 Section 08 11 00 - Metal Frames
- .3 Section 09 91 23 - Interior Painting

**1.2 REFERENCES**

- .1 ASTM International
  - .1 ASTM C475/C475M-15, Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
  - .2 ASTM C754-15, Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
  - .3 ASTM C840-13, Standard Specification for Application and Finishing of Gypsum Board.
  - .4 ASTM C1002-14, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
  - .5 ASTM C1047-14a, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
  - .6 ASTM C1396/C1396M-14a, Standard Specification for Gypsum Board.
  - .7 ASTM E90-09 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
  - .8 ASTM E2638-10 Standard Test Method for Objective Measurement of the Speech Privacy Provided by a Closed Room.
- .2 Association of the Wall and Ceilings Industries International (AWCI)
  - .1 AWCI Levels of Gypsum Board Finish 101a-97.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for gypsum board assemblies and include product characteristics, performance criteria, physical size, finish and limitations.

**1.4 DESIGN REQUIREMENTS**

- .1 Partition assembly to be fire resistance rated.
  - .2 Minimum sound transmission rating of installed panel partition to be STC 30, tested to ASTM E90.
-

- .3 Minimum speech privacy category SPC Standard Speech Privacy 60-65, tested to ASTM E2638.

## **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store gypsum board assemblies materials level off ground, indoors, in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect gypsum board assemblies from nicks, scratches, and blemishes.
  - .3 Protect from weather, elements and damage from construction operations.
  - .4 Handle gypsum boards to prevent damage to edges, ends or surfaces.
  - .5 Protect prefinished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.
  - .6 Replace defective or damaged materials with new.

## **1.6 AMBIENT CONDITIONS**

- .1 Maintain temperature 10 degrees C minimum, 21 degrees C maximum for 48 hours prior to and during application of gypsum boards and joint treatment, and for 48 hours minimum after completion of joint treatment.
- .2 Apply board and joint treatment to dry, frost free surfaces.
- .3 Ventilation: ventilate building spaces as required to remove excess moisture that would prevent drying of joint treatment material immediately after its application.

## **Part 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Standard board: to ASTM C1396/C1396M, minimum 40% recycled content, regular, fire rated where indicated, 12.7 and 15.9 mm thick, 1200 mm wide x maximum practical length, ends square cut, edges bevelled.
  - .2 Non-load bearing channel stud framing: to ASTM C645, stud size as indicated on Drawings, roll formed from 0.53 mm thickness hot dipped galvanized steel sheet, for screw attachment of gypsum board. Knock-out service holes at 460 mm centres. Steel: minimum 25% recycled content.
    - .1 Use 0.91 mm thickness stud framing to support fire rated door frames.
  - .3 Floor and ceiling tracks: to ASTM C645, in widths to suit stud sizes, 32 mm flange height. Steel: minimum 25% recycled content.
-

- .4 Slotted Deflection Track: Premanufactured slotted top runner with 63 mm down standing legs and having 6 mm wide x 38 mm high slots spaced at 25 mm on centre along length of runner; tested and certified for use in fire rated wall construction and have a ULC or cUL<sub>US</sub> labelled assembly for fire rated assemblies.
- .5 Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated; 1.2 mm nominal base metal thickness x 400 mm wide
- .6 Metal channel stiffener: 19 x 38 mm size, 1.4 mm thick cold rolled steel, coated with rust inhibitive coating, minimum 25% recycled content.
- .7 Metal furring runners, hangers, tie wires, inserts, anchors: to ASTM C645.
- .8 Drywall furring channels: 0.5 mm core thickness galvanized steel channels for screw attachment of gypsum board.
- .9 Resilient clips: 0.5 mm base steel thickness galvanized steel for resilient attachment of gypsum board.
- .10 Steel drill screws: to ASTM C1002.
- .11 Laminating compound: as recommended by manufacturer, asbestos-free.
- .12 Casing beads, corner beads, control joints and edge trim: to ASTM C1047, aluminum coated, 0.5 mm base thickness, perforated flanges, one piece length per location.
- .13 Sealants: in accordance with Section 07 92 00.
  - .1 Acoustic sealant: in accordance with Section 07 92 00.
- .14 Insulating strip: rubberized, moisture resistant, 3 mm thick closed cell neoprene strip, 12 mm wide, with self sticking permanent adhesive on one face, lengths as required.
- .15 Joint compound: to ASTM C475/C475M, asbestos-free.
- .16 Joint Tape: To ASTM C475/C475M, Type as recommended by gypsum board manufacturer for type of installation; use only mould resistant tape for mould and moisture resistant materials.
- .17 Acoustic Sound Batts for Non-Rated Assemblies: Meeting the requirements of ASTM C423, ASTM E90 and ASTM E413, and ULC S702 mineral fibre acoustic sound batts, Type 1 for all properties other than thermal, width to friction fit steel studs; un-faced, thickness to fill a minimum of 90% of the cavity thickness, nominal density 12.2 kg/m<sup>3</sup> minimum; STC 45 rating.

## **Part 3 EXECUTION**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for gypsum board assemblies installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

### 3.2 STEEL STUD FRAMING INSTALLATION

- .1 Install steel framing members to receive screw-attached gypsum board in accordance with ASTM C754 except where specified otherwise.
- .2 Align partition tracks at floor and ceiling and secure at 600 mm on centre maximum.
- .3 Install damp proof course under stud shoe tracks of partitions on slabs on grade.
- .4 Place studs vertically at centres indicated on Drawings and not more than 50 mm from abutting walls, and at each side of openings and corners. Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.
- .5 Erect metal studding to tolerance of 1:1000.
- .6 Attach studs to bottom and ceiling track using screws.
- .7 Co-ordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.
- .8 Co-ordinate erection of studs with installation of door/window frames and special supports or anchorage for work specified in other Sections.
- .9 Provide two studs extending from floor to ceiling at each side of openings wider than stud centres specified. Secure studs together, 50 mm apart using column clips or other approved means of fastening placed alongside frame anchor clips.
- .10 Erect track at head of door openings to accommodate intermediate studs. Secure track to studs at each end, in accordance with manufacturer's instructions. Install intermediate studs above openings in same manner and spacing as wall studs.
- .11 Frame openings and around built-in equipment, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.
- .12 Install steel studs or furring channel between studs for attaching electrical and other boxes.
- .13 Extend partitions to ceiling height except where noted otherwise on drawings.
- .14 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs. Use Slotted Deflection Track.
- .15 Install continuous insulating strips to isolate studs from uninsulated surfaces.
- .16 Install structural channel steel framing members to receive security mesh, sheet steel strapping and gypsum board in accordance with ASTM C754 except where specified otherwise.

### 3.3 FURRING INSTALLATION

- .1 Erect hangers and runner channels for suspended gypsum board ceilings to ASTM C840 except where specified otherwise.
-

- .2 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
- .3 Install work level to tolerance of 1:1200.
- .4 Frame perimeter of openings for access panels, light fixtures, diffusers and grilles.
- .5 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.
- .6 Install wall furring for gypsum board wall finishes to ASTM C840, except where specified otherwise.
- .7 Furr beams, columns, pipes and exposed services where indicated.

### 3.4 ACCESSORIES INSTALLATION

- .1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150 mm on centre.
- .2 Install casing beads around perimeter of suspended ceilings.
- .3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.
- .4 Install insulating strips continuously at edges of gypsum board and casing beads abutting metal window and exterior door frames, to provide thermal break.
- .5 Construct control joints of preformed units set in gypsum board facing and supported independently on both sides of joint.
- .6 Provide continuous polyethylene dust barrier behind and across control joints.
- .7 Locate control joints where indicated and at changes in substrate construction.
- .8 Install control joints straight and true.
- .9 Construct expansion joints as detailed, at building expansion and construction joints. Provide continuous dust barrier.
- .10 Install expansion joint straight and true.
- .11 Splice corners and intersections together and secure to each member with 3 screws.
- .12 Install access doors to electrical and mechanical fixtures specified in respective sections.
  - .1 Rigidly secure frames to furring or framing systems.

### 3.5 GYPSUM BOARD INSTALLATION AND FINISHING

- .1 Do installation and finishing of gypsum board to ASTM C840 except where specified otherwise.
  - .2 Apply gypsum board after bucks, anchors, blocking, electrical and mechanical work have been reviewed.
-

- .3 Apply single or double layer gypsum board to metal furring or framing using screw fasteners for first layer, screw fasteners for second layer. Maximum spacing of screws 300 mm on centre.
    - .1 Single-Layer Application:
      - .1 Apply gypsum board on ceilings prior to application of walls to ASTM C840.
      - .2 Apply gypsum board vertically unless indicated otherwise. If horizontal is required, provide sheet lengths that will minimize end joints.
    - .2 Double-Layer Application:
      - .1 Install gypsum board for base layer and exposed gypsum board for face layer.
      - .2 Apply base layer to ceilings prior to base layer application on walls; apply face layers in same sequence. Offset joints between layers at least 250 mm.
      - .3 Apply base layers at right angles to supports unless otherwise indicated.
      - .4 Apply base layer on walls and face layers vertically with joints of base layer over supports and face layer joints offset at least 250 mm with base layer joints.
  - .4 Install ceiling boards in direction that will minimize number of end-butt joints. Stagger end joints at least 250 mm.
  - .5 Install gypsum board on walls vertically to avoid end-butt joints. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs, except where local codes or fire-rated assemblies require vertical application.
  - .6 Install gypsum board with face side out.
  - .7 Do not install damaged or damp boards.
  - .8 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.
  - .9 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with AWC Levels of Gypsum Board Finish:
    - .1 Levels of finish:
      - .1 Level 4: embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener
  - .10 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.
  - .11 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.
  - .12 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.
  - .13 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.
-

- .14 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.
- .15 Mix joint compound slightly thinner than for joint taping.
- .16 Apply thin coat to entire surface using trowel or drywall broad knife to fill surface texture differences, variations or tool marks.
- .17 Allow skim coat to dry completely.
- .18 Remove ridges by light sanding or wiping with damp cloth.

### **3.6 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
  - .1 Leave Work area clean at end of each day.
  - .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

### **3.7 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by gypsum board assemblies installation.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 American National Standards Institute (ANSI)/Ceramic Tile Institute (CTI)
  - .1 ANSI A108.1- 2013, Specification for the Installation of Ceramic Tile (Includes ANSI A108.1A-C, 108.4-.13, A118.1-.10, ANSI A136.1).
  - .2 CTI A118.3-2013, Specification for Chemical Resistant, Water Cleanable Tile Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive (included in ANSI A108.1).
  - .3 CTI A118.4-2013, Specification for Latex Cement Mortar (included in ANSI A108.1).
  - .4 CTI A118.5-2013, Specification for Chemical Resistant Furan Resin Mortars and Grouts for Tile Installation (included in ANSI A108.1).
  - .5 CTI A118.6-2013, Specification for Ceramic Tile Grouts (included in ANSI A108.1).
- .2 American Society for Testing and Materials International (ASTM)
  - .1 ASTM C979/C979M-16, Standard Specification for Pigments for Integrally Coloured Concrete.
- .3 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-75.1-M88, Tile, Ceramic.
- .4 Canadian Standards Association (CSA International)
  - .1 CSA A123.3-05(R2015), Asphalt Saturated Organic Roofing Felt.
  - .2 CSA A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .5 Terrazzo, Tile and Marble Association of Canada (TTMAC):
  - .1 Tile Specification Guide 09 30 00 2016/2017, Tile Installation Manual.
  - .2 Hard Surface Maintenance Guide.

**1.2 SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Provide product data in accordance with Section 01 33 00.
  - .1 Include manufacturer's information on:
    - .1 Ceramic tile, marked to show each type, size, and shape required.
    - .2 Chemical resistant mortar and grout (Epoxy).
    - .3 Divider strip.
    - .4 Elastomeric membrane and bond coat.
    - .5 Reinforcing tape.
    - .6 Levelling compound.

- .3 Provide samples in accordance with Section 01 33 00.
  - .1 Wall tile: submit duplicate, 300 x 300 mm sample panels of each colour, texture, size, and pattern of tile.
  - .2 Trim shapes, bullnose cap and cove including bullnose cap and base pieces at internal and external corners of vertical surfaces, each type, colour, and size.
  - .3 Adhere tile samples to 11 mm thick plywood and grout joints to represent project installation.

### **1.3 QUALITY ASSURANCE**

- .1 Quality Assurance Submittals:
  - .1 Manufacturer's Instructions: manufacturer's installation instructions.
  - .2 Manufacturer's Field Reports: manufacturer's field reports specified.

### **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle materials in accordance with Section 01 61 00.
- .2 Waste Management and Disposal:
  - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

### **1.5 AMBIENT CONDITIONS**

- .1 Maintain air temperature and structural base temperature at ceramic tile installation area above 12 degrees C for 48 hours before, during, and 48 hours after, installation.
- .2 Do not install tiles at temperatures less than 12 degrees C or above 38 degrees C.
- .3 Do not apply epoxy mortar and grouts at temperatures below 15 degrees C or above 25 degrees C.

### **1.6 MAINTENANCE**

- .1 Extra Materials:
    - .1 Provide maintenance materials in accordance with Section 01 78 00.
    - .2 Provide minimum 2% of each type and colour of tile required for project for maintenance use. Store where directed.
    - .3 Maintenance material same production run as installed material.
-

**Part 2 PRODUCTS**

**2.1 WALL TILE**

- .1 Ceramic tile (CT-1): to CAN/CGSB-75.1, Type 5 Class MR 2, CR 1, 100 mm x 400 mm size, square edges, bright glazed surface, colour white.

**2.2 TRIM SHAPES**

- .1 Conform to applicable requirements of adjoining floor and wall tile.
- .2 Use slip resistant trim shapes for horizontal surfaces.
- .3 Use trim shapes sizes conforming to size of adjoining field wall tile, including existing spaces, unless specified otherwise.
- .4 Internal and External Corners: provide trim shapes as follows where indicated.
  - .1 Bullnose shapes for external corners including edges.
  - .2 Coved shapes for internal corners.
  - .3 Special shapes for:
    - .1 Base to floor internal corners to provide integral coved vertical and horizontal joint.
    - .2 Base to floor external corners to provide bullnose vertical edge with integral coved horizontal joint. Use as stop at bottom of openings having bullnose return to wall.

**2.3 MORTAR MATERIALS**

- .1 Primer: Low VOC, low viscosity primer as recommended by manufacturer to suit substrate and site conditions; provide proof of bonding ability of setting system where manufacturer recommends that a primer is not necessary to installation.
- .2 Rapid Setting Mortar: Dry set mortar meeting or exceeding the requirements of ASTM C627 for Extra Heavy installation using rapid curing, latex modified, portland cement mortar meeting requirements of ANSI A108.1.
- .3 Water: potable and free of minerals and chemicals which are detrimental to mortar and grout mixes.

**2.4 BOND COAT**

- .1 Epoxy bond coat: non-toxic, non-flammable, non-hazardous during storage, mixing, application, and when cured. To produce shock and chemical resistant mortars having the following physical characteristics:
  - .1 Compressive Strength: 246 kg/cm<sup>2</sup>.
  - .2 Bond Strength: 53 kg/cm<sup>2</sup>.
  - .3 Water Absorption: 4.0% Max.
  - .4 Ozone Resistance, 200 hours @ 200 ppm: no loss of strength.
  - .5 Smoke Contribution Factor: 0.
  - .6 Flame Contribution Factor: 0.

- .7 Finished mortar and grout to be resistant to urine, dilute acid, dilute alkali, sugar, brine and food waste products, petroleum distillates, oil and aromatic solvents.
- .8 Bond Coat: maximum VOC limit 65 g/L.

## 2.5 GROUT

- .1 Colouring Pigments:
  - .1 Pure mineral pigments, limeproof and nonfading, complying with ASTM C979/C979M.
  - .2 Colouring pigments to be added to grout by manufacturer.
  - .3 Job coloured grout is not acceptable.
  - .4 Use in Commercial Cement Grout, Dry-Set Grout, and Latex Cement Grout.
- .2 Chemical-Resistant Grout:
  - .1 Epoxy grout: to ANSI A108.1, having quality, colour and characteristics to match epoxy bond coat. Adhesive and grout by same manufacturer.
  - .2 Furan grout: to CTI A118.5.

## 2.6 ACCESSORIES

- .1 Straight Edge Strips: Roll formed stainless steel edge strips, 3 mm wide at top edge; height as required to suit tile installation; with integral perforated anchoring leg for setting the strip into the setting material.
- .2 Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers and as follows:
  - .1 Job Site Cleaner: Phosphoric acid/nitric acid based cleaning solution mixed in accordance with cleaner manufacturers recommendations and as recommended by tile manufacturer.
  - .2 Maintenance Cleaner: Non-toxic, electrolytic, biodegradable, non-ammonia containing, pH controlled cleaning solution mixed in accordance with manufacturer's recommendations.

## 2.7 CLEANING COMPOUNDS

- .1 Specifically designed for cleaning masonry and concrete and which will not prevent bond of subsequent tile setting materials including patching and leveling compounds and elastomeric waterproofing membrane and coat.
- .2 Materials containing acid or caustic material are not acceptable.

## Part 3 EXECUTION

### 3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.
-

### 3.2 WORKMANSHIP

- .1 Do tile work in accordance with TTMAC Tile Installation Manual 2012/2013, "Ceramic Tile", except where specified otherwise.
- .2 Apply tile to clean and sound surfaces.
- .3 Fit tile around corners, fitments, fixtures, drains and other built-in objects. Maintain uniform joint appearance. Cut edges smooth and even. Do not split tiles.
- .4 Maximum surface tolerance 1:800.
- .5 Make joints between tile uniform and approximately 3.0 mm wide, plumb, straight, true, even and flush with adjacent tile. Ensure sheet layout not visible after installation. Align patterns.
- .6 Lay out tiles so perimeter tiles are minimum 1/2 size.
- .7 Sound tiles after setting and replace hollow-sounding units to obtain full bond.
- .8 Make internal angles square, external angles bullnosed.
- .9 Use bullnose edged tiles at termination of wall tile panels, except where panel abuts projecting surface or differing plane.
- .10 Allow minimum 24 hours after installation of tiles, before grouting.
- .11 Clean installed tile surfaces after installation and grouting cured.
- .12 Make control joints at 3 m in each direction. Make joint width same as tile joints. Fill control joints with sealant in accordance with Section 07 92 00. Keep building expansion joints free of mortar and grout.

### 3.3 WALL TILE

- .1 Install in accordance with TTMAC detail 305W.

### 3.4 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
  - .1 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

### 3.5 CLEANING

- .1 Proceed in accordance with Section 01 74 11.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 American Society for Testing and Materials (ASTM)
  - .1 ASTM E1264-08e1, Standard Classification for Acoustical Ceiling Products.
  - .2 ASTM E2638-10, Standard Test Method for Objective Measurement of the Speech Privacy Provided by a Closed Room.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.
  - .2 CAN/CGSB-92.1-M89, Sound Absorptive Prefabricated Acoustical Units.
- .3 Canadian Standards Association (CSA)
  - .1 CSA B111-74(R1998), Wire Nails, Spikes and Staples.
- .4 Underwriters Laboratories of Canada (ULC)
  - .1 CAN/ULC-S102-10, Surface Burning Characteristics of Building Materials.

**1.2 SAMPLES**

- .1 Submit samples in accordance with Section 01 33 00.
- .2 Submit duplicate full size samples of each type acoustical units.

**1.3 REGULATORY REQUIREMENTS**

- .1 Fire-resistance rated floor/ceiling and roof/ceiling assembly: certified by a Canadian Certification Organization accredited by Standards Council of Canada.

**1.4 QUALITY ASSURANCE**

- .1 Minimum speech privacy category SPC Standard Speech Privacy 60-65 tested to ASTM E2638.

**1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 20.
- .2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.

**1.6 ENVIRONMENTAL REQUIREMENTS**

- .1 Permit wet work to dry before commencement of installation.
  - .2 Maintain uniform minimum temperature of 15°C and humidity of 20 - 40% before and during installation.
  - .3 Store materials in work area 48 hours prior to installation.
-

**Part 2 PRODUCTS**

**2.1 MATERIALS**

- .1 ACT-1: Existing heritage acoustic ceiling tile
- .2 ACT-2: Acoustic units for suspended ceiling system: to CAN/CGSB-92.1.
  - .1 Type XII.
  - .2 Glass fibre with minimum 35% recycled content.
  - .3 Pattern: match existing.
  - .4 Flame spread rating of Class A or less in accordance with CAN/ULC-S102.
  - .5 Smoke developed 50 or less in accordance with CAN/ULC-S102.
  - .6 Noise reduction coefficient (NRC) designation of 0.95.
  - .7 Ceiling Attenuation Class (CAC) rating N/A, in accordance with ASTM E1264
  - .8 Light reflectance range of 0.86.
  - .9 Edge type bevelled.
  - .10 Colour white.
  - .11 Size 610 x 610 x 25 mm thick.
  - .12 Shape panel.
  - .13 Alloy designation for stainless steel pans 302.
  - .14 Surface finish of aluminum panels anodized.
  - .15 Surface coverings: factory applied latex paint.
- .3 Adhesive: low VOC type recommended by acoustic unit manufacturer.
- .4 Staples, nails and screws: to CSA B111 non-corrosive finish as recommended by acoustic unit manufacturer.
- .5 Polyethylene: to CAN/CGSB-51.34, 0.15 mm thick.
- .6 Hold down clips: purpose made clips to secure tile to suspension system, approved for use in fire-rated systems.

**Part 3 EXECUTION**

**3.1 EXAMINATION**

- .1 Do not install acoustical panels and tiles until work above ceiling has been inspected by Departmental Representative.

**3.2 INSTALLATION**

- .1 Install acoustical panels and tiles in ceiling suspension system.
  - .2 In fire rated ceiling systems, secure lay-in panels with hold-down clips and protect over light fixtures, diffusers, air return grilles and other appurtenances according to Certification Organizations design requirements.
-

**3.3 INTERFACE WITH OTHER WORK**

- .1 Co-ordinate ceiling work to accommodate components of other sections, such as light fixtures, diffusers, speakers, sprinkler heads, to be built into acoustical ceiling components.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 ASTM International
  - .1 ASTM C635/C635M-13a, Standard Specifications for the Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
  - .2 ASTM C636/C636M-13, Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for acoustical suspension and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
  - .2 Submit reflected ceiling plans for special grid patterns as indicated.
  - .3 Indicate lay-out, insert and hanger spacing and fastening details, splicing method for main and cross runners, location of access splines, change in level details, access door dimensions, and locations and acoustical unit support at ceiling fixture.
- .4 Samples:
  - .1 Submit for review and acceptance of each unit.
  - .2 Samples will be returned for inclusion into work.
  - .3 Submit one representative model of ceiling suspension system.
  - .4 Ceiling system to show basic construction and assembly, treatment at walls, recessed fixtures, splicing, interlocking, finishes, acoustical unit installation.

**1.3 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00.
  - .2 Operation and Maintenance Data: submit operation and maintenance data for acoustical suspension for incorporation into manual.
-

## 1.4 QUALITY ASSURANCE

- .1 Fire-resistance rated suspension system: certified by a Canadian Certification Organization accredited by Standards Council of Canada.
- .2 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

## 1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect acoustical ceiling tiles and tracks from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 20.

## Part 2 PRODUCTS

### 2.1 DESIGN CRITERIA

- .1 Design Requirements: maximum deflection: 1/360th of span to ASTM C635/C635M deflection test.

### 2.2 MATERIALS

- .1 Intermediate duty system to ASTM C635/C635M.
- .2 Basic materials for suspension system: commercial quality cold rolled steel, zinc coated.
- .3 Suspension system: non fire rated, made up as follows:
  - .1 2 directional exposed tee bar grid to match existing.
  - .2 Concealed tee access spline.
- .4 Exposed tee bar grid components: shop painted satin sheen, white colour. Components die cut. Main tee with double web, rectangular bulb and 25 mm rolled cap on exposed face. Cross tee with rectangular bulb; web extended to form positive interlock with main tee webs; lower flange extended and offset to provide flush intersection.
- .5 Hanger wire: galvanized soft annealed steel wire:
  - .1 3.6 mm diameter for access tile ceilings.
- .6 Hanger inserts: purpose made.

- .7 Carrying channels: 38mm galvanized steel, as recommended by acoustic unit manufacturer.
- .8 Accessories: splices, clips, wire ties, retainers and wall moulding flush, to complement suspension system components, as recommended by system manufacturer.

### **Part 3 EXECUTION**

#### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for acoustical ceiling tile and track installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

#### **3.2 INSTALLATION**

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
  - .2 Installation: to ASTM C636/C636M except where specified otherwise.
  - .3 Do not erect ceiling suspension system until work above ceiling has been inspected and approved by Departmental Representative.
  - .4 Secure hangers to overhead structure using attachment methods acceptable to Departmental Representative.
  - .5 Install hangers spaced at maximum 1200 mm centres and within 150 mm from ends of main tees.
  - .6 Lay out system according to reflected ceiling plan.
  - .7 Ensure suspension system is co-ordinated with location of related components.
  - .8 Install wall moulding to provide correct ceiling height.
  - .9 Completed suspension system to support super-imposed loads, such as lighting fixtures, diffusers and grilles.
  - .10 Support at light fixtures and diffusers with additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
  - .11 Interlock cross member to main runner to provide rigid assembly.
  - .12 Frame at openings for light fixtures, air diffusers and at changes in ceiling heights.
  - .13 Install access splines to provide 10% ceiling access.
  - .14 Finished ceiling system to be square with adjoining walls and level within 1:1000.
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- .15 Expansion joints:
  - .1 Supply and install "Z" shaped metal trim pieces at each side of expansion joint. Design to accommodate plus or minus 25 mm movement and maintain visual closure. Finish metal components to match adjacent exposed metal trim. Provide backing plates behind butt joints.

### 3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
  - .1 Touch up scratches, abrasions, voids and other defects in painted surfaces.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

### 3.4 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by acoustical suspension installation.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 02 41 99 – Demolition: Removal of existing floor finishes ready for work of this Section.
- .2 Section 09 68 13 – Tile Carpeting
- .3 Division 26 – Electrical: Floor mounted accessories.

**1.2 REFERENCES**

- .1 ASTM International
  - .1 ASTM F1066-04(2014)e1, Standard Specification for Vinyl Composition Floor Tile.
  - .2 ASTM F2982-13, Standard Specification for Polyester Composition Floor Tile.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for resilient tile flooring and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
  - .1 Submit duplicate tile in size specified, 300 mm long base.

**1.4 MAINTENANCE MATERIAL SUBMITTALS**

- .1 Extra Materials:
  - .1 Provide maintenance materials of resilient tile flooring, base and adhesive in accordance with Section 01 78 00.
  - .2 Provide 1 m<sup>2</sup> of each colour, pattern and type flooring material required for this project for maintenance use.
  - .3 Extra materials from same production run as installed materials.
  - .4 Identify each container of floor tile and each container of adhesive.
  - .5 Deliver to Departmental Representative, upon completion of the work of this section.
  - .6 Store where directed by Departmental Representative.

**1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
  - .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
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- .3 Storage and Handling Requirements:
  - .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect specified materials from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 20.

## **1.6 SITE CONDITIONS**

- .1 Ambient Conditions:
  - .1 Maintain air temperature and structural base temperature at flooring installation area above 20 degrees C for 48 hours before, during and for 48 hours after installation.

## **Part 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Vinyl composition tile (VCT-1 and VCT-2): to ASTM F1066, Composition 1 - non asbestos Class 3 - surface patterned, plain, 3 mm thickness, 300 x 300 mm size, in standard colour indicated.
    - .1 Finish: Factory prefinished, colour as indicated on Drawings.
  - .2 Polyester Composition Tile (PCT-1): to ASTM F2982, through patterned, 3.2 mm thickness, 305 x 305 mm size, in standard colour indicated.
    - .1 Finish: Factory prefinished, colour as indicated on Drawings.
  - .3 Resilient base (B-1): to ASTM F1861, Type TS rubber vulcanized thermoset, Group 1 solid homogeneous, 100 mm high, continuous, Style A-Straight.
  - .4 Primers and adhesives: recommended by flooring manufacturer for specific material on applicable substrate, above, at or below grade.
    - .1 Flooring adhesives:
      - .1 Adhesive: maximum VOC limit 60 g/L.
  - .5 Sub-floor filler and leveller: white premix latex requiring water only to produce cementitious paste as recommended by flooring manufacturer for use with their product.
  - .6 Metal edge strips: aluminum extruded, smooth, polished with lip to extend under floor finish, shoulder flush with top of adjacent floor finish.
  - .7 Sealer: type recommended by flooring manufacturer.
    - .1 Sealant:
      - .1 Sealant: maximum VOC limit 50 g/L.
  - .8 Wax: to CAN/CGSB-25.21 and type recommended by flooring manufacturer.
-

**Part 3 EXECUTION**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for resilient tile flooring installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

**3.2 INSPECTION**

- .1 Ensure concrete floors are dry, by using test methods recommended by tile manufacturer.

**3.3 SUB-FLOOR TREATMENT**

- .1 Remove or treat old adhesives to prevent residual, old flooring adhesives from bleeding through to new flooring and/or interfering with the bonding of new adhesives.
- .2 Clean floor and apply filler; trowel and float to leave smooth, flat hard surface. Prohibit traffic until filler cured and dry.
- .3 Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.
- .4 Seal concrete to flooring manufacturer's printed instructions.

**3.4 TILE APPLICATION**

- .1 Provide high ventilation rate, with maximum outside air, during installation, and for 48 to 72 hours after installation. If possible, vent directly to outside. Do not let contaminated air recirculate through district or whole building air distribution system. Maintain extra ventilation for at least one month following building occupation.
  - .2 Apply adhesive uniformly using recommended trowel in accordance with flooring manufacturer's instructions. Do not spread more adhesive than can be covered by flooring before initial set takes place.
  - .3 Lay flooring with joints parallel to building lines to produce symmetrical tile pattern. Border tiles minimum half tile width.
  - .4 Install flooring with pattern grain parallel for units and parallel to width of room.
  - .5 As installation progresses, and after installation, roll flooring in 2 directions including resilient tile with 45 kg minimum roller to ensure full adhesion.
  - .6 Cut tile and fit neatly around fixed objects.
  - .7 Terminate flooring at centerline of door in openings where adjacent floor finish or colour is dissimilar.
  - .8 Install metal edge strips at unprotected or exposed edges where flooring terminates.
-

### 3.5 BASE APPLICATION

- .1 Lay out base to keep number of joints at minimum. Base joints at maximum length available or at internal or premoulded corners.
- .2 Clean substrate and prime with one coat of adhesive.
- .3 Apply adhesive to back of base.
- .4 Set base against wall and floor surfaces tightly by using 3 kg hand roller.
- .5 Install straight and level to variation of 1:1000.
- .6 Scribe and fit to door frames and other obstructions. Use premoulded end pieces at flush door frames.
- .7 Cope internal corners. Use premoulded corner units for right angle external corners. Use formed straight base material for external corners of other angles, minimum 300 mm each leg. Wrap around toeless base at external corners.
- .8 Install toeless type base before installation of carpet on floors.

### 3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
  - .1 Clean flooring and base surfaces to flooring manufacturer's printed instructions.
- .3 Remove excess adhesive from floor, base and wall surfaces without damage.
- .4 Clean, seal and wax floor surface to flooring manufacturer's instructions. In carpeted areas clean base surface before carpet installation.
- .5 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

### 3.7 PROTECTION

- .1 Protect new floors from time of final set of adhesive until final inspection.
- .2 Prohibit traffic on floor for 48 hours after installation.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 American Association of Textile Chemists and Colorists (AATCC)
    - .1 AATCC Test Method 23-2005, Colorfastness to Burn Gas Fumes.
    - .2 AATCC Test Method 129-2005, Colourfastness to Ozone in the Atmosphere Under High Humidities.
    - .3 AATCC Test Method 134-2006, Electrostatic Propensity of Carpets.
    - .4 AATCC Test Method 175-2008, Stain Resistance: Pile Floor Coverings.
    - .5 AATCC Test Method 189-2007, Fluorine Content of Carpet Fibers.
  - .2 ASTM International
    - .1 ASTM D297-13, Standard Test Methods for Rubber Products-Chemical Analysis.
    - .2 ASTM D1335-12, Standard Test Method for Tuft Bind of Pile Yarn Floor Coverings.
    - .3 ASTM D2661-11, Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) Schedule 40 Plastic Drain, Waste, and Vent Pipe and Fittings.
    - .4 ASTM D1667-05(2011), Standard Specification for Flexible Cellular Materials-Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam).
    - .5 ASTM D3574-11, Standard Test Methods for Flexible Cellular Materials - Slab, Bonded, and Molded Urethane Foams.
    - .6 ASTM D3936-12, Standard Test Method for Resistance to Delamination of the Secondary Backing of Pile Yarn Floor Covering.
  - .3 Canadian General Standards Board (CGSB)
    - .1 CAN/CGSB-4.2 No. 22-2004, Textile Test Methods - Colourfastness to Rubbing (Crocking).
    - .2 CAN/CGSB-4.2 No.27.6M-2004, Textile Test Methods - Flame Resistance - Methemine Tablet Test for Textile Floor Coverings.
    - .3 CAN/CGSB-4.2 No. 76-94/ISO 2551: 1981, Textile Test Methods - Machine-Made Textile Floor Coverings - Determination of Dimensional Changes Due to the Effects of Varied Water and Heat Conditions.
    - .4 CAN/CGSB-4.2 No.77.1-94/ISO 4919:2000, Textile Test Methods - Carpets - Determination of Tuft Withdrawal Force.
    - .5 CAN/CGSB-4.129-93(R1997), Carpets for Commercial Use.
  - .4 Canadian Standards Association (CSA)
    - .1 CSA B651-12, Accessible Design for the Built Environment, including Annex A
  - .5 Carpet and Rug Institute (CRI)
    - .1 CRI Carpet Installation Standard 2011.
    - .2 CRI Green Label Indoor Air Quality Testing Program.
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- .3 CRI Green Label Plus Indoor Air Quality Testing Program.
- .6 Environmental Choice Program (ECP)
  - .1 CCD-152-2009, Flooring Products, Commercial Non-modular Textile Flooring.
- .7 Health Canada
  - .1 C.R.C., c.923-10, Hazardous Products Act - Carpet Regulations, Part II of Schedule 1.
- .8 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .9 National Floor Covering Association (NFCA)
  - .1 National Floor Covering Specification Manual 2007.
- .10 Underwriters' Laboratories of Canada (ULC)
  - .1 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
  - .2 CAN/ULC-S102.2-10, Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings and Miscellaneous Materials and Assemblies.

## 1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Installation Meetings:
  - .1 Convene pre-installation meeting 1 week prior to beginning work of this Section with Contractor's Representative and Departmental Representative in accordance with Section 01 31 19 to:
    - .1 Verify project requirements.
    - .2 Review installation and substrate conditions.
    - .3 Co-ordination with other construction subtrades.
    - .4 Review manufacturer's written installation instructions and warranty requirements.
- .2 Sequencing and Scheduling: sequence with other work in accordance with Section 01 31 13 – Project Coordination. Comply with manufacturer's written recommendations for sequencing construction operations.

## 1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 0.
  - .2 Product Data:
    - .1 Submit manufacturer's instructions, printed product literature and data sheets for each carpet tile, adhesive, and subfloor patching compound and include product characteristics, performance criteria, physical size, finish and limitations.
    - .2 Submit 2 copies of WHMIS MSDS.
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- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
  - .2 Information on shop drawings to indicate:
    - .1 Nap: direction, open edges, special patterns.
    - .2 Cutouts: show locations where cutouts are required.
    - .3 Edgings: show location of edge moldings and edge bindings.
- .4 Samples:
  - .1 Submit for review and acceptance of each unit.
  - .2 Samples will be returned for inclusion into work.
  - .3 Submit duplicate samples of each type of carpet tile specified and duplicate tiles for each colour selected, 150 mm length base.
- .5 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .6 Test and Evaluation Reports:
  - .1 Certified test reports showing compliance with specified performance characteristics and physical properties.
- .7 Manufacturer's Instructions: submit manufacturer's installation and storage instructions.
- .8 Manufacturers Reports:
  - .1 Manufacturer's Field Reports: submit manufacturer's written reports within 3 days of review, verifying compliance with specifications.
- .9 Qualification Statements:
  - .1 Compliance: to CAN/ULC-S102 and CAN/ULC-S102.2.
  - .2 Testing: passes testing requirements of:
    - .1 Green Label Indoor Air Quality Testing Program.
  - .3 Tuft bind: meets requirements of CAN/CGSB-4.129 when tested to CAN/CGSB-4.2 No.77.1.

#### **1.4 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00.
- .2 Operation and Maintenance Data: submit operation and maintenance data for installed products for incorporation into manual.

#### **1.5 MAINTENANCE MATERIAL SUBMITTALS**

- .1 Extra stock materials in accordance with Section 01 78 00: deliver to Departmental Representative extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Section 01 78 00.
  - .1 Quantity: provide minimum of:
    - .1 Carpet tile: 2%

- .2 Carpet base: 5%
- .3 Adhesives: 2%
- .2 Delivery, storage and protection: comply with Departmental Representative's requirements for delivery and storage of extra materials.

## 1.6 QUALITY ASSURANCE

- .1 Regulatory Requirements:
  - .1 Prequalification: compliance with Health Canada regulations under "Hazardous Products Act", Part II of Schedule 1, to CAN/CGSB-4.2 No. 27.6.
- .2 Qualifications:
  - .1 Manufacturer: capable of providing field service representation during construction and approving application method.
  - .2 Flooring Installer:
    - .1 Experienced in performing work of this Section who has specialized in installation of work similar to that required for this project.
    - .2 Certified by carpet manufacturer prior to bid submission.
    - .3 Must not sub-contract labour without written approval of Departmental Representative.
    - .4 Responsible for proper product installation, including floor testing and preparation as specified and in accordance with carpet manufacturer's written instructions.

## 1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store materials protected from exposure to harmful weather conditions and at temperature conditions recommended by manufacturer.
  - .3 Store and protect carpet tile and adhesive in original containers or wrapping with manufacturer's seals and labels intact.
  - .4 Store and protect carpet tile and accessories in location as directed by Departmental Representative.
  - .5 Store carpet and adhesive at minimum temperature of 18 degrees C and relative humidity of maximum 65% for minimum of 48 hours before installation.
  - .6 Prevent damage to materials during handling and storage. Keep materials under cover and free from dampness.
  - .7 Safety: comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.

- .8 Off gas carpet products off site in accordance with CSA B651.
- .9 Replace defective or damaged materials with new.

## 1.8 SITE CONDITIONS

- .1 Ambient Conditions:
  - .1 Moisture: ensure substrate is within moisture limits and alkalinity limits recommended by manufacturer. Prepare moisture testing and provide report to Departmental Representative.
  - .2 Temperature: maintain ambient temperature of not less than 18 degrees C from 48 hours before installation to at least 48 hours after completion of work.
  - .3 Relative humidity: maintain between 10% and 65% for 48 hours before, during and 48 hours after installation.
  - .4 Ventilation:
    - .1 Ventilate area of work as directed by Departmental Representative by use of approved portable supply and exhaust fans.
    - .2 Ventilate enclosed spaces in accordance with Section 01 51 00. Provide fans with HEPA filters.
    - .3 Provide continuous ventilation during and after carpet application. Run ventilation system 24 hours per day during installation; provide continuous ventilation for 7 days after completion of carpet installation.
  - .5 Install carpet after space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete.

## 1.9 WARRANTY

- .1 Manufacturer's warranty: submit, for Departmental Representative's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to and does not limit other rights Departmental Representative may have under Contract Documents.
- .2 Warranty period: 1 year, commencing on date of substantial performance of work.
  - .1 Warranty covers labour and repair or replacement of defective components for 1 year after date of substantial performance.

## Part 2 PRODUCTS

### 2.1 MATERIALS

- .1 Manufacturers:
  - .1 Ensure manufacturer has minimum 5 years experience in manufacturing components similar to or exceeding requirements of project.

### 2.2 PERFORMANCE

- .1 Flammability: certified for flammability to Health Canada regulations under "Hazardous Products - Carpet Regulations", Part II of Schedule 1.

- .2 Flame Spread: maximum flame spread rating 300, maximum smoke developed classification 500, when tested to CAN/ULC-S102.2.
- .3 Smoke Development: 450 or less per ASTM E662.
- .4 Dry Breaking Strength: to ASTM D2661, minimum acceptable tear strength in both length and width:
  - .1 11.3 kg for carpets installed by glue down installation.
- .5 Wear: maximum 10% of pile face fiber by weight for 10 years.
- .6 Edge Ravel: none for 10 years.
- .7 Static Resistance: permanent static control to AATCC 134, 2000 V maximum at 20% RH and 22 degrees C.
- .8 Static Generation: less than 3.0 kV per AATCC 134 for 10 years.
- .9 Tuft Bind: Tuft Lock: to ASTM D1335, minimum acceptable 3.6 kilograms.
- .10 De-lamination of Secondary Backing: Lamination Strength of Secondary Backing: to ASTM D3936, minimum acceptable peel strength of 1.6 kg/25 mm.
- .11 Stain resistance: to AATCC 175, 8.
- .12 Soil Resistance: 350 ppm fluorine minimum. Fluorine Durability Level to AATCC 189.
- .13 Colourfastness to light: to CAN/CGSB-4.2 No.18.3
- .14 Colourfastness to atmosphere: to AATCC 129 and AATCC 23.
- .15 Colourfastness to crocking: to CAN/CGSB-4.2 No. 22.
- .16 Indoor Air Quality Certification: certified to CRI Green Label IAQ requirements.

## 2.3

### FABRICATION

- .1 Type CPT-1: colour and pattern to be selected by Departmental Representative from manufacturer's standard range, size 610 mm x 610 mm.
- .2 Face construction: Tufted.
- .3 Pile Surface Appearance: Level loop; textured.
- .4 Pile fibre: to CAN/CGSB-4.129.
  - .1 Nylon: BCF.
    - .1 Type: Nylon 6.
- .5 Dyeing Method: solution dyed.
- .6 Tufted Carpet Backing: to CAN/CGSB-4.129.
  - .1 Primary backing:
    - .1 Polypropylene: Cut Pile Carpet: 100% woven polypropylene at a minimum weight of 126 g/m<sup>2</sup>.
- .7 Secondary and Unitary Backings: to CAN/CGSB-4.129.
- .8 Stitches: 39.4 stitches/10 cm.
- .9 Gauge: 50.4 rows/10 cm.

- .10 Finished Pile Height: minimum 4.7 mm average.
- .11 Surface Pile Weight: minimum 711.9 g/sq.m.
- .12 Total Weight: 3330 g/sq.m.
- .13 Dimensional Stability: maximum + 0.15% to CAN/CGSB-4.2 No. 76/ISO 2551.

## 2.4 TILE CUSHION BACKING

- .1 Density: urethane 224 kg/m<sup>3</sup>; EVA and PVC 240 kg/m<sup>3</sup> to ASTM D3574.
- .2 Compression force deflection, minimum: urethane 34.5 kN/m<sup>2</sup> to ASTM D3574.
- .3 Compression deflection, minimum: EVA and PVC 48.3 kN/m<sup>2</sup> to ASTM D1667.
- .4 Compression set at 50%, maximum: urethane 15% to ASTM D3574.
- .5 Compression set at 25%, maximum: EVA and PVC 10% to ASTM D3574.
- .6 Ash content, maximum: urethane 50%; EVA and PVC 50% to ASTM D297.
- .7 Anti-microbial Resistance: to AATCC 174, 2 mm minimum halo of inhibition for gram positive bacteria.
  - .1 1 mm minimum halo of inhibition for gram negative bacteria.
  - .2 Ensure no fungal growth.

## 2.5 ACCESSORIES

- .1 Base:
    - .1 Resilient Base (B-1): as specified in Section 09 65 19.
    - .2 Carpet Base (B-2): 100 mm high, same material, colour, pattern and texture as adjoining carpet tile. Bound exposed edge.
  - .2 Edge Strips:
    - .1 Metal:
      - .1 Designed for carpet being installed.
      - .2 Floor flange minimum 38 mm wide, face minimum 16 mm wide.
      - .3 Finish: clear anodic coating.
  - .3 Adhesive:
    - .1 Pressure Sensitive Type: recommended by carpet tile manufacturer for direct glue down installation of specialty backed carpet tiles.
    - .2 On site application VOC limit: 50 g/L maximum to SCAQMD Rule 1168.
    - .3 Adhesive in compliance with CCD-152.
  - .4 Transition Mouldings:
    - .1 Carpet edge / reducer strip: Extruded vinyl shapes meeting or exceeding ADA Recommendations for change of level transitions for transition between floors finishes having different levels.
  - .5 Carpet protection: non-staining heavy duty kraft paper.
-

- .6 Subfloor patching compound: Portland cement base filler, mix with latex and water to form cementitious paste.

### **Part 3 EXECUTION**

#### **3.1 INSTALLERS**

- .1 Use experienced and qualified technicians to carry out assembly and installation of tile carpet.

#### **3.2 EXAMINATION**

- .1 Examine conditions, substrates and work to receive work of this Section.
- .2 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for carpet tile installation in accordance with manufacturer's written instructions.
  - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

#### **3.3 PREPARATION**

- .1 Subfloor Preparation:
  - .1 Inspect concrete and determine special care required to make it suitable for carpet.
  - .2 Fill and level cracks 3 mm wide or protrusions over 0.8 mm with appropriate and compatible latex patching compound.
  - .3 Comply with manufacturer's written recommendations for maximum patch thickness.
  - .4 Prime large patch areas with compatible primer.
  - .5 Ensure concrete substrates are cured, clean and dry.
  - .6 Ensure concrete substrates are free of paint, dirt, grease, oil, curing or parting agents, and other contaminants, including sealers, that interfere with the bonding of adhesive.
  - .7 Where powdery or porous concrete surface is encountered, apply primer compatible with adhesive to provide a suitable surface for glue-down installation.
- .2 Surface Preparation: prepare surface in accordance with manufacturer's written recommendations.
  - .1 Prepare floor surfaces in accordance with CRI Carpet Installation Standard.
- .3 Tile Carpeting Preparation:
  - .1 Pre-condition carpeting: following manufacturer's written instructions.

### 3.4 INSTALLATION

- .1 Install carpet tiles in accordance with manufacturer's written instructions, and CRI Carpet Installation Standard and co-ordinate with Section 01 73 00.
- .2 Co-ordinate tile carpeting work with work of other trades, for proper time and sequence to avoid construction delays.
- .3 Install carpet tile after finishing work is completed but before demountable office partitions and telephone and electrical pedestal outlets are installed.
- .4 Install carpet tile as per manufacturer's recommendation. This can include quarter-turn 90 degree format, monolithic, random, quarter turn ashlar, horizontal, herringbone or vertical ashlar.
- .5 Snugly join carpet tiles in completed installation.
  - .1 Measure distance covered by 11 carpet tiles (10 joints) and ensure distance is in compliance with manufacturer specifications.
  - .2 Do not trap yarn between carpet tiles.
- .6 Apply thin film of pressure-sensitive adhesive according to manufacturer's recommendations.
- .7 Ensure finished installation presents smooth wearing surface free from conspicuous seams, burring and other faults.
- .8 Use material from same dye lot.
  - .1 Ensure colour, pattern and texture match within visual areas.
  - .2 Maintain constant pile direction.
- .9 Fit around architectural, mechanical, electrical and telephone outlets, and furniture fitments, around perimeter of rooms into recesses, and around projections.
- .10 Extend carpet tiles into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- .11 Install carpet tiles smooth and free from bubbles, puckers, and other defects.
- .12 Protect exposed carpet tile edges at transition to other flooring materials with suitable transition strips.
- .13 Base Installation: Install base in accordance with Section 09 65 00.

### 3.5 SITE QUALITY CONTROL

- .1 Site Tests and Inspections:
  - .1 Co-ordinate site test with Section 01 45 00.
- .2 Manufacturer's Field Services:
  - .1 Co-ordinate manufacturer's services with Section 01 45 00. Have manufacturer review work involved in handling, installation / application, protection and cleaning of its products, and submit written reports, in acceptable format, to verify compliance of work with Contract.

- .2 Manufacturer's field services: provide manufacturer's field services, consisting of product use recommendations and periodic site visits for inspection of product installation, in accordance with manufacturer's instructions.
- .3 Schedule site visits:
  - .1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.
  - .2 Twice during progress of Work at 25% and 60% complete.
  - .3 Upon completion of Work, after cleaning is carried out.
- .4 Obtain reports within 3 days of review and submit immediately to Departmental Representative.

### **3.6 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
  - .1 Leave Work area clean at end of each day.
  - .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
    - .1 Vacuum carpets clean immediately after completion of installation.

### **3.7 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Prohibit traffic on carpet for period of 24 hours minimum after installation and until adhesive is cured.
- .3 Install carpet protection to satisfaction of Departmental Representative.
- .4 Repair damage to adjacent materials caused by tile carpeting installation.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 RELATED SECTIONS**

Section 09 21 16 – Gypsum Board Assemblies

**1.2 REFERENCES**

- .1 Architectural Painting Specifications Manual, Master Painters Institute (MPI), 2010.
- .2 Systems and Specifications Manual, SSPC Painting Manual, Volume Two, Society for Protective Coatings (SSPC).
- .3 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings) of the Environmental Protection Agency (EPA).
- .4 National Fire Code of Canada 2010 (NFC).

**1.3 QUALITY ASSURANCE**

- .1 Qualified journeymen shall be engaged in painting work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with trade regulations.
- .2 Conform to latest MPI requirements for interior painting work including preparation and priming.
- .3 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) shall be in accordance with MPI Painting Specification Manual "Approved Product" listing and shall be from a single manufacturer for each system used.
- .4 Other paint materials such as linseed oil, shellac, turpentine, etc. shall be the highest quality product of an approved manufacturer listed in MPI Painting Specification Manual and shall be compatible with other coating materials as required.
- .5 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Departmental Representative.
- .6 Standard of Acceptance:
  - .1 Walls: No defects visible from a distance of 1000 mm at 90° to surface.
  - .2 Ceilings: No defects visible from floor at 45° to surface when viewed using final lighting source.
  - .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

**1.4 ENVIRONMENTAL PERFORMANCE REQUIREMENTS**

- .1 Provide paint products meeting MPI "Environmentally Friendly" E1 ratings based on VOC (EPA Method 24) content levels.
  - .2 Where indoor air quality (odour) is a problem, use only MPI listed materials having a minimum E2 rating.
-

**1.5 INSPECTION REQUIREMENTS**

- .1 Interior painting and decorating work shall be inspected by a Paint Inspection Agency (inspector) acceptable to the specifying authority and local Painting Contractor's Association. Painting contractor shall notify Paint Inspection Agency a minimum of one week prior to commencement of work and provide a copy of project painting specification, plans and elevation drawings (including pertinent details) as well as a Finish Schedule.
- .2 Interior surfaces requiring painting shall be inspected by Paint Inspection Agency who shall notify Departmental Representative and General Contractor in writing of defects or problems, prior to commencing painting work, or after prime coat shows defects in substrate.
- .3 Where "special" painting, coating or decorating system applications (i.e. elastomeric coatings) or non-MPI listed products or systems are to be used, paint or coating manufacturer shall provide as part of this work, certification of surfaces and conditions for specific paint or coating system application as well as on site supervision, inspection and approval of their paint or coating system application as required at no additional cost to Departmental Representative.

**1.6 SCHEDULING OF WORK**

- .1 Submit work schedule for various stages of painting to Departmental Representative for approval. Submit schedule minimum of 48 hours in advance of proposed operations.
- .2 Obtain written authorization from Departmental Representative for any changes in work schedule.
- .3 Schedule painting operations to prevent disruption of occupants in and about the building.

**1.7 SUBMITTALS**

- .1 Submit product data and manufacturer's installation/application instructions for each paint and coating product to be used in accordance with Section 01 33 00.
- .2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00.
- .3 Upon completion, submit records of products used. List products in relation to finish system and include the following:
  - .1 Product name, type and use.
  - .2 Manufacturer's product number.
  - .3 Colour numbers.
  - .4 MPI Environmentally Friendly classification system rating.
  - .5 Manufacturer's Material Safety Data Sheets (MSDS).

**1.8 SAMPLES**

- .1 Submit full range colour sample chips in accordance with Section 01 33 00. Indicate where colour availability is restricted.
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- .2 Submit duplicate 200 x 300 mm sample panels of each paint with specified paint or coating in colours, gloss/sheen and textures required to MPI Painting Specification Manual standards submitted on the following substrate materials:
  - .1 50 mm concrete block for finishes over concrete or concrete masonry surfaces.
  - .2 13 mm gypsum board for finishes over gypsum board and other smooth surfaces.
- .3 When approved, sample panels shall become acceptable standard of quality for appropriate on-site surface with one of each sample retained on-site.

## **1.9 QUALITY CONTROL**

- .1 Provide mock-up in accordance with Section 01 33 00.
- .2 When requested by Departmental Representative, prepare and paint designated surface, area, room or item (in each colour scheme) to requirements specified herein, with specified paint or coating showing selected colours, gloss/sheen, textures and workmanship to MPI Painting Specification Manual standards for review and approval. When approved, surface, area, room and/or items shall become acceptable standard of finish quality and workmanship for similar on-site work.

## **1.10 EXTRA MATERIALS**

- .1 Submit maintenance materials in accordance with Section 01 33 00.
- .2 Submit one - four litre can of each type and colour of finish coating. Identify colour and paint type in relation to established colour schedule and finish system.
- .3 Deliver to Contractor and store where directed.

## **1.11 DELIVERY, HANDLING AND STORAGE**

- .1 Deliver, store and handle materials in accordance with Section 01 33 00.
  - .2 Labels shall clearly indicate:
    - .1 Manufacturer's name and address.
    - .2 Type of paint or coating.
    - .3 Compliance with applicable standard.
    - .4 Colour number in accordance with established colour schedule.
  - .3 Remove damaged, opened and rejected materials from site.
  - .4 Provide and maintain dry, temperature controlled, secure storage.
  - .5 Observe manufacturer's recommendations for storage and handling.
  - .6 Store materials and supplies away from heat generating devices.
  - .7 Store materials and equipment in a well ventilated area with temperature range 7°C to 30°C.
  - .8 Store temperature sensitive products above minimum temperature as recommended by manufacturer.
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- .9 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Departmental Representative. After completion of operations, return areas to clean condition to approval of Departmental Representative.
- .10 Remove paint materials from storage only in quantities required for same day use.
- .11 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
- .12 Fire Safety Requirements:
  - .1 Provide one 9 kg Type ABC fire extinguisher adjacent to storage area.
  - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
  - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

## 1.12 SITE REQUIREMENTS

- .1 Heating, Ventilation and Lighting:
  - .1 Ventilate enclosed spaces in accordance with Section 01 35 29.
  - .2 Perform no painting work unless adequate and continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above 10°C for 24 hours before, during and after paint application until paint has cured sufficiently.
  - .3 Where required, provide continuous ventilation for seven days after completion of application of paint.
  - .4 Coordinate use of existing ventilation system with Departmental Representative and ensure its operation during and after application of paint as required.
  - .5 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.
  - .6 Perform no painting work unless a minimum lighting level of 323 Lux is provided on surfaces to be painted. Adequate lighting facilities shall be provided by General Contractor.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
  - .1 Unless specifically pre-approved by the specifying body, Paint Inspection Agency and the applied product manufacturer, perform no painting work when:
    - .1 Ambient air and substrate temperatures are below 10°C.
    - .2 Substrate temperature is over 32°C unless paint is specifically formulated for application at high temperatures.
    - .3 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's prescribed limits.
    - .4 The relative humidity is above 85% or when the dew point is less than 3°C variance between the air/surface temperature.
    - .5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.

- .2 Perform no painting work when the maximum moisture content of the substrate exceeds:
  - .1 12% for concrete and masonry (clay and concrete brick/block).
  - .2 15% for wood.
  - .3 12% for plaster and gypsum board.
- .3 Conduct moisture tests using a properly calibrated electronic Moisture Meter, except test concrete floors for moisture using a simple "cover patch test".
- .4 Test concrete, masonry and plaster surfaces for alkalinity as required.
- .3 Surface and Environmental Conditions:
  - .1 Apply paint finish only in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
  - .2 Apply paint only to adequately prepared surfaces and to surfaces within moisture limits noted herein.
  - .3 Apply paint only when previous coat of paint is dry or adequately cured.
- .4 Additional Interior Application Requirements:
  - .1 Apply paint finishes only when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.
  - .2 Apply paint in occupied facilities during silent hours only. Schedule operations to approval of Departmental Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.

### **1.13 WASTE MANAGEMENT AND DISPOSAL**

- .1 Paint, stain and wood preservative finishes and related materials (thinners, solvents, etc.,) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.
- .2 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
- .3 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
- .4 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into ground the following procedures shall be strictly adhered to:
  - .1 Retain cleaning water for water-based materials to allow sediments to be filtered out.
  - .2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
  - .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
  - .4 Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.
  - .5 Empty paint cans are to be dry prior to disposal or recycling (where available).

- .5 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.
- .6 Set aside and protect surplus and uncontaminated finish materials; deliver to or arrange collection by employees, individuals, or organizations for verifiable re-use or re-manufacturing.
- .7 Close and seal tightly partly used sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.

## **Part 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.
  - .2 Paint materials for paint systems shall be products of a single manufacturer.
  - .3 Only qualified products with E2 "Environmentally Friendly" rating are acceptable for use on this project.
  - .4 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids, shall:
    - .1 be manufactured without compounds which contribute to ozone depletion in the upper atmosphere.
    - .2 be manufactured without compounds which contribute to smog in the lower atmosphere.
    - .3 do not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.
  - .5 Water-borne surface coatings must be manufactured and transported in a manner that steps of process, including disposal of waste products arising therefrom, will meet requirements of applicable governmental acts, by-laws and regulations including, for facilities located in Canada, Fisheries Act and Canadian Environmental Protection Act (CEPA).
  - .6 Water-borne surface coatings must not be formulated or manufactured with aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.
  - .7 Water-borne surface coatings and recycled water-borne surface coatings must have a flash point of 61.0°C or greater.
  - .8 Both water-borne surface coatings and recycled water-borne surface coatings must be made by a process that does not release:
    - .1 Matter in undiluted production plant effluent generating a 'Biochemical Oxygen Demand' (BOD) in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.
    - .2 Total Suspended Solids (TSS) in undiluted production plant effluent in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.
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- .9 Water-borne paints and stains, recycled water-borne surface coatings and water borne varnishes must meet a minimum "Environmentally Friendly" E2 rating.
- .10 Recycled water-borne surface coatings must contain 50% post-consumer material by volume.
- .11 Recycled water-borne surface coatings must not contain:
  - .1 Lead in excess of 600.0 ppm weight/weight total solids.
  - .2 Mercury in excess of 50.0 ppm weight/weight total product.
  - .3 Cadmium in excess of 1.0 ppm weight/weight total product.
  - .4 Hexavalent chromium in excess of 3.0 ppm weight/weight total product.
  - .5 Organochlorines or polychlorinated biphenyls (PCBS) in excess of 1.0 ppm weight/weight total product.
- .12 The following must be performed on each batch of consolidated post-consumer material before surface coating is reformulated and canned. These tests must be performed at a laboratory or facility which has been accredited by the Standards Council of Canada.
  - .1 Lead, cadmium and chromium are to be determined using ICP-AES (Inductively Coupled Plasma - Atomic Emission Spectroscopy) technique no. 6010 as defined in EPA SW-846.
  - .2 Mercury is to be determined by Cold Vapour Atomic Absorption Spectroscopy using Technique no. 7471 as defined in EPA SW-846.
  - .3 Organochlorines and PCBs are to be determined by Gas Chromatography using Technique no. 8081 as defined in EPA SW-846.

## **2.2 COLOURS**

- .1 Refer to Colour Schedule on Drawings.
- .2 Second coat in a three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats.

## **2.3 MIXING AND TINTING**

- .1 Perform colour tinting operations prior to delivery of paint to site. On-site tinting of painting materials is allowed only with Departmental Representative's written permission.
  - .2 Paste, powder or catalyzed paint mixes shall be mixed in strict accordance with manufacturer's written instructions.
  - .3 Where thinner is used, addition shall not exceed paint manufacturer's recommendations. Do not use kerosene or any such organic solvents to thin water-based paints.
  - .4 Thin paint for spraying according in strict accordance with paint manufacturer's instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to Departmental Representative.
  - .5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.
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## 2.4 GLOSS/SHEEN RATINGS

- .1 Paint gloss shall be defined as the sheen rating of applied paint, in accordance with the following values:

Gloss Level Category	Units @ 60°	Units @ 85°
G1 – matte finish	0 to 5	max. 10
G2 – velvet finish	0 to 10	10 to 35
G3 – eggshell finish	10 to 25	10 to 35
G4 – satin finish	20 to 35	min. 35
G5 - semi-gloss finish	35 to 70	
G6 – gloss finish	70 to 85	
G7 - high gloss finish	> 85	

- .2 Gloss level ratings of painted surfaces as noted on Finish Schedule provided after Contract Award.

## 2.5 INTERIOR PAINTING SYSTEMS

- .1 Galvanized Metal: doors, frames, railings, misc. steel, pipes, overhead decking, ducts, etc.
- .1 INT 5.3M High performance architectural latex G4 finish.
- .2 Gypsum Board: gypsum wallboard:
- .1 INT 9.2B High performance architectural latex finish.

## Part 3 EXECUTION

### 3.1 GENERAL

- .1 Perform preparation and operations for interior painting in accordance with MPI Painting Specifications Manual except where specified otherwise.
- .2 Apply paint materials in accordance with paint manufacturer's written application instructions.

### 3.2 EXISTING CONDITIONS

- .1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Departmental Representative damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.

- .2 Conduct moisture testing of surfaces to be painted using a properly calibrated electronic moisture meter, except test concrete floors for moisture using a simple "cover patch test" and report findings to Departmental Representative. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.
- .3 Maximum moisture content as follows:
  - .1 Stucco, Plaster and Gypsum Board: 12%.

### 3.3 PROTECTION

- .1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore such surfaces as directed by Departmental Representative.
- .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
- .3 Protect factory finished products and equipment.
- .4 Protect building occupants and general public in and about the building.
- .5 Removal of electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings shall be done prior to undertaking any painting operations by Contractor. Items shall be securely stored and re-installed after painting is completed by Contractor.
- .6 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
- .7 As painting operations progress, place "WET PAINT" signs in occupied areas to approval of Departmental Representative.

### 3.4 CLEANING AND PREPARATION

- .1 Clean and prepare surfaces in accordance with MPI Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:
  - .1 Remove dust, dirt, and other surface debris by vacuuming, wiping with dry, clean cloths or compressed air.
  - .2 Wash surfaces with a biodegradable detergent and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.
  - .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
  - .4 Allow surfaces to drain completely and allow to dry thoroughly.
  - .5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.
  - .6 Use trigger operated spray nozzles for water hoses.
  - .7 Many water-based paints cannot be removed with water once dried. However, minimize the use of kerosene or any such organic solvents to clean up water-based paints.

- .2 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.
- .3 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.
- .4 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements. Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes, blowing with clean dry compressed air, or vacuum cleaning.
- .5 Touch up of shop primers with primer as specified in applicable section. Major touch-up including cleaning and painting of field connections, welds, rivets, nuts, washers, bolts, and damaged or defective paint and rusted areas, shall be by supplier of fabricated material.
- .6 Do not apply paint until prepared surfaces have been accepted by Departmental Representative.

### 3.5 APPLICATION

- .1 Method of application to be as approved by Departmental Representative. Apply paint by brush, roller, or air sprayer. Conform to manufacturer's application instructions unless specified otherwise.
  - .2 Brush and Roller Application:
    - .1 Apply paint in a uniform layer using brush and/or roller of types suitable for application.
    - .2 Work paint into cracks, crevices and corners.
    - .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
    - .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces shall be free of roller tracking and heavy stipple unless approved by Departmental Representative.
    - .5 Remove runs, sags and brush marks from finished work and repaint.
  - .3 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access and only when specifically authorized by Engineer.
  - .4 Apply coats of paint as a continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
  - .5 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
  - .6 Sand and dust between coats to remove visible defects.
  - .7 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.
  - .8 Finish closets and alcoves as specified for adjoining rooms.
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- .9 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

### 3.6 MECHANICAL/ ELECTRICAL EQUIPMENT

- .1 Unless otherwise specified, paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as noted otherwise.
- .2 Boiler room, mechanical and electrical rooms: paint exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment.
- .3 Other unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.
- .4 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.
- .5 Do not paint over nameplates.
- .6 Keep sprinkler heads free of paint.
- .7 Paint inside of ductwork where visible behind grilles, registers and diffusers with primer and one coat of matt black paint.
- .8 Paint fire protection piping red.
- .9 Paint disconnect switches for fire alarm system and exit light systems in red enamel.
- .10 Paint natural gas piping yellow.
- .11 Paint both sides and edges of backboards for telephone and electrical equipment before installation. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.
- .12 Do not paint interior transformers and substation equipment.

### 3.7 FIELD QUALITY CONTROL

- .1 Field inspection of painting operations to be carried out by independent inspection firm as designated by Departmental Representative.
- .2 Advise Departmental Representative when surfaces and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.
- .3 Co-operate with inspection firm and provide access to areas of work.

### 3.8 RESTORATION

- .1 Clean and re-install all hardware items removed before undertaken painting operations.
- .2 Remove protective coverings and warning signs as soon as practical after operations cease.
- .3 Remove paint splashings on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.
- .4 Protect freshly completed surfaces from paint droppings and dust to approval of Departmental Representative. Avoid scuffing newly applied paint.
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- .5      Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Departmental Representative.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for terminal boxes, water heaters, and controls and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop drawings:
  - .1 Drawings to show:
    - .1 Mounting arrangements.
    - .2 Operating and maintenance clearances.
  - .2 Drawings and product data accompanied by:
    - .1 Detailed drawings of bases, supports, and anchor bolts.
    - .2 Acoustical sound power data, where applicable.
    - .3 Points of operation on performance curves.
    - .4 Manufacturer to certify current model production.
    - .5 Certification of compliance to applicable codes.

**1.2 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00.
- .2 Operation and Maintenance Data: submit operation and maintenance data for all mechanical equipment for incorporation into manual.
  - .1 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
  - .2 Operation data to include:
    - .1 Control schematics for systems including environmental controls.
    - .2 Description of systems and their controls.
    - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
    - .4 Operation instruction for systems and component.
    - .5 Description of actions to be taken in event of equipment failure.
    - .6 Valves schedule and flow diagram.
    - .7 Colour coding chart.
  - .3 Maintenance data to include:
    - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
    - .2 Data to include schedules of tasks, frequency, tools required and task time.

- .4 Performance data to include:
    - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
    - .2 Equipment performance verification test results.
    - .3 Special performance data as specified.
    - .4 Testing, adjusting and balancing reports as specified in Section 23 05 93.
  - .5 Approvals:
    - .1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
    - .2 Make changes as required and re-submit as directed by Departmental Representative.
  - .6 Additional data:
    - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
  - .7 Site records:
    - .1 Departmental Representative will provide 1]set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
    - .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
    - .3 Use different colour waterproof ink for each service.
    - .4 Make available for reference purposes and inspection.
  - .8 As-Built drawings:
    - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
    - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
    - .3 Submit to Departmental Representative for approval and make corrections as directed.
    - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
    - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
  - .9 Submit copies of as-built drawings for inclusion in final TAB report.
-

### **1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect material from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

## **Part 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 HVAC&R Equipment:
  - .1 Terminal Box
  - .2 Exhaust Fans
  - .3 Split Air Conditioning Units
- .2 Plumbing Equipment
  - .1 Hot water heater
- .3 HVAC building automation system

## **Part 3 EXECUTION**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

### **3.2 PAINTING REPAIRS AND RESTORATION**

- .1 Do painting in accordance with Section 09 91 23.
  - .2 Prime and touch up marred finished paintwork to match original.
  - .3 Restore to new condition, finishes which have been damaged.
-

### **3.3 SYSTEM CLEANING**

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

### **3.4 FIELD QUALITY CONTROL**

- .1 Manufacturer's Field Services:
  - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
  - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

### **3.5 DEMONSTRATION**

- .1 Trial usage to apply to following equipment and systems:
  - .1 Terminal Box
  - .2 Hot Water Heater
  - .3 HVAC Controls
- .2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .3 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.
- .4 Schedule instruction duration time requirements.

### **3.6 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

### **3.7 PROTECTION**

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for sprinkler heads, piping, hangers, and fittings, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
  - .2 Indicate on drawings:
    - .1 Sprinkler head type and layout.
    - .2 Sprinkler pipe routing and sizes.
    - .3 Hydraulic calculation.

**1.2 REFERENCES**

- .1 Not Used

**1.3 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00.
- .2 Operation and Maintenance Data: submit operation and maintenance data for Sprinkler Work for incorporation into manual.
  - .1 Approvals:
    - .1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
    - .2 Make changes as required and re-submit as directed by Departmental Representative.
  - .2 Additional data:
    - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
    - .2 Submit Letter from a licensed professional engineer stating that all work has been completed in compliance with NFPA 13.
  - .3 Site records:
    - .1 Departmental Representative will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur.

- .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
- .3 Use different colour waterproof ink for each service.
- .4 Make available for reference purposes and inspection.
- .4 As-Built drawings:
  - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
  - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
  - .3 Submit to Departmental Representative for approval and make corrections as directed.
  - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
  - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .5 Submit copies of as-built drawings for inclusion in final TAB report.

#### **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

### **Part 2 PRODUCTS**

#### **2.1 MATERIALS**

- .1 Sprinkler heads, piping, and hangers.

### **Part 3 EXECUTION**

#### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.

- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

### **3.2 FIELD QUALITY CONTROL**

- .1 Manufacturer's Field Services:
  - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
  - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

### **3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

### **3.4 PROTECTION**

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

**END OF SECTION**

---

**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 National Fire Prevention Association (NFPA)
  - .1 NFPA 13-2016, Standard for the Installation of Sprinkler Systems.
  - .2 NFPA 25-2014, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00.
  - .2 Product Data:
    - .1 Provide manufacturer's printed product literature and data sheets, and include product characteristics, performance criteria, physical size, finish and limitations.
  - .3 Shop Drawings:
    - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
    - .2 Indicate:
      - .1 Materials.
      - .2 Finishes.
      - .3 Method of anchorage
      - .4 Number of anchors.
      - .5 Supports.
      - .6 Reinforcement.
      - .7 Assembly details.
      - .8 Accessories.
  - .4 Samples:
    - .1 Submit samples of following:
      - .1 Each type of sprinkler head.
      - .2 Signs.
  - .5 Test reports:
    - .1 Submit certified test reports for wet pipe fire protection sprinkler systems from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
  - .6 Certificates:
    - .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .7 Manufacturers' Instructions:
    - .1 Provide manufacturer's installation instructions.
-

### **1.3 CLOSEOUT SUBMITTALS**

- .1 Provide operation, maintenance and engineering data for incorporation into manual specified in Section 01 78 00 in accordance with NFPA 20.
  - .2 Manufacturer's Catalog Data, including specific model, type, and size for:
    - .1 Pipe and fittings.
    - .2 Alarm valves.
    - .3 Valves, including gate, check, and globe.
    - .4 Water motor alarms.
    - .5 Sprinkler heads.
    - .6 Pipe hangers and supports.
    - .7 Pressure or flow switch.
    - .8 Fire department connections.
    - .9 Excess pressure pump.
    - .10 Mechanical couplings.
  - .3 Drawings:
    - .1 Sprinkler heads and piping system layout.
      - .1 Prepare 760 mm by 1050 mm detail working drawings of system layout in accordance with NFPA 13, "Working Drawings (Plans)".
      - .2 Show data essential for proper installation of each system.
      - .3 Show details, plan view, elevations, and sections of systems supply and piping.
      - .4 Show piping schematic of systems supply, devices, valves, pipe, and fittings. Show point to point electrical wiring diagrams.
  - .4 Design Data:
    - .1 Calculations of sprinkler system design.
    - .2 Indicate type and design of each system and certify that each system has performed satisfactorily in the manner intended for not less than 18 months.
  - .5 Field Test Reports:
    - .1 Preliminary tests on piping system.
  - .6 Records:
    - .1 As-built drawings of each system.
      - .1 After completion, but before final acceptance, submit complete set of as-built drawings of each system for record purposes.
      - .2 Submit 760 mm by 1050 mm drawings and reproducible CAD file with title block similar to full size contract drawings.
  - .7 Operation and Maintenance Manuals:
    - .1 Provide detailed hydraulic calculations including summary sheet, and Material and Test Certificate for aboveground piping and other documentation for incorporation into manual in accordance with NFPA 13.
-

## **1.4 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Installer: company or person specializing in wet sprinkler systems with documented experience
- .2 Supply grooved joint couplings, fittings, valves, grooving tools and specialties from a single manufacturer. Use date stamped castings for coupling housings, fittings, valve bodies, for quality assurance and traceability.

## **1.5 MAINTENANCE MATERIAL SUBMITTALS**

- .1 Extra Materials:
  - .1 Provide maintenance materials in accordance with Section 01 78 00.
  - .2 Provide spare sprinklers and tools in accordance with NFPA 13.

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

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
  - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Storage and Protection:
  - .1 Store materials indoors in dry location.
  - .2 Store and protect materials from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

## **Part 2 PRODUCTS**

### **2.1 DESIGN REQUIREMENTS**

- .1 Design automatic wet pipe fire suppression sprinkler systems in accordance with required and advisory provisions of NFPA 13, by pipe schedules for ordinary hazard occupancy or hydraulic calculations for uniform distribution of water over design area.
  - .2 Include with each system materials, accessories, and equipment inside and outside building to provide each system complete and ready for use.
  - .3 Design and provide each system to give full consideration to blind spaces, piping, electrical equipment, ducts, and other construction and equipment in accordance with detailed shop drawings.
  - .4 Locate sprinkler heads in consistent pattern with ceiling grid, lights, and air supply diffusers.
  - .5 Devices and equipment for fire protection service: ULC approved for use in wet pipe sprinkler systems.
-

- .6 Location of Sprinkler Heads:
  - .1 Locate heads in relation to ceiling and spacing of sprinkler heads not to exceed that permitted by NFPA 13 for ordinary hazard occupancy.
  - .2 Uniformly space sprinklers on branch.
- .7 Water Distribution:
  - .1 Make distribution uniform throughout the area in which sprinkler heads will open.
- .8 Density of Application of Water:
  - .1 Size pipe to provide specified density when system is discharging specified total maximum required flow.

## 2.2 ABOVE GROUND PIPING SYSTEMS

- .1 Provide fittings for changes in direction of piping and for connections.
  - .1 Make changes in piping sizes through tapered reducing pipe fittings, bushings will not be permitted.
- .2 Perform welding in shop; field welding will not be permitted.

## 2.3 PIPE, FITTINGS AND VALVES

- .1 Pipe:
  - .1 Ferrous: to NFPA 13.
- .2 Fittings and joints to NFPA 13:
  - .1 Ferrous: screwed, welded, flanged or roll grooved.
    - .1 Grooved joints designed with two ductile iron housing segments, pressure responsive gasket, and zinc-electroplated steel bolts and nuts. Cast with offsetting angle-pattern bolt pads for rigidity and visual pad-to-pad offset contact.
  - .2 Provide threaded fittings into which sprinkler heads, sprinkler head riser nipples, or drop nipples are threaded.
  - .3 Plain-end fittings with mechanical couplings and fittings which use steel gripping devices to bite into pipe when pressure is applied will not be permitted.
  - .4 Rubber gasketed grooved-end pipe and fittings with mechanical couplings are permitted in pipe sizes 32 mm and larger.
  - .5 Fittings: ULC approved for use in wet pipe sprinkler systems.
  - .6 Ensure fittings, mechanical couplings, and rubber gaskets are supplied by same manufacturer.
  - .7 Side outlet tees using rubber gasketed fittings are not permitted.
  - .8 Sprinkler pipe and fittings: metal.
- .3 Pipe hangers:
  - .1 ULC listed for fire protection services in accordance with NFPA.

## **2.4 SPRINKLER HEADS**

- .1 General: to NFPA 13 and ULC listed for fire services.
- .2 Sprinkler Head Type:
  - .1 Pendant chrome glass bulb type.
- .3 Provide nominal 1.2 cm orifice sprinkler heads.
  - .1 Release element of each head to be of appropriate temperature rating or higher as suitable for specific application.
  - .2 Provide polished chromium-plated pendent sprinklers below suspended ceilings.
  - .3 Provide corrosion-resistant sprinkler heads and sprinkler head guards in accordance with NFPA 13.
  - .4 Provide sprinkler heads as indicated.

## **Part 3 EXECUTION**

### **3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

### **3.2 INSTALLATION**

- .1 Install, inspect and test to acceptance in accordance with NFPA 13 and NFPA 25.

### **3.3 PIPE INSTALLATION**

- .1 Install piping straight and true to bear evenly on hangers and supports. Do not hang piping from plaster ceilings.
- .2 Keep interior and ends of new piping and existing piping thoroughly cleaned of water and foreign matter.
- .3 Keep piping systems clean during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of piping to prevent entry of water and foreign matter.
- .4 Inspect piping before placing into position.

### **3.4 CONNECTIONS TO EXISTING WATER SUPPLY SYSTEMS**

- .1 Notify Departmental Representative in writing at least 15 days prior to connection date.
  - .2 Use tapping or drilling machine valve and mechanical joint type sleeves for connections to be made under pressure.
  - .3 Bolt sleeves around main piping.
  - .4 Bolt valve to branch connection. Open valve, attach drilling machine, make tap, close valve, and remove drilling machine, without interruption of service.
-

- .5 Furnish materials required to make connections into existing water supply systems, and perform excavating, backfilling, and other incidental labour as required.

**3.5 CLEANING**

- .1 Clean in accordance with Section 01 74 11.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for hot water heater, sink and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Indicate on drawings:
    - .1 Mounting arrangements.
    - .2 Operating and maintenance clearances.

**1.2 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00.
- .2 Operation and Maintenance Data: submit operation and maintenance data for hot water heater for incorporation into manual.
  - .1 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
  - .2 Operation data to include:
    - .1 Description of actions to be taken in event of equipment failure.
  - .3 Maintenance data to include:
    - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
    - .2 Data to include schedules of tasks, frequency, tools required and task time.
  - .4 Performance data to include:
    - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
    - .2 Equipment performance verification test results.
    - .3 Special performance data as specified.
  - .5 Approvals:
    - .1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
    - .2 Make changes as required and re-submit as directed by Departmental Representative.
  - .6 Additional data:
    - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

- .7 Site records:
  - .1 Departmental Representative will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur.
  - .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
  - .3 Use different colour waterproof ink for each service.
  - .4 Make available for reference purposes and inspection.
- .8 As-built drawings:
  - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
  - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
  - .3 Submit to Departmental Representative for approval and make corrections as directed.
  - .4 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .9 Submit copies of as-built drawings for inclusion in final TAB report.

### **1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

## **Part 2 PRODUCTS**

### **2.1 NOT USED**

- .1 Not used.
-

**Part 3 EXECUTION**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

**3.2 PAINTING REPAIRS AND RESTORATION**

- .1 Do painting in accordance with Section 09 91 23.
- .2 Prime and touch up marred finished paintwork to match original.
- .3 Restore to new condition, finishes which have been damaged.

**3.3 SYSTEM CLEANING**

- .1 Clean interior and exterior of all systems including strainers and piping.

**3.4 DEMONSTRATION**

- .1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Trial usage to apply to following equipment and systems:
  - .1 Hot water heater
  - .2 Sink
- .3 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.
- .4 Departmental Representative will record these demonstrations on video tape for future reference.

**3.5 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

**3.6 PROTECTION**

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

**END OF SECTION**

---

**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME).
  - .1 ANSI/ASME B16.24-2001(2006), Cast Copper Alloy Pipe Flanges and Flanged Fittings.
- .2 American Society of Mechanical Engineers International (ASME)
  - .1 ASME B16.15-2013, Cast Copper Alloy Threaded Fittings: Classes 125 and 250.
  - .2 ASME B16.18-2012, Cast Copper Alloy Solder Joint Pressure Fittings.
  - .3 ASME B16.22-2001(R2005), Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
- .3 ASTM International Inc. (ASTM)
  - .1 ASTM A307-14, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.
  - .2 ASTM B88M-13, Standard Specification for Seamless Copper Water Tube (Metric).
- .4 Canadian Standards Association (CSA International)
  - .1 CSA B242-05(R2016), Groove and Shoulder Type Mechanical Pipe Couplings.
- .5 Department of Justice Canada (Jus)
  - .1 Canadian Environmental Protection Act, 1999, c. 33 (CEPA).
- .6 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .7 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).
  - .1 MSS-SP-67-2011, Butterfly Valves.
  - .2 MSS-SP-70-2011, Gray Iron Gate Valves, Flanged and Threaded Ends.
  - .3 MSS-SP-71-2011, Gray Iron Swing Check Valves, Flanged and Threaded Ends.
  - .4 MSS-SP-80-2013, Bronze Gate, Globe, Angle and Check Valves.
- .8 National Research Council (NRC)/Institute for Research in Construction
  - .1 NRCC 47668, National Plumbing Code of Canada (NPC) - 2010.
- .9 Transport Canada (TC)
  - .1 Transportation of Dangerous Goods Act, 1992, c. 34 (TDGA).

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

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

- .2 Product Data:
  - .1 Provide manufacturer's printed product literature and datasheets for insulation and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Closeout Submittals:
  - .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00.

### **1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Packaging Waste Management:
  - .1 Separate and recycle waste materials in accordance with Section 01 74 20.
- .2 Place materials defined as hazardous or toxic in designated containers.
- .3 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.

## **Part 2 PRODUCTS**

### **2.1 PIPING**

- .1 Domestic hot, cold and recirculation systems, within building.
  - .1 Above ground: copper tube, hard drawn, type L: to ASTM B88M.
  - .2 Buried or embedded: copper tube, soft annealed, type K: to ASTM B88M, in long lengths and with no buried joints.

### **2.2 FITTINGS**

- .1 Bronze pipe flanges and flanged fittings, Class 150 and 300: to ANSI/ASME B16.24.
- .2 Cast bronze threaded fittings, Class 125 and 250: to ASME B16.15.
- .3 Cast copper, solder type: to ASME B16.18.
- .4 Wrought copper and copper alloy, solder type: to ASME B16.22.
- .5 NPS 2 and larger: roll grooved to CSA B242.

### **2.3 JOINTS**

- .1 Rubber gaskets, latex-free 1.6 mm thick: to AWWA C111.
  - .2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.
  - .3 Solder: lead free.
  - .4 Teflon tape: for threaded joints.
  - .5 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM flush seal gasket.
  - .6 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner.
-

## 2.4 VALVES

- .1 Refer to section 23 05 23.01 for details.

## Part 3 EXECUTION

### 3.1 APPLICATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

### 3.2 INSTALLATION

- .1 Install in accordance with NPC.
- .2 Assemble piping using fittings manufactured to ANSI standards.
- .3 Install CWS piping below and away from HWS and HWC and other hot piping so as to maintain temperature of cold water as low as possible.
- .4 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.
- .5 Screwed fittings jointed with Teflon tape.
- .6 Protect openings against entry of foreign material.
- .7 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.
- .8 Assemble piping using fittings manufactured to ANSI standards.
- .9 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.
- .10 Install concealed pipework to minimize furring space, maximize headroom, conserve space.
- .11 Install, except where indicated, to permit separate thermal insulation of each pipe.
- .12 Group piping wherever possible and as indicated.
- .13 Ream pipes, remove scale and other foreign material before assembly.
- .14 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.
- .15 Provide for thermal expansion as indicated.
- .16 Valves:
  - .1 Install in accessible locations.
  - .2 Remove interior parts before soldering.
  - .3 Install with stems above horizontal position unless otherwise indicated.
  - .4 Valves accessible for maintenance without removing adjacent piping.
  - .5 Install globe valves in bypass around control valves.

- .6 Use ball valves at branch take-offs for isolating purposes except where otherwise specified.

### 3.3 VALVES

- .1 Isolate equipment, fixtures and branches with ball valves.

### 3.4 PRESSURE TESTS

- .1 Conform to requirements of Section 22 05 00.
- .2 Test pressure: greater of maximum system operating pressure or 860 kPa.

### 3.5 FLUSHING AND CLEANING

- .1 Flush entire system for 8 h. Ensure outlets flushed for 2 h. Let stand for 24 h, then draw one sample off longest run. Submit to testing laboratory to verify that system is clean to Federal potable water guidelines. Let system flush for additional 2 h, then draw off another sample for testing.

### 3.6 PRE-START-UP INSPECTIONS

- .1 Systems to be complete, prior to flushing, testing and start-up.
- .2 Verify that system can be completely drained.
- .3 Ensure that pressure booster systems are operating properly.
- .4 Ensure that air chambers, expansion compensators are installed properly.

### 3.7 DISINFECTION

- .1 Flush out, disinfect and rinse system to requirements of authority having jurisdiction.
- .2 Upon completion, provide laboratory test reports on water quality for Departmental Representative approval.

### 3.8 START-UP

- .1 Timing: Start up after:
  - .1 Pressure tests have been completed.
  - .2 Disinfection procedures have been completed.
  - .3 Certificate of static completion has been issued.
  - .4 Water treatment systems operational.
- .2 Provide continuous supervision during start-up.
- .3 Start-up procedures:
  - .1 Establish circulation and ensure that air is eliminated.
  - .2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.
  - .3 Bring domestic hot water storage tank up to design temperature slowly.
  - .4 Monitor piping systems for freedom of movement, pipe expansion as designed.
  - .5 Check control, limit, safety devices for normal and safe operation.

- .4 Rectify start-up deficiencies.

### **3.9 PERFORMANCE VERIFICATION**

- .1 Scheduling:
  - .1 Verify system performance after pressure and leakage tests and disinfection are completed, and Certificate of Completion has been issued by authority having jurisdiction.
- .2 Procedures:
  - .1 Verify that flow rate and pressure meet Design Criteria.
  - .2 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.
  - .3 Sterilize piping systems for Legionella control.
  - .4 Verify performance of temperature controls.
  - .5 Verify compliance with safety and health requirements.
  - .6 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut off water immediately. If water hammer occurs, replace water hammer arrestor or re-charge air chambers. Repeat for outlets and flush valves.
  - .7 Confirm water quality consistent with supply standards, and ensure no residuals remain as result of flushing or cleaning.
- .3 Reports:
  - .1 Provide report detailing testing/verification procedure and results.

### **3.10 CLEANING**

- .1 Clean in accordance with Section 01 74 11.

**END OF SECTION**

---

**Part 1 GENERAL**

**1.1 RELATED SECTIONS**

- .1 Section 22 11 16: Domestic Water Piping

**1.2 REFERENCES**

- .1 ASTM International Inc.
  - .1 ASTM B32-08 (2014), Standard Specification for Solder Metal.
  - .2 ASTM B306-13, Standard Specification for Copper Drainage Tube (DWV).
  - .3 ASTM C564-14, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- .2 Canadian Standards Association (CSA International).
  - .1 CSA B67-1972(R1996), Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories.
  - .2 CSA B70-12, Cast Iron Soil Pipe, Fittings and Means of Joining.
  - .3 CSA B125.3-12, Plumbing Fittings.
- .3 Green Seal Environmental Standards (GSES)
  - .1 Standard GS-36-00, Commercial Adhesives.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature and datasheets for adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle in accordance with Section 01 61 00.
  - .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
  - .3 Packaging Waste Management: remove for reuse and return packaging materials in accordance with Section 01 74 20.
-

**Part 2 PRODUCTS**

**2.1 COPPER TUBE AND FITTINGS**

- .1 Above ground sanitary and vent: Type DWV to: ASTM B306.
  - .1 Fittings.
    - .1 Cast brass: to CSA B125.3.
    - .2 Wrought copper: to CSA B125.3.
  - .2 Solder: lead free, to ASTM B32.

**2.2 CAST IRON PIPING AND FITTINGS**

- .1 Above ground sanitary and vent: to CSA B70.
  - .1 Joints:
    - .1 Hub and spigot:
      - .1 Caulking lead: to CSA B67.
    - .2 Mechanical joints:
      - .1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.

**Part 3 EXECUTION**

**3.1 APPLICATION**

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

**3.2 INSTALLATION**

- .1 In accordance with Section 22 05 00.
- .2 Install in accordance with National Plumbing Code and local authority having jurisdiction.

**3.3 TESTING**

- .1 Hydraulically test to verify grades and freedom from obstructions.

**3.4 PERFORMANCE VERIFICATION**

- .1 Cleanouts:
    - .1 Ensure accessible and that access doors are correctly located.
    - .2 Open, cover with linseed oil and re-seal.
    - .3 Verify that cleanout rods can probe as far as the next cleanout, at least.
  - .2 Test to ensure traps are fully and permanently primed.
  - .3 Ensure that fixtures are properly anchored, connected to system and effectively vented.
-

- .4 Affix applicable label (sanitary, vent, pump discharge etc.) c/w directional arrows every floor or 4.5 m (whichever is less).

**3.5 CLEANING**

- .1 Clean in accordance with Section 01 74 11
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 ASTM International Inc.
  - .1 ASTM D2235-04(2011), Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
  - .2 ASTM D2564-12, Standard Specification for Solvent Cements for Poly (Vinyl-Chloride) (PVC) Plastic Piping Systems.
- .2 Canadian Standards Association (CSA International)
  - .1 CSA B1800-15, Thermoplastic Nonpressure Piping Compendium.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature and datasheets for piping and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Provide two copies WHMIS MSDS - Material Safety Data Sheets.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle in accordance with Section 01 61 00.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Store at temperatures and conditions recommended by manufacturer.

**Part 2 PRODUCTS**

**2.1 MATERIAL**

- .1 Not Used.

**2.2 PIPING AND FITTINGS**

- .1 For above ground DWV piping to:
  - .1 CSA B1800.

**2.3 JOINTS**

- .1 Solvent weld for PVC: to ASTM D2564.
-

- .2 Solvent weld for ABS: to ASTM D2235.

### **Part 3 EXECUTION**

#### **3.1 APPLICATION**

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

#### **3.2 INSTALLATION**

- .1 In accordance with Section 22 05 00.
- .2 Install in accordance with National Plumbing Code.

#### **3.3 PERFORMANCE VERIFICATION**

- .1 Cleanouts:
  - .1 Ensure accessible and that access doors are correctly located.
  - .2 Open, cover with linseed oil and re-seal.
  - .3 Verify cleanout rods can probe as far as the next cleanout, at least.
- .2 Test to ensure traps are fully and permanently primed.
- .3 Ensure fixtures are properly anchored, connected to system and effectively vented.
- .4 Affix applicable label (sanitary, vent,) c/w directional arrows every floor or 4.5 m (whichever is less).

#### **3.4 CLEANING**

- .1 Clean in accordance with Section 01 74 11.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

---

**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA B51-14, Boiler, Pressure Vessel, and Pressure Piping Code.
  - .2 CAN/CSA-C22.2 No.110-94(R2014), Construction and Test of Electric Storage Tank Water Heaters.
  - .3 CAN/CSA-C191-13, Performance of Electric Storage Tank Water Heaters for Domestic Hot Water Service.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature and datasheets for domestic water heater, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Indicate:
    - .1 Equipment, including connections, fittings, control assemblies and ancillaries, identifying factory and field assembled.
    - .2 Electrical characteristics including voltage, phase, and current draw

**1.3 CLOSEOUT SUBMITTALS**

- .1 Provide maintenance and engineering data for incorporation into manual specified in Section 01 78 00.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle in accordance with Section 01 61 00.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 20.

**1.5 WARRANTY**

- .1 For the Work of this Section 22 30 05 - Domestic Water Heaters, 12 months warranty period prescribed in subsection GC3.13 of General Conditions.

**Part 2 PRODUCTS**

**2.1 ELECTRIC WATER HEATER**

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- .1 Heater to be a glass-lined commercial electric domestic water heater
- .2 Heater to be constructed in accordance with ASME code, and listed with Underwriters' Laboratories
- .3 All internal surfaces of the tank shall be glass-lined with an alkaline borosilicate composition that has been fused-to-steel by firing at a temperature of 871°F.
- .4 Tank shall be cathodically protected with powered anodes.
- .5 Entire vessel is to be enclosed in a round steel enclosure with a baked enamel finish
- .6 Temperature controls include limiting switch which will require resetting manually in the event the temperature reaches 88°C.
- .7 Capacity: as indicated on drawings
- .8 Dimensions: as indicated on drawings

## **2.2 TRIM AND INSTRUMENTATION**

- .1 Drain valve: NPS 1 with hose end.
- .2 Thermometer: 100 mm dial type with red pointer and thermowell filled with conductive paste.
- .3 Pressure gauge: 75 mm dial type with red pointer, syphon, and shut-off cock.
- .4 Thermowell filled with conductive paste for control valve temperature sensor.
- .5 ASME rated temperature and pressure relief valve sized for full capacity of heater, having discharge terminating over floor drain and visible to operators.

## **Part 3 EXECUTION**

### **3.1 APPLICATION**

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

### **3.2 INSTALLATION**

- .1 Install in accordance with manufacturer's recommendations and authority having jurisdiction.
- .2 Provide structural steel for support, as indicated on the drawings.
- .3 Provide insulation between tank and supports.
- .4 Install natural gas fired domestic water heaters in accordance with CSA-B149.1-15.

### **3.3 FIELD QUALITY CONTROL**

- .1 Manufacturer's factory trained representative to start up and commission DHW heaters.

### **3.4 CLEANING**

- .1 Clean in accordance with Section 01 74 11.

- .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 SUMMARY**

- .1 Section Includes:
  - .1 The supply and installation of Plumbing Fixtures and Trim.
- .2 Products Installed but not Supplied Under this Section:
  - .1 Install rough-in for equipment supplied by others, complete with valves on hot and cold water supplies, waste and vent.
  - .2 Equipment installed by others.
    - .1 Connect with unions.
  - .3 Equipment not installed.
    - .1 Capped for future connection by others.

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International).
  - .1 CAN/CSA-B45 Series-02(R2013), Plumbing Fixtures.
  - .2 CSA-B125.3-12, Plumbing Fittings.
  - .3 CAN/CSA-B651-12, Accessible Design for the Built Environment.
- .2 American Society for Mechanical Engineers (ASME)/Canadian Standards Association(CSA International).
  - .1 ASME A112.18.1-2012/CSA B125.1-12, Plumbing Supply Fittings.
  - .2 ASME A112.18.2-2015/CSA B125.2-15, Plumbing Waste Fittings.

**1.3 SUBMITTALS**

- .1 Submit shop drawings and product data in accordance with Section 01 33 00.
  - .1 Indicate, for all fixtures and trim:
    - .1 Dimensions, construction details, roughing-in dimensions.
    - .2 Size of water and waste connections.
- .2 Closeout Submittals:
  - .1 Submit maintenance data in accordance with Section 01 78 00.
  - .2 Include:
    - .1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.
    - .2 Details of operation, servicing, maintenance.
    - .3 List of recommended spare parts.

**1.4 QUALITY ASSURANCE**

- .1 Not Used
-

## **1.5 DELIVERY STORAGE AND DISPOSAL**

- .1 Waste Management and Disposal:
  - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.
  - .2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
  - .3 Fold up metal and plastic banding, flatten and place in designated area for recycling.

## **Part 2 PRODUCTS**

### **2.1 MANUFACTURED UNITS**

- .1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.
- .2 Trim, fittings: manufacture in accordance with CAN/CSA-B125.
- .3 Exposed plumbing brass to be chrome plated.
- .4 Number, locations: architectural drawings to govern.
- .5 Fixtures in any one location to be product of one manufacturer and of same type.
- .6 Trim in any one location to be product of one manufacturer and of same type.
- .7 Refer to mechanical drawings for fixture specifications.
- .8 Fixture piping:
  - .1 Hot and cold water supplies to each fixture:
    - .1 Chrome plated flexible supply pipes each with handwheel stop, reducers, escutcheon.
  - .2 Waste:
    - .1 Brass P trap with clean out on each fixture not having integral trap.
    - .2 Chrome plated in all exposed places.

## **Part 3 EXECUTION**

### **3.1 INSTALLATION**

- .1 Mounting heights:
  - .1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified.

### **3.2 ADJUSTING**

- .1 Conform to water conservation requirements specified this section.
- .2 Adjustments:
  - .1 Adjust water flow rate to design flow rates.

- .2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.
- .3 Checks:
  - .1 Aerators: operation, cleanliness.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 22 05 00: Common Work Results for Plumbing.
- .2 Section 22 11 16: Domestic Water Piping
- .3 Section 22 13 17: Drainage Waste and Vent Piping – Cast Iron and Copper
- .4 Section 22 13 18: Drainage Waste and Vent Piping – Plastic

**1.2 REFERENCES**

- .1 ASTM International
  - .1 ASTM A126-04(2014), Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
  - .2 ASTM B62-15, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .2 American Water Works Association (AWWA)
  - .1 AWWA C700-15, Cold Water Meters - Displacement Type, Metal Alloy Main Case
  - .2 AWWA C701-15, Cold-Water Meters – Turbine Type for Customer Service
  - .3 AWWA C702-15, Cold Water Meters – Compound Type
- .3 CSA International
  - .1 CSA-B64 Series-11, Backflow Preventers and Vacuum Breakers.
  - .2 CSA B79-08 (R2013), Commercial and Residential Drains and Cleanouts.
  - .3 CAN/CSA-B356-10 (R2015), Water Pressure Reducing Valves for Domestic Water Supply Systems.
- .4 Plumbing and Drainage Institute (PDI)
  - .1 Standard PDI-WH 201-R2010, Water Hammer Arresters

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for plumbing products and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Indicate on drawings to indicate materials, finishes, method of anchorage, number of anchors, dimensions construction and assembly details and accessories.

- .4 Instructions: submit manufacturer's installation instructions.
- .5 Manufacturers' Field Reports: manufacturers' field reports specified.

#### **1.4 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00.
- .2 Operation and Maintenance Data: submit operation and maintenance data for plumbing specialties and accessories for incorporation into manual.
  - .1 Description of plumbing specialties and accessories, giving manufacturers name, type, model, year and capacity.
  - .2 Details of operation, servicing and maintenance.
  - .3 Recommended spare parts list.

#### **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect plumbing materials from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return in accordance with Section 01 74 20.

### **Part 2 PRODUCTS**

#### **2.1 CLEANOUTS**

- .1 Cleanout Plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.
- .2 Access Covers:
  - .1 Wall Access: face or wall type, polished nickel bronze round cover with flush head securing screws, bevelled edge frame complete with anchoring lugs.
  - .2 Floor Access: round cast iron body and frame with adjustable secured nickel bronze top and:
    - .1 Plugs: bolted bronze with neoprene gasket.

**Part 3 EXECUTION**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify that site conditions are acceptable for plumbing specialties and accessories installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect site conditions in area where equipment is to be installed.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.

**3.2 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.

**3.3 INSTALLATION**

- .1 Install in accordance with National Plumbing Code of Canada and local authority having jurisdiction.
- .2 Install in accordance with manufacturer's instructions and as specified.

**3.4 CLEANOUTS**

- .1 Install cleanouts at base of soil and waste stacks, and rainwater leaders, at locations required code, and as indicated.
- .2 Bring cleanouts to wall or finished floor unless serviceable from below floor.
- .3 Building drain cleanout and stack base cleanouts: line size to maximum NPS 4.

**3.5 START-UP**

- .1 General:
  - .1 In accordance with Section 01 91 13: General Requirements, supplemented as specified herein.
- .2 Timing: start-up only after:
  - .1 Pressure tests have been completed.
  - .2 Disinfection procedures have been completed.
  - .3 Certificate of static completion has been issued.
  - .4 Water treatment systems operational.
- .3 Provide continuous supervision during start-up.

### **3.6 TESTING AND ADJUSTING**

- .1 General:
  - .1 Test and adjust plumbing specialties and accessories in accordance with Section 01 79 00: Demonstration and Training, supplemented as specified.
- .2 Timing:
  - .1 After start-up deficiencies rectified.
  - .2 After certificate of completion has been issued by authority having jurisdiction.
- .3 Cleanouts:
  - .1 Verify covers are gas-tight, secure, yet readily removable.

### **3.7 CLOSEOUT ACTIVITIES**

- .1 Training: provide training in accordance with Section 01 79 00: Demonstration and Training, supplemented as specified.

### **3.8 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

### **3.9 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by plumbing specialties and accessories installation.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 RELATED SECTIONS**

- .1 Section 01 51 00 - Temporary Utilities.

**1.2 USE OF SYSTEMS**

- .1 Use of new and existing permanent heating and ventilating systems for supplying temporary heat or ventilation is permitted only under the following conditions:
  - .1 Active portion of system is complete, pressure tested, cleaned, flushed out.
  - .2 Specified water treatment system has been commissioned, water treatment is being continuously monitored.
  - .3 Areas of the building under construction have been closed in, and areas to be heated/ventilated are clean and will not thereafter be subjected to dust-producing processes.
  - .4 There is no possibility of damage from any cause.
  - .5 Supply ventilation systems are protected by 60% filters, which shall be inspected daily, changed every week, or more frequently as required.
  - .6 Return systems have approved filters over all openings, inlets, outlets.
  - .7 All systems will be:
    - .1 operated as per manufacturer's recommendations or instructions.
    - .2 operated by Contractor.
    - .3 monitored continuously by Contractor.
  - .8 Warranties and guarantees are not thereby relaxed.
  - .9 Regular preventive and all other manufacturers recommended maintenance routines are performed by Contractor at his own expense and under supervision of Departmental Representative.
  - .10 Before static completion, entire system to be refurbished, cleaned internally and externally, restored to "as- new" condition, filters in air systems replaced.
- .2 Filters referred to herein are over and above those specified elsewhere in this specification.
- .3 Exhaust systems are not included in any approvals for temporary heating ventilation.

**Part 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not Used.

**Part 3 EXECUTION**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for terminal boxes, air terminals, and duct accessories and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Indicate on drawings:
    - .1 Mounting arrangements.
    - .2 Operating and maintenance clearances.
  - .2 Shop drawings and product data accompanied by:
    - .1 Detailed drawings of bases, supports, and anchor bolts.
    - .2 Acoustical sound power data, where applicable.
    - .3 Points of operation on performance curves.
    - .4 Manufacturer to certify current model production.
    - .5 Certification of compliance to applicable codes.

**1.2 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00.
- .2 Operation and Maintenance Data: submit operation and maintenance data for terminal box and air terminal for incorporation into manual.
  - .1 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
  - .2 Operation data to include:
    - .1 Control schematics for systems including environmental controls.
    - .2 Description of systems and their controls.
    - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
    - .4 Operation instruction for systems and component.
    - .5 Description of actions to be taken in event of equipment failure.
    - .6 Valves schedule and flow diagram.
    - .7 Colour coding chart.
  - .3 Maintenance data to include:
    - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
    - .2 Data to include schedules of tasks, frequency, tools required and task time.
  - .4 Performance data to include:

- .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
  - .2 Equipment performance verification test results.
  - .3 Special performance data as specified.
  - .4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
  - .5 Approvals:
    - .1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
    - .2 Make changes as required and re-submit as directed by Departmental Representative.
  - .6 Additional data:
    - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
  - .7 Site records:
    - .1 Departmental Representative will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
    - .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
    - .3 Use different colour waterproof ink for each service.
    - .4 Make available for reference purposes and inspection.
  - .8 As-built drawings:
    - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
    - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
    - .3 Submit to Departmental Representative for approval and make corrections as directed.
    - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
    - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
  - .9 Submit copies of as-built drawings for inclusion in final TAB report.
-

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

**Part 2 PRODUCTS**

**2.1 MATERIALS**

- .1 HVAC and R Equipment:
  - .1 Air Terminal Box;
  - .2 Air Terminal;
  - .3 Duct Accessories;
  - .4 Electronic Controls.
  - .5 Split Air Conditioning Units

**Part 3 EXECUTION**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

**3.2 PAINTING REPAIRS AND RESTORATION**

- .1 Do painting in accordance with Section 09 91 23.
  - .2 Prime and touch up marred finished paintwork to match original.
  - .3 Restore to new condition, finishes which have been damaged.
-

**3.3 SYSTEM CLEANING**

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

**3.4 DEMONSTRATION**

- .1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Trial usage to apply to following equipment and systems:
  - .1 Air Terminal Box
  - .2 Building automation controls
- .3 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

**3.5 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

**3.6 PROTECTION**

- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 American Society of Mechanical Engineers (ASME)
  - .1 ASME B1.20.1-2013, Pipe Threads, General Purpose (Inch).
  - .2 ASME B16.18-2012, Cast Copper Alloy Solder Joint Pressure Fittings.
- .2 ASTM International
  - .1 ASTM A276-10/A276M-16, Standard Specification for Stainless Steel Bars and Shapes.
  - .2 ASTM B62-15, Standard Specification for Composition Bronze or Ounce Metal Castings.
  - .3 ASTM B283/B283M-14a, Standard Specification for Copper and Copper Alloy Die Forgings (Hot-Pressed).
  - .4 ASTM B505/B505M-14, Standard Specification for Copper-Base Alloy Continuous Castings.
- .3 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS)
  - .1 MSS SP-25-2013, Standard Marking System for Valves, Fittings, Flanges and Unions.
  - .2 MSS SP-80-2013, Bronze Gate Globe, Angle and Check Valves.
  - .3 MSS SP-110-2010, Ball Valves, Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature and data sheets for equipment and systems and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit WHMIS MSDS - Material Safety Data Sheets.
- .3 Shop Drawings:
  - .1 Submit data for valves specified in this Section.

**1.3 CLOSEOUT SUBMITTALS**

- .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00.

**1.4 MAINTENANCE MATERIAL SUBMITTALS**

- .1 Extra Materials/Spare Parts:
  - .1 Furnish following spare parts:
    - .1 Valve seats: one for every 10 valves each size, minimum 1.

- .2 Discs: one for every 10 valves, each size. Minimum 1.
- .3 Stem packing: one for every 10 valves, each size. Minimum 1.
- .4 Valve handles: 2 of each size.
- .5 Gaskets for flanges: one for every 10 flanged joints.
- .2 Tools:
  - .1 Furnish special tools for maintenance of systems and equipment.
  - .2 Include following:
    - .1 Lubricant gun for expansion joints..

## **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
  - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials in accordance with Section 01 74 20.

## **Part 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Provide valves in accordance with the valve schedule that forms part of this Section.
  - .2 Use one manufacturer only for all valves of the same type.
  - .3 Equip valves with renewable seats suitable for the service intended and to provide positive shutoff.
  - .4 Provide composition discs on globe and check valves that are suitable for temperature and fluid or gas encountered.
  - .5 Comply with ANSI B16.18 for solder joint ends.
  - .6 Comply with ANSI/ASME B1.20.1 for threaded ends.
  - .7 Comply with ANSI/AWWA C606 and CAN/CSA B242 for grooved ends.
  - .8 Comply with ANSI/ASME B16.1 for cast iron flanges with face-to-face distance to ANSI/ASME B16.10.
  - .9 Comply with ASTM A126 Cl.B for cast iron valves; bronze valves to ASTM B61 and ASTM B62 as noted.
  - .10 Threaded Valve Stem Materials: Naval brass to ASTM B21/B21M; copper silicone alloys to ASTM B98/B98M; or phosphor bronze to ASTM B139/B139M.
-

## 2.2 VALVE APPLICATION SCHEDULE

<b>HEATING SYSTEMS (Heating Water, Condenser Water and Glycol)</b>							
STYLE		0 - 50 mm	55 - 75 mm	100 - 150 mm	150 - 200 mm	200 - 250 mm	300 - 400 mm
GATE	Connection	--	Flanged	Flanged	Flanged	Flanged	Flanged
	Valve Item Number	--	1.5	1.5	1.5	1.5	1.5
	Function	--	Isolation	Isolation	Isolation	Isolation	Isolation
BUTTERFLY	Connection	--	Grooved	Grooved	Grooved	Grooved	Grooved
	Valve Item Number	--	7.1	7.1	7.1	7.1	7.5
	Function	--	Isolation	Isolation	Isolation	Isolation	Isolation
BALANCING	Connection	--	Grooved / Flanged	Grooved / Flanged	Grooved / Flanged	Grooved / Flanged	Grooved / Flanged
	Valve Item Number	--	13.4 / 13.3	13.4 / 13.3	13.4 / 13.3	13.4 / 13.3	13.4 / 13.3
	Function	--	Circuit balancing	Circuit balancing	Circuit balancing	Circuit balancing	Circuit balancing
GLOBE	Connection	--	Flanged	--	--	--	--
	Valve Item Number	--	2.6	--	--	--	--
	Function	--	Isolation/Throttling	--	--	--	--
GATE	Connection	--	--	--	--	--	--
	Valve Item Number	--	--	--	--	--	--
	Function	--	--	--	--	--	--
GLOBE	Connection	--	--	--	--	--	--
	Valve Item Number	--	--	--	--	--	--
	Function	--	--	--	--	--	--
CHECK	Connection	--	Flanged/Grooved	Flanged/Grooved	Flanged	Flanged	Flanged
	Valve Item Number	--	3.4 / 3.7	3.4 / 3.7	3.4	3.4	3.4
	Function	--	Check	Check	Check	Check	Check
CHECK	Connection	--	--	--	--	--	--
	Valve Item Number	--	--	--	--	--	--
	Function	--	--	--	--	--	--
SPRING CHECK	Connection	--	Wafer/Grooved	Wafer/Grooved	Wafer/Grooved	Wafer/Grooved	Wafer/Grooved
	Valve Item Number	--	4.2 / 4.4	4.2 / 4.4	4.2 / 4.4	4.2 / 4.4	4.2 / 4.4 / 4.5
	Function	--	Check Condenser Water Pumps	Check Condenser Water Pumps	Check Condenser Water Pumps	Check Condenser Water Pumps	Check Condenser Water Pumps
PLUG	Connection	--	Flanged/Grooved	Flanged/Grooved	Flanged/Grooved	Flanged/Grooved	Flanged
	Valve Item Number	--	5.2 / 5.7	5.3 / 5.7	5.4 / 5.7	5.4 / 5.7	5.4
	Function	--	Balancing	Balancing	Balancing	Balancing	Balancing
LOCK SHIELD	Connection	--	--	--	--	--	--
	Valve Item Number	--	--	--	--	--	--
	Function	--	--	--	--	--	--
BALL	Connection	Screwed/VicPress	Grooved	Grooved	--	--	--

<b>HEATING SYSTEMS (Heating Water, Condenser Water and Glycol)</b>							
STYLE		0 - 50 mm	55 - 75 mm	100 - 150 mm	150 - 200 mm	200 - 250 mm	300 - 400 mm
	Valve Item Number	9.1 / 6.8	6.9	6.9	--	--	--
	Function	Drains Angle & Isolation	Isolation	Isolation	--	--	--

<b>PLUMBING (Cold Water (soft and hard), Hot Water and Hot Water Recirculation)</b>							
STYLE		0 - 50 mm	65 - 75 mm	100 - 150 mm	150 - 200 mm	200 - 250 mm	300 - 400 mm
GATE	Connection	--	Screwed	Flanged	Flanged	Flanged	Flanged
	Valve Item Number	--	1.1	1.5	1.5	1.5	1.5
	Function	--	Isolation	Isolation	Isolation	Isolation	Isolation
BUTTER-FLY	Connection	--	Grooved	Grooved	Grooved	Grooved	Grooved
	Valve Item Number	--	7.1 / 7.6	7.1 / 7.6	7.1	7.1	7.5
	Function	--	Isolation	Isolation	Isolation	Isolation	Isolation
GLOBE	Connection	--	Screwed	Flanged	Flanged	Flanged	Flanged
	Valve Item Number	--	2.1	2.6	2.6	2.6	2.6
	Function	--	Isolation/Throttling	Isolation/Throttling	Isolation/Throttling	Isolation/Throttling	Isolation/Throttling
CHECK	Connection	--	Screwed/Grooved	Flanged/Grooved	Flanged	Flanged	Flanged
	Valve Number	--	3.3 / 3.7	3.4 / 3.7	3.4	3.4	3.4
	Function	--	Check	Check	Check	Check	Check
SPRING	Connection	--	Wafer/Grooved	Wafer/Grooved	Wafer/Grooved	Wafer/Grooved	Wafer/Grooved
	Valve Item Number	--	4.2 / 4.4	4.2 / 4.4	4.2 / 4.4	4.2 / 4.4	4.2 / 4.4 / 4.5
	Function	--	Check, Sewage & Sump	Check, Sewage & Sump	Check, Sewage & Sump	Check, Sewage & Sump	Check, Sewage & Sump
BALL	Connection	VicPress	Grooved	Grooved	--	--	--
	Valve Item Number	6.8	6.9	6.9	--	--	--
	Function	Isolation	Isolation	Isolation	--	--	--

<b>PLUMBING (Waste Water)</b>							
STYLE		0 - 50 mm	65 - 75 mm	100 - 150 mm	150 - 200 mm	200 - 250 mm	300 - 400 mm
GATE	Connection	--	Flanged	Flanged	Flanged	Flanged	Flanged
	Valve Item Number	--	1.5	1.5	1.5	1.5	1.5
	Function	--	Isolation	Isolation	Isolation	Isolation	Isolation
GLOBE	Connection	--	Flanged	Flanged	Flanged	Flanged	Flanged
	Valve Item Number	--	2.6	2.6	2.6	2.6	2.6
	Function	--	Isolation/Throttling	Isolation/Throttling	Isolation/Throttling	Isolation/Throttling	Isolation/Throttling
CHECK	Connection	--	Flanged	Flanged	Flanged	Flanged	Flanged
	Valve Item Number	--	3.4	3.4	3.4	3.4	3.4
	Function	--	Check	Check	Check	Check	Check

<b>NATURAL GAS (Natural Gas)</b>							
STYLE		0 – 50 mm	55 - 75 mm	100 – 150 mm	150 – 200 mm	200 – 250 mm	300 – 400 mm
PLUG	Connection	Screwed	Screwed	Screwed	Screwed	Screwed	Screwed
	Valve Item Number	5.5	5.6	5.6	5.6	5.6	5.6
	Function	Isolation	Isolation	Isolation	Isolation	Isolation	Isolation
BALL	Connection	Screwed					
	Valve Item Number	6.6					
	Function	Isolation					

<b>FIRE (Standpipe and Sprinklers)</b>							
STYLE		0 - 50 mm	65 - 75 mm	100 - 150 mm	150 – 200 mm	200 - 250 mm	300 - 400 mm
BALL	Connection	Screwed/Grooved	--	--	--	--	--
	Valve Item Number	6.7 / 6.10	--	--	--	--	--
	Function	Isolation (UL)	--	--	--	--	--
GLOBE	Connection	Screwed	Flanged	--	--	--	--
	Valve Item Number	2.5	2.6	--	--	--	--
	Function	Isolation/Throttling	Isolation/Throttling	--	--	--	--
CHECK	Connection	Screwed	--	--	--	--	--
	Valve Item Number	3.2	--	--	--	--	--
	Function	Check	--	--	--	--	--
SPRING	Connection	--	Wafer/Grooved	Wafer/Grooved	Wafer/Grooved	Wafer/Grooved	Wafer/Grooved
	Valve Item Number	--	4.3 / 4.6	4.3 / 4.6	4.3 / 4.6	4.3 / 4.6	4.3 / 4.6
	Function	--	Check (UL)	Check (UL)	Check (UL)	Check (UL)	Check (UL)
GATE	Connection	--	Grooved	Grooved	Grooved	Grooved	--
	Valve Item Number	--	1.9	1.9	1.9	1.9	--
	Function	--	Isolation	Isolation	Isolation	Isolation	--
BUTTERFLY	Connection	--	Grooved	Grooved	Grooved	Grooved	Grooved
	Valve Item Number	--	7.4	7.4	7.4	7.4	7.4
	Function	--	Isolation	Isolation	Isolation	Isolation	Isolation

## 2.3 VALVE PRODUCT SCHEDULE

VALVE TYPE	ITEM	DESCRIPTION	PRESSURE RATING SERVICE (PSI)	CONNECTION	OPERATOR
1.0 GATE VALVES	1.1	B62 Bronze Construction, Solid Wedge Disc, Union Bonnet	125 Steam 200 WOG	Threaded or Soldered	Handwheel, Rising Stem
	1.2	B62 Bronze Construction, Solid Wedge Disc, Union Bonnet	200 PSI	Solder	Handwheel, Rising Stem
	1.3	Cast Iron, Solid Wedge Disc	1380 CWP	Flanged	Handwheel, Rising Stem

	1.4	Bronze Construction, Solid Wedge Disc, Bolted Bonnet	125 Steam 200 WOG	Flanged	Handwheel, Non-Rising Stem
	1.5	Cast Iron Construction, Bronze Fitted, Solid Wedge Disc, Bolted Bonnet	125 Steam 200 WOG	Flanged	Handwheel, OS & Y
	1.6	All stainless steel gate valve	1035 CWP	Threaded	Handwheel
	1.7	Cast steel construction, Hard Facing Trim, Solid Wedge Disc, Bolted Bonnet. Bypass where specified for service HP steam	Class 150	Flanged	Handwheel, OS & Y
	1.8	Bronze Construction, Union Bonnet, Solid Wedge Disc, Stainless Steel Seat	200 Steam 400 WOG	Screwed	Handwheel, Rising Stem
	1.9	Cast ductile iron construction, EPDM coated disc, brass stem	1725 kPa CWP	Grooved	Handwheel, Rising or Non-Rising stem.
Approved acceptable manufacturers: Crane, Jenkins, Kitz -					

VALVE TYPE	ITEM	DESCRIPTION	PRESSURE RATING SERVICE (PSI)	CONNECTION	OPERATOR
2.0 GLOBE VALVES	2.1	Bronze Construction, Swivel Type Metal Disc, Screwed Bonnet	125 Steam 200 WOG	Screwed	Handwheel
	2.2	Bronze Construction, Swivel Type Metal Disc, Bonnet	125 Steam 200 WOG	Solder	Handwheel
	2.3	Bronze Construction, Renewable Teflon Disc, Swivel Type Disc Holder, Union Bonnet	125 Steam 200 WOG	Screwed	Handwheel
	2.4	Bronze Construction, Renewable Teflon Disc, Swivel Type Disc Holder, Union Bonnet	125 Steam 200 WOG	Soldered	Handwheel
	2.5	Bronze Construction, 420 S.S. Union Bonnet	2760 CWP	Screwed	Handwheel, Rising Stem
	2.6	Cast Iron Construction, Bronze trimmed, Bolted Bonnet	125 Steam 200 WOG	Flanged	Handwheel, OS & Y
	2.7	Cast steel construction, plug type disc, bolted bonnet, stellite trim	Class 150	Flanged	Handwheel, OS & Y
	2.8	All stainless steel globe valve	1035 CWP	Threaded	Handwheel
	2.9	Union Bonnet, Renewable Teflon Disc, Swivel Type Disc Holder, Screwed Ends	150 Steam 300 WOG	Screwed	Handwheel, Stem Rising
Approved acceptable manufacturers: Crane, Jenkins, Nibco -					

VALVE TYPE	ITEM	DESCRIPTION	PRESSURE RATING SERVICE (PSI)	CONNECTION	OPERATOR
3.0 CHECK VALVES	3.1	Bronze Construction Y-Pattern, Regrind seating, Screwed Cap, Integral Disc	125 Steam 200 WOG	Solder	Swing

	3.2	Bronze Construction, T-Pattern Regrind Seating, Screwed Cap	4140 CWP	Threaded	Swing
	3.3	Bronze Construction Y-pattern, Regrind Seating, Screwed Cap, Integral Disc	125 Steam 200 WOG	Threaded	Swing
	3.4	Cast Iron Construction, Bronze Trimmed, Regrindable Disc, Bolted Cover	125 Steam 200 WOG	Flanged	Swing
	3.5	Cast Steel Construction, Stellite Trim	Class 150	Flanged	Swing
	3.6	All stainless steel check valve	1035 CWP	Screwed	Swing
	3.7	Cast ductile iron body, stainless steel trimmed, coupled cover.	2065 kPa CWP	Grooved	Swing
Approved acceptable manufacturers: Crane, Jenkins, Nibco -					

VALVE TYPE	ITEM	DESCRIPTION	PRESSURE RATING SERVICE (PSI)	CONNECTION	OPERATOR
6.0 BALL VALVES	6.1	Brass Construction, 2-piece construction, Teflon seats, Seals Buna-N O-ring, Blow out Proof stem	150 Steam 600 WOG	Screwed	Lever
	6.2	Brass Construction, 2-piece construction, Teflon seats, Seals Buna-N O-ring, Blow out Proof stem	150 Steam 600 WOG	Screwed	Wing Handles
	6.3	Brass Construction, 2-piece construction, Teflon seats, Seals Buna-N O-ring, Blow out Proof stem	150 Steam 600 WOG	Soldered	Lever
	6.4	Brass Construction, 2-piece construction, Teflon seats, Seals Buna-N O-ring, Blow out XXXX stem	150 Steam 600 WOG	Soldered	Wing Handles c/w Memory Stop
	6.5	ANSI 150 All stainless steel ball valve	1970 CWP Kitz 150 UTRM (Reduced Bore)	Flanged	Worm Gear
	6.6	Forged Brass, 2-piece Construction, Blow Out Proof Stem, Hard chrome Plated Forged Brass Ball, Teflon seats, Buna-N O-ring, CGA Approved	600 GAS	Screwed	Lever
	6.7	Forged Brass, 2-piece Construction, Blow Out Proof Stem, Hard chrome Plated Forged Brass Ball, Teflon seats, Buna-N O-ring, UL Approved	600 GAS	Screwed	Lever
	6.8	Forged Brass, 2-piece Construction, Blow Out Proof Stem, Hard chrome Plated Forged Brass Ball, Teflon seats,	2065 CWP	Vic-Press	Lever

	6.9	Cast Ductile Iron, 2-piece Construction, Blow Out Proof Stem, Hard chrome Plated Steel Ball, TFE seats.	5515 CWP	Grooved	Lever or gear
	6.10	Cast Bronze, 2-piece Construction, Blow Out Proof Stem, Hard Chrome Plated Brass Ball, TFE seats, with Supervisory Switches. UL approved.	2410 CWP	Grooved / Threaded	Handwheel
	Approved acceptable manufacturers: Crane, Nibco, Newman Hattersley -				

VALVE TYPE	ITEM	DESCRIPTION	PRESSURE RATING SERVICE (PSI)	CONNECTION	OPERATOR
7.0 BUTTERFLY VALVES	7.1	Cast Iron Body, EPDM Resilient Seat, Bronze Disc, 416 SS Shaft, Bronze Bushings Ductile iron body, enamel coated body, EPDM pressure responsive seat.	200  2065 CWP	Lug  Grooved	10 Position Lever  10 position lever or Gear
	7.2	Cast Iron Body, EPDM Resilient Seat, Bronze Disc, 416 SS Shaft, Bronze Bushings	200	Lug	Infinite Position Lever c/w Memory Stop
	7.3	Cast Iron Body, EPDM Resilient Seat, Bronze Disc, 416 SS Shaft, Bronze Bushings	200	Lug	Gear Wheel c/w Flag Indicator
	7.4	DI Body, Disc, and Shaft, EPDM Disc Coating, UL approved -	2065 CWP	Grooved -	Gear, Wheel, c/w Flag Indicator & Provision for Monitor
	7.5	DI Body, PPS Coated DI Disc, EPDM seal, SS Shaft	2065 CWP	AGS Grooved	Gear
	7.6	Cast Bronze Body, EPDM Coated Disc, Copper-Tube Dimension Ends.	2065 CWP	Grooved	Lever or Gear
	7.7	Grade CF8M Stainless Steel Body and Disc, Elastomer Seal, 316SS Stem.	2065 CWP	Grooved	Lever or Gear
	Approved acceptable manufacturers: Jenkins, Keystone, Crane-				

VALVE TYPE	ITEM	DESCRIPTION	PRESSURE RATING SERVICE (PSI)	CONNECTION	OPERATOR
9.0 DRAIN VALVES	9.1	Hard Chrome Plated Ball, Cap and Drain	1380 WP @ 121°C	Screwed X hose	Lever
Approved acceptable manufacturers: Toyo, Kitz					

VALVE TYPE	ITEM	DESCRIPTION	PRESSURE RATING SERVICE (PSI)	CONNECTION	OPERATOR
10.0 NEEDLE VALVES	10.1	B62 Bronze Construction	2760 CWP	Screwed	Handwheel Rising Stem
	Approved acceptable manufacturers: Jenkins, WH Bolton, Crane				

VALVE TYPE	ITEM	DESCRIPTION	PRESSURE RATING SERVICE (PSI)	CONNECTION	OPERATOR
11.0 RELIEF VALVES	11.1	Bronze Body, Composition Disc	Heating Water to 1100 kPa	Screwed	Pressure
	11.2	Bronze Body, Composition Disc	Domestic water	Screwed	Temperature and Pressure
	11.3	Brass or Bronze Body, Teflon Disc, SS Spring	LP Steam	Screwed	Pressure
	Approved acceptable manufacturers: Sarco, Lunkenheimer				

VALVE TYPE	ITEM	DESCRIPTION	PRESSURE RATING SERVICE (PSI)	CONNECTION	OPERATOR
13.0 CIRCUIT BALANCING VALVES	13.1	DZR brass (Ametal) copper alloy body, globe type, with EPDM seat, and venturi taps.	2065 kPa	Screwed	Handwheel with memory stop
	13.2	DZR brass (Ametal) copper alloy body, globe type, with EPDM seat, and venturi taps.	2065 kPa	Soldered	Handwheel with memory stop
	13.3	Ductile iron body, globe type, with EPDM seat, and venturi taps.	2065 kPa	Flanged	Handwheel with memory stop
	13.4	Ductile iron body, globe type, with EPDM seat, and venturi taps.	2065 kPa	Grooved	Handwheel with memory stop

## Part 3 EXECUTION

### 3.1 INSTALLATION

- .1 Install rising stem valves in upright position with stem above horizontal.
- .2 Remove internal parts before soldering.
- .3 Install valves with unions at each piece of equipment arranged to allow servicing, maintenance, and equipment removal.

**3.2 CLEANING**

- .1 Clean in accordance with Section 01 74 11.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 American Society of Mechanical Engineers (ASME)
  - .1 ASME B31.1-2014, Power Piping.
- .2 ASTM International
  - .1 ASTM A125-96(2013)e1, Standard Specification for Steel Springs, Helical, Heat-Treated.
  - .2 ASTM A307-14, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength.
  - .3 ASTM A563-15, Standard Specification for Carbon and Alloy Steel Nuts.
- .3 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
  - .1 MSS SP 58-2009, Pipe Hangers and Supports - Materials, Design and Manufacture.
  - .2 MSS SP 69-2009, Pipe Hangers and Supports – Materials, Design, Manufacture, Selection, Application, and Installation.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Submit shop drawings for:
    - .1 Bases, hangers and supports.
    - .2 Connections to equipment and structure.
    - .3 Structural assemblies.
- .4 Certificates:
  - .1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Manufacturers' Instructions:
  - .1 Provide manufacturer's installation instructions.

**1.3 CLOSEOUT SUBMITTALS**

- .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00.

**1.4 DELIVERY, STORAGE AND HANDLING**

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- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
  - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse in accordance with Section 01 74 20.

## **Part 2 PRODUCTS**

### **2.1 SYSTEM DESCRIPTION**

- .1 Design Requirements:
  - .1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
  - .2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP 58.
  - .3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.
  - .4 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.
  - .5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP 58.

### **2.2 GENERAL**

- .1 Fabricate hangers, supports and sway braces in accordance with MSS SP 58 and ASME B31.1.
- .2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

### **2.3 PIPE HANGERS**

- .1 Finishes:
  - .1 Pipe hangers and supports: galvanized after manufacture.
  - .2 Use hot dipped galvanizing process.
  - .3 Ensure steel hangers in contact with copper piping are epoxy coated.
- .2 Upper attachment structural: suspension from lower flange of I-Beam:
  - .1 Cold piping NPS 2 maximum: malleable iron C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip.
    - .1 Rod: 9 mm UL listed.
  - .2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers, UL listed.

- .3 Upper attachment structural: suspension from upper flange of I-Beam:
  - .1 Cold piping NPS 2 maximum: ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, UL listed.
  - .2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nut UL listed.
- .4 Upper attachment to concrete:
  - .1 Ceiling: carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye 6 mm minimum greater than rod diameter.
  - .2 Concrete inserts: wedge shaped body with knockout protector plate UL listed to MSS SP 69.
- .5 Shop and field-fabricated assemblies:
  - .1 Trapeze hanger assemblies: As indicated on drawings.
  - .2 Steel brackets: As indicated on drawings.
- .6 Hanger rods: threaded rod material to MSS SP 58:
  - .1 Ensure that hanger rods are subject to tensile loading only.
  - .2 Provide linkages where lateral or axial movement of pipework is anticipated.
  - .3 Do not use 22 mm or 28 mm rod.
- .7 Pipe attachments: material to MSS SP 58:
  - .1 Attachments for steel piping: carbon steel galvanized.
  - .2 Attachments for copper piping: copper plated black steel.
  - .3 Use insulation shields for hot pipework.
  - .4 Oversize pipe hangers and supports.
- .8 Adjustable clevis: material to MSS SP 69 UL listed, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.
  - .1 Ensure "U" has hole in bottom for rivetting to insulation shields.
- .9 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP 69.
- .10 U-bolts: carbon steel to MSS SP 69 with 2 nuts at each end to ASTM A563.
  - .1 Finishes for steel pipework: galvanized.
  - .2 Finishes for copper, glass, brass or aluminum pipework: galvanized, with formed portion plastic coated epoxy coated.
- .11 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP 69.

## **2.4 RISER CLAMPS**

- .1 Steel or cast iron pipe: galvanized carbon steel to MSS SP 58, type 42, UL listed and FM approved.
  - .2 Copper pipe: carbon steel copper plated to MSS SP 58, type 42.
  - .3 Bolts: to ASTM A307.
-

- .4 Nuts: to ASTM A563.

## **2.5 INSULATION PROTECTION SHIELDS**

- .1 Insulated cold piping:
  - .1 64 kg/m<sup>3</sup> density insulation plus insulation protection shield to: MSS SP 69, galvanized sheet carbon steel. Length designed for maximum 3 m span.
- .2 Insulated hot piping:
  - .1 Curved plate 300 mm long, with edges turned up, welded-in centre plate for pipe sizes NPS 12 and over, carbon steel to comply with MSS SP 69.

## **2.6 CONSTANT SUPPORT SPRING HANGERS**

- .1 Springs: alloy steel to ASTM A125, shot peened, magnetic particle inspected, with +/-5% spring rate tolerance, tested for free height, spring rate, loaded height and provided with Certified Mill Test Report (CMTR).
- .2 Load adjustability: 10% minimum adjustability each side of calibrated load. Adjustment without special tools. Adjustments not to affect travel capabilities.
- .3 Provide upper and lower factory set travel stops.
- .4 Provide load adjustment scale for field adjustments.
- .5 Total travel to be actual travel + 20%. Difference between total travel and actual travel 25 mm minimum.
- .6 Individually calibrated scales on each side of support calibrated prior to shipment, complete with calibration record.

## **2.7 EQUIPMENT SUPPORTS**

- .1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel meeting requirements of Section 05 12 23. Submit calculations with shop drawings.

## **2.8 EQUIPMENT ANCHOR BOLTS AND TEMPLATES**

- .1 Provide templates to ensure accurate location of anchor bolts.

## **2.9 HOUSE-KEEPING PADS**

- .1 Provide 100 mm high concrete housekeeping pads for base-mounted equipment; size pads 50 mm larger than equipment; chamfer pad edges.
- .2 Concrete: to Section 03 30 00.

## **2.10 OTHER EQUIPMENT SUPPORTS**

- .1 Fabricate equipment supports from structural grade steel meeting requirements of Section 05 12 23.
  - .2 Submit structural calculations with shop drawings.
-

**Part 3 EXECUTION**

**3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

**3.2 INSTALLATION**

- .1 Install in accordance with:
  - .1 Manufacturer's instructions and recommendations.
- .2 Clamps on riser piping:
  - .1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.
  - .2 Bolt-tightening torques to industry standards.
  - .3 Steel pipes: install below coupling or shear lugs welded to pipe.
  - .4 Cast iron pipes: install below joint.
- .3 Clevis plates:
  - .1 Attach to concrete with 4 minimum concrete inserts, one at each corner.
- .4 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.
- .5 Use approved constant support type hangers where:
  - .1 Vertical movement of pipework is 13 mm or more,
  - .2 Transfer of load to adjacent hangers or connected equipment is not permitted.
- .6 Use variable support spring hangers where:
  - .1 Transfer of load to adjacent piping or to connected equipment is not critical.
  - .2 Variation in supporting effect does not exceed 25 % of total load.

**3.3 HANGER SPACING**

- .1 Plumbing piping: to National Plumbing Code.
- .2 Fire protection: to National Fire Code and requirements of authority having jurisdiction.
- .3 Gas piping: up to NPS 1/2: every 1.8 m.
- .4 Copper piping: up to NPS 1/2: every 1.5 m.
- .5 Flexible joint roll groove pipe: in accordance with table below for steel, but not less than one hanger at joints. Table listings for straight runs without concentrated loads and where full linear movement is not required.
- .6 Within 300 mm of each elbow.

Maximum Pipe Size : NPS	Maximum Spacing Steel	Maximum Spacing Copper
up to 1-1/4	2.4 m	1.8 m

1-1/2	3.0 m	2.4 m
2	3.0 m	2.4 m
2-1/2	3.7 m	3.0 m
3	3.7 m	3.0 m
3-1/2	3.7 m	3.3 m
4	3.7 m	3.6 m
5	4.3 m	
6	4.3 m	
8	4.3 m	
10	4.9 m	
12	4.9 m	

- .7 Pipework greater than NPS 12: to MSS SP 69.

### 3.4 HANGER INSTALLATION

- .1 Install hanger so that rod is vertical under operating conditions.
- .2 Adjust hangers to equalize load.
- .3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

### 3.5 HORIZONTAL MOVEMENT

- .1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.
- .2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

### 3.6 FINAL ADJUSTMENT

- .1 Adjust hangers and supports:
  - .1 Ensure that rod is vertical under operating conditions.
  - .2 Equalize loads.
- .2 Adjustable clevis:
  - .1 Tighten hanger load nut securely to ensure proper hanger performance.
  - .2 Tighten upper nut after adjustment.
- .3 C-clamps:
  - .1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.
- .4 Beam clamps:
  - .1 Hammer jaw firmly against underside of beam.

### 3.7 FIELD QUALITY CONTROL

- .1 Site Tests: conduct following tests in accordance with Section 01 45 00 and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

- .2 Manufacturer's Field Services:
  - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
  - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
  - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

### **3.8 CLEANING**

- .1 Clean in accordance with Section 01 74 11.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 Canadian Standards Association (CSA)
  - .1 CSA-B149.1-15, Natural Gas and Propane Installation Code.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-24.3-92, Identification of Piping Systems.
- .3 National Fire Protection Association (NFPA)
  - .1 NFPA 13-2016, Standard for the Installation of Sprinkler Systems.
  - .2 NFPA 14-2016, Standard for the Installation of Standpipe and Hose Systems.

**1.2 SUBMITTALS**

- .1 Product Data: submit product data for each item specified.
- .2 Submittals: in accordance with Section 01 33 00.
- .3 Product data to include paint colour chips, other products specified in this section.
- .4 Samples:
  - .1 Submit samples in accordance with Section 01 33 00.
  - .2 Samples to include nameplates, labels, tags, lists of proposed legends.

**1.3 QUALITY ASSURANCE**

- .1 Quality assurance submittals: submit following in accordance with Section 01 33 00.

**1.4 DELIVERY, STORAGE, AND HANDLING**

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle in accordance with Section 01 61 00.
  - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
  - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
  - .2 Dispose of unused paint material at official hazardous material collections site.
  - .3 Do not dispose of unused paint material into sewer system, into streams, lakes, onto ground or in locations where it will pose health or environmental hazard.

**Part 2 PRODUCTS**

**2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES**

---

- .1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.
- .2 Lettering and numbers raised or recessed.
- .3 Information to include, as appropriate:
  - .1 Equipment: manufacturer's name, model, size, serial number, capacity.
  - .2 Motor: voltage, Hz, phase, power factor, duty, frame size.

## 2.2 SYSTEM NAMEPLATES

- .1 Colours:
  - .1 Hazardous: red letters, white background.
  - .2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).
- .2 Construction:
  - .1 3 mm thick laminated plastic, matte finish, with square corners, letters accurately aligned and machine engraved into core.
- .3 Sizes:
  - .1 Conform to following table:

Size #	mm	Sizes (mm)	No. of Lines	Height of Letters (mm)
1		10 x 50	1	3
2		13 x 75	1	5
3		13 x 75	2	3
4		20 x 100	1	8
5		20 x 100	2	5
6		20 x 200	1	8
7		25 x 125	1	12
8		25 x 125	2	8
9		35 x 200	1	20
  - .2 Use maximum of 25 letters/numbers per line.
- .4 Locations:
  - .1 Terminal cabinets, control panels: use size #5.
  - .2 Equipment in Mechanical Rooms: use size #9.
- .5 Identification for PWGSC Preventive Maintenance Support System (PMSS):
  - .1 Use arrangement of Main identifier, Source identifier, Destination identifier.
  - .2 Equipment in Mechanical Room:
    - .1 Main identifier: size #9.
    - .2 Source and Destination identifiers: size #6.
    - .3 Terminal cabinets, control panels: size #5.
  - .3 Equipment elsewhere: sizes as appropriate.

## **2.3 EXISTING IDENTIFICATION SYSTEMS**

- .1 Apply existing identification system to new work.
- .2 Where existing identification system does not cover for new work, use identification system specified this section.
- .3 Before starting work, obtain written approval of identification system from Departmental Representative.

## **2.4 PIPING SYSTEMS GOVERNED BY CODES**

- .1 Identification:
  - .1 Natural gas: to CAN/CSA-B149.1
  - .2 Sprinklers: to NFPA 13.
  - .3 Standpipe and hose systems: to NFPA 14.

## **2.5 IDENTIFICATION OF PIPING SYSTEMS**

- .1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB-24.3 except where specified otherwise.
  - .2 Pictograms:
    - .1 Where required: Workplace Hazardous Materials Information System (WHMIS) regulations.
  - .3 Legend:
    - .1 Block capitals to sizes and colours listed in CAN/CGSB-24.3.
  - .4 Arrows showing direction of flow:
    - .1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.
    - .2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.
    - .3 Use double-headed arrows where flow is reversible.
  - .5 Extent of background colour marking:
    - .1 To full circumference of pipe or insulation.
    - .2 Length to accommodate pictogram, full length of legend and arrows.
  - .6 Materials for background colour marking, legend, arrows:
    - .1 Pipes and tubing 20 mm and smaller: waterproof and heat-resistant pressure sensitive plastic marker tags.
    - .2 Other pipes: pressure sensitive vinyl with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150°C and intermittent temperature of 200°C.
  - .7 Colours and Legends:
    - .1 Where not listed, obtain direction from Departmental Representative.
    - .2 Colours for legends, arrows: to following table:
-

Background colour:	Legend, arrows:
Yellow	BLACK
Green	WHITE
Red	WHITE

.3 Background colour marking and legends for piping systems:

Contents	Background colour	Legend
	Marking	
Hot water heating supply	Yellow	HEATING SUPPLY
Hot water heating return	Yellow	HEATING RETURN
Domestic hot water supply	Green	DOM. HW SUPPLY
Dom. HWS recirculation	Green	DOM. HW CIRC
Domestic cold water supply	Green	DOM. CWS
Sanitary	Green	SAN
Plumbing vent	Green	SAN. VENT
Refrigeration suction	Yellow	REF. SUCTION
Refrigeration liquid	Yellow	REF. LIQUID
Refrigeration hot gas	Yellow	REF. HOT GAS
Natural gas	to Codes	
Gas regulator vents	to Codes	
Fire protection water	Red	FIRE PROT. WTR
Sprinklers	Red	SPRINKLERS

## 2.6 IDENTIFICATION DUCTWORK SYSTEMS

- .1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.
- .2 Colours: black, or co-ordinated with base colour to ensure strong contrast.

## 2.7 VALVES, CONTROLLERS

- .1 Brass tags with 12 mm stamped identification data filled with black paint.
- .2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

## 2.8 CONTROLS COMPONENTS IDENTIFICATION

- .1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.
- .2 Inscriptions to include function and (where appropriate) fail-safe position.

## 2.9 LANGUAGE

- .1 Identification in English.

## Part 3 EXECUTION

### 3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

### 3.2 TIMING

- .1 Provide identification only after painting specified Section 09 91 23 has been completed.

### 3.3 INSTALLATION

- .1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.
- .2 Provide ULC and CSA registration plates as required by respective agency.
- .3 Identify systems, equipment to conform to PWGSC PMSS.

### 3.4 NAMEPLATES

- .1 Locations:
  - .1 In conspicuous location to facilitate easy reading and identification from operating floor.
- .2 Standoffs:
  - .1 Provide for nameplates on hot and/or insulated surfaces.
- .3 Protection:
  - .1 Do not paint, insulate or cover.

### 3.5 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

- .1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.
- .2 Adjacent to each change in direction.
- .3 At least once in each small room through which piping or ductwork passes.
- .4 On both sides of visual obstruction or where run is difficult to follow.
- .5 On both sides of separations such as walls, floors, partitions.
- .6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.
- .7 At beginning and end points of each run and at each piece of equipment in run.
- .8 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.
- .9 Identification easily and accurately readable from usual operating areas and from access points.
  - .1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

**3.6 VALVES, CONTROLLERS**

- .1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.
- .2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by Departmental Representative. Provide one copy (reduced in size if required) in each operating and maintenance manual.
- .3 Number valves in each system consecutively.

**3.7 CLEANING**

- .1 Proceed in accordance with Section 01 74 11.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 GENERAL**

- .1 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do other work as specified in this section.
- .2 Scope of work includes new and existing systems and equipment.

**1.2 RELATED REQUIREMENTS**

- .1 Section 23 05 93.13 Testing, Adjusting, and Balancing of Fume Hoods

**1.3 QUALIFICATIONS OF TAB PERSONNEL**

- .1 Names of personnel it is proposed to perform TAB to be submitted to and approved by Departmental Representative within 60 days of award of contract.

**1.4 PURPOSE OF TAB**

- .1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads
- .2 Adjust and regulate equipment and systems so as to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.
- .3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

**1.5 EXCEPTIONS**

- .1 TAB of systems and equipment regulated by codes, standards to be to satisfaction of authority having jurisdiction.

**1.6 CO-ORDINATION**

- .1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule so as to ensure completion before acceptance of project.
- .2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

**1.7 PRE-TAB REVIEW**

- .1 Review contract documents before project construction is started and confirm in writing to Departmental Representative adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.
  - .2 Review specified standards and report to Departmental Representative in writing all proposed procedures which vary from standard.
  - .3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.
-

## **1.8 SITE VISITS**

- .1 Total of 2 site visits shall be made to be coordinated with the general contractor and client. After each site visit, a written report shall be submitted to the Contractor and Departmental Representative.
- .2 A review of the installation and access to all valves, dampers, and equipment shall be made at the specified site visits and any additional dampers or valves required for proper balancing shall be forwarded in writing to be reviewed by the Departmental Representative.
- .3 Allow for 2 visits to site to adjust systems for seasonal changes during warranty. Coordinate time of visits with the Departmental Representative. Submit reports to Departmental Representative.
- .4 Begin balancing after equipment start-up and testing and after systems have been completed and are in full working order. Place systems and equipment into full operation and continue operation during each working day of balancing.

## **1.9 START-UP**

- .1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.
- .2 Follow special start-up procedures specified elsewhere in Division 23.

## **1.10 OPERATION OF SYSTEMS DURING TAB**

- .1 Operate systems for length of time required for TAB and as required by Departmental Representative for verification of TAB reports.

## **1.11 SUBMITTALS**

- .1 Provide required information in accordance with Section 01 30 00 – Administrative Requirements.
- .2 Submit, prior to commencement of TAB:
  - .1 Proposed methodology and procedures for performing TAB if different from referenced standard.
- .3 Informational Submittals: Provide the following submittals electronically during the course of the work:
- .4 Balancing Agenda:
  - .1 Submit balancing agenda to the Departmental Representative for review at least sixty (60) days prior to the start of balancing work. Start balancing work only after agenda has been approved. Include descriptive data, procedure data, and sample forms in agenda.
  - .2 Descriptive Data: General description of each system including associated equipment and different operation cycles, listing of flow and terminal measurements to be performed.
  - .3 Procedure Data: Procedures for converting test measurements to establish compliance with requirements, specify type of instrument to be used, method of instrument application (by sketch) and correction factors.

- .4 Sample Forms: Form showing application of procedures to typical systems.
- .5 Prior to commencement of work on site, the balancing agent shall arrange with the Departmental Representative, a pre-determined test area on site. This is to determine the accuracy of test equipment and to review the balancing methods outlined in the written, pre-approved balancing procedures.
- .6 At the completion of balancing the first major air system the balancing agent shall notify the Departmental Representative to re-visit the site to evaluate work completed to this time. Provide the Departmental Representative with 5 days written notice, prior to request for site visit.
- .7 Balance Report:
  - .1 Submit electronic copies of rough balancing reports to the Departmental Representative for review, prior to on-site verification and acceptance of Project.
  - .2 Provide four (4) copies of final reports to contractor for inserting in Owner's Operating and Maintenance Manuals as described in Section 01 78 00.
  - .3 Include types, serial number, and dates of calibration of instruments in the reports.

#### **1.12 START OF TAB**

- .1 Notify Departmental Representative 7 days prior to start of TAB.
- .2 Start TAB when building is essentially completed, including:
- .3 Installation of ceilings, doors, windows, other construction affecting TAB.
- .4 Application of weatherstripping, sealing, caulking.
- .5 All pressure, leakage, other tests specified elsewhere in Division 23.
- .6 All provisions for TAB installed and operational.
- .7 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:
  - .1 Air systems:
    - .1 Duct systems clean.
    - .2 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.
    - .3 Correct fan rotation.
    - .4 Outlets installed, volume control dampers open.

**1.13 INSTRUMENTS**

- .1 Prior to TAB, submit to Departmental Representative list of instruments used together with serial numbers.
- .2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.
- .3 Calibrate within 3 months of TAB. Provide certificate of calibration to Departmental Representative.

**1.14 APPLICATION TOLERANCES**

- .1 Do TAB to following tolerances of design values:
  - .1 Office and support space HVAC systems: plus 5%, minus 5 %.
  - .2 Hydronic systems: plus or minus 10%.

**1.15 ACCURACY TOLERANCES**

- .1 Measured values to be accurate to within plus or minus 2% of actual values.

**1.16 INSTRUMENTS**

- .1 Prior to TAB, submit to Departmental Representative list of instruments to be used together with serial numbers.
- .2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.
- .3 Calibrate within 3 months of TAB. Provide certificate of calibration to Departmental Representative.

**1.17 SUBMITTALS**

- .1 Submit, prior to commencement of TAB:
- .2 Proposed methodology and procedures for performing TAB if different from referenced standard.
- .3 Submit preliminary TAB Report and final TAB Report as indicated below.

**1.18 PRELIMINARY TAB REPORT**

- .1 Submit for checking and approval of Departmental Representative, prior to submission of formal TAB report, sample of rough TAB sheets. Include:
    - .1 Date testing work is performed.
    - .2 Details of instruments used.
    - .3 Details of TAB procedures employed.
    - .4 Calculations procedures.
    - .5 Summaries.
-

**1.19 TAB REPORT**

- .1 Format in accordance with referenced standard.
- .2 TAB report to show results in SI units and to include:
  - .1 Project record drawings.
  - .2 System schematics.
- .3 Submit 6 copies of TAB Report to Departmental Representative for verification and approval, in English, in D-ring binders, complete with index tabs.

**1.20 SYSTEM DATA**

- .1 Split Air Conditioning Units (Indoor Unit):
  - Manufacturers catalogue identification and type;
  - \*Application factors;
  - Supply Airflow at maximum
  - Supply air temperature
- .2 Air Terminal Devices (VAV boxes):
  - Outlet identification location and designation;
  - Manufacturers catalogue identification and type;
  - \*Application factors;
  - Air flow at minimum position;
  - Air flow at maximum position
  - Secondary Fan motor data:
    - Manufacturer
    - Model Number
    - Horse power
    - Full Load Amp
    - External Static Pressure
- .3 Air Terminal Devices (VAV Fan Power boxes):
  - Outlet identification location and designation;
  - Manufacturers catalogue identification and type;
  - \*Application factors;
  - Primary air flow at minimum position;
  - Primary air flow at maximum position
  - Secondary air flow at minimum primary air flow position
  - Secondary air flow at maximum primary air flow position
  - Secondary Fan motor data:
    - Manufacturer
    - Model Number
    - Horse power
    - Full Load Amp
    - External Static Pressure
- .4 Exhaust Fans:
  - Outlet identification location and designation;
  - Manufacturers catalogue identification and type;

Speed controller setting  
Air flow  
External Static Pressure  
Motor data:  
    Manufacturer  
    Model Number  
    Horse power  
    Full Load Amp  
    External Static Pressure

.5 Air Inlet and Outlets:

Outlet identification location and designation;  
Manufacturers catalogue identification and type;  
\*Application factors;  
Design and recorded velocities;  
Design and recorded air flow rates;  
Deflector vane or diffuser cone settings.

\* (Refer to 3.1.3 for supporting information)

**1.21 VERIFICATION**

- .1 Reported results subject to verification by Departmental Representative.
- .2 Provide manpower and instrumentation to verify up to 30% of reported results.
- .3 Number and location of verified results to be at discretion of Departmental Representative.
- .4 Bear costs to repeat TAB as required to satisfaction of Departmental Representative.

**1.22 SETTINGS**

- .1 After TAB is completed to satisfaction of Departmental Representative, replace drive guards, close access doors, lock devices in set positions, ensure sensors are at required settings.
- .2 Permanently mark settings to allow restoration at any time during life of facility. Markings not to be eradicated or covered in any way.

**1.23 COMPLETION OF TAB**

- .1 TAB to be considered complete when final TAB Report received and approved by Departmental Representative.

**1.24 OTHER TAB REQUIREMENTS**

- .1 General requirements applicable to work specified this paragraph:
  - .1 Qualifications of TAB personnel: as for air systems specified this section.
  - .2 Quality assurance: as for air systems specified this section.

**1.25 POST- OCCUPANCY TAB**

- .1 Participate in systems checks twice during Warranty Period - #1 approximately 3 months after acceptance and #2 within 3 months of termination of Warranty Period.

**Part 2 PRODUCTS**

- .1 Not Used.

**Part 3 EXECUTION**

**3.1 GENERAL PROCEDURE**

- .1 Permanently mark, by stick-on labels and/or fluorescent paint, settings on valves, splitters, dampers, and other adjustment devices
- .2 Subsequent to correctional work, take measurements to verify balance has not been disrupted or that any such disruption has been rectified.
- .3 Where vane anemometer is used to measure supply, return or exhaust air grilles, AK factors shall be determined as follows:
  - .1 Determine and tabulate similar sized grilles being balanced for AK schedule.
  - .2 Traverse all ducts serving grilles (outlined in AK schedule) to verify AK factors.
  - .3 AK factor from schedule, must be approved by Departmental Representative during initial review with balancer on site. (Balancer shall include written procedure for determination of AK factors).
  - .4 No flow hoods are to be used for measurement of exhaust or return air grilles.
- .4 Balancing contractor shall advise mechanical contractor of required revised pulleys, sheaves and impellor shavings to allow proper balancing of systems
- .5 Where axial fans require blade pitch changes, this shall be the responsibility of the balancing contractor

**3.2 AIR SYSTEM PROCEDURE**

- .1 Perform balancing, adjusting, and testing with building doors and windows in their normal operation position.
  - .2 The following procedure shall be adopted for central systems:
    - .1 Ensure dampers or volume control devices are in fully open position
    - .2 Balance central apparatus to  $\pm 5\%$  air flow
    - .3 Balance branches and mains as stated previously
    - .4 Recheck central apparatus
    - .5 Balance all terminal air outlets as stated previously
    - .6 Re-balance central apparatus to  $\pm 5\%$
    - .7 Recheck all air outlets.
    - .8 Perform acoustical measurements.
-

- .3 When balancing air outlets:
  - .1 Rough balance furthest outlets and then balance sequentially back to source.
  - .2 Fine balance furthest outlet back to source.
- .4 Take static pressure readings and air supply temperature readings at 10 points on each system.
- .5 Make air quantity measurements in ducts by "Pitot Tube" traverse of entire cross sectional area. Take minimum of 4 for rectangular ducts, and 2 on each vertical and horizontal axis for round ducts, traverse readings. If readings are inconsistent across duct, try to obtain straight run of six (6) diameters widths upstream and re-do traverse. Measure air quantities on each system.
- .6 Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control only by duct internal devices such as dampers and splitters
- .7 Vary total system air quantities by adjustment of fan speeds. Vary branch air quantities by damper regulation.
- .8 Verify all terminal unit factory settings for maximum air flow (and minimum if applicable). Adjust terminal unit controller if required. Record adjusted units.
- .9 The final balanced condition of each area shall include testing and adjusting of pressure conditions. Test and record building pressurization levels in variable volume systems throughout full range of fan delivery rates, under both heating and cooling conditions. Front doors, exits, elevator shafts, should be checked for air flow so that exterior conditions do not cause excessive or abnormal pressure conditions. Document abnormal building leakage conditions noted.
- .10 Complete balancing to achieve positive building pressure unless otherwise instructed. A positive pressure relative to outside of 10 Pa minimum and 20 Pa maximum shall be achieved, measured with negligible outside wind velocity

### 3.3 **BALANCING REPORT**

- .1 Submit draft copies of rough balancing reports prior to final acceptance of project.
- .2 Include types, serial number and dates of calibration of instruments.
- .3 Record test data on a sepia made from the latest available revised set of mechanical drawings and submit three (3) copies upon completion of the balancing contract for inclusion in equipment and maintenance manuals.
- .4 Submit with report, fan and pump curves with operating conditions plotted. Submit grille and diffuser shop drawings and diffusion factors.
- .5 Report shall be indexed as follows:

#### **Air**

Summary  
Procedure  
Instrumentation  
Drawings  
Equipment Summary

---

Static Data  
Traverse Data and Schedule  
Terminal Unit Summary  
Outlet Data Summary and Schematics (per system)

**END OF SECTION**

**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 Definitions:
  - .1 For purposes of this section:
    - .1 "CONCEALED" - insulated mechanical services and equipment in suspended ceilings and non-accessible chases and furred-in spaces.
    - .2 "EXPOSED" - means "not concealed" as previously defined.
    - .3 Insulation systems - insulation material, fasteners, jackets, and other accessories.
  - .2 TIAC Codes:
    - .1 CRD: Code Round Ductwork,
    - .2 CRF: Code Rectangular Finish.
- .2 Reference Standards:
  - .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
    - .1 ANSI/ASHRAE/IES 90.1-2013, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.
  - .2 ASTM International Inc.
    - .1 ASTM B209M-14, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
    - .2 ASTM C335/C335M-10e1, Standard Test Method for Steady State Heat Transfer Properties of Pipe Insulation.
    - .3 ASTM C411-11, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
    - .4 ASTM C449-07 (2013), Standard Specification for Mineral Fiber-Hydraulic- Setting Thermal Insulating and Finishing Cement.
    - .5 ASTM C547-15, Standard Specification for Mineral Fiber Pipe Insulation.
    - .6 ASTM C553-13, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
    - .7 ASTM C612-104, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
    - .8 ASTM C795-08 (2013), Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
    - .9 ASTM C921-10 (2015), Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
  - .3 Canadian General Standards Board (CGSB)
    - .1 CGSB 51-GP-52Ma-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
  - .4 Green Seal Environmental Standards (GSES)
    - .1 Standard GS-36-13 Adhesives for Commercial Use.

- .5 South Coast Air Quality Management District (SCAQMD), California State
  - .1 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.
- .6 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (2005).
- .7 Underwriters Laboratories of Canada (ULC)
  - .1 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
  - .2 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

## 1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature and datasheets for duct insulation, and include product characteristics, performance criteria, physical size, finish and limitations.
    - .1 Description of equipment giving manufacturer's name, type, model, year and capacity.
    - .2 Details of operation, servicing and maintenance.
    - .3 Recommended spare parts list.
- .3 Samples:
  - .1 Submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed.
  - .2 Mount sample on 12 mm plywood board.
  - .3 Affix typewritten label beneath sample indicating service.
- .4 Manufacturers' Instructions:
  - .1 Provide manufacture's written duct insulation jointing recommendations, special handling criteria, installation instructions, and cleaning procedures.

## 1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 61 00.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, and ULC markings.
- .3 Packaging Waste Management: remove for reuse in accordance with Section 01 74 20.

## Part 2 PRODUCTS

### 2.1 FIRE AND SMOKE RATING

- .1 To CAN/ULC-S102:
  - .1 Maximum flame spread rating: 25.

- .2 Maximum smoke developed rating: 50.

## 2.2 INSULATION

- .1 Mineral fibre: as specified includes glass fibre, rock wool, slag wool.
- .2 Thermal conductivity ("k" factor) not to exceed specified values at 24°C mean temperature when tested in accordance with ASTM C335.
- .3 TIAC Code C-1: Rigid mineral fibre board to ASTM C612, with factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in Part 3 of this Section).
- .4 TIAC Code C-2: Mineral fibre blanket to ASTM C553 faced with factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in Part 3 of this section).
  - .1 Mineral fibre: to ASTM C553.
  - .2 Jacket: to CGSB 51-GP-52Ma.
  - .3 Maximum "k" factor: to ASTM C553.

## 2.3 JACKETS

- .1 Canvas:
  - .1 220 gm/m<sup>2</sup> cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
- .2 Lagging adhesive: compatible with insulation.
  - .1 Maximum VOC limit to GSES GS-36.
- .3 Aluminum:
  - .1 To ASTM B209M with moisture barrier as scheduled in Part 3 of this section.
  - .2 Thickness: 0.50 mm sheet.
  - .3 Finish: Smooth.
  - .4 Jacket banding and mechanical seals: 12 mm wide, 0.5 mm thick stainless steel.
    - .1 Stainless steel:
  - .5 Type: 316.
  - .6 Thickness: 0.25 mm sheet.
  - .7 Finish: Smooth.
  - .8 Jacket banding and mechanical seals: 12 mm wide, 0.5 mm thick stainless steel.

## 2.4 ACCESSORIES

- .1 Vapour retarder lap adhesive:
  - .1 Water based, fire retardant type, compatible with insulation.
    - .1 Maximum VOC limit to GSES GS-36.
- .2 Indoor Vapour Retarder Finish:
  - .1 Vinyl emulsion type acrylic, compatible with insulation.
- .3 Insulating Cement: hydraulic setting on mineral wool, to ASTM C449.
- .4 ULC Listed Canvas Jacket:

- .1 220 gm/m<sup>2</sup> cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
- .5 Outdoor Vapour Retarder Mastic:
  - .1 Vinyl emulsion type acrylic, compatible with insulation.
  - .2 Reinforcing fabric: Fibrous glass, untreated 305 g/m<sup>2</sup>.
- .6 Tape: self-adhesive, aluminum, 50 mm wide minimum.
- .7 Contact adhesive: quick-setting
  - .1 Maximum VOC limit to GSES GS-36.
- .8 Canvas adhesive: washable.
  - .1 Maximum VOC limit to GSES GS-36.
- .9 Tie wire: 1.5 mm stainless steel.
- .10 Banding: 12 mm wide, 0.5 mm thick stainless steel.
- .11 Facing: 25 mm stainless steel hexagonal wire mesh stitched on both faces of insulation.
- .12 Fasteners: 2 mm diameter pins with 35 mm diameter clips, length to suit thickness of insulation.

### **Part 3 EXECUTION**

#### **3.1 APPLICATION**

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

#### **3.2 PRE-INSTALLATION REQUIREMENTS**

- .1 Pressure test ductwork systems complete, witness and certify.
- .2 Ensure surfaces are clean, dry, free from foreign material.

#### **3.3 INSTALLATION**

- .1 Install in accordance with TIAC National Standards.
- .2 Apply materials in accordance with manufacturer's instructions and as indicated.
- .3 Use 2 layers with staggered joints when required nominal thickness exceeds 75 mm.
- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
  - .1 Ensure hangers, and supports are outside vapour retarder jacket.
- .5 Hangers and supports in accordance with Section 23 05 29.
  - .1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.
- .6 Fasteners: install at 300 mm on centre in horizontal and vertical directions, minimum 2 rows each side.

### 3.4 DUCTWORK INSULATION SCHEDULE

- .1 Insulation types and thicknesses: conform to following table:

	TIAC Code	Vapour Retarder	Thickness (mm)
Rectangular cold and dual temperature supply air ducts	C-1	yes	50
Round cold and dual temperature supply air ducts	C-2	yes	50
Rectangular warm air ducts	C-1	no	25
Round warm air ducts	C-1	no	25
Supply, return and exhaust ducts exposed in space being served			none
Outside air ducts to mixing plenum	C-1	yes	25
Mixing plenums	C-1	yes	25
Exhaust duct between dampers and louvres	C-1	no	25
Rectangular ducts outside	C-1	special	50
Round ducts outside	C-1	special	50
Acoustically lined ducts	none		

### 3.5 CLEANING

- .1 Clean in accordance with Section 01 74 11.
- .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 SUMMARY**

- .1 Section Includes:
  - .1 Thermal insulation for piping and piping accessories in commercial type applications.

**1.2 REFERENCES**

- .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
  - .1 ASHRAE Standard 90.1-2013, Energy Standard for Buildings Except Low-Rise Residential Buildings (ANSI approved; IESNA co-sponsored).
- .2 American Society for Testing and Materials International (ASTM)
  - .1 ASTM B209M-14, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
  - .2 ASTM C335/C335M-10e1, Standard Test Method for Steady State Heat Transfer Properties of Pipe Insulation.
  - .3 ASTM C411-11, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
  - .4 ASTM C449-07 (2013), Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
  - .5 ASTM C547-15, Standard Specification for Mineral Fiber Pipe Insulation.
  - .6 ASTM C553-13, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
  - .7 ASTM C795-08 (2013), Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
  - .8 ASTM C921-10 (2015), Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- .3 Canadian General Standards Board (CGSB)
  - .1 CGSB 51-GP-52Ma-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
  - .2 CAN/CGSB-51.53-95, Poly (Vinyl Chloride) Jacketing Sheet, for Insulated Pipes, Vessels and Round Ducts.
- .4 Department of Justice Canada (Jus)
  - .1 Canadian Environmental Assessment Act (CEAA), 1992, c. 37.
  - .2 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
  - .3 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

- .6 Manufacturer's Trade Associations
  - .1 Thermal Insulation Association of Canada (TIAC): Mechanical Insulation Best Practice Guide(Revised 2005).
- .7 Underwriters' Laboratories of Canada (ULC)
  - .1 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies.
  - .2 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
  - .3 CAN/ULC-S702-14, Thermal Insulation, Mineral Fibre, for Buildings
  - .4 ULC-S702.2-15, Mineral Fibre Thermal Insulation for Buildings, Part 2: Application Guidelines

### 1.3 DEFINITIONS

- .1 For purposes of this section:
  - .1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.
  - .2 "EXPOSED" - will mean "not concealed" as specified.
- .2 TIAC ss:
  - .1 CRF: Code Rectangular Finish.
  - .2 CPF: Code Piping Finish.

### 1.4 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00. Include product characteristics, performance criteria, and limitations.
    - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS).
- .3 Shop Drawings:
  - .1 Submit shop drawings in accordance with Section 01 33 00.
- .4 Samples:
  - .1 Submit samples in accordance with Section 01 33 00.
- .5 Quality assurance submittals: submit following in accordance with Section 01 33 00.
  - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .2 Instructions: submit manufacturer's installation instructions.
    - .1 Departmental Representative will make available 1 copy of systems supplier's installation instructions.

## 1.5 QUALITY ASSURANCE

- .1 Health and Safety:
  - .1 Do construction occupational health and safety in accordance with Section 01 35 29.

## 1.6 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00.
  - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
  - .3 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .2 Storage and Protection:
  - .1 Protect from weather, construction traffic.
  - .2 Protect against damage.
  - .3 Store at temperatures and conditions required by manufacturer.

## Part 2 PRODUCTS

### 2.1 FIRE AND SMOKE RATING

- .1 In accordance with CAN/ULC-S102.
  - .1 Maximum flame spread rating: 25.
  - .2 Maximum smoke developed rating: 50.

### 2.2 INSULATION

- .1 Cold Piping: Formed fine fibrous glass or formed mineral fibre pipe insulation meeting requirements of CAN/ULC S702-14; with factory applied vapour barrier jacket, factory moulded to conform to piping and as follows:
    - .1 K Value: Maximum 0.033 W/m°C at 24°C
    - .2 Service Temperature: 4°C to 100°C
  - .2 Hot Piping: Formed fine fibrous glass or mineral fibre pipe insulation meeting requirements of CAN/ULC S702-14; with factory applied general purpose jacket, factory moulded to conform to piping and as follows:
    - .1 K Value: Maximum 0.033 W/m°C at 24°C
    - .2 Service Temperature: Up to 150°C
  - .3 Refrigerant Piping: Foamed plastic of closed cell structure or closed cell elastomer meeting requirements of ULC S704 and as follows:
    - .1 K Value: Maximum 0.04 W/m°C at 24°C
-

- .2 Maximum Water Vapour Transmission Rating:
  - .1 Unjacketed: 0.1 perm
  - .2 Jacketed: 0.1 perm

## **2.3 INSULATION SECUREMENT**

- .1 Tape: self-adhesive, aluminum, 50 mm wide minimum.
- .2 Contact adhesive: quick setting.
- .3 Canvas adhesive: washable.
- .4 Tie wire: 1.5 mm diameter stainless steel.
- .5 Bands: stainless steel, 19 mm wide, 0.5 mm thick.

## **2.4 CEMENT**

- .1 Thermal insulating and finishing cement:
  - .1 Hydraulic setting on mineral wool, to ASTM C449.

## **2.5 VAPOUR RETARDER LAP ADHESIVE**

- .1 Water based, fire retardant type, compatible with insulation.

## **2.6 INDOOR VAPOUR RETARDER FINISH**

- .1 Vinyl emulsion type acrylic, compatible with insulation.

## **2.7 ACCESSORIES**

- .1 Canvas Lagging Adhesive: Compatible with insulation and compliant with requirements for ULC listed dilute fire retardant lagging adhesive, washable type.
- .2 Tape: Self-adhesive, aluminum, reinforced, 50 mm wide minimum
- .3 Contact Adhesive: Quick setting type
- .4 Tie wire: 1.5 mm diameter stainless steel
- .5 Bands: Stainless steel, 19 mm wide, 0.6 mm thick
- .6 Thermal Insulating and Finishing Cement: Hydraulic setting or Air drying for use on mineral wool meeting requirements of ASTM C449.
- .7 Vapour Retarder Lap Adhesive: Water based, fire retardant type, compatible with insulation.
- .8 Interior Vapour Retarder Finish: Vinyl emulsion type acrylic, compatible with insulation.
- .9 Exterior Vapour Retarder Finish: Vinyl emulsion type acrylic, compatible with insulation; fibrous glass reinforcing fabric; untreated 305 g/m<sup>2</sup>.
- .10 Sealants: Joint and weatherproofing sealants of type compatible with adjacent materials and as specified in Section 07 92 00 - Joint Sealants.

## **Part 3 EXECUTION**

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### 3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

### 3.2 PRE-INSTALLATION REQUIREMENT

- .1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.
- .2 Surfaces clean, dry, free from foreign material.

### 3.3 INSTALLATION

- .1 Install insulation and recovery jacket in accordance with TIAC Best Practices Guide, manufacturer's written instructions and requirements of this specification.
- .2 Install insulation so that it is continuous through inside walls; pack around pipes with fireproof self-supporting insulation material, properly sealed in accordance with Section 07 84 00.
- .3 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.
- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes; hangers and supports must be outside vapour retarder jacket.
- .5 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided at supports and hanger locations.
- .6 Cold systems:
  - .1 Insulate complete system including, but not limited to:
    - .1 Piping;
    - .2 Fittings;
    - .3 Valves;
    - .4 Unions;
    - .5 Flanges;
    - .6 Victaulic Couplings and fittings;
    - .7 and strainers.
  - .2 Piping: Seal lap joints with 100% coverage of vapour barrier adhesive; seal butt joints with 50 mm wide strips of vapour barrier sealed with vapour barrier adhesive; apply hydraulic insulating cement for fittings and valves or apply factory fabricated insulation half shells, seal all laps and joints.
  - .3 Do not insulate flexible connections and expansion joints.
  - .4 For piping 25mm or smaller, insulation is not required on strainers, control valves and balancing valves.
  - .5 Terminate insulation bevelled to the pipe and sealed.

- .7 Hot systems:
  - .1 Insulate:
    - .1 Piping
    - .2 Fittings
    - .3 Valves
    - .4 Victaulic pipe fittings such as tees and elbows
  - .2 Do not insulate:
    - .1 Unions
    - .2 Flanges (except on flanged valves)
    - .3 Strainers
    - .4 Flexible connections
    - .5 Expansion joints;
    - .6 Victaulic couplings directly connected to equipment to facilitate equipment replacement or removal.
  - .3 For piping 25mm or smaller, insulation is not required on strainers, control valves and balancing valves.
  - .4 Terminate insulation beveled to the pipe and sealed.
  - .5 Piping: Apply hydraulic insulating cement or apply factory fabricated insulation half shells for fittings and valves; flare-out staples may be used to secure jacket laps on hot systems applied on 100 mm centres.
    - .1 Insulate Victaulic couplings with pre-formed removable insulation.
- .8 Refrigerant Piping: Cover fittings and valves with equivalent thickness of pipe insulation material; apply with edges tightly butted; seal joints with sealant.
- .9 Equipment: Apply insulation with edges tightly butted, joints staggered and secured in place by metal bands and as follows:
  - .1 Weld on suitable anchors where necessary.
  - .2 Provide sufficient clearance around openings for normal operation of equipment.
  - .3 Finish surface of cold equipment insulation with vapour barrier jacket sealed with vapour barrier adhesive.
  - .4 Make uneven surfaces smooth with insulating cement.

### 3.4 FINISHING

- .1 Finish insulation neatly at hangers, supports and other protrusions.
  - .2 Provide recovering jackets on exposed insulation throughout, including equipment rooms:
  - .3 Interior Exposed Finishing Applications, in accordance with TIAC CPF/1:
    - .1 Apply factory integral service jacket to receive treated fabric jacket applied using recommended fabric adhesive.
    - .2 Cover fittings, valves and strainers not finished with PVC covers with a hard coat cement and finished with treated fitting fabric applied with using recommended fabric adhesive.
    - .3 Locate insulation seams in least visible locations.
-

- .4 Finish fabric with one (1) coat of fabric coating.
  - .4 Interior Concealed Finishing Applications in accordance with TIAC CPF/2:
    - .1 Leave insulation on concealed piping left as factory finished with no further finish required.
    - .2 Apply pipe insulation with an integral all service jacket.
    - .3 Secure jacket using appropriate fastenings on 100 mm centres.
    - .4 Locate insulation seams on piping on side of the pipe visible to access point of concealed space, such as: underside of pipe in concealed ceiling applications.
    - .5 Cover longitudinal and circumferential joints with jacket finishing tape neatly applied or secure jacketing using integral self-sealing lap and self-sealing circumferential joint strips depending on system used.
    - .6 Cover fittings, valves and strainers not finished with PVC covers with a hard coat cement and finish with treated fitting fabric applied with fabric adhesive.
  - .5 Exterior Exposed Finishing Applications (Metal Recovery Jacket), in accordance with TIAC CPF/3:
    - .1 Apply aluminum jacket over the pipe insulation using necessary fastenings on 150 mm centres.
    - .2 Apply metal jacket or preformed metal fittings over insulated fittings, valve bodies, valve bonnets, strainers and flanges to provide a complete jacket system.
    - .3 Lap circumferential joints 50 mm minimum and seal with compatible waterproof lap cement
    - .4 Lock form longitudinal joints and seal.
    - .5 Locate metal jacket seams in least visible locations.
    - .6 Secure with recommended fastenings.
  - .6 Interior/Exterior Exposed Finishing Applications (PVC Recovery Jacket), in accordance with TIAC CPF/4:
    - .1 Apply PVC Jacket over the pipe insulation using necessary fastenings on 100 mm centres.
    - .2 Cover longitudinal and circumferential joints with finishing tape neatly applied.
    - .3 Apply PVC jacket or preformed PVC fitting covers over insulated fittings, valve bodies, valve bonnets, strainers and flanges to provide a complete jacket system.
    - .4 Locate PVC jacket seams in least visible locations.
    - .5 Secure with appropriate fastenings and jacket finishing tape.
  - .7 Exterior Concealed, in accordance with TIAC CPF/5: Apply 2 ply weatherproof coating to insulated surfaces:
    - .1 First Ply: Apply minimum 1 litre per 1.5 m length of pipe weatherproof coating applied to insulated surfaces, increase application rate based on pipe diameter and manufacture's recommendations.
    - .2 Embed a layer of reinforcing membrane while still wet.
    - .3 Second Ply: Apply minimum 1 litre per 1.5 m length of pipe weatherproof coating applied to insulated surfaces, increase application rate based on pipe diameter and manufacture's recommendations.
-

### 3.5 INSULATION INSTALLATION THICKNESS SCHEDULE

- .1 Insulation thicknesses shall confirm with ASHRAE 90.1 2010 or at a minimum be as follows;

- .1 Insulation thicknesses listed below are based on based on Maximum K Value of least efficient insulation materials such as glass fibre and mineral fibre; thickness can be decreased for higher efficiency insulation materials such as polyurethane while maintaining overall K Value for the installation:

Piping or Equipment	Pipe Sizes mm	Insulation Thickness mm	Recovery Jacket
Domestic Cold Water Piping	13 to 25	25	Aluminum (exterior)
	32 and over	38	Canvas (shafts) PVC (exposed areas)
Domestic Hot Water Supply and Recirculation Piping	13 to 32	25	Canvas (shafts)
	40 and over	38	PVC (exposed areas)
Refrigerant Piping	13 to 20	25	Aluminum (exterior)
	25 to 150	25	PVC (exposed areas)
	200 and Over	38	PVC (exposed areas)
Note: Pipe insulation for piping installed in partitions within conditioned spaces can be reduced by 25mm but not to thickness below 25mm.			

### 3.6 REMOVABLE INSULATION COVERS

- .1 Installation to permit movement of expansion joint and to permit periodic removal and replacement without damage to adjacent insulation.
- .1 Removable insulation covers shall be provided for the following:
- .1 Hydronic heating system flex connections, expansion joints.

### 3.7 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 American Society for Testing and Materials
  - .1 ASTM E202-12, Standard Test Methods for Analysis of Ethylene Glycols and Propylene Glycols.

**1.2 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 20.
- .2 Dispose of unused cleaning solutions at official hazardous material collections site approved by the Departmental Representative.
- .3 Do not dispose of unused cleaning solutions into sewer system, into streams, lakes, onto ground or in other locations where it will pose health or environmental hazard.
- .4 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .5 Dispose of corrugated cardboard, polystyrene, plastic packaging material in appropriate on-site bin for recycling in accordance with site waste management program.

**Part 2 PRODUCTS**

**2.1 CLEANING SOLUTIONS**

- .1 Tri-sodium phosphate: 0.40 kg per 100 L water in system.
- .2 Sodium carbonate: 0.40 kg per 100 L water in system.
- .3 Low-foaming detergent: 0.01 kg per 100 L water in system.

**Part 3 EXECUTION**

**3.1 CLEANING DOMESTIC WATER SYSTEMS**

- .1 All domestic hot, cold and domestic recirculation water systems will be required to be flushed and disinfected. Add chlorine to water in system to **50 milligrams per litre (50 ppm)** and let stand for **24 hours**. Check chlorine content after **24 hours** and insure the content is not less than **20 milligrams per litre (20 ppm)**. If less than **20 milligrams per litre (20 ppm)** repeat process. Flush system until the chlorine content of water being drained is equal to the chlorine content of the make-up water. Utilize plumbing fixtures (i.e. lav, sinks, flushometers, and similar criteria.) for drainage.
- .2 Cleaning Agency:
  - .1 Retain qualified water treatment specialist to perform system cleaning.
- .3 Report on Completion of Cleaning
  - .1 When cleaning is completed, submit report, complete with certificate of compliance with specifications of cleaning component supplier.

### **3.2 START-UP OF DOMESTIC SYSTEMS**

- .1 After cleaning is completed and system is filled:
  - .1 Ensure air is removed.
  - .2 Clean out strainers repeatedly until system is clean.
  - .3 Monitor pipe movement, performance of expansion joints, loops, guides, anchors.
  - .4 If sliding type expansion joints bind or if bellows type expansion joints flex incorrectly, shut down system, re-align, repeat start-up procedures.
  - .5 Re-tighten bolts, etc. using torque wrench, to compensate for heat-caused relaxation. Repeat several times during commissioning.

**END OF SECTION**

## **Part 4**

**Part 1 GENERAL**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for electric and electronic control system for HVAC and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

**1.2 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect electric and electronic control systems from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

**1.3 BUILDING AUTOMATION SYSTEM (BAS)**

- .1 Provide all necessary controllers, wiring, and communication devices to integrate new VAV box to existing Building Automation System.
- .2 Existing BAS is based on Snyder Electric Controls; Serviced by Controls Systems (Ontario) Inc; 519-453 4100

**1.4 SEQUENCE OF OPERATION**

- .1 VAV box sequence of operation to match existing.
- .2 Fan power box sequence of operation to match existing.
- .3 Split Air Conditioning System
  - .1 Manufacturer supplied temperature controller shall modulate Split System cooling operation to meet space temperature set-point (adjustable by user through local thermostat).

**Part 2 PRODUCTS**

**2.1 THERMOSTAT (LOW VOLTAGE)**

- .1 Low voltage wall thermostat:
  - .1 For use on 24 V circuit at 1.5 A capacity.
  - .2 Temperature setting range: 10 degrees C to 25 degrees C.
  - .3 Appearance to match existing.

## **2.2 TERMINAL BOX CONTROLLER**

- .1 Coordinate with terminal box manufacturer for control points.
- .2 VAV control points to match existing VAV boxes. Point include but are not limited to:
  - .1 Min/Max Airflow Setpoint
  - .2 Space Temperature
  - .3 Space Temperature Setpoint
  - .4 Space Temperature Setpoint Override
  - .5 Space Temperature Setpoint (Remote/Automatic)
  - .6 Box Air Flow
  - .7 Box Air Flow Setpoint
  - .8 Box Air Flow Setpoint Override
  - .9 Box Air Flow Set Point (Remote/Automatic)
- .3 Fan Power Box control points to match existing boxes. Point include but are not limited to:
  - .1 Min/Max Airflow Setpoint
  - .2 Space Temperature
  - .3 Space Temperature Setpoint
  - .4 Space Temperature Setpoint Override
  - .5 Space Temperature Setpoint (Remote/Automatic)
  - .6 Box Air Flow
  - .7 Box Air Flow Setpoint
  - .8 Box Air Flow Setpoint Override
  - .9 Box Air Flow Set Point (Remote/Automatic)
  - .10 Primary supply air temperature
  - .11 Fan status (on/off/alarm)
- .4 Modify existing BAS graphics to accommodate new terminal box box. Graphics display information and layout to match existing.

## **Part 3 EXECUTION**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for electric and electronic control systems installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

- .2 Site verify available capacity of existing LAN/WAN controllers to accommodate new VAV controller. Provide new LAN/WAN controllers if required.

### **3.2 INSTALLATION**

- .1 Install control devices, wiring, and conduits.
- .2 Modify BAS graphics and sequence of operation.
- .3 On outside wall, mount thermostats on bracket or insulated pad 25 mm from exterior wall.
- .4 Install remote sensing device and capillary tube in metallic conduit. Conduit enclosing capillary tube must not touch heater or heating cable.

### **3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
  - .1 Leave Work area clean at end of each day.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 ASME
  - .1 ASME B16.22-12, Wrought Copper and Copper Alloy Solder - Joint Pressure Fittings.
  - .2 ASME B16.24-11, Cast Copper Pipe Flanges and Flanged Fittings: Class 150, 300, 600, 900, 1500 and 2500.
  - .3 ASME B16.26-11, Cast Copper Alloy Fittings for Flared Copper Tubes.
  - .4 ASME B31.5-10, Refrigeration Piping and Heat Transfer Components.
- .2 ASTM International
  - .1 ASTM A307-12, Standard Specification for Carbon Steel Bolts and Studs, and Threaded Rod 60,000 PSI Tensile Strength.
  - .2 ASTM B280-13, Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
- .3 CSA Group
  - .1 CSA B52-13, Mechanical Refrigeration Code.
- .4 Environment Canada (EC)
  - .1 EPS 1/RA/1-96, Environmental Code of Practice for the Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for refrigerant piping, fittings and equipment and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit 1 copy of WHMIS MSDS. Indicate VOC's for adhesive and solvents during application and curing.
- .3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

**1.3 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00.
  - .2 Operation and Maintenance Data: submit operation and maintenance data for refrigerant piping for incorporation into manual.
-

- .3 Submit copies of operation and maintenance information for inclusion in manual.

#### **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect refrigerant piping, fittings and equipment from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
  - .4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Section 01 74 20.

### **Part 2 PRODUCTS**

#### **2.1 TUBING**

- .1 Processed for refrigeration installations, deoxidized, dehydrated and sealed.
  - .1 Hard copper: to ASTM B280, type ACR.
  - .2 Annealed copper: to ASTM B280, with minimum wall thickness as per CSA B52 and ASME B31.5.

#### **2.2 FITTINGS**

- .1 Service: design pressure 2070 kPa and temperature 121 degrees C.
- .2 Brazed:
  - .1 Fittings: wrought copper to ASME B16.22.
  - .2 Joints: silver solder, 15% Ag-80% Cu-5%P and non-corrosive flux.
- .3 Flanged:
  - .1 Bronze or brass, to ASME B16.24, Class 150 and Class 300.
  - .2 Gaskets: suitable for service.
  - .3 Bolts, nuts and washers: to ASTM A307, heavy series.
- .4 Flared:
  - .1 Bronze or brass, for refrigeration, to ASME B16.26.

#### **2.3 PIPE SLEEVES**

- .1 Hard copper or steel, sized to provide 6 mm clearance around between sleeve and uninsulated pipe or between sleeve and insulation.

## **2.4 VALVES**

- .1 22 mm and under: Class 500, 3.5 Mpa, globe or angle non-directional type, diaphragm, packless type, with forged brass body and bonnet, moisture proof seal for below freezing applications, brazed connections.
- .2 Over 22 mm: Class 375, 2.5 Mpa, globe or angle type, diaphragm, packless type, back-seating, cap seal, with cast bronze body and bonnet, moisture proof seal for below freezing applications, brazed connections.

## **Part 3 EXECUTION**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that site conditions are acceptable for refrigerant piping installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect area of installation.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.

### **3.2 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

### **3.3 GENERAL**

- .1 Install in accordance with CSA B52, EPS1/RA/1 and ASME B31.5 Section 23 05 05.

### **3.4 BRAZING PROCEDURES**

- .1 Bleed inert gas into pipe during brazing.
- .2 Remove valve internal parts, solenoid valve coils, sight glass.
- .3 Do not apply heat near expansion valve and bulb.

### **3.5 PIPING INSTALLATION**

- .1 General:
  - .1 Hard drawn copper tubing: do not bend. Minimize use of fittings.
- .2 Hot gas lines:
  - .1 Pitch at least 1:240 down in direction of flow to prevent oil return to compressor during operation.
  - .2 Provide trap at base of risers greater than 2400 mm high and at each 7600 mm thereafter.
  - .3 Provide inverted deep trap at top of risers.

- .4 Provide double risers for compressors having capacity modulation.
  - .1 Large riser: install traps as specified.
  - .2 Small riser: size for 5.1 m<sup>3</sup>/s at minimum load. Connect upstream of traps on large riser.
- .5 Provide sufficient refrigerant charge as required.

### 3.6 PRESSURE AND LEAK TESTING

- .1 Close valves on factory charged equipment and other equipment not designed for test pressures.
- .2 Leak test to CSA B52 before evacuation to 2 MPa and 1 MPa on high and low sides respectively.
- .3 Test procedure: build pressure up to 35 kPa with refrigerant gas on high and low sides. Supplement with nitrogen to required test pressure. Test for leaks with electronic or halide detector. Repair leaks and repeat tests.

### 3.7 FIELD QUALITY CONTROL

- .1 Site Tests/Inspection:
  - .1 Close service valves on factory charged equipment.
  - .2 Ambient temperatures to be at least 13 degrees C for at least 12 hours before and during dehydration.
  - .3 Use copper lines of largest practical size to reduce evacuation time.
  - .4 Use two-stage vacuum pump with gas ballast on 2nd stage capable of pulling 5 Pa absolute and filled with dehydrated oil.
  - .5 Measure system pressure with vacuum gauge. Take readings with valve between vacuum pump and system closed.
  - .6 Triple evacuate system components containing gases other than correct refrigerant or having lost holding charge as follows:
    - .1 Twice to 14 Pa absolute and hold for 4 hours.
    - .2 Break vacuum with refrigerant to 14 kPa.
    - .3 Final to 5 Pa absolute and hold for at least 12 hours.
    - .4 Isolate pump from system, record vacuum and time readings until stabilization of vacuum.
    - .5 Submit test results to Departmental Representative.
- .7 Charging:
  - .1 Charge system through filter-drier and charging valve on high side. Low side charging not permitted.
  - .2 With compressors off, charge only amount necessary for proper operation of system. If system pressures equalize before system is fully charged, close charging valve and start up. With unit operating, add remainder of charge to system.
  - .3 Re-purge charging line if refrigerant container is changed during charging process.

- .8 Checks:
  - .1 Make checks and measurements as per manufacturer's operation and maintenance instructions.
  - .2 Record and report measurements to Departmental Representative.
- .9 Manufacturer's Field Services:
  - .1 Have manufacturer of products, supplied under this Section, review Work involved in the handling, installation/application, protection and cleaning, of its products and submit written reports, in acceptable format, to verify compliance of Work with Contract.
  - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
    - .1 Upon completion of the Work, after cleaning is carried out.
  - .3 Obtain reports, within 3 days of review, and submit, immediately, to Departmental Representative.

### **3.8 DEMONSTRATION**

- .1 Instructions:
  - .1 Post instructions in frame with glass cover in accordance with Section 01 78 00 and CSA B52.

### **3.9 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
- .2 ASTM International
  - .1 ASTM A480/A480M-16, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
  - .2 ASTM A635/A635M-15, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Alloy, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, General Requirements for.
  - .3 ASTM A653/A653M-15, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- .3 Green Seal Environmental Standards (GS)
  - .1 GS-36-11, Standard for Adhesives for Commercial Use.
- .4 National Fire Protection Association (NFPA)
  - .1 NFPA 90A-15, Standard for the Installation of Air-Conditioning and Ventilating Systems.
- .5 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
  - .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2005.
  - .2 SMACNA HVAC Air Duct Leakage Test Manual, 2012.
  - .3 IAQ Guideline for Occupied Buildings Under Construction 2007.
- .6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
  - .1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for metal ducts and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Test and Evaluation Reports:
  - .1 Certification of Ratings:
    - .1 Catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

### 1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground, indoors, in dry location, and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect metal ducts from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

## Part 2 PRODUCTS

### 2.1 SEAL CLASSIFICATION

- .1 Classification as follows:

Maximum Pressure Pa	SMACNA Seal Class
500	B
- .2 Seal classification:
  - .1 Class B: longitudinal seams, transverse joints and connections made airtight with sealant.

### 2.2 SEALANT

- .1 Low VOC Characteristics:
  - .1 Adhesives and sealants: in accordance with Section 07 92 00.
  - .2 Adhesives and sealants: VOC limit to GS-36.
- .2 Sealant: synthetic latex emulsion water based type with a service temperature of -17°C to 105°C.

### 2.3 DUCT LEAKAGE

- .1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

### 2.4 FITTINGS

- .1 Fabrication: to SMACNA.
- .2 Radiused elbows:
  - .1 Rectangular: standard radius with centreline radius: 1.5 times width of duct.
  - .2 Round: smooth radius with, centreline radius: 1.5 times diameter of duct.
- .3 Mitred elbows, rectangular:
  - .1 To 400 mm: with single thickness turning vanes.
  - .2 Over 400 mm: with double thickness turning vanes.

- .4 Branches:
  - .1 Rectangular main and branch: with radius on branch 1.5 times width of duct.
  - .2 Round main and branch: enter main duct at 45 degrees with conical connection.
  - .3 Provide volume control damper in branch duct near connection to main duct.
  - .4 Main duct branches: with splitter damper.
- .5 Transitions:
  - .1 Diverging: 20 degrees maximum included angle.
  - .2 Converging: 30 degrees maximum included angle.
- .6 Offsets:
  - .1 Short radiused elbows, or as indicated on drawings.
- .7 Obstruction deflectors: maintain full cross-sectional area.
  - .1 Maximum included angles: as for transitions.

## **2.5 FIRE STOPPING**

- .1 Provide 50 mm x 50 mm x 3 mm retaining angles ready for and firestops and smoke seals.
- .2 Fire stopping material and installation must not distort duct.

## **2.6 GALVANIZED STEEL**

- .1 Steel Sheet: Tension levelled, Forming Steel (FS) designation, Type A, Grade 230 in accordance with ASTM A653/A653M.
- .2 Thickness: Minimum base metal thickness as noted for specific configuration or thicker as required to meet design loads.
- .3 Galvanizing Designation: Z350 applied evenly to both sides.
- .4 Thickness, Fabrication and Reinforcement: to SMACNA requirements.
- .5 Joints: to meet SMACNA requirements.
- .6 Finish in exposed areas shall be ready for painting, ductwork to match ceiling finish. Refer to floor plans for extent of ductwork to be exposed.

## **2.7 STAINLESS STEEL**

- .1 Type: 316 meeting the requirements of ASTM A167.
- .2 Finish: ready for painting, ductwork to match ceiling finish.
- .3 Thickness, Fabrication and Reinforcement: to SMACNA requirements.
- .4 Joints: to meet welded SMACNA requirements.

## **2.8 PRE-MANUFACTURED FLEXIBLE DUCTS:**

- .1 Low Pressure:
  - .1 Location: Use flexible air duct where shown on Drawings.
  - .2 Length: Not greater than 600 mm.

- .3 Composition: CPE liner banded to steel wire helix, wrapped with fibreglass insulation and outer fibreglass reinforced metalized vapour barrier jacket.
- .4 Velocity Rating: Flexible duct rated for 12 m/s velocity and pressure rated for 500 Pa positive and 500 Pa negative.
- .2 Medium and High Pressure:
  - .1 Location: Use flexible air duct to connect terminal units to metal ductwork.
  - .2 Length: Not greater than 300 mm.
  - .3 Composition: Woven and vinyl coated fibreglass liner bonded to a steel wire helix; furnish flexible air duct with fibreglass insulation and outer fibreglass reinforced metalized vapour barrier jacket where flexible air duct is attached to metal insulated duct.
  - .4 Velocity Rating: Flexible duct rated for 30 m/s velocity and pressure rated for 4.0 kPa positive and 500 Pa negative.

## 2.9 FASTENERS

- .1 Use rivets and bolts throughout; sheet metal screws accepted on low pressure ducts; weld fume hood exhaust ducts.

## 2.10 HANGERS AND SUPPORTS

- .1 Hangers and Supports: in accordance with Section 23 05 29.
  - .1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.
    - .1 Maximum size duct supported by strap hanger: 500.
  - .2 Hanger configuration: to SMACNA.
  - .3 Hangers: galvanized steel angle with galvanized steel rods to the following table:

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)
up to 750	25 x 25 x 3	6
751 to 1050	40 x 40 x 3	6
1051 to 1500	40 x 40 x 3	10
1501 to 2100	50 x 50 x 3	10
2101 to 2400	50 x 50 x 5	10
2401 and over	50 x 50 x 6	10
  - .4 Upper hanger attachments:
    - .1 For concrete: manufactured concrete inserts.
    - .2 For steel joist: manufactured joist clamp.
    - .3 For steel beams: manufactured beam clamps:

**Part 3 EXECUTION**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions are acceptable for metal duct installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect elements to which ductwork hangers will be attached.
  - .2 Visually inspect elements which will be penetrated by ductwork.
  - .3 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .4 Proceed with installation only after unacceptable conditions have been remedied.

**3.2 GENERAL**

- .1 Do work in accordance with NFPA 90A, SMACNA, and drawings as indicated.
- .2 Do not break continuity of insulation vapour barrier with hangers or rods.
  - .1 Insulate strap hangers 100 mm beyond insulated duct.
- .3 Support risers in accordance with SMACNA as indicated.
- .4 Install breakaway joints in ductwork on sides of fire separation.
- .5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.
- .6 Manufacture duct in lengths and diameter to accommodate installation of acoustic duct lining.
- .7 Where acoustic duct lining is noted, ductwork sizing stated on drawings represents clear inside dimensions.

**3.3 CONSTRUCTION**

- .1 Construct ductwork from site measurements and not from plans and shop drawings exclusively; failure to do so will not constitute an extra to the Contract.
- .2 Complete metal ducts within themselves with no single partition between ducts; cross brace ducts for rigidity where width of duct exceeds 450 mm; open corners are not acceptable.
- .3 Lap metal ducts in direction of air flow; hammer down edges and slips to leave interior of duct smooth.
- .4 Construct ductwork using materials in thicknesses indicated; reinforced and sealed for pressure class indicated, and as follows:
  - .1 Increase duct size gradually, not exceeding 15° divergence wherever possible; do not exceed 30° divergence upstream of equipment; do not exceed 45° convergence downstream of equipment.

- .2 Construct tees, bends and elbows with radius of not less than 1.5 times the width of duct on centreline; provide double wall air foil type turning vanes where turning radius is not possible and where rectangular elbows are specified; provide turning vanes of perforated metal type with fibreglass inside, where acoustical lining is provided.
- .5 Rigidly construct metal ducts with joints mechanically tight, substantially airtight, braced and stiffened so as not to breathe, rattle, vibrate or sag; caulk duct joints and connections using sealant as ducts are being assembled; seal seams on fresh air and exhaust ducts watertight with mastic or high velocity duct sealant.
- .6 Weld stainless steel ductwork and ensure a smooth finish on all interiors.
- .7 Fabricate continuously welded round and oval duct fittings two gauge thicknesses heavier than duct gauges indicated in SMACNA Standard.
- .8 Set plenum doors 150 mm above floor; arrange door swings so that fan static holds door in closed position.
- .9 All supply and return ductwork shall be galvanized as per section 2.

### 3.4 HANGERS

- .1 Strap hangers: install in accordance with SMACNA.
- .2 Angle hangers: complete with locking nuts and washers.
- .3 Hanger spacing: in accordance with SMACNA, or as follows, whichever is more stringent:

<u>Duct Size</u>	<u>Spacing</u>
(mm)	(mm)
to 1500	3000
1501 and over	2500

### 3.5 DUCT SEALING

- .1 Seal all supply, return and exhaust duct joints, longitudinal as well as transverse, using the following:
  - .1 Low Pressure Ductwork:
    - .1 Slip Joints: Apply heavy brush-on high pressure duct sealant. Apply second application after the first application has completely dried out. Where metal clearance exceeds 1.519 mm use heavy mastic type sealant.
    - .2 Flanged Joints: Soft elastomer butyl or extruded form of sealant between flanges followed by an application of heavy brush-on high pressure duct sealant.
    - .3 Other Joints: Heavy mastic type sealant.
  - .2 Medium and High Pressure Ductwork: Combination of woven fabrics and sealing compound followed by an application of high pressure duct sealant.
- .2 Duct tapes as sealing method are not permitted.
- .3 Surfaces to receive sealant should be free from oil, dust, dirt, moisture, rust and other substances that inhibit or prevent bonding.

- .4 Prior to sealing all ductwork, demonstrate sealing of a section of each type of duct and obtain approval from the Departmental Representative.
- .5 Do not insulate any section of the ductwork until it has been inspected and approved of duct sealant application.
- .6 All existing ductwork to remain shall be sealed with sprayable water based duct sealant. Sealant shall be indoor grade, listed for up to 15" w.g., flame and smoke development shall be 0/5.
  - .1 Sealant shall be a synthetic latex emulsion water based type with a service temperature from 0F to 220F.
  - .2 Pressure test of ductwork existing ductwork shall be carried out prior to making connections to new distribution system.

### 3.6 LEAKAGE TESTS

- .1 In accordance with SMACNA HVAC Duct Leakage Test Manual.
- .2 Do leakage tests in sections.
- .3 Make trial leakage tests as instructed to demonstrate workmanship.
- .4 Do not install additional ductwork until trial test has been passed.
- .5 Test section minimum of 30 m long with not less than three branch takeoffs and two 90 degrees elbows.
- .6 Complete test before performance insulation or concealment Work.

### 3.7 INSTALLATION

- .1 Locate ducts with sufficient space around equipment to allow normal operation and maintenance activities.
  - .2 Coordinate the location of duct access doors with ceiling construction.
  - .3 Provide openings in ductwork where required to accommodate thermometers and controllers.
  - .4 Provide pitot tube openings where required for testing of systems, including metal cap with spring device or screw to prevent air leakage; install insulation material inside a metal ring where openings are provided in insulated ductwork.
  - .5 Interrupt duct linings at fire, balancing, backdraft and smoke dampers so as not to interfere with operation of devices; provide sheet metal edge protection over linings on both side of damper device.
  - .6 Shield ductwork from dust and construction material during construction; clean any ductwork found to be dirty at no extra cost to the Contract.
  - .7 Install ducts associated with fans subject to forced vibration with flexible connections immediately adjacent to equipment.
  - .8 Do not use flexible duct to change direction.
  - .9 Provide a minimum of three (3) duct diameters of straight metal duct between box inlet and flexible connector.
-

- .10 Connect diffusers or troffer boots to low pressure ducts with 300 mm maximum stretched length of flexible duct; hold in place with sealant, and strap or clamp.
- .11 Prove that ductwork is substantially air tight before covering or concealing.
- .12 Clean duct systems and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment that may be harmed by excessive dirt with filters, or bypass during cleaning.

### 3.8 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 Sheet Metal and Air Conditioning National Association (SMACNA)
  - .1 SMACNA HVAC Duct Construction Standards, Metal and Flexible-2015.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for dampers and include product characteristics, performance criteria, physical size, finish and limitations.

**1.3 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00.
- .2 Operation and Maintenance Data: submit operation and maintenance data for dampers for incorporation into manual.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect dampers from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 20.

**Part 2 PRODUCTS**

**2.1 GENERAL**

- .1 Manufacture to SMACNA standards.

**2.2 SPLITTER DAMPERS**

- .1 Fabricate from same material as duct but one sheet metal thickness heavier, with appropriate stiffening.
-

- .2 Single thickness construction.
- .3 Control rod with locking device and position indicator.
- .4 Rod configuration to prevent end from entering duct.
- .5 Pivot: piano hinge.
- .6 Folded leading edge.

## 2.3 SINGLE BLADE DAMPERS

- .1 Fabricate from same material as duct, but one sheet metal thickness heavier. V-groove stiffened.
- .2 Size and configuration to recommendations of SMACNA, except maximum height as indicated.
- .3 Locking quadrant with shaft extension to accommodate insulation thickness.
- .4 Inside and outside nylon end bearings.
- .5 Channel frame of same material as adjacent duct, complete with angle stop.

## 2.4 MULTI-BLADED DAMPERS

- .1 Factory manufactured of material compatible with duct.
- .2 Opposed blade: configuration, metal thickness and construction to recommendations of SMACNA.
- .3 Maximum blade height: as indicated.
- .4 Bearings: self-lubricating nylon.
- .5 Linkage: shaft extension with locking quadrant.
- .6 Channel frame of same material as adjacent duct, complete with angle stop.
- .7 Maximum leakage: 21 L/s/m<sup>2</sup> at 250 Pa.

## 2.5 FIRE DAMPERS

- .1 Fabricate of galvanized steel or prime coated black steel weighted to close and lock in closed position when released by fusible link.
  - .2 Provide curtain type fire dampers with damper blades retained out of air stream in a recess so that free area of connecting ductwork is not reduced.
  - .3 Set fusible links to activate at 160°C.
  - .4 Provide all supplemental material, steel angles or channels to provide a fully compliant installation, keeping with the manufacturer's listing.
-

**Part 3 EXECUTION**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify that site conditions are acceptable for damper installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect site conditions in area where dampers are to be installed.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.

**3.2 INSTALLATION**

- .1 Install where indicated.
- .2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
- .3 Locate balancing dampers in each branch duct, for supply, return and exhaust systems.
- .4 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.
- .5 Dampers: vibration free.
- .6 Ensure damper operators are observable and accessible.
- .7 Corrections and adjustments conducted by Departmental Representative.

**3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 National Fire Protection Association (NFPA)
  - .1 NFPA 90A-15, Standard for the Installation of Air-Conditioning and Ventilating Systems.
- .2 Sheet Metal and Air-Conditioning Contractors' National Association (SMACNA)
  - .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2005.
  - .2 SMACNA IAQ Guideline for Occupied Buildings under Construction, 2005.
- .3 Underwriters' Laboratories (UL)
  - .1 UL 181-2013, Standard for Factory-Made Air Ducts and Air Connectors.
- .4 Underwriters' Laboratories of Canada (ULC)
  - .1 CAN/ULC-S110-2013, Standard Methods of Tests for Air Ducts.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for flexible ducts and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Indicate:
    - .1 Thermal properties.
    - .2 Friction loss.
    - .3 Acoustical loss.
    - .4 Leakage.
    - .5 Fire rating.
- .3 Test and Evaluation Reports:
  - .1 Catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
  - .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
-

- .3 Storage and Handling Requirements:
  - .1 Store materials off ground, indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect flexible ducts from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 20.

## **Part 2 PRODUCTS**

### **2.1 GENERAL**

- .1 Factory fabricated to CAN/ULC-S110.
- .2 Pressure drop coefficients listed below are based on relative sheet metal duct pressure drop coefficient of 1.00.
- .3 Flame spread rating not to exceed 25. Smoke developed rating not to exceed 50.

### **2.2 NON-METALLIC - UNINSULATED**

- .1 Type 3: non-collapsible, aluminum foil/mylar type, mechanically bonded to, and helically supported by, external steel wire, as indicated.
- .2 Performance:
  - .1 Factory tested to 2.5 kPa without leakage.
  - .2 Maximum relative pressure drop coefficient: 3.

### **2.3 NON-METALLIC - INSULATED**

- .1 Type 4: non-collapsible, coated aluminum foil/mylar type mechanically bonded to, and helically supported by, external steel wire with factory applied, 37 mm thick flexible mineral fibre thermal insulation with vapour barrier and vinyl reinforced mylar/neoprene laminate jacket, as indicated.
- .2 Performance:
  - .1 Factory tested to 2.5 kPa without leakage.
  - .2 Maximum relative pressure drop coefficient: 3.
  - .3 Thermal loss/gain: 1.6 RSI.

## **Part 3 EXECUTION**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that site conditions are acceptable for flexible ducts installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect area where flexible ducts are to be installed.

- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied.

### 3.2 DUCT INSTALLATION

- .1 Install in accordance with: CAN/ULC-S110, UL 181, NFPA 90A, and SMACNA.

### 3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 American National Standards Institute/Air Movement and Control Association (ANSI/AMCA)
  - .1 ANSI/AMCA Standard 99-2010, Standards Handbook.
  - .2 ANSI/AMCA Standard 210-2007/( ANSI/ASHRAE 51-07), Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
  - .3 ANSI/AMCA Standard 300-2014, Reverberant Room Method for Sound Testing of Fans.
  - .4 ANSI/AMCA Standard 301-2014, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
  - .5 AMCA Standard 99-0401, Classification for Spark Resistant Construction.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for HVAC fans and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Provide:
    - .1 Fan performance curves showing point of operation, flow rate, kW, static pressure, and efficiency.
    - .2 Sound rating data at point of operation.
  - .2 Indicate:
    - .1 Motors, sheaves, bearings, shaft details.
    - .2 Minimum performance achievable with variable speed controllers, as appropriate.
    - .3 Manufacturer name and model number
    - .4 Electrical voltage, phase, and current draw

**1.3 MAINTENANCE MATERIAL SUBMITTALS**

- .1 Extra Materials:
  - .1 Submit in accordance with Section 01 78 00.
    - .1 Provide:
      - .1 Furnish list of individual manufacturer's recommended spare parts for equipment, include:
        - .1 Bearings and seals.
        - .2 Addresses of suppliers.

- .3 List of specialized tools necessary for adjusting, repairing or replacing.

## **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect HVAC fans from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Section 01 74 20.

## **Part 2 PRODUCTS**

### **2.1 SYSTEM DESCRIPTION**

- .1 Performance Requirements:
  - .1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards in force.
  - .2 Capacity: flow rate, static pressure, W, efficiency, revolutions per minute, power, model, size, sound power data and as indicated on schedule.
  - .3 Fans: statically and dynamically balanced, constructed in conformity with ANSI/AMCA Standard 99.
  - .4 Sound ratings: comply with ANSI/AMCA Standard 301, tested to ANSI/AMCA Standard 300. Supply unit with ANSI/AMCA certified sound rating seal.
  - .5 Performance ratings: based on tests performed in accordance with ANSI/AMCA Standard 210. Supply unit with ANSI/AMCA certified rating seal, except for propeller fans smaller than 300 mm diameter.

### **2.2 FANS GENERAL**

- .1 Motors:
    - .1 Motors to be in accordance with the requirements of ASHRAE 90.1.
    - .2 Motors under 373 W: speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, 120 V, unless otherwise specified or indicated.
    - .3 For use with variable speed controllers.
    - .4 Sizes as indicated on equipment schedules.
-

- .2 Accessories and hardware: matched sets of V-belt drives, adjustable slide rail motor bases, belt guards, coupling guards fan or safety screens as indicated and as specified in Section 23 05 13.
- .3 Factory primed before assembly in colour standard to manufacturer.
- .4 Scroll casing drains: as indicated.
- .5 Finish on fume hood exhaust fans: mill.
- .6 Bearing lubrication systems plus extension lubrication tubes where bearings are not easily accessible.
- .7 Statically and dynamically balance fans so no objectionable vibration or noise is transmitted to occupied areas of the building.
- .8 Provide fans capable of accommodating static pressure variations of  $\pm 10\%$  with no objectionable operating characteristics.
- .9 Vibration isolation: to Section 23 05 48.
- .10 Flexible connections: to Section 23 33 00.

## 2.3 IN-LINE CENTRIFUGAL FANS

- .1 Characteristics and construction: as for centrifugal fan wheels, with axial flow construction and direct or belt drive, as indicated on the equipment schedules.
- .2 Provide AMCA arrangements 1 or 9 as indicated with stiffened flanges, smooth rounded inlets, and stationary guide vanes.
- .3 Wheel:
  - 1. Non-overloading, backward inclined centrifugal wheel
  - 2. Constructed of aluminum
  - 3. Statically and dynamically balanced in accordance to AMCA Standard 204-05
  - 4. The wheel cone and fan inlet will be matched and shall have precise running tolerances for maximum performance and operating efficiency
  - 5. Single thickness blades are securely riveted or welded to a heavy gauge back plate and wheel cone.
- .4 Motors:
  - 1. AC Induction Motor
    - a. Motor enclosures: Open dripproof
    - b. Motors are permanently lubricated, heavy duty ball bearing type to match with the fan load and pre-wired to the specific voltage and phase
- .5 Housing/Cabinet Construction
  - 1. Construction material: Aluminum
  - 2. Square design constructed of heavy gauge galvanized steel and shall include square duct mounting collars
  - 3. Housing and bearing supports shall be constructed of heavy gauge bolted and welded steel construction to prevent vibration and to rigidly support the shaft and bearing assembly.
  - 4. Housing Supports and Drive Frame:
    - a. Housing supports are constructed of structural steel with formed flanges
    - b. Drive frame is welded steel which supports the motor

- .6 Duct Collars:
  - 1. Square design to provide a large discharge area
  - 2. Inlet and discharge collars provide easy duct connection
- .7 Access Panel:
  - 1. Two sided access panels, permit easy access to all internal components
  - 2. Located perpendicular to the motor mounting panel

### **Part 3 EXECUTION**

#### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions are acceptable for HVAC fan installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect installation area.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.

#### **3.2 FAN INSTALLATION**

- .1 Install fans as indicated
- .2 Bearings and extension tubes to be easily accessible.
- .3 Access doors and access panels to be easily accessible.
- .4 Provide vibration isolation as per schedules.
- .5 Provide roof curbs and sleepers in accordance with manufacturer recommendation.
- .6 Coordinate final location of exhaust fans with ceiling access panels for sufficient access to fan components.

#### **3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 American National Standards Institute/Air Movement and Control Association (ANSI/AMCA)
  - .1 ANSI/AMCA Standard 210-2007/(ANSI/ASHRAE 51-07), Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
- .2 International Organization of Standardization (ISO)
  - .1 ISO 3741-2010, Acoustics-Determination of Sound Power Levels of Noise Sources Using Sound Pressure - Precision Methods for Reverberation Rooms.
- .3 National Fire Protection Association (NFPA)
  - .1 NFPA 90A-15, Standard for the Installation of Air Conditioning and Ventilating Systems.
- .4 Underwriter's Laboratories (UL)
  - .1 UL 181-2013, Factory-Made Air Ducts and Air Connectors.
- .5 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
  - .1 ASHRAE 130-2008, Methods of Testing Air Terminal Units

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for air terminal units and include product characteristics, performance criteria, physical size, electrical connection information, finish and limitations.
- .3 Shop Drawings:
  - .1 Indicate the following:
    - .1 Capacity.
    - .2 Pressure drop.
    - .3 Noise rating.
    - .4 Leakage.
    - .5 Electrical connection requirements.
- .4 Test and Evaluation Reports:
  - .1 Test data: to procedures documented by ASHRAE 130

**1.3 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00.
-

- .2 Operation and Maintenance Data: submit operation and maintenance data for air terminal units for incorporation into manual.

#### **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground, indoors, and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect air terminal units from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 20.

### **Part 2 PRODUCTS**

#### **2.1 SYSTEM DESCRIPTION**

- .1 Performance Requirements:
  - .1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from certified ADC (Air Diffusion Council) testing agency signifying adherence to codes and standards.

#### **2.2 MANUFACTURED UNITS**

- .1 Terminal units of the same type to be product of one manufacturer.
- .2 Single duct variable volume pressure independent box.
  - .1 Reset to any airflow between zero and the maximum cataloged air volume.
  - .2 Minimum operating pressure shall not exceed 35 Pa.
  - .3 Maximum operating pressure shall be not less than 746 Pa.
  - .4 Provide factory 1000 mm acoustically lined attenuator.
  - .5 Performance shall be AHRI certified.
  - .6 Air flow sensor shall be of a cross configuration located at the inlet of the assembly. The sensor be accurate to 5% with a 90° sheet metal elbow directly at the inlet of the assembly. The air flow sensor shall amplify the sensed air flow signal.
  - .7 The assembly casing shall be constructed of 22 gauge zinc coated steel, internally lined with 13 MM thick fiberglass insulation which complies with UL-181-2013, and NFPA 90A-15.

- .8 The primary air valve damper shall be heavy gauge metal, with peripheral gasket and solid steel shaft, pivoted in self-lubricating bearings. In the full closed position, air leakage past the closed damper shall not exceed 2% of the nominal catalog rating at 746 Pa inlet static pressure, when tested in accordance with ASHRAE 130.
  - .9 Coordinate control points with Controls Contractor.
  - .3 Constant volume series flow Fan Power boxes
    - .1 Terminal units of the same type to be product of one manufacturer.
    - .2 Primary air assemblies shall be pressure independent and shall reset to any air flow between zero and the maximum cataloged air volume.
    - .3 Sound rating of air distribution assemblies shall not exceed 30 NC
    - .4 Reset to any airflow between zero and the maximum cataloged air volume.
    - .5 Provide factory 1000 mm acoustically lined attenuator.
    - .6 Performance shall be AHRI certified.
    - .7 Air flow sensor shall be of a cross configuration located at the inlet of the assembly. The sensor be accurate to 5% with a 90° sheet metal elbow directly at the inlet of the assembly. The air flow sensor shall amplify the sensed air flow signal.
    - .8 The assembly casing shall be constructed of 22 gauge zinc coated steel, internally lined with 19 MM thick fiberglass insulation which complies with UL-181-2013.
    - .9 The primary air valve damper shall be heavy gauge metal, with peripheral gasket and solid steel shaft, pivoted in self-lubricating bearings. In the full closed position, air leakage past the closed damper shall not exceed 2% of the nominal catalog rating at 746 Pa inlet static pressure, when tested in accordance with ASHRAE 130.
    - .10 Casing shall incorporate an internal sound reduction baffle.
    - .11 Unit casing shall have a bottom access door to allow removal of fan and servicing of unit.
    - .12 Fan blower shall be constructed of steel with forward curved blades, dynamically balanced wheels and direct drive motor. Motors shall be Electronically Commutated Motor (ECM) DC Brushless motors complete with and operated by a single phase integrated controllers/inverter that operates the wound stator and sensor motor position to electronically commute the stator. All motors shall be designed for synchronous rotation. Motor rotor shall be permanent magnet type with near zero rotor losses. Motor shall be permanently lubricated with ball bearings. Motor shall maintain a minimum of 70% efficiency over its entire operating range. Motors shall be direct coupled to the blower. Provide isolation between motor and blower assembly. Provide manual fan speed control for field adjustment of air flow set-point.
    - .13 Speed control shall accept a standard 0 -10 VDC or 0-20mA signal for remote fan adjustment from a BAS.
    - .14 Coordinate control points with Controls Contractor.
-

**Part 3 EXECUTION**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify that site conditions are acceptable for air terminal units installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect area where air terminal units are to be installed.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.

**3.2 INSTALLATION**

- .1 Install in accordance with manufacturers recommendations.
- .2 Support equipment independently of ductwork.
- .3 Install with at least 1000 mm of flexible inlet ducting and minimum of four duct diameters of straight inlet duct, same size as inlet.
- .4 Locate controls, dampers and access panels for easy access.

**3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for diffusers, registers and grilles and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Indicate following:
    - .1 Capacity.
    - .2 Throw and terminal velocity.
    - .3 Noise criteria.
    - .4 Pressure drop.
    - .5 Neck velocity.
    - .6 Dimensions.

**1.2 MAINTENANCE MATERIAL SUBMITTALS**

- .1 Extra Materials:
  - .1 Provide maintenance materials in accordance with Section 01 78 00.
  - .2 Include:
    - .1 Keys for volume control adjustment.
    - .2 Keys for air flow pattern adjustment.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
  - .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
  - .3 Storage and Handling Requirements:
    - .1 Store materials off ground, indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
    - .2 Store and protect diffuser, registers and grilles from nicks, scratches, and blemishes.
    - .3 Replace defective or damaged materials with new.
  - .4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as in accordance with Section 01 74 20.
-

**Part 2 PRODUCTS**

**2.1 SYSTEM DESCRIPTION**

- .1 Performance Requirements:
  - .1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

**2.2 GENERAL**

- .1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity as indicated.
- .2 Frames:
  - .1 Full perimeter gaskets.
  - .2 Frames where set into gypsum board and as indicated on drawings.
  - .3 Concealed fasteners.
- .3 Concealed manual volume control damper operators.
- .4 Colour: as indicated on drawings.

**2.3 MANUFACTURED UNITS**

- .1 Grilles, registers and diffusers of same generic type, products of one manufacturer.

**2.4 SUPPLY GRILLES AND REGISTERS**

- .1 As indicated on drawings.

**2.5 RETURN AND EXHAUST GRILLES AND REGISTERS**

- .1 As indicated on drawings.

**2.6 DIFFUSERS**

- .1 As indicated on drawings.

**Part 3 EXECUTION**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify that site conditions are acceptable for diffuser, register and grille installation in accordance with manufacturer's written instructions.
    - .1 Visually inspect area where the diffuser, grille, or register is to be installed.
    - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
    - .3 Proceed with installation only after unacceptable conditions have been remedied.
-

### **3.2 INSTALLATION**

- .1 Install in accordance with manufacturer's instructions.
- .2 Install with screws in countersunk holes where fastenings are visible.
- .3 Bolt grilles, registers and diffusers, in place, in areas which may be subject to accidental impact.

### **3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

---

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Not used.

**1.2 REFERENCES**

- .1 American National Standards Institute/American Society of Heating, Refrigeration and Air-Conditioning Engineers (ANSI/ASHRAE)
  - .1 ANSI/ASHRAE 52.2-2012, Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particulate Size.
  - .2 ANSI/ASHRAE 127-2012, Method of Testing for Rating Computer and Data Processing Room Unitary Air-Conditioners.
- .2 ASTM International
  - .1 ASTM C547-11, Specification for Mineral Fiber Pipe Insulation.
- .3 CSA International
  - .1 CSA B52-13 Mechanical Refrigeration Code.
  - .2 CAN/CSA-C65614, Performance Standard for Single Package Central Air-Conditioners and Heat Pumps.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for air conditioning components and accessories and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Indicate on drawings:
    - .1 Major components and accessories including sound power levels of units.
    - .2 Type of refrigerant used.
    - .3 Cooling/heating performance and capacities.
    - .4 Maximum and minimum operating ambient temperatures.
    - .5 Maximum refrigerant pipe length.
    - .6 Electrical wiring diagram.
    - .7 Electrical voltages, phase, amperages.

**1.4 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00.
-

- .2 Operation and Maintenance Data: submit operation and maintenance data for air conditioning components for incorporation into manual.

## **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect air conditioning components from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

## **1.6 WARRANTY**

- .1 For LAN room air conditioning 12 months warranty period.

## **Part 2 PRODUCTS**

### **2.1 DESCRIPTION**

#### **1.1 TYPE**

- 1.1.1 Provide split type AC units with
  - 1.1.1.1 variable speed compressors,
  - 1.1.1.2 R410A refrigerant,
  - 1.1.1.3 indoor wall mounted evaporator unit
  - 1.1.1.4 outdoor condenser/compressor units
  - 1.1.1.5 ultra low ambient kit capable of operating in -40C ambient conditions
  - 1.1.1.6 standalone programmable thermostat
- 1.1.2 The system installed within each building shall be a single complete system with interconnected refrigerant piping and common condenser units.
- 1.1.3 All equipment including in the refrigeration system shall be from a single manufacturer.
- 1.1.4 Provide condensate pumps rated for 120V.

#### **1.2 CONTROLS**

- 1.2.1 Provide factory digital controls complete with
  - 1.2.1.1 Programmable thermostat located in each rooms served by an evaporator unit.

- 1.2.1.2 Temperature set point shall be offset by 2°C cooler than the room's zone thermostat.

## **2.2 REFRIGERANT CHARGE**

- .1 Charge refrigerant system at factory, seal and test.
- .2 Holding charge of refrigerant applied at factory.

## **Part 3 EXECUTION**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for air conditioning components installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

### **3.2 GENERAL**

- .1 Install as indicated, to manufacturer's recommendations, and to EPS 1/RA/2.
- .2 Manufacturer to certify installation.
- .3 Run drain line from cooling coil condensate drain pan to terminate over nearest floor drain.

### **3.3 EQUIPMENT PREPARATION**

- .1 Provide services of manufacturer's field engineer to set and adjust equipment for operation as specified.

### **3.4 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

### **3.5 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by computer room air conditioning installation.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 Definitions:
  - .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.
- .2 Reference Standards:
  - .1 CSA Group
    - .1 CSA C22.1-15, Canadian Electrical Code, Part 1 (23rd Edition), Safety Standard for Electrical Installations.
    - .2 CAN3-C235-83(R2015), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
  - .2 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
    - .1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
  - .2 Product Data:
    - .1 Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.
  - .3 Shop drawings:
    - .1 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.
    - .2 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
    - .3 Indicate on drawings clearances for operation, maintenance, and replacement of operating equipment devices.
    - .4 Submit drawings and product data to Departmental Representative for consultant and client review.
    - .5 If changes are required, notify Departmental Representative of these changes before they are made.
  - .4 Certificates:
    - .1 Provide CSA certified equipment and material.
    - .2 Where CSA certified equipment and material is not available, submit such equipment and material to authority having jurisdiction inspection authorities for special approval before delivery to site.
-

- .3 Submit test results of installed electrical systems and instrumentation.
- .4 Permits and fees: in accordance with General Conditions of contract.
- .5 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.
- .6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.
- .5 Manufacturer's Field Reports: submit to Departmental Representative manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

### **1.3 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00.
- .2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.
  - .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
  - .2 Operating instructions to include following:
    - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
    - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
    - .3 Safety precautions.
    - .4 Procedures to be followed in event of equipment failure.
    - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
  - .3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.
  - .4 Post instructions where directed.
  - .5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
  - .6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

### **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

- .2 Store and protect from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan and Waste Reduction Workplan related to Work of this Section and in accordance with Section 01 74 20.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Construction Waste Management Plan and Waste Reduction Workplan in accordance with Section 01 74 20.

## **Part 2 PRODUCTS**

### **2.1 DESIGN REQUIREMENTS**

- .1 Operating voltages: to CAN3-C235.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
  - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .3 Language operating requirements: provide identification nameplates and labels for control items in English.

### **2.2 MATERIALS AND EQUIPMENT**

- .1 Provide material and equipment in accordance with Section 01 61 00.
- .2 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .3 Factory assemble control panels and component assemblies.

### **2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS**

- .1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.
- .2 Control wiring and conduit: in accordance with 26 05 34 except for conduit, wiring and connections below 50 V which are related to control systems specified in mechanical sections and as indicated on mechanical drawings.

### **2.4 WARNING SIGNS**

- .1 Warning Signs: in accordance with requirements of authority having jurisdiction, inspection authorities and Departmental Representative.
- .2 Decal signs, minimum size 175 x 250 mm.

### **2.5 WIRING TERMINATIONS**

- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

## 2.6 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates and labels as follows:
  - .1 Nameplates: lamicoid, matt white finish face, black core, lettering accurately aligned and engraved into core mechanically attached with self tapping screws.
  - .2 Nameplates for Critical Power Panels: same as above, except with blue lamicoid
  - .3 Sizes as follows:

<u>NAMEPLATE SIZES</u>			
Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters
- .2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.
- .3 Wording on nameplates and labels to be approved by Departmental Representative prior to manufacture.
- .4 Allow for minimum of twenty-five (25) letters per nameplate and label.
- .5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .6 Identify equipment with Size 3 labels engraved "ASSET INVENTORY NO. [\_\_\_\_\_]" as directed by Departmental Representative.
- .7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .8 Terminal cabinets and pull boxes: indicate system and voltage.
- .9 Transformers: indicate capacity, primary and secondary voltages.

## 2.7 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour coding: to CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

## 2.8 CONDUIT AND CABLE IDENTIFICATION

- .1 Colour code conduits, boxes and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.
- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

<u>System</u>	<u>Prime</u>	<u>Auxiliary</u>
up to 250 V	Yellow	

Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security	Red	Yellow

## 2.9 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

- .1 Paint indoor switchgear and distribution enclosures light gray.

## 2.10 SERVICE INTERRUPTIONS

- .1 Coordinate all service interruptions in advance with the Departmental Representative, in accordance with 01 14 00 Work Restrictions and provide:

- .1 List of all scheduled interruptions
  - .2 Areas and equipment affected by each interruption
  - .3 Duration of each interruption

- .2 Minimum of 48 hour notice required for all service interruptions

## Part 3 EXECUTION

### 3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.

- .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

### 3.2 INSTALLATION

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
-

### 3.3 NAMEPLATES AND LABELS

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

### 3.4 CONDUIT AND CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete.
  - .1 Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.
- .2 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

### 3.5 LOCATION OF OUTLETS

- .1 Locate outlets in accordance with Section 26 05 32.
- .2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.
- .3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.
- .4 Locate light switches on latch side of doors.
  - .1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.

### 3.6 MOUNTING HEIGHTS

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- .3 Install electrical equipment at following heights unless indicated otherwise.
  - .1 Local switches: 1100 mm.
  - .2 Wall receptacles:
    - .1 General: 400 mm.
    - .2 Above top of continuous baseboard heater: 200 mm.
    - .3 Above top of counters or counter splash backs: 175 mm.
    - .4 In mechanical rooms: 1200 mm.
    - .5 TV height: 1600mm.
  - .3 Panelboards: as required by Code or as indicated.
  - .4 Telephone and interphone outlets: 400 mm.
  - .5 Wall mounted telephone and interphone outlets: 1100 mm.
  - .6 Fire alarm stations: 1200 mm.
  - .7 Fire alarm horn/strobe: 2300 mm.
  - .8 Television outlets: 1200 mm.

- .9 Doorbell pushbuttons: 1100 mm.

### 3.7 CO-ORDINATION OF PROTECTIVE DEVICES

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

### 3.8 FIELD QUALITY CONTROL

- .1 Load Balance:
  - .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
  - .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
  - .3 Provide upon completion of work, load balance report as directed in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS, phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.
- .2 Conduct following tests in accordance with Section 01 45 00.
  - .1 Circuits originating from branch distribution panels.
  - .2 Lighting and its control.
  - .3 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
  - .4 Systems: fire alarm, communications.
  - .5 Insulation resistance testing:
    - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
    - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
    - .3 Check resistance to ground before energizing.
- .3 Carry out tests in presence of Departmental Representative.
- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .5 Manufacturer's Field Services:
  - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
  - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

**3.9 SYSTEM STARTUP**

- .1 Instruct Departmental Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.
- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

**3.10 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00.

**1.2 REFERENCES**

- .1 CSA International
  - .1 CSA C22.2 No.18.1-13, Metallic outlet boxes (Tri-national standard, with UL 514A and ANCE NMX- J-023/1).
  - .2 CAN/CSA-C22.2 No.18.2-06(R2011), Nonmetallic Outlet Boxes.
  - .3 CSA C22.2 No.18.3-12, Conduit, tubing, and cable fittings (Tri-national standard, with ANCE NMX-J-017 and UL 514B).
  - .4 CAN/CSA-C22.2 No.18.4-15, Hardware for the Support of Conduit, Tubing, and Cable (Bi-National standard, with UL 2239).
  - .5 CSA C22.2 No. 18.5-13, Positioning devices (Bi-national standard, with UL 1565).
  - .6 CSA C22.2 NO. 65-13, Wire connectors (Tri- national standard, with UL 486A-486B and NMX-J-543-ANCE).
- .2 National Electrical Manufacturers Association (NEMA).

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for wire and box connectors and include product characteristics, performance criteria, physical size, finish and limitations.

**1.4 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00.
- .2 Operation and Maintenance Data: submit operation and maintenance data for wire and box connectors for incorporation into manual.

**1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
  - .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
  - .3 Storage and Handling Requirements:
    - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
-

- .2 Store and protect wire and box connectors from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan and Waste Reduction Workplan related to Work of this Section and in accordance with Section 01 74 20.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Construction Waste Management Plan and Waste Reduction Workplan in accordance with Section 01 74 20.

## **Part 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Pressure type wire connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.
- .2 Fixture type splicing connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.
- .3 Bushing stud connectors: to NEMA to consist of:
  - .1 Connector body and stud clamp for stranded, round copper conductors.
  - .2 Clamp for stranded, round copper conductors.
  - .3 Stud clamp bolts.
  - .4 Bolts for copper conductors.
  - .5 Sized for conductors as indicated.
- .4 Clamps or connectors for armoured cable, flexible conduit, as required to: CAN/CSA-C22.2 No.18.4.

## **Part 3 EXECUTION**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wire and box connectors installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

### **3.2 INSTALLATION**

- .1 Remove insulation carefully from ends of conductors and cables and:
  - .1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65.

- .2 Install fixture type connectors and tighten to CSA C22.2 No.65. Replace insulating cap.
- .3 Install bushing stud connectors in accordance with NEMA.

### 3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 PRODUCT DATA**

- .1 Provide product data in accordance with Section 01 33 00.

**1.2 DELIVERY, STORAGE AND HANDLING**

- .1 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, paddling, and packaging materials in accordance with Section 01 74 20.

**1.3 REFERENCE**

- .1 CSA Group
  - .1 C22.2 NO. 123-08 (R2012) - Metal Sheathed Cables
  - .2 C22.2 NO. 174-M1984 (R2012) - Cables and Cable Glands for Use in Hazardous Locations

**Part 2 PRODUCTS**

**2.1 BUILDING WIRES**

- .1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .2 Copper conductors: size as indicated, with 600 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE.
- .3 Conductors:
  - .1 Grounding conductor: copper.
  - .2 Circuit conductors: copper, size as indicated.
- .4 Insulation:
  - .1 Cross-linked polyethylene XLPE.
- .5 Inner jacket: polyvinyl chloride material.
- .6 Overall covering: thermoplastic polyvinyl chloride, compliant to applicable Building Code classification for this project.

**2.2 ARMOURED CABLES**

- .1 Conductors: insulated, copper, size as indicated.
  - .2 Type: AC90 - sheath over cable assembly and under armour.
  - .3 Armour: interlocking type fabricated from aluminum strip.
  - .4 Type: PVC jacket over thermoplastic armour and compliant to applicable Building Code classification for this project.
  - .5 Connectors: anti short connectors.
-

## **2.3 VARIABLE FREQUENCY DRIVE CABLES**

- .1 Variable Frequency (Speed) Drive Cables: Provide variable frequency drive cables meeting the requirements of CSA C22.2 No. 123 and CSA C22.2 No. 174 from all VFD's to each designated motor load, comprised as follows:
  - .1 Sectored ground design consisting of 3 bare bonding conductors
  - .2 1000 volt rated cross linked polyethylene insulated phase conductors
  - .3 FT4 rated PVC outer jacket
  - .4 Sized to suit project requirements

## **Part 3 EXECUTION**

### **3.1 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00.
- .2 Perform tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.

### **3.2 GENERAL CABLE INSTALLATION**

- .1 Terminate cables in accordance with Section 26 05 20.
- .2 Cable Colour Coding: to Section 26 05 00.
- .3 Conductor length for parallel feeders to be identical.
- .4 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.
- .5 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.
- .6 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e. common neutrals not permitted.
- .7 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

### **3.3 INSTALLATION OF BUILDING WIRES**

- .1 Install wiring as follows:
  - .1 In conduit systems in accordance with Section 26 05 34.

### **3.4 INSTALLATION OF ARMoured CABLES**

- .1 Group cables wherever possible on channels.
-

**3.5            INSTALLATION OF VARIABLE FREQUENCY DRIVES**

- .1        Install and connect to all variable frequency drives (VFD's) supplied with mechanical equipment, and in accordance with VFD cable manufacturers installation requirements.
- .2        Provide input power supply to VFD's; provide VFD cable from VFD to designated motor.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 00 Common Work Results - For Electrical

**1.2 REFERENCES**

- .1 American National Standards Institute /Institute of Electrical and Electronics Engineers (ANSI/IEEE)
  - .1 ANSI/IEEE 837-02, IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.
  - .2 Operations and Maintenance 2009.
- .2 CSA International
  - .1 CSA Z32-09, Electrical Safety and Essential Electrical Systems in Health Care Facilities.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for grounding equipment and include product characteristics, performance criteria, physical size, finish and limitations.

**1.4 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00.
- .2 Operation and Maintenance Data: submit operation and maintenance data for grounding equipment for incorporation into manual.

**1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
  - .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
  - .3 Storage and Handling Requirements:
    - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
    - .2 Store and protect grounding equipment from nicks, scratches, and blemishes.
    - .3 Replace defective or damaged materials with new.
-

**Part 2 PRODUCTS**

**2.1 EQUIPMENT**

- .1 Grounding conductors: bare stranded copper, soft annealed, sized per Code or as indicated.
- .2 Insulated grounding conductors: green, copper conductors, sized per Code or as indicated.
- .3 Ground bus: copper, size size 6 mm x 50 mm x 0.6 m long, complete with insulated supports, fastenings, connectors.
- .4 Non-corroding accessories necessary for grounding system shall be mechanical type made of silicon bronze, including but not necessarily limited to:
  - .1 Grounding and bonding bushings.
  - .2 Protective type clamps.
  - .3 Bolted type conductor connectors.
  - .4 Thermit welded type conductor connectors.
  - .5 Bonding jumpers, straps.
  - .6 Pressure wire connectors.

**Part 3 EXECUTION**

**3.1 INSTALLATION GENERAL**

- .1 Where EMT is used, run ground wire in conduit.
  - .2 Install connectors in accordance with manufacturer's instructions.
  - .3 Protect exposed grounding conductors from mechanical injury.
  - .4 Use mechanical connectors for grounding connections to equipment provided with lugs.
  - .5 Soldered joints not permitted.
-

- .6 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Bonding conductor shall be installed within the conduit.
- .7 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.
- .8 Bond single conductor, metallic armoured cables to ground at supply end, and provide non metallic entry plate at load end and run separate ground conductor.
- .9 Ground all low tension conduits that terminate in telecom rooms/closets/panels and at cable trays, using grounding clamps or grounding bushings.
- .10 Equipment Grounding: Install grounding connections from the equipment ground bus to typical equipment included in, but not necessarily limited to the following list. Service equipment, transformers, switch gear, panels, duct systems, frame of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting.
- .11 Communications Grounding: Extend existing grounding system to provide grounding and bonding system for all communication systems.
- .12 Ground items of electrical equipment in electrical room and IT equipment in communication equipment room to ground bus with individual bare stranded copper connections size 2/0 AWG.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.1-15, Canadian Electrical Code, Part 1, 23rd Edition.

**1.2 SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Provide shop drawings: in accordance with Section 01 33 00.
  - .1 Provide drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Waste Management and Disposal:
  - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

**Part 2 PRODUCTS**

**2.1 SPLITTERS**

- .1 Construction: sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.
- .2 Terminations: main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.
- .3 Spare Terminals: minimum three spare terminals or lugs on each connection or lug block sized less than 400 A.

**2.2 JUNCTION AND PULL BOXES**

- .1 Construction: welded steel enclosure.
- .2 Covers Flush Mounted: 25 mm minimum extension all around.
- .3 Covers Surface Mounted: screw-on flat covers.

**2.3 CABINETS**

- .1 Construction: welded sheet steel as indicated hinged door, handle, latch, lock with 2 keys and catch

- .2 Type E Empty: surface return flange mounting.
- .3 Type T Terminal: surface return flange containing 19 mm fire retardant treated plywood backboard.

**Part 3 EXECUTION**

**3.1 SPLITTER INSTALLATION**

- .1 Mount plumb, true and square to building lines.
- .2 Extend splitters full length of equipment arrangement except where indicated otherwise.

**3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION**

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Mount cabinets with top not higher than 2 m above finished floor except where indicated otherwise.
- .3 Install terminal block as indicated in Type T cabinets.
- .4 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

**3.3 IDENTIFICATION**

- .1 Equipment Identification: to Section 26 05 00.
- .2 Identification Labels: size 2 indicating system name, voltage and phase or as indicated.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.1-15, Canadian Electrical Code, Part 1, 23rd Edition.

**1.2 SUBMITTALS**

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

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00.
- .2 Waste Management and Disposal:
  - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 0.

**Part 2 PRODUCTS**

**2.1 OUTLET AND CONDUIT BOXES GENERAL**

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 Combination boxes with barriers where outlets for more than one system are grouped.
- .6 Shallow depth boxes where required for flush mounting, coordinate with architectural drawings

**2.2 GALVANIZED STEEL OUTLET BOXES**

- .1 One-piece electro-galvanized construction.
- .2 Single and multi-gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
- .3 Utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.
- .4 102 mm square or octagonal outlet boxes for lighting fixture outlets.
- .5 Extension and plaster rings for flush mounting devices in finished plaster or tile walls.

**2.3 CONDUIT BOXES**

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- .1 Cast FS or FD aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of devices.

## **2.4 FITTINGS - GENERAL**

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 35mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

## **Part 3 EXECUTION**

### **3.1 INSTALLATION**

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.
- .5 Vacuum clean interior of outlet boxes before installation of wiring devices.
- .6 Identify systems for outlet boxes as required.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.2 NO. 18.1-13, Metallic Outlet Boxes.
  - .2 CAN/CSA-C22.2 NO. 18.2-06(R2011), Nonmetallic Outlet Boxes.
  - .3 CSA C22.2 No. 18.3-12, Conduit, Tubing, and Cable Fittings (Tri-National standard, with ANCE NMX-J-017 and UL 514B).
  - .4 CAN/CSA-C22.2 No. 18.4-04(R2013), Hardware for the Support of Conduit, Tubing, and Cable.
  - .5 CSA C22.2 No. 45.1-07(R2012), Electrical Rigid Metal Conduit - Steel (Tri-National standard, with UL 6 and NMX-J-534-ANCE-2007).
  - .6 CSA C22.2 No. 56-13, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit
  - .7 CSA C22.2 No. 83-M1985(R2013), Electrical Metallic Tubing.
  - .8 CSA C22.2 No. 211.2-06(R2011), Rigid PVC (Unplasticized) Conduit.
  - .9 CAN/CSA-C22.2 No. 227.3-05(R2010), Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006).

**1.2 SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product data: submit manufacturer's printed product literature, specifications and datasheets.
  - .1 Submit cable manufacturing data.
- .3 Quality assurance submittals:
  - .1 Test reports: submit certified test reports.
  - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .3 Instructions: submit manufacturer's installation instructions.

**1.3 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

**Part 2 PRODUCTS**

**2.1 CONDUITS**

- .1 Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel threaded.
-

- .2 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.
- .3 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings with expanded ends.
- .4 Rigid pvc conduit: to CSA C22.2 No. 211.2.
- .5 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal.
- .6 Flexible pvc conduit: to CAN/CSA-C22.2 No. 227.3.

## **2.2 CONDUIT FASTENINGS**

- .1 One hole steel straps to secure surface conduits NPS 2 50 mm and smaller.
  - .1 Two hole steel straps for conduits larger than NPS 2 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at 3 m on centre.
- .4 Threaded rods, 6 mm diameter, to support suspended channels.

## **2.3 CONDUIT FITTINGS**

- .1 Fittings: to CSA C22.2 No. 18.3 and CAN/CSA- C22.2 No. 18.4, manufactured for use with conduit specified. Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for NPS 1 25 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT.
  - .1 Set-screws are not acceptable.

## **2.4 EXPANSION FITTINGS FOR RIGID CONDUIT**

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

## **2.5 FISH CORD**

- .1 Polypropylene.

## **Part 3 EXECUTION**

### **3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.
-

### 3.2 INSTALLATION

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in mechanical and electrical service rooms and in other unfinished areas.
- .3 Flexible metal conduit only acceptable for connection to motors in dry areas, and final connections to surface or recessed fixtures (maximum 3 meters).
- .4 Use EMT for vertical runs in partitions.
- .5 No horizontal wiring runs through partition studs will be accepted.
- .6 Use electrical metallic tubing (EMT) except in cast concrete above 2.4 m not subject to mechanical injury.
- .7 Use flexible metal conduit for connection to motors in dry areas, connection to surface or recessed fluorescent fixtures and work in movable metal partitions.
- .8 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.
- .9 Use explosion proof flexible connection for connection to explosion proof motors.
- .10 Install conduit sealing fittings in hazardous areas.
  - .1 Fill with compound.
- .11 Minimum conduit size for lighting and power circuits: NPS  $\frac{3}{4}$  19 mm.
- .12 Bend conduit cold:
  - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .13 Mechanically bend steel conduit over 19 mm diameter.
- .14 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .15 Install fish cord in empty conduits.
- .16 Run 2-NPS 1 25 mm spare conduits up to ceiling space and 2-NPS 1 25 mm spare conduits down to ceiling space from each flush panel.
  - .1 Terminate these conduits in 152 x 152 x 102 mm junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in surface type box.
- .17 Remove and replace blocked conduit sections.
  - .1 Do not use liquids to clean out conduits.
- .18 Dry conduits out before installing wire.

### 3.3 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.
  - .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
  - .3 Run conduits in flanged portion of structural steel.
  - .4 Group conduits wherever possible on suspended or surface channels.
-

- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

### **3.4 CONCEALED CONDUITS**

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install horizontal runs in masonry walls.
- .3 Do not install conduits in terrazzo or concrete toppings.

### **3.5 CONDUITS UNDERGROUND**

- .1 Slope conduits to provide drainage.
- .2 Waterproof joints (pvc excepted) with heavy coat of bituminous paint.

### **3.6 CLEANING**

- .1 Proceed in accordance with Section 01 74 11.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 CSA International
  - .1 CSA C22.2 No.42-10, General Use Receptacles, Attachment Plugs and Similar Devices.
  - .2 CSA-C22.2 No.42.1-00(R2009), Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
  - .3 CSA C22.2 No.55-M1986(R2008), Special Use Switches.
  - .4 CSA C22.2 No.111-10, General-Use Snap Switches (Bi-national standard, with UL 20).

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for wiring devices and include product characteristics, performance criteria, physical size, finish and limitations.

**1.3 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00.
- .2 Operation and Maintenance Data: submit operation and maintenance data for wiring devices for incorporation into manual.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect wiring devices from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

**Part 2 PRODUCTS**

**2.1 SWITCHES**

- .1 15/20 A, 120V, single pole, switches to: CSA C22.2 No.55 and CSA C22.2 No.111.

- .2 Manually-operated general purpose AC switches with following features:
  - .1 Terminal holes approved for No. 10 AWG wire.
  - .2 Silver alloy contacts.
  - .3 Urea or melamine moulding for parts subject to carbon tracking.
  - .4 Suitable for back and side wiring.
  - .5 Ivory toggle.
- .3 Switches of one manufacturer throughout project.

## 2.2 RECEPTACLES

- .1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA C22.2 No.42 with following features:
  - .1 Ivory moulded housing.
  - .2 Suitable for No. 10 AWG for back and side wiring.
  - .3 Break-off links for use as split receptacles.
  - .4 Eight back wired entrances, four side wiring screws.
  - .5 Triple wipe contacts and rivetted grounding contacts.
- .2 Other receptacles with ampacity and voltage as indicated.
- .3 Receptacles of one manufacturer throughout project.

## 2.3 COVER PLATES

- .1 Cover plates for wiring devices to: CSA C22.2 No.42.1.
- .2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
- .3 Plastic white cover plates, thickness 2.5 mm for wiring devices mounted in flush-mounted outlet box.

## 2.4 SOURCE QUALITY CONTROL

- .1 Cover plates from one manufacturer throughout project.

## Part 3 EXECUTION

### 3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wiring devices installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.

### 3.2 INSTALLATION

- .1 Switches:
  - .1 Install single throw switches with handle in "UP" position when switch closed.
  - .2 Install switches in gang type outlet box when more than one switch is required in one location.
  - .3 Mount toggle switches at height in accordance with Section 26 05 00.
- .2 Receptacles:
  - .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
  - .2 Mount receptacles at height in accordance with Section 26 05 00.
  - .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
  - .4 Install GFI type receptacles as indicated.
- .3 Cover plates:
  - .1 Install suitable common cover plates where wiring devices are grouped.
  - .2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

### 3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

### 3.4 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Protect devices with paper or plastic film until painting and other work is finished.
- .3 Repair damage to adjacent materials caused by wiring device installation.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 CSA International (CSA)
  - .1 CSA C22.2 No. 5-13, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE-2010).

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for circuit breakers and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Include time-current characteristic curves for breakers with ampacity of 100 A and over or with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.
- .3 Certificates:
  - .1 Prior to installation of circuit breakers in either new or existing installation, Contractor must submit 3 copies of a production certificate of origin from the manufacturer. Production certificate of origin must be duly signed by factory and local manufacturer's representative certifying that circuit breakers come from this manufacturer and are new and meet standards and regulations.
    - .1 Production certificate of origin must be submitted to Departmental Representative for approval.
  - .2 Delay in submitting production of certificate of origin will not justify any extension of contract and additional compensation.
  - .3 Any work of manufacturing, assembly or installation to begin only after acceptance of production certificate of origin by Departmental Representative. Unless complying with this requirement, Departmental Representative reserves the right to mandate manufacturer listed on circuit breakers to authenticate new circuit breakers under the contract, and to Contractor's expense.
  - .4 Production certificate of origin must contain:
    - .1 Manufacturer's name and address and person responsible for authentication. Person responsible must sign and date certificate.
    - .2 Licensed dealer's name and address and person of distributor responsible for Contractor's account.
    - .3 Contractor's name and address and person responsible for project.
    - .4 Local manufacturer's representative name and address. Local manufacturer's representative must sign and date certificate.
    - .5 Name and address of building where circuit breakers will be installed:
      - .1 Project title:
      - .2 End user's reference number:

.3 List of circuit breakers:

### **1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store circuit breakers indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect circuit breakers from [nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Construction Waste Management Plan and Waste Reduction Workplan in accordance with Section 01 74 20.

## **Part 2 PRODUCTS**

### **2.1 BREAKERS GENERAL**

- .1 Moulded-case circuit breakers and ground-fault circuit-interrupters: to CSA C22.2 No. 5
- .2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.
- .3 Plug-in moulded case circuit breakers: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40°C ambient.
- .4 Common-trip breakers: with single handle for multi-pole applications.
- .5 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.
  - .1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.
- .6 Circuit breakers with interchangeable trips as indicated.
- .7 Circuit breakers to have minimum 18kA symmetrical rms interrupting capacity rating.

### **2.2 THERMAL MAGNETIC BREAKERS DESIGN A**

- .1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

### **2.3 ENCLOSURE**

- .1 NEMA 2.
-

**Part 3 EXECUTION**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

**3.2 INSTALLATION**

- .1 Install circuit breakers as indicated.

**3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 PRODUCT DATA**

- .1 Submit product data in accordance with Section 01 33 00.

**1.2 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 20.

**Part 2 PRODUCTS**

**2.1 DISCONNECT SWITCHES**

- .1 Fusible, non-fusible, horsepower rated disconnect switch in CSA Enclosure, size as indicated.
- .2 Provision for padlocking in on-off switch position by three locks.
- .3 Mechanically interlocked door to prevent opening when handle in ON position.
- .4 Fuses: size as indicated.
- .5 Fuseholders: relocatable and suitable without adaptors, for type and size of fuse indicated.
- .6 Quick-make, quick-break action.
- .7 ON-OFF switch position indication on switch enclosure cover.
- .8 Weatherproof enclosure where installed outdoors

**2.2 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00.
- .2 Indicate name of load controlled on size 4 nameplate.

**Part 3 EXECUTION**

**3.1 INSTALLATION**

- .1 Install disconnect switches complete with fuses if applicable.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 American National Standards Institute (ANSI)
  - .1 ANSI C82.1-2004, American National Standard for Lamp Ballasts - Line Frequency Fluorescent Lamp Ballasts.
  - .2 ANSI C82.4-2002, American National Standard for Ballasts for High-Intensity Discharge and Low-Pressure Sodium (LPS) Lamps (Multiple-Supply Type).
- .2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
  - .1 ANSI/IEEE C62.41-1991, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- .3 ASTM International Inc.
  - .1 ASTM F1137-00(2006), Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.
- .4 Canadian Standards Association (CSA):
  - .1 CAN/CSA E598-Series-98(R2012), Luminaires
- .5 Underwriters' Laboratories of Canada (ULC)
  - .1 UL1598, Standard for Safety of Luminaires
- .6 Illuminating Engineering Society of North America (IESNA)
  - .1 IESNA LM-79, Electrical and Photometric Measurements of Solid-State Lighting Products
  - .2 IESNA LM-80, Approved Method for Measuring Lumen Maintenance of LED Light Sources
  - .3 IESNA TM-21, Luminaire Classification System for Indoor Luminaires

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Provide complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Departmental Representative.
  - .3 Photometric data to include: VCP Table where applicable and spacing criterion.

- .3 Quality assurance submittals: provide following in accordance with Section 01 45 00.
  - .1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence, cleaning procedures and processes.

### **1.3 QUALITY ASSURANCE**

- .1 Provide mock-ups in accordance with Section 01 45 00.

### **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 20.
- .4 Divert unused metal materials from landfill to metal recycling facility.
- .5 Disposal and recycling of fluorescent lamps as per local regulations.
- .6 Disposal of old PCB filled ballasts.

### **1.5 COORDINATION**

- .1 Confirm compatibility and interface with other materials with luminaire and ceiling system, and report discrepancies to the Departmental Representative; defer ordering materials until discrepancies are clarified.
- .2 Supply plaster frames, trim rings, and back boxes to other trades, as the work requires.
- .3 Coordinate with mechanical subcontractor to avoid conflicts between luminaires, supports and fittings with mechanical equipment; do not suspend fixtures from mechanical equipment, pipes or ducts.

### **1.6 WARRANTY**

- .1 Replace completely free of charge:
  - .1 Fluorescent lamps burning out within 12 months of takeover.
  - .2 Ballasts that fail or exceed their original noise level rating within 12 months of takeover.

## **Part 2 PRODUCTS**

### **2.1 GENERAL REQUIREMENTS**

- .1 Metal Parts: Free of burrs and sharp corners and edges.
  - .2 Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.
-

- .3 Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

## 2.2 DIFFUSERS AND GLOBES:

- 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
  - .1 Lens Thickness: At least 3.175 mm minimum unless otherwise indicated.
  - .2 UV stabilized.
- 2. Glass: Annealed crystal glass unless otherwise indicated.

## 2.3 RECESSED FIXTURES

- .1 Supply recessed fixtures complete with trim type required for ceiling system installed.
- .2 Before ordering, confirm the ceiling construction details and architectural finish for each area.
- .3 Recessed pot-light style fixtures: Provide pre-wired type with junction box forming an integral part of the assembly with satisfactory access complete with necessary plaster rings, supports, and other required accessories for complete installation.
- .4 Recessed fluorescent fixtures: Maintain maximum 150 mm depth, including mounting yokes or bridges with distance from back face of fixture or lens to centre of lamp minimum 65 mm; design reflector and lamp positions to provide high efficiency, even brightness and lack of lamp lines.

## 2.4 SUSPENDED FIXTURES

- .1 Coordinate supply of ceiling support for fixtures so that they are suitable for ceiling system installed.

## 2.5 DRIVERS FOR LED FIXTURES

- .1 Electronic Driver for LED Fixtures: Comply with UL 1310 Class 2 requirements for dry and damp locations.
- .2 Rated for 50,000 hours of life, unless otherwise noted.
- .3 Sound Rating: Class A.
- .4 Total Harmonic Distortion Rating: 20 percent or less.
- .5 Current Crest Factor: 1.5 or less.
- .6 Drivers shall typically operate one luminaire, unless noted otherwise on the light fixture schedule.
- .7 Driver shall operate from 50/60 Hz input source of 120 volts, and sustained variations of  $\pm 10\%$  (Voltage & Frequency) with no damage to the driver or solid state circuitry.
- .8 Operating Temperature:
  - .1 Interior: 15C to 30C

- .2 Exterior: -40C to 35C
- .9 Surge Protection: Automatic, withstand line transients as defined in ANSI C62.41, Category A
- .10 Dimming:
  - .1 Dimming shall be compatible with lighting control system, typically 0 - 10V low voltage dimming
  - .2 Dimming range shall be 1% - 100% of full light output
  - .3 Drivers shall be dimmable to 1% minimum flicker free and shall meet IEC 60929 Annex E for max mA draw of 2mA.
  - .4 Drivers and dimmers to be fully matched and compatible for the quantity of fixtures being dimmed.
  - .5 Any substitution to the dimming driver control mechanism which requires extra wiring or materials for the lighting control system to operate shall be paid for by the fixture manufacturer.
- .11 Drivers shall have a Power Factor greater than 0.98.

## 2.6 BALLASTS

- .1 Programmed Start T8 Ballasts: Ballasts shall operated one or more T8 lamps as indicated in the lighting fixture schedule:
  - .1 Ballast shall have a minimum Rh/Rc of 4.00 each time the lamps are started.
  - .2 Ballast shall have a maximum ionization current (Glow Current) of 10 mAmps during the preheating interval.
  - .3 Ballast shall have a minimum start temperature of -18°C.
  - .4 Ballasts shall operate from a 50/60 Hz input source of 120 through 347 Volts, and sustained variations of  $\pm 10\%$  (Voltage & Frequency) with no damage to the ballasts; refer to fixture schedule for voltage.
  - .5 Ballasts shall be high frequency electronic type, and operate lamps at a frequency above 42 kHz to minimize interference with infrared control systems.
  - .6 Lamp Current Crest Factor (ratio of peak to RMS current) shall be 1.7 or less in accordance with lamp manufacturer recommendation and ANSI C82.11.
  - .7 Ballasts shall tolerate operation in ambient temperatures up to 40°C without damage.
  - .8 Ballasts shall comply with FCC Part 18 Non-Consumer Equipment for EMI (power line conducted) and RFI (Radiated).
  - .9 Ballasts shall provide transient immunity as recommended by ANSI C62.41, Location A2.
  - .10 Ballasts shall operate lamps with no visible flicker (<3% flicker index).
  - .11 Ballasts shall tolerate sustained open circuit and short circuit output conditions without damage.
  - .12 Ballasts shall be Underwriters Laboratory (UL 935) listed, Class P, Type 1 Outdoor, and CSA certified where applicable.
  - .13 Ballast shall have a Ballast factor greater than 0.85, per ANSI C82.11.

- .14 Input current Total Harmonic Distortion shall not exceed 10%.
- .15 Ballasts shall have a Power Factor greater than 0.98, for primary application.
- .16 Mounting: integral with luminaire.

## 2.7 LAMPS

- .1 Fluorescent lamps to be - T8, 32 Watt, programmed-start, colour temperature as specified, 40,000 hour lamp life, 2800 initial lumens, CRI of Minimum 85; Low Mercury TCLP compliant
- .2 LED Light Sources
  - .1 Photometrics of fixture to be tested according to LM79 requirements
  - .2 Minimum L70 lamp life within the fixture of 50,000 as measured according to LM80 and TM21
  - .3 CRI  $\geq 82$ ; R9  $\geq 35$
  - .4 Colour temperature range from 2700 - 5000 K, as noted on the luminaire schedule; Binning to  $\pm 200$ K
  - .5 Interior LEDs (within luminaires) suitable for an ambient temperature range of 15C to 30C

## 2.8 FINISHES

- .1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.

## 2.9 LUMINAIRES

- .1 As indicated in luminaire schedule.

## 2.10 LINE VOLTAGE OCCUPANCY SENSOR SWITCHES – WALL MOUNTED

- .1 Indoor, wall mounted, line voltage occupancy sensor switch, dual technology occupancy sensor, complete with manual on/off push buttons, and dimming where indicated
  - .2 Suitable for use with 120V lighting.
  - .3 Integral self-contained relays to allow for light switching with no minimum load requirement. Suitable for LED drivers. Maximum loading as follows
    - .1 800W @ 120VAC
    - .2 1200W @ 277VAC
    - .3 1500W @ 347VAC
  - .4 Provide 2 pole unit where required to control 2 lighting circuits or 2 different loads.
  - .5 Occupancy sensor shall include the following features:
    - .1 Manual on, with option for fully automatic.
    - .2 Adjustable time out (30 sec to 20 min) and sensitivity.
  - .6 Semi-circular coverage; up to 6m radius for small motion (hand), up to 10m radius for large motion (walking)
-

- .7 .6 Device shall be fully matched and compatible for the fixtures being dimmed

## **2.11 LINE VOLTAGE OCCUPANCY SENSOR SWITCHES – CEILING MOUNTED**

- .1 Indoor, ceiling mount, low voltage, occupancy sensor switch, passive dual technology occupancy sensors with 360° coverage pattern.
- .2 Suitable for use with 120V lighting via power pack
- .3 Occupancy sensor shall include the following features:
  - .1 Fully automatic operation.
  - .2 Minimum on timer to maximum lamp life, set 15 min.
  - .3 Adjustable time out (30 sec to 20 min).
- .4 Standard range for small rooms, circular coverage up to 3.66m radius when mounted on 2.77m high ceiling.
- .5 Extended range for large rooms, coverage up to 8.53m radius when mounted on 2.77m high ceiling.
- .6 Device shall be fully matched and compatible for the fixtures being dimmed

## **2.12 POWER PACKS**

- .1 Power Pack to incorporate one or more Class 1 relays for switching lighting loads on and off.
- .2 Power Packs to accept 120 VAC, be plenum rated, and provide Class 2 power to the system for powering remote sensors.
- .3 Power Pack to be securely mount to junction location through a threaded ½ inch chase nipple. Plastic clips into junction box not acceptable. All Class 1 wiring to pass through chase nipple into adjacent junction box without any exposure of wire leads.
- .4 Power Packs to be available that provide up to 16 Amp switching of all load types, and be rated for 400,000 cycles.

## **Part 3 EXECUTION**

### **3.1 SUPPORTS**

- .1 Recessed Fixtures:
  - .1 In areas without suspended ceilings, support fluorescent fixtures directly from the building structure by rod hangers and inserts
  - .2 Provide plaster frames or plaster trim as required and turn same over to the ceiling section for installation
  - .3 Support fixtures equal to or larger than 610 mm in width by four hangers per fixture, minimum, independent of ceiling supports or T-bars
  - .4 Support fixtures smaller than 610 mm in width by two hangers per fixture, minimum, independent of ceiling supports or T-bars

- .5 Install recessed fixtures to permit removal from below, to gain access to outlet or pre-wired fixture box.
- .6 Connect recessed fixtures to boxes with flexible conduit and approved fixture wire.
- .2 Suspended Fixtures:
  - .1 Install suspended linear fluorescent fixtures with airplane cable and fittings having field adjustable length.
  - .2 Fixtures shall be installed level unless specifically noted otherwise on Drawings, with less than 10 mm variation over 2440 mm.
  - .3 Fixtures shall be mounted at the same height above the floor unless specifically noted otherwise on Drawings.

### **3.2 LUMINAIRE WIRING**

- .1 Connect recessed luminaires to outlet boxes with flexible conduit using 90°C wire.

### **3.3 LUMINAIRE ALIGNMENT**

- .1 Align luminaires mounted in continuous rows to form straight uninterrupted line.
- .2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

### **3.4 CLEANING**

- .1 Specular reflector protection to remain in place through construction
- .2 Align luminaries and clean diffusers, baskets and remove reflector protection prior to final acceptance.
- .3 Clean in accordance with Section 01 74 11.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .4 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.2 No.141-15, Unit Equipment for Emergency Lighting.
  - .2 CAN/CSA-C860-11(R2016), Performance of Internally Lighted Exit Signs.
- .2 National Fire Protection Association (NFPA)
  - .1 NFPA 101-2015, Life Safety Code.
- .3 Underwriters Laboratories of Canada (ULC)
  - .1 ULC/ORD-924-02, Standard for Emergency Lighting and Power Equipment.
  - .2 CAN/ULC-S572-10, First Edition Standard for Photoluminescent and Self-Luminous Exit Signs and Path Marking Systems.

**1.2 SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Submit WHMIS MSDS - Material Safety Data Sheets.
- .4 Quality Assurance Submittals: submit following in accordance with Section 01 45 00.
  - .1 Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

**1.3 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

**Part 2 PRODUCTS**

**2.1 STANDARD UNITS**

- .1 Exit lights: to CSA C22.2 No.141 and CAN/CSA-C860.
  - .2 Housing: extruded aluminum
  - .3 Mounting: Recessed base
  - .4 Face and back plates: double face panels standard with capability to modify on site for use in single-face or double-face applications
  - .5 Lamps: LED, 120V
  - .6 Operation: designed for 50,000 hours of continuous operation without relamping.
-

- .7 Type: Exit/Sortie to match existing in building

**Part 3 EXECUTION**

**3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

**3.2 INSTALLATION**

- .1 Install exit lights to manufacturer's recommendations, listing requirements, NFPA standard and local regulatory requirements.
- .2 Connect fixtures to exit light circuits.
- .3 Ensure that exit light circuit breaker is locked in on position.

**3.3 CLEANING**

- .1 Proceed in accordance with Section 01 74 11.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

**Part 1 GENERAL**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for communication raceway systems and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Identify types of cable tray used.
  - .3 Show actual cable tray installation details and suspension system.

**1.2 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect communication raceway systems and wiring from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 20.

**Part 2 PRODUCTS**

**2.1 SYSTEM DESCRIPTION**

- .1 Telecommunications raceways system consists rough-in with conduits stubs to cable tray, and cable tray, including outlet boxes, cover plates, conduits, sleeves and caps, and fish wires.

**2.2 MATERIAL**

- .1 Conduits: in accordance with Section 26 05 34.
  - .2 Outlet boxes, conduit boxes, and fittings: in accordance with Section 26 05 31 and 26 05 32.
  - .3 Fish wire: polypropylene type.
  - .4 Cable tray: Basket-type
-

- .1 Minimum cable tray size for general areas is 4"x12"
- .2 Minimum cable tray size for Communications/LAN Room is 4"x24", mounted 96" above fixed floor.
- .3 Provide metal divider for separation of data and voice cables
- .4 The cable tray system shall be bonded and grounded per Canadian Electrical Code

## **Part 3 EXECUTION**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for communication raceway systems installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

### **3.2 INSTALLATION**

- .1 Install cable tray, raceway system, outlet boxes, pull boxes, cover plates, conduit, sleeves and caps, miscellaneous and positioning material to constitute complete system.
- .2 Support cable tray on both sides from structure above. Tray shall not be suspended from HVAC ducting, sprinkler system, etc.
- .3 Remove sharp burrs or projections to prevent damage to cables or injury to personnel.
- .4 Install fish wire within empty conduits

### **3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

### **3.4 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by pathways for communications systems installation.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 SUMMARY**

- .1 This Section includes requirements for supply and installation of a fully addressable networked sound masking system controllable from a single control panel with future options to connect a central computer.

**1.2 RELATED REQUIREMENTS**

- .1 Section 26 05 00 – Common Work Results for Electrical
- .2 Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings
- .3 Section 26 05 34 – Conduits, Conduit Fastenings And Conduit Fittings
- .4 Section 26 05 21 – Wires And Cables (0-1000V)

**1.3 REFERENCE STANDARDS**

- .1 American National Standards Institute (ANSI):
  - .1 ANSI S1.4-1983 (R2001), American National Standard Specification for Sound Level Meters
  - .2 ANSI/ASA S1.11-2004 (R2009, American National Standard Specification for Octave-Band and Fractional-Octave-Band Analog and Digital Filters
- .2 American Society for Testing and Materials (ASTM):
  - .1 ASTM 1130-08, Standard Test Method for Objective Measurement of Speech Privacy in Open Plan Spaces Using Articulation Index
  - .2 ASTM E1374-06(2011), Standard Guide for Open Office Acoustics and Applicable ASTM Standards
  - .3 ASTM E1433-04, Standard Guide for Selection of Standards on Environmental Acoustics
  - .4 ASTM E1573-09, Standard Test Method for Evaluating Masking Sound in Open Offices Using A-Weighted and One-Third Octave Band Sound Pressure Levels

**1.4 ADMINISTRATIVE REQUIREMENTS**

- .1 Scheduling: Schedule work of this Section so that installation, testing, adjusting, and balancing is performed after above ceiling mechanical and electrical work, suspended acoustic tile ceiling are complete , and as follows:
  - .1 Schedule installation, testing, tuning, and balancing after normal working hours of users in occupied facilities.

**1.5 SUBMITTALS**

- .1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

- .2 Action Submittals: Provide the following submittals before starting any work of this Section:
  - .1 Product Data: Submit manufacturer's product data identifying components used for the project.
  - .2 Shop Drawings: Submit shop drawings indicating proposed quantity and location of system components and related wiring and accessories.
- .3 Informational Submittals: Provide the following submittals during the course of the work:
  - .1 Design Submittals: Provide network design schematics indicating general layout and types of equipment proposed for use for Departmental Representative's review and comment before preparing finalized shop drawings listed in this Section.

## **1.6 PROJECT CLOSEOUT SUBMISSIONS**

- .1 Operation and Maintenance Data: Submit manufacturer's written instructions for operations and maintenance procedures; include name of original installer and contact information in accordance with Section 01 78 00 – Closeout Submittals.
- .2 Record Documentation: Submit as constructed information in accordance with Section 01 78 00 – Closeout Submittals including copy of final sound pressure level readings, accurate description of reading locations and test methods and equipment used.
- .3 Spare Tools and Software: Submit unique tools and software in accordance with Section 01 78 00 – Closeout Submittals.

## **1.7 QUALIFICATIONS**

- .1 Regulatory Requirements: Provide electrical components, devices and accessories, controls and wiring conforming to CSA Standards and CSA labelled in accordance with requirements of Authority Having Jurisdiction.
- .2 Qualifications: Provide proof of qualifications when requested by Departmental Representative:
  - .1 Manufacturer: Use manufacturer that can provide required network design in advance of providing shop drawings and site representation during set-up, testing and commissioning, and that has capacity to provide all network components and devices from a single point of responsibility.
  - .2 Installer: Use installer that is qualified or approved by component manufacturer having experienced personnel installing and adjusting sound masking systems of similar extent and complexity as required by this Section.

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

- .1 Delivery and Acceptance Requirements: Deliver materials in manufacturer's original unopened and undamaged packaging with labels intact and legible.
  - .2 Storage and Handling Requirements: Store in dry locations and handle in accordance with manufacturer's written instructions.
-

## 1.9 WARRANTY

- .1 Manufacturer Warranty: Submit manufacturer's warranty stating installed are free from defects in parts or assembly for period of five (5) years from date of Substantial Performance for the Project and will be replaced or repaired at no expense during the warranty period without disruption to use of the installed system.

## Part 2 PRODUCTS

### 2.1 SYSTEM DESIGN

- .1 Design Requirements: Design network and prepare schematics of network showing quantity and location of network components and related cabling and accessories used to establish bid price before submitting shop drawings; obtain Departmental Representative approval for any changes in quantity or location of sound masking units after shop drawings have been reviewed and accepted.

### 2.2 PERFORMANCE REQUIREMENTS

- .1 Sound Masking Performance: Provide systems using digital signal processing (DSP) technology to generate masking sound and adjustment of masking signals and as follows:
  - .1 Masking Sound: Random with no noticeable repetitive pattern
  - .2 Equalizer: Primary network devices capable of equalizing in 1/3 octave increments for masking signal and capable of equalizing zones in groups of 1 to 3 speakers.
  - .3 Masking Volume: Digitally adjustable in 0.5 dBA increments at each primary network device and grouping of speakers over a range of 35 dBA to 85 dBA measured 1 metre from source
  - .4 Muting: Muting masking volume control at each primary network device.
  - .5 Spatial Uniformity: Provide system capable of achieving spatial uniformity of  $\pm 0.5$  dBA for masking volume with furnishings in place after adjustment.
- .2 Timer Performance: Provide system having timer function allowing masking volume levels to adjust automatically according to programmed schedule and as follows:
  - .1 Time Scheduling: Calendar based programmable timer function; assigned to individual or group of primary network devices and allowing for the following:
    - .1 Allow independent timer schedules for each day of the week
    - .2 Allow variable rates of volume adjustment
    - .3 Allow exception timer schedules for calendar days requiring different schedule from the normal
    - .4 Allow programmed system activation date
  - .2 Daylight Savings: Automatic daylight saving time adjustments
  - .3 Acclimation Period: Automatic acclimation process that increases masking volume over a period of time according to programmed schedule; allowing for independent acclimatization schedules for each timer zone.
  - .4 Timer Zones: Allow for up to nine independent timer zones per control panel/programmable timer.

- .3 Diagnostic Performance: Provide system capable of providing expected number of primary network devices and communicating correctly with network control panel and that provides failure indication of identifying primary network devices that fail to communicate properly over the network.
- .4 Reporting Performance: Provide system network control panel capable of reading and displaying current settings for all primary network devices and generating detailed reports of system settings down to level of individual primary network devices.
- .5 Security Performance: Provide locked metal enclosure for network control panel with access to control functions password protected and no physical controls located on system loudspeakers or primary network devices and that allows for settings to be backed up on an electronic storage medium with performance monitoring at each network component.

## 2.3 COMPONENTS

- .1 Provide fully networked decentralized sound masking system comprised of manufacturer's fully addressable components including; but not limited to, the following:
  - .1 Primary Network Device: Include sound masking generator; equalizer for masking; individual volume control for masking; network communication components; and audio amplifier.
  - .2 Secondary Network Devices: Provide loudspeaker connections; and signal connections to or from other primary and secondary devices.
  - .3 Loudspeakers: System matched and enclosed in acoustically dampened enclosure; suspension chain, connections to network devices; and tool-less on-site adjustment of upward or downward speaker orientation.
  - .4 Network Control Panel: Include required network communication components; control electronics for sound masking and timer functions; connections to audio inputs, network devices, control panels and computer; Ethernet connection and IP addressable.
  - .5 PC Network Control Software Capable: System must have software that allows for control of system adjustments from a dedicated computer including: network set-up; sound masking volume and equalization adjustment; sound masking timer programs; and programmable keypad set-up. Software not in contract.
  - .6 Keypads: Fully programmable, network compatible having visual display for function and volume adjustments; infrared remote control receiver and sized to fit within a single gang box.
  - .7 Accessories: Provide accessories required for a complete and functioning system including; but not limited to: cable assemblies for power, audio and control signals; audio input modules for microphone, telephone and auxiliary audio sources; mounting adaptors; and power supplies.

**Part 3 EXECUTION**

**3.1 EXAMINATION**

- .1 Verification of Conditions: Verify that plenum heights and power source, and other manufacturer prerequisites are met before beginning of installation of products specified in this Section.
  - .1 Installation of products specified in this Section will denote acceptance of site conditions.

**3.2 INSTALLATION**

- .1 Install system components in accordance with manufacturer's written instructions and with components placed as indicated on accepted shop drawings.

**3.3 CLOSEOUT ACTIVITIES**

- .1 Start-up and Adjusting: Perform system start-up in accordance with manufacturer's recommended procedures and as follows:
  - .1 Calibrate measuring microphone and related test equipment prior to start-up and adjusting and as follows:
  - .2 Balance system with mechanical system and other noise generating equipment shut down, and spaces unoccupied in areas receiving sound masking for duration of start-up operations.
  - .3 Adjust system until sound spectrum and levels meet required performance requirements; relocate units where required.
  - .4 Confirm consistency of masking volume and quality.
- .2 Demonstration and Training: Provide demonstration and training for operating system as required by Section 01 79 00 – Demonstration and Training and as follows:
  - .1 Demonstrate operational system by walking the space and indicating nominal operating conditions
  - .2 Demonstrate functionality of system to facilities personnel; train assigned personnel to maintain system
- .3 Commissioning: Provide verification and commissioning services as follows using manufacturer's trained technical representative to measure and report on sound masking system acoustical performance requirements in accordance with ASTM E1573 and as follows:
  - .1 Performance verification will be performed after Substantial Performance of the Work.
  - .2 Perform one post-occupancy calibration to adjust sound levels to suit occupancy.
  - .3 Move sound generating units or replace where commissioning process shows that adjustments are required.

**END OF SECTION**

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**Part 1 GENERAL**

**1.1 SUMMARY**

- .1 Section Includes:
  - .1 Materials and installation for fire alarm systems.
  - .2 Manual alarm stations.
  - .3 Automatic alarm initiating devices.
  - .4 Audible signal devices.
  - .5 Visual alarm signal devices.
  - .6 Ancillary devices.
  - .7 Verification.

**1.2 REFERENCES**

- .1 National Building Code (NBC)
    - .1 National Building Code of Canada 2010
  - .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
    - .1 Material Safety Data Sheets (MSDS).
  - .3 Underwriter's Laboratories of Canada (ULC)
    - .1 CAN/ULC-S524-14, Standard for the Installation of Fire Alarm Systems.
    - .2 CAN/ULC-S525-07, Audible Signal Device for Fire Alarm Systems.
    - .3 CAN/ULC-S526-07, Visual Signal Devices for Fire Alarm Systems.
    - .4 CAN/ULC-S527-11, Control Units.
    - .5 CAN/ULC-S528-14, Manual Pull Stations for Fire Alarm Systems.
    - .6 CAN/ULC-S529-16, Smoke Detectors for Fire Alarm Systems.
    - .7 CAN/ULC-S530-M91, Heat Actuated Fire Detectors for Fire Alarm Systems.
    - .8 CAN/ULC-S531-14, Standard for Smoke Alarms.
    - .9 CAN/ULC-S537-13, Standard for Verification of Fire Alarm Systems.
    - .10 CAN/ULC-S1001-11, Standard for Integrated Systems Testing of Fire Protection and Life Safety Systems.
  - .4 National Fire Protection Agency
    - .1 NFPA 72-2016, National Fire Alarm Code.
    - .2 NFPA 90A-2015, Installation of Air Conditioning and Ventilating Systems.
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### 1.3 SUBMITTALS

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00.
    - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00.
- .2 Shop Drawings:
  - .1 Include:
    - .1 Layout of equipment.
    - .2 Zoning.
    - .3 Complete wiring diagram, including schematics of modules.
- .3 Quality assurance submittals: submit following in accordance with Section 01 33 00.
  - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .2 Instructions: submit manufacturer's installation instructions.
  - .3 Manufacturer's Field Reports: manufacturer's field reports specified.
- .4 Closeout Submittals:
  - .1 Submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00.
  - .2 Authority of Jurisdiction will delegate authority for review and approval of submittals required by this Section.
  - .3 Submit to Authority of Jurisdiction 2 sets of approved submittals and drawings immediately after approval but no later than 15 working days to prior to final inspection.
  - .4 Submit following:
    - .1 Manufacturer's Data for:
      - .1 Control panel and modules.
      - .2 Manual pull stations.
      - .3 Heat detectors.
      - .4 Open-area smoke detectors.
      - .5 Duct smoke detectors.
      - .6 Alarm bells.
      - .7 Wiring.
      - .8 Conduit.
      - .9 Outlet boxes.
      - .10 Fittings for conduit and outlet boxes.
      - .11 Mark data which describe more than one type of item to indicate which type will be provided.

- .12 Submit 1 original for each item and clear, legible, first-generation photocopies for remainder of specified copies.
- .2 System wiring diagrams:
  - .1 Submit complete wiring diagrams of system showing points of connection and terminals used for electrical connections in the system.
- .3 Design data: Power Calculations:
  - .1 Submit design calculations for existing system to substantiate that battery capacity exceeds supervisory and alarm power requirements.
  - .2 Show comparison of detector power requirements per zone versus control panel smoke detector power output per zone in both standby and alarm modes.
  - .3 Show comparison of notification appliance circuit alarm power requirements with rated circuit power output.
- .4 Schedules:
  - .1 Conductor wire marker schedule.
- .5 Test Reports:
  - .1 Open-area 2-wire smoke detectors.
  - .2 Preliminary testing:
    - .1 Final acceptance testing.
    - .2 Submit for inspections and tests specified under Field Quality Control.

#### 1.4 QUALITY ASSURANCE

- .1 Provide services of representative or technician from manufacturer of system, experienced in installation and operation of type of system being provided, to supervise installation, adjustment, preliminary testing, and final testing of system and to provide instruction to project personnel.
- .2 Extra Materials:
  - .1 Provide maintenance materials in accordance with Section 01 78 00.
  - .2 Include:
    - .1 Two spare glass rods for manual pull box stations if applicable.
- .3 Maintenance Service:
  - .1 Provide one year's free maintenance on new parts.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle in accordance with Section 01 61 00.
  - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:

- .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

## **Part 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 All equipment and devices: ULC listed and labelled, to match existing manufacturer: Edwards
- .2 Audible signal devices: to CAN/ULC-S525.
- .3 Visual signal devices: to CAN/ULC-S526.
- .4 Manual pull stations: to CAN/ULC-S528.
- .5 Thermal detectors: to CAN/ULC-S530.
- .6 Smoke detectors: to CAN/ULC-S529.
- .7 Smoke alarms: to CAN/ULC-S531.

### **2.2 SYSTEM OPERATION**

- .1 Provide fire alarm new devices and connect to existing fire alarm system
- .2 Utilize separate circuits from control panel for each zone of initiating devices. Transmission of signals from more than one zone over common circuit to control panel is prohibited.
- .3 Determine existing zoning configuration and connect all new devices to the correct zone.

### **2.3 MANUAL ALARM STATIONS**

- .1 Provide non-coded single action type with mechanical reset features.
    - .1 Non-coded single pole normally open contact for single stage.
    - .2 General alarm key switch for two stage system.
  - .2 Stations: surface mounted and interior type as indicated.
    - .1 For surface mounting provide station manufacturer's approved back box.
    - .2 Back box finish to match station finish.
  - .3 Equip each station with terminal strip with contacts of proper number and type to perform functions required.
  - .4 Stations: type not subject to operation by jarring or vibration.
    - .1 Break-glass-front stations are not permitted;
  - .5 Station colour: red.
  - .6 Provide station with visible indication of operation.
  - .7 Restoration to require use of key.
    - .1 Keys: identical throughout system for stations and control panel(s).
  - .8 Mount stations with operating lever not more than 1.2 m above finished floor.
-

- .9 Where weatherproof stations are required, provide stations with cast metal, weatherproof housings with hinged access doors.
  - .1 Finish housings with red enamel paint and provide permanently bilingual English French signage indicating "FIRE ALARM" with white letters of 19 mm high.

## 2.4 AUTOMATIC ALARM INITIATING DEVICES

- .1 Heat detectors: provide heat detectors designed for detection of fire by combination fixed temperature rate-of-rise principle.
- .2 Combination Fixed Temperature Rate-Of-Rise Detectors (Spot Type): designed for surface or semi-flush outlet box mounting and supported independently of conduit, tubing or wiring connections.
  - .1 Contacts: self-resetting after response to rate-of-rise actuation
  - .2 Operation under fixed temperature actuation to result in external indication.
  - .3 Detector units located in boiler rooms, showers, or other areas subject to abnormal temperature changes to operate on fixed temperature principle only.
- .3 Open-Area Smoke Detectors: provide detectors designed for detection of abnormal smoke densities by photoelectric principle.
  - .1 Detectors: wire type to match existing
  - .2 Provide necessary control and power modules required for operation integral with control panel.
  - .3 Detectors and associated modules: compatible with control panel and suitable for use in supervised circuit.
  - .4 Malfunction of electrical circuits to detector or its control or power units to result in operation of system trouble signals.
  - .5 Equip each detector with visible indicator lamp that will flash when detector is in normal standby mode and glow continuously when detector is activated.
  - .6 Provide remote indicator lamps for each detector that is located above suspended ceilings.
  - .7 Each detector: plug-in type with tab-lock or twist-lock, quick disconnect head and separate base in which detector base contains screw terminals for making wiring connections.
  - .8 Detector head: removable from its base without disconnecting wires. Removal of detector head from its base to cause activation of system trouble signals.
  - .9 Screen each detector to prevent entrance of insects into detection chamber(s).
- .4 Photoelectric Detectors: operate on light scattering principle using LED light source.
  - .1 Detector: respond to both flaming and smoldering fires.
- .5 Locate detectors in accordance with their listing by ULC, except provide at least 2 detectors in rooms of 54 square meters or larger in area.
- .6 Mount detectors at underside of ceiling or deck above unless otherwise indicated.
- .7 Ensure detectors, located in areas subject to moisture or exterior atmospheric conditions or hazardous locations are approved for such locations.

- .8 Provide detectors with terminal screw type connections.
- .9 Removal of detector head from its base to cause activation of system trouble signals if detectors are provided with separable heads and bases.

## **2.5 ALARM INITIATING DEVICE SPACING AND LOCATION**

- .1 Detector spacing and location: in accordance with manufacturer's recommendations.
- .2 Provide at least 2 detectors in rooms of 54 square meters or larger.
- .3 Spacing: not to exceed 9m by 9m per detector, and 9 linear m per detector along corridors.
- .4 Locate detectors minimum 900mm from air discharge or return grille, and not closer than 450 mm to lighting fixtures.
- .5 In areas without finished ceilings, mount detectors at underside of deck above unless otherwise indicated.

## **2.6 DUCT SMOKE DETECTORS**

- .1 Provide detectors installed in ducts of photoelectric type and listed by ULC duct installation.
  - .2 Provide integral control and power modules required for operation with main control panel.
  - .3 Ensure detectors and associated modules are compatible with main control panel and suitable for use in supervised circuit.
  - .4 Detector circuits: 4-wire type where detector operating power is transmitted over conductors separate from initiating circuit. Malfunction of electrical circuits to detector or its control or power modules to cause operation of system trouble signals.
  - .5 Provide a separate, fused power circuit for each smoke detection initiating circuit.
  - .6 Failure of power circuit: indicated as a trouble condition on corresponding initiating circuit.
  - .7 Provide duct detectors with approved duct housing, mounted exterior to duct, with perforated sampling tubes extending across width of duct.
  - .8 Activation of duct detectors to cause shutdown of associated air handling unit, annunciation at control panel and tripping of master box and sounding of building evacuation alarms.
  - .9 Provide detectors with visible indicator lamp that flashes when detector is in normal standby mode and glows continuously when detector is activated.
  - .10 Provide remote indicator lamp for each detector.
  - .11 Permanently label remote indicator with tag of associated air handling unit(s).
  - .12 Provide each detector with remote test switch. Mount switch not more than 1.8 m above finished floor.
  - .13 Permanently label test switch with tag of associated air handling unit(s).
-

## 2.7 AUDIBLE SIGNAL DEVICES

- .1 Audible device(s):
  - .1 Horns: 95 db, flush mounting, 24 V dc.
- .2 Do not exceed 80 percent of listed rating in amperes of notification appliance circuit. Provide additional circuits above those shown if required to meet this requirement.
- .3 Provide appliances specifically listed for outdoor use in locations exposed to weather.
- .4 Finish appliances in red enamel.
- .5 For surface mounting provide appliance manufacturer's approved back box. Back box finish to match appliance finish.

## 2.8 VISUAL ALARM SIGNAL DEVICES

- .1 Flush-mounted assembly of stroboscopic type suitable for use in electrically supervised circuit and powered from notification appliance circuit.
- .2 Appliances: minimum of 110 candela measured as approved by ULC, but not less than effective intensity required by National Building Code of Canada for appliance spacing and location.
- .3 Protect lamps with thermoplastic lens and labelled "FIRE" in letters 12 mm high.
- .4 Provide visible appliances within 300 mm of each audible appliance as indicated.
- .5 Visible appliances may be part of audio-visual assembly, where more than two appliances are located in same room or corridor.

## 2.9 CONDUIT

- .1 Rigid Steel Conduit:
  - .1 Zinc-Coated.
- .2 Intermediate Metal Conduit (IMC):
  - .1 Zinc-coated steel only.
- .3 Electrical Metallic Tubing (EMT)
- .4 Surface Metal Raceway and Fittings:
  - .1 Two-piece painted steel.
  - .2 Totally enclosed snap-cover type.

## 2.10 WIRING

- .1 Wire for 120 V circuits: No. 12 AWG minimum solid copper conductor.
  - .2 Wire for low voltage DC circuits: No. 14 AWG minimum solid copper conductor
  - .3 Wire to remote annunciators: No. 18 AWG minimum solid copper conductor.
  - .4 Wire for connection to base telegraphic alarm loop: No. 12 AWG minimum solid copper conductor.
  - .5 Insulation 75 °C minimum with nylon jacket.
-

- .6 For underground or wet allocations cable from control panel to master box and to telegraphic loop: type UF.

- .7 Colour code wiring.

## **2.11 AS-BUILT RISER DIAGRAM**

- .1 Fire alarm system riser diagram: on black lamicaid sheet with bevelled edges, white lettering and designations, minimum size 600 x 600 mm.

## **2.12 ANCILLARY DEVICES**

- .1 Remote relay unit to initiate fan shutdown.

# **Part 3 EXECUTION**

## **3.1 MANUFACTURER'S INSTRUCTIONS**

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

## **3.2 INSTALLATION**

- .1 Install systems in accordance with CAN/ULC-S524 and TB OSH Chapter 3-04.
- .2 Locate and install manual alarm stations and connect to alarm circuit wiring.
- .3 Locate and install detectors and connect to alarm circuit wiring. Do not mount detectors within 0.9 m of air outlets. Maintain at least 450 mm radius clear space on ceiling, below and around detectors. Locate duct type detectors in straight portions of ducts.
- .4 Connect alarm circuits to main control panel.
- .5 Locate and install horns and visual signal devices and connect to signalling circuits.
- .6 Connect signalling circuits to main control panel.
- .7 Install end-of-line devices at end of alarm and signalling circuit.
- .8 Locate and install remote relay units to control fan shut down.
- .9 All devices to be installed on the correct zones. Confirm zoning with Departmental Representative.

## **3.3 FIELD QUALITY CONTROL**

- .1 Site Tests:
  - .1 Perform tests in accordance with Section 26 05 00 and CAN/ULC-S537.
  - .2 Fire alarm system:
    - .1 Test each device and alarm circuit to ensure manual stations, thermal and smoke detectors transmit alarm to control panel and actuate alarm.
    - .2 Check annunciator panels to ensure zones are shown correctly.
    - .3 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of system.

- .4 Class A circuits.
  - .1 Test each conductor on circuits for capability of providing alarm signal on each side of single open-circuit fault condition imposed near midmost point of circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.
  - .2 Test each conductor on circuits for capability of providing alarm signal during ground-fault condition imposed near midmost point of circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.
- .5 Class B circuits.
  - .1 Test each conductor on circuits for capability of providing alarm signal on line side of single open-circuit fault condition imposed at electrically most remote device on circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.
  - .2 Test each conductor on circuits for capability of providing alarm signal during ground-fault condition imposed at electrically most remote device on circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.
- .2 Manufacturer's Field Services:
  - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
  - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
  - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

### **3.4 TRAINING**

- .1 Arrange and pay for on-site lectures and demonstrations by fire alarm equipment manufacturer to train operational personnel in use and maintenance of fire alarm system.

### **3.5 CLEANING**

- .1 Proceed in accordance with Section 01 74 11.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

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## **ASBESTOS PRODUCT SURVEY**

**REASSESSMENT 2011**

# **GOVERNMENT OF CANADA BUILDING**

457 Richmond Street  
London, Ontario  
Complex #500249

Prepared for:

SNC-Lavalin ProFac Inc.  
451 Talbot Street, Suite 1115  
London, Ontario N6A 5C9

December 7, 2011

Project No.: 11-5577

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APPENDIX IV                 Required Remedial Work

APPENDIX V                 Intentionally Left Blank

## EXECUTIVE SUMMARY

Exp Services Inc. (exp) was retained by SNC-Lavalin ProFac Inc. to conduct a re-assessment of the condition of known friable and non-friable asbestos containing materials (ACM) at the Government of Canada Building located at 457 Richmond Street in London, Ontario (the Site). The re-assessment of the building was requested by SNC-Lavalin ProFac Inc. in order to comply with Deputy Minister Directive 057 and the Ontario Ministry of Labour Regulation 278/05 made under the *Occupational Health and Safety Act* (Regulation Respecting Asbestos on Construction Projects and in Buildings and Repair Operations).

The Site is a six-story building with three upper level mechanical floors and full basement. The building has a total footprint of approximately 9,000 square metres and appears to have been constructed in 1936.

Asbestos-containing parging cement and straight run insulation was identified within two locations during the re-assessment of the building. An asbestos-containing parging cement roof hopped was identified within the elevator machine room (Location 901). This material is accessible to maintenance and operations staff without a ladder and is presently in poor condition. Exp recommends that this material be removed. Asbestos-containing parging cement fittings and straight run mechanical insulation was located within a corridor (Location 704). This material is in good condition but accessible to all, for this reason exp recommends this material to be removed.

While not observed during the re-assessment of the building, a review of previous assessments identified asbestos-containing pipe insulation on concealed pipe-risers around the exterior of the building. This material is currently inaccessible and does not require remediation.

With the exception of newly renovated areas, floor tiles and vinyl sheet flooring are present at the facility and have been assumed to contain asbestos. In general, sampling of floor tile and vinyl sheet flooring was not conducted during the survey of the building. These products were noted to be in good condition at the time of the assessment.

With the exception of recently renovated areas, asbestos-containing drywall joint compound has been applied to drywall walls and ceiling surfaces throughout the building. It is not possible to determine if the asbestos-containing drywall joint compound was installed during the original construction of the building or during subsequent renovation activities. Unless proven by additional sampling or concrete

knowledge of recent installation dates, exp recommends that all drywall joint compound within the building be treated as though it contains asbestos. All drywall and associated compound observed by exp was noted to be in good condition at the time of the assessment and therefore no remediation is required at this time.

## 1.0 INTRODUCTION

Exp Services Inc. (exp) was retained by SNC-Lavalin ProFac Inc. to conduct a re-assessment of known friable and non-friable asbestos-containing materials (ACM) at the Government of Canada Building located at 457 Richmond Street in London, Ontario (the Site). The re-assessment of the building was requested by SNC-Lavalin ProFac Inc. in order to comply with Deputy Minister Directive 057 and the Ontario Ministry of Labour Regulation 278/05 made under the *Occupational Health and Safety Act* (Regulation Respecting Asbestos on Construction Projects and in Buildings and Repair Operations). For information regarding the type of building materials sampled and specific sampling locations refer to the methodology and results sections of this report.

Asbestos is a general name for several varieties of naturally occurring minerals composed of masses of strong, flexible fibres that can be separated into thin threads and woven. The fibres are valued for their heat and chemical resistance properties. The combination of fibrous structures, low heat conductivity, high electrical resistance, chemical inertness, strength and flexibility, as well as its effectiveness as a reinforcing or binding agent when combined with cement and or plastic, made asbestos popular for widespread industrial use present in more than 5,000 products. Commercially significant types of asbestos include chrysotile, amosite and crocidolite. The most common friable building products used in construction are surfacing materials (sprayed fireproofing, textured finishes, decorative or acoustic finishes) and thermal insulations. Manufactured materials containing asbestos include vinyl floor tile, ceiling tiles, gasket material, asbestos cement products and asbestos textile.

Since the use of asbestos fibres in building materials it was determined that exposure to asbestos fibres increases a person's risk to develop a number of asbestos-related diseases. Asbestos fibres tend to break down easily into a dust composed of tiny fibres that can float in the air and stick to clothes. The fibres may be easily inhaled or swallowed and can cause serious occupational disease.

This report has been completed to document the location of asbestos-containing materials and to fulfil the building owners responsibilities to comply with the Ontario Ministry of Labour Regulation 278/05 under the *Occupational Health and Safety Act* (Regulation Respecting Asbestos on Construction Projects and in Buildings and Repair Operations). This report will assist in the management of asbestos-containing materials.

Ontario Regulation 278/05 defines an asbestos-containing material (ACM) as a material that contains 0.5 per cent or more asbestos by dry weight. It further defines material based on friability. A friable material is defined as a material when dry can be crumbled, pulverized or powdered by hand pressure or is crumbled, pulverized or powdered. The friability of ACM is theoretically an indicator of the ease with which fibres may be released into the air. Non-friable products with bound asbestos pose no danger of releasing airborne fibres unless cut, broken up or otherwise physically abraded.

The following report explains the survey methodology and summarizes the survey findings.

## **2.0 SURVEY METHODOLOGY**

### **2.1 Methodology**

During this investigation the surveyor inspected the building for construction material suspected of containing asbestos after reviewing previous reports and database information. The fieldwork detailed in this report was performed on December 7, 2011 by Jenny Scudamore of exp.

Note:

- No destructive testing was performed. The inaccessible spaces within the building were not inspected. This includes areas above plaster and drywall ceilings, as well as shafts, chases and bulkheads. Similarly, motors, doors and other equipment were not disassembled to determine composition. Such items should be considered to have asbestos as a component until destructive testing demonstrates otherwise.
- Vinyl sheet flooring and vinyl floor tiles may be present beneath existing floor coverings.
- Roofing materials such as felt and sealers on flat roofs may contain asbestos. These items are typically not sampled as it may damage the integrity of the roof, resulting in leaks. These items should be tested for the presence of asbestos prior to demolition of roofing or other building components.

## **2.2 Analysis**

No additional bulks were collected during this re-assessment. The previous samples of suspect materials were submitted for analysis to an independent, NVLAP accredited, laboratory. Preliminary identification was made using Polarized Light Microscopy (PLM), with confirmation of presence and type of asbestos made by dispersion staining optical microscopy following US EPA Method 600/R-93/116. This analytical procedure conforms to the requirements outlined in Ontario Regulation 278/05.

A total of forty-four (44) samples have been collected that are suspect of being asbestos containing material in accordance with Table 1 outlined in Ontario Regulation 278/05. The analytical results are attached within Appendix I.

Ontario Regulation 278/05 defines an asbestos-containing material (ACM) as a material that contains 0.5 per cent or more asbestos by dry weight.

## **2.3 Drawings**

Drawings outlining sample locations and locations inspected during the assessment have been presented in Appendix III for reference.

## **2.4 Asbestos Conditions**

The condition of asbestos-containing materials is critical to the assessment of hazard. In order to help evaluate the hazard, the following terms and criteria were used:

### **2.4.1 Mechanical Insulation**

To evaluate the condition of mechanical insulation (on boilers, breeching, ductwork, piping, tanks, equipment, etc.), the following criteria was applied:

**GOOD** Insulation is completely covered in jacketing and exhibits no evidence of damage or deterioration. No insulation is exposed. Includes condition where the jacketing has minor damage (i.e. scuffs or stains) but the jacketing is not penetrated.

**FAIR** Minor penetrating damage to jacketed insulation (cuts, tears, nicks, deterioration or delamination) or undamaged insulation that has never been jacketed. Insulation was exposed but not showing surface disintegration. The extent of missing insulation ranges from minor to none. Damage can be repaired.

**POOR** Original insulation jacket is missing, damaged, deteriorated or delaminated. Insulation is exposed and significant areas have been dislodged. Damage cannot be readily repaired.

#### **2.4.2 Sprayed Applied Fireproofing, Insulation and Texture Finishes**

To evaluate the condition of surfacing material such as fireproofing, non-mechanical thermal insulation and texture finishes, the following criteria was applied:

**GOOD** Surface of material shows no significant signs of damage, deterioration or delamination. Up to one (1) percent visible damage to surface was allowed within range of GOOD. 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 (1) percent damage to surface of ACM spray.

In observations where damage exists in isolated locations, both GOOD and POOR conditions may be applicable. FAIR condition is not utilized in the evaluation of the fireproofing, non-mechanical insulation or texture coat finishes.

#### **2.4.3 Non-friable and Potentially Friable Materials**

The condition of non-friable or potentially friable ACM, such as plaster finishes, drywall compound, ceiling tiles, asbestos cement products, vinyl asbestos and asbestos paper backed vinyl sheet flooring, which have the potential to become friable when handled were evaluated as follows:

**GOOD** No significant damage. Material may be cracked or broken but is stable and not likely to become friable upon casual contact. If there is no friable debris present, the condition is rated as GOOD.

**POOR** Material is severely damaged. Loose debris is present or binder has disintegrated to the point where the material has become friable.

The evaluation of the condition of non-friable or potentially friable materials does not utilize a FAIR condition rating.

#### **2.4.4 Asbestos-Containing Debris**

The presence of fallen debris was noted separately from the presumed asbestos-containing source material. Debris is considered to be in POOR condition.

#### **2.5 Material Accessibility**

For each component four (4) categories of accessibilities were used:

A – Accessible to all occupants of the building;

B – Accessible to maintenance staff without a ladder;

C – Accessible to maintenance staff with a ladder; and,

D – Not accessible without demolition or removal of fixed building components or building systems.

#### **2.6 Actions**

Recommended actions for compliance and for the management of the ACM were classified under the following eight (8) actions:

1. Action dealing with the immediate cleanup of fallen ACM likely to be disturbed.
2. Action dealing with the need to use Type 2 asbestos procedures to enter an area (other than a ceiling space).
3. Action dealing with performing asbestos removal for compliance with the regulations.
4. Action for dealing with Type 2 asbestos procedures for ceiling entry where friable ACM debris is present on top of a ceiling system.
5. Action dealing with the removal of asbestos that goes beyond compliance requirements but simplifies the asbestos management.
6. Action dealing with the repair of asbestos.
7. Action dealing with ACM surveillance requirements of the regulations.
8. Action for dealing with material that may contain asbestos but not conclusively identified in the survey.

### **3.0 FINDINGS**

#### **3.1 Building Description**

The Site is a six-story building with three upper level mechanical floors and full basement. The building has a total footprint of approximately 9,000 square metres and appears to have been constructed in 1936.

#### **3.2 Asbestos**

The results of sampling for asbestos-containing materials are included as Appendix I. The ACM found during this survey is briefly summarized below. A more detailed summary of the asbestos-containing materials observed is provided in Appendix II – Room-By-Room Asbestos Materials Summary. Exp's recommendations pertaining to the building materials described below are provided in Section 5 of this report.

##### **3.2.1 Sprayed Fireproofing (Friable)**

Sprayed cementitious fireproofing was encountered within a vacant room on the sixth floor (Location 602). This material was sampled and does not contain asbestos (Sample Group 10).

Sprayed fibrous fireproofing was encountered within a mechanical room on the third floor (Location 322). This material was sampled and does not contain asbestos (Sample Group 09).

##### **3.2.2 Textured Finish (Friable)**

Textured ceiling finishes suspected to contain asbestos were not observed during the assessment of the building.

##### **3.2.3 Mechanical Insulation (Friable)**

The following types of insulation were observed:

*“Asbestos and parging cement”*, a mixture of cement and asbestos fibre has been applied to elbows, tees, valves (fittings). The parging cement is present within the elevator machine room (Location 901) and is in poor condition. As well in the corridor (Location 704) and is in good condition. The parging cement contains 80% chrysotile asbestos (Sample Group 08).

“Cellulose” straight run pipe insulation was noted within the electrical room (Location 28). This material was sampled and does not contain asbestos (Sample Group 07).

“Aircell” straight run pipe insulation was noted within a 7<sup>th</sup> floor corridor (Location 704).

While not observed during the assessment of the building, a review of previous assessments identified asbestos-containing pipe insulation on concealed pipe-risers around the exterior of the building. This material is currently inaccessible to building occupants.

Locations where asbestos-containing mechanical insulation has been identified during our assessment are listed in Appendix II – Room-By-Room Asbestos Materials Summary.

#### **3.2.4 Acoustic Ceiling Tile (Non-Friable)**

The building has recently undergone extensive renovations and the majority of building materials have been replaced. Two (2) distinct types of ceiling tiles were identified as suspect ceiling tile. Three (3) samples were collected from each type (Sample Groups 04 and 05). All samples collected were non-asbestos.

#### **3.2.5 Plaster (Friable)**

Plaster wall and ceiling finishes are present throughout the facility. Twenty-one (21) representative samples of the material were submitted for analysis and do not contain asbestos (Sample Groups 02, 03 and 06).

#### **3.2.6 Drywall (Non-Friable)**

Seven (7) representative samples of the material were submitted for analysis (Sample Group 01). The second sample analyzed (Sample 01-02) contained 1.8% chrysotile asbestos. This sample was collected from a storage room within the basement (Location 16). Subsequent samples were not analyzed.

Locations with drywall and associated asbestos-containing drywall joint compound are identified on drawings located in Appendix III and within the Room-By-Room Asbestos Materials Summary in Appendix II.

### **3.2.7 Vinyl Sheet Flooring (Non-Friable)**

Several visually distinct styles of vinyl sheet flooring were observed within the facility. Since the vinyl sheet flooring was noted to be in good condition in all areas in which it was observed, no sampling of the material was conducted. This material has been assumed to contain asbestos. Prior to disturbance, this material should be tested for asbestos content.

Locations with vinyl sheet flooring assumed to contain asbestos are identified on drawings located in Appendix III and within the Room-By-Room Asbestos Materials Summary in Appendix II.

### **3.2.8 Vinyl Floor Tile (Non-Friable)**

Vinyl floor tiles assumed to contain asbestos are present in various locations within the facility. Since all of the floor tiles observed at the facility are in good condition sampling of the material was not conducted. Prior to disturbance, this material should be tested for asbestos content.

Locations with vinyl floor tile assumed to contain asbestos are identified on drawings located in Appendix III and within the Room-By-Room Asbestos Materials Summary in Appendix II.

### **3.2.9 Asbestos Cement Products (Non-Friable)**

Asbestos cement products or “Transite” were not identified during the assessment of the building.

### **3.2.10 Asbestos Paper Products (Non-Friable)**

No asbestos paper products were observed during building survey.

### **3.2.11 Vermiculite Insulation (Friable)**

No loose fill vermiculite insulation was observed, however, it should be noted that this material may be present in inaccessible spaces such as cores of concrete blocks.

### **3.2.12 Other ACM**

The presence of asbestos is possible in the following materials: material components or insulation within electrical switchgear, motors, lights, etc.; mechanical packings and pipe gaskets; plastic laboratory benches; moulded

chair seats or other plastic products; fire door cores; window putty or caulking. Asbestos textile may have been used as vibration dampers with ductwork. No testing of these products has been performed.

#### **4.0 CONCLUSIONS**

Asbestos-containing parging cement and straight run insulation was identified within two locations during the re-assessment of the building (Location 901, 704). The roof hopper is located in the elevator machine room (Location 901), is in poor condition and is accessible to maintenance and operations staff without a ladder. Two fittings and five linear feet of mechanical insulation are located within corridor (Location 704) is accessible to all and is in good condition. Exp recommends these items to be removed.

While not observed during the assessment of the building, a review of previous assessments identified asbestos-containing pipe insulation on concealed pipe-risers around the exterior of the building. This material is currently inaccessible to building occupants.

Drywall joint compound has been identified as an asbestos-containing material within this building. The drywall joint compound within this building contains approximately 1.8% chrysotile asbestos. The drywall and associated joint compound within the building was noted to be in good condition at the time of the assessment.

With the exception of newly renovated areas, floor tiles and vinyl sheet flooring are present at the facility and have been assumed to contain asbestos. In general, sampling of floor tile and vinyl sheet flooring was not conducted during the survey of the building. These products were noted to be in good condition at the time of the assessment.

#### **5.0 RECOMMENDATIONS**

##### **5.1 Overall Recommendations**

As asbestos-containing materials have been found in this facility, it is subject to the requirement for an Asbestos Management Program, as specified under Ontario Regulation 278/05.

Where an owner knows that friable asbestos-containing materials has been used in the building, the owner shall,

- (a) Prepare and maintain on the premises a record of the location of the friable material,
- (b) Give any other person who is an occupier of the building written notice of any information in the record that relates to the area occupied by the person,
- (c) Give any employer with whom the owner arranges or contracts for work written notice of the information in the record, if the work,
  - (i) may involve material mentioned in the record, or
  - (ii) may be carried on in close proximity to such material and may disturb it;
- (d) Advise the workers employed by the owner who work in the building of the information in the record, if the workers may do work that,
  - (i) involves material mentioned in the record, or
  - (ii) is to be carried on in close proximity to such material and may disturb it;
- (e) Establish and maintain, for the training and instruction of every worker employed by the owner who works in the building and may do work;
- (f) Inspect the material mentioned and update the survey at reasonable intervals (annually) or whenever the owner becomes aware of new information relating to the matters within the survey.

## **5.2 Specific Recommendations**

The following recommendations are made with respect to asbestos-containing materials noted on-site:

### **5.2.1 Mechanical Insulation**

Asbestos-containing parging cement and straight run insulation was identified within two locations during the re-assessment of the building. An asbestos-containing parging cement roof hopped was identified within the elevator machine room (Location 901). This material is accessible to maintenance and operations staff without a ladder and is presently in poor condition. Exp recommends that this material be removed. Asbestos- containing parging cement fittings and straight run insulation was located within a corridor (Location 704). This material is in good condition but accessible to all, for this reason exp. recommends this material to be removed.

Any activity, which will disturb asbestos-containing mechanical insulation, is governed by the procedures outlined in Ontario Regulation 278/05. The disturbance of less than one (1) square metre of asbestos-containing mechanical

insulation may be performed as a Type 2 operation, while any greater disturbance requires Type 3 precautions.

### **5.2.2 Drywall (Non-Friable)**

At the time of the assessment, it was not possible to determine if the asbestos-containing drywall joint compound collected from the basement storage room was installed during the original construction of the building or during subsequent renovation activities. Unless proven by additional sampling or concrete knowledge of recent installation dates, exp recommends that all drywall joint compound within the building be treated as though it contains asbestos. All drywall and associated compound observed by exp was noted to be in good condition at the time of the assessment and, therefore, no remediation is required at this time.

The removal of less than one (1) square metre of drywall where asbestos-containing drywall joint compound has been used may be conducted following Type 1 procedures outlined in Ontario Regulation 278/05. The removal of one (1) square metre or more of drywall where asbestos-containing drywall joint compound has been used must be conducted following Type 2 procedures outlined in Ontario Regulation 278/05.

### **5.2.3 Vinyl Sheet Flooring**

Since the vinyl sheet flooring was noted to be in good condition in all of the areas in which it was observed, no sampling of the material was conducted. This material has been assumed to contain asbestos. Prior to disturbance, this material should be tested for asbestos content.

Any activity, which will disturb asbestos-containing vinyl sheet flooring, is governed by the procedures outlined in Ontario Regulation 278/05. The disturbance of less than one (1) square metre of asbestos-containing sheet flooring may be performed as a Type 2 operation, while any greater disturbance requires Type 3 precautions.

### **5.2.4 Vinyl Floor Tiles**

Vinyl floor tiles assumed to contain asbestos are present in various locations within the facility. Since all of the floor tiles observed at the facility are in good condition, sampling of the material was not conducted. Prior to disturbance, this material should be tested for asbestos content.

Vinyl floor tiles may be removed with manually powered tools, following the Type 1 procedures outlined in Ontario Regulation 278/05. The use of powered equipment on non-friable asbestos materials, an activity which could result in the release of airborne fibres, must be performed under Type 3 precautions, unless the equipment is equipped with a HEPA filtered dust collection system.

## **6.0 LIMITATIONS AND WARRANTY**

Exp has prepared this report for the exclusive use of the Client in evaluating the Site at the time of exp's assessment. Exp will not be responsible for the use of this report by any third party, or reliance on or any decision to be made based on it without the prior written consent of exp. Exp accepts no responsibility for damages, if any, by any third party because of decisions or actions based on this report.

The findings and conclusions documented in this report have been prepared for specific application to this project and have been developed in a manner consistent with that level of care and skill normally exercised by qualified professionals currently practising in this area of environmental assessment. No other warranty, expressed or implied, is made.

The findings contained in this report are based upon conditions as they were observed at the time of investigation. No assurance is made regarding changes in conditions subsequent to the time of investigation.

If new information is developed in future work, exp, should be contacted to re-evaluate the conclusions of this report and to provide amendments as required.

Respectfully submitted,

**Exp Services Inc.**



Jeff Doherty, BSc  
Senior Occupational Hygienist



Kris Olson, P.Eng  
Senior Project Manager

## **APPENDIX I**

### **BULK SAMPLE SUMMARY TABLE AND LABORATORY RESULTS**



## SUMMARY OF BULK SAMPLE RESULTS

BUILDING: 457 Richmond Street, London, ON				Project #: 06-3580		
SAMPLE NO.		LOCATION	DESCRIPTION	CONDITION	FRIABLE (Yes/No)	RESULTS
01 -	01	LOC 001	Drywall Joint Compound	Good	No	ND
	02	LOC 016	Drywall Joint Compound	Good	No	1.8% CH
	03	LOC 124	Drywall Joint Compound	Good	No	Analysis Not Required
	04	LOC 406	Drywall Joint Compound	Good	No	Analysis Not Required
	05	LOC 507	Drywall Joint Compound	Good	No	Analysis Not Required
	06	LOC 602	Drywall Joint Compound	Good	No	Analysis Not Required
	07	LOC 705	Drywall Joint Compound	Good	No	Analysis Not Required
02-	01	LOC 001	Plaster	N/A	N/A	ND
	02	LOC 014	Plaster	N/A	N/A	ND
	03	LOC 030	Plaster	N/A	N/A	ND
	04	LOC 043	Plaster	N/A	N/A	ND
	05	LOC 803	Plaster	N/A	N/A	ND
	06	LOC 802	Plaster	N/A	N/A	ND
	07	LOC 803	Plaster	N/A	N/A	ND
03 -	01	LOC 007	Plaster	N/A	N/A	ND
	02	LOC 018	Plaster	N/A	N/A	ND
	03	LOC 105	Plaster	N/A	N/A	ND
	04	LOC 705	Plaster	N/A	N/A	ND

The table above is a description of samples collected during the assessment of the facility. At the request of PWGSC, AEC has provided information regarding the condition and friability of each sample. This table cannot be used to assess friability or condition of materials throughout the building. For room specific information please refer to the survey report.

**CH - Chrysotile Asbestos    AM - Amosite Asbestos    CR - Crocidolite Asbestos    ND - No Asbestos Fibre Detected**

Note:

International Asbestos Testing Laboratories, Mt. Laurel, New Jersey analyzed the asbestos bulk samples, using a combination of dispersion staining and polarized light microscopy. This laboratory is certified under the National Voluntary Laboratory Accreditation Program (NVLAP) to perform asbestos analysis.



BUILDING: 457 Richmond Street, London, ON							Project #: 06-3580	
SAMPLE NO.		LOCATION	DESCRIPTION	CONDITION	FRIABLE (Yes/No)	RESULTS		
	05	LOC 324	Plaster	N/A	N/A	ND		
	06	LOC 410	Plaster	N/A	N/A	ND		
	07	LOC 501	Plaster	N/A	N/A	ND		
04 -	01	LOC 013	2 x 4 Lay-in Ceiling Tile	N/A	N/A	ND		
	02	LOC 037	2 x 4 Lay-in Ceiling Tile	N/A	N/A	ND		
	03	LOC 037	2 x 4 Lay-in Ceiling Tile	N/A	N/A	ND		
05 -	01	LOC 023	2 x 4 Lay-in Ceiling Tile	N/A	N/A	ND		
	02	LOC 308	2 x 4 Lay-in Ceiling Tile	N/A	N/A	ND		
	03	LOC 707	2 x 4 Lay-in Ceiling Tile	N/A	N/A	ND		
06 -	01	LOC 026	Plaster	N/A	N/A	ND		
	02	LOC 322	Plaster	N/A	N/A	ND		
	03	LOC 505	Plaster	N/A	N/A	ND		
	04	LOC 609	Plaster	N/A	N/A	ND		
	05	LOC 615	Plaster	N/A	N/A	ND		
	06	LOC 801	Plaster	N/A	N/A	ND		
	07	LOC 803	Plaster	N/A	N/A	ND		
07 -	01	LOC 028	Cellulose	N/A	N/A	ND		
	02	LOC 028	Cellulose	N/A	N/A	ND		
	03	LOC 028	Cellulose	N/A	N/A	ND		
08 -	01	LOC 104	Parging Cement	Good	Yes	80% CH		

The table above is a description of samples collected during the assessment of the facility. At the request of PWGSC, AEC has provided information regarding the condition and friability of each sample. This table cannot be used to assess friability or condition of materials throughout the building. For room specific information please refer to the survey report.

**CH - Chrysotile Asbestos      AM - Amosite Asbestos      CR - Crocidolite Asbestos      ND - No Asbestos Fibre Detected**

Note:

International Asbestos Testing Laboratories, Mt. Laurel, New Jersey analyzed the asbestos bulk samples, using a combination of dispersion staining and polarized light microscopy. This laboratory is certified under the National Voluntary Laboratory Accreditation Program (NVLAP) to perform asbestos analysis.



**BUILDING: 457 Richmond Street, London, ON**

**Project #: 06-3580**

SAMPLE NO.		LOCATION	DESCRIPTION	CONDITION	FRIABLE (Yes/No)	RESULTS
09 -	01	LOC 322	Fibrous Fireproofing	N/A	N/A	ND
	02	LOC 322	Fibrous Fireproofing	N/A	N/A	ND
	03	LOC 322	Fibrous Fireproofing	N/A	N/A	ND
10 -	01	LOC 602	Cementitious Fireproofing	N/A	N/A	ND
	02	LOC 602	Cementitious Fireproofing	N/A	N/A	ND
	03	LOC 602	Cementitious Fireproofing	N/A	N/A	ND

The table above is a description of samples collected during the assessment of the facility. At the request of PWGSC, AEC has provided information regarding the condition and friability of each sample. This table cannot be used to assess friability or condition of materials throughout the building. For room specific information please refer to the survey report.

**CH - Chrysotile Asbestos      AM - Amosite Asbestos      CR - Crocidolite Asbestos      ND - No Asbestos Fibre Detected**

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## CERTIFICATE OF ANALYSIS

Client: Advanced Environ. Consultants

4056MeadowBrookDr.;Unit130

London

ON

N6L 1E3

Report Date: 10/20/2006

Project: FederalBldgs.-457RichmondSt

Project No.: 06-3580

## BULK SAMPLE ANALYSIS SUMMARY

Lab No.: 2733987

Client No.: 01-01

Description / Location: White Joint Compound (014)

Location 001

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

Lab No.: 2733988

Client No.: 01-02

Description / Location: Tan Joint Compound (014)

Location 016

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
PC 1.8	Chrysotile	None Detected	None Detected	PC 98.2

Lab No.: 2733989

Client No.: 01-03

Description / Location: Sample Not Analyzed

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
Sample Not Analyzed		Sample Not Analyzed		

Lab No.: 2733990

Client No.: 01-04

Description / Location: Sample Not Analyzed

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
Sample Not Analyzed		Sample Not Analyzed		

NIST-NVLAP No. 101165-0

NY-DOH No. 11021

AIHA Lab No. 100188

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Analysis Method: EPA 600/R-93/116

**Comments:** (PC) Indicates Stratified Point Count Method performed. Method not performed unless stated. Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, negative PLM results cannot be guaranteed. Electron Microscopy can be used as a confirming technique. Regulatory Limit is based upon the sample matrix. Quantification at <0.25% by volume is possible with this method. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed.

Analysis Performed By: L. Solebello

Approved By:

Frank E. Ehrenfeld, III  
Laboratory Director

Date: 10/19/2006

## CERTIFICATE OF ANALYSIS

**Client:** Advanced Environ. Consultants  
4056MeadowBrookDr.;Unit130  
London ON N6L 1E3

**Report Date:** 10/20/2006  
**Project:** FederalBldgs.-457RichmondSt  
**Project No.:** 06-3580

### BULK SAMPLE ANALYSIS SUMMARY

<b>Lab No.:</b> 2733991	<b>Description / Location:</b> Sample Not Analyzed		
<b>Client No.:</b> 01-05			
<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>
Sample Not Analyzed		Sample Not Analyzed	
<u>% Non-Fibrous Material</u>			

<b>Lab No.:</b> 2733992	<b>Description / Location:</b> Sample Not Analyzed		
<b>Client No.:</b> 01-06			
<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>
Sample Not Analyzed		Sample Not Analyzed	
<u>% Non-Fibrous Material</u>			

<b>Lab No.:</b> 2733993	<b>Description / Location:</b> Sample Not Analyzed		
<b>Client No.:</b> 01-07			
<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>
Sample Not Analyzed		Sample Not Analyzed	
<u>% Non-Fibrous Material</u>			

<b>Lab No.:</b> 2733994	<b>Description / Location:</b> Grey Plaster (016)		
<b>Client No.:</b> 02-01	Location 001		
<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>
None Detected	None Detected	None Detected	None Detected
			100
<u>% Non-Fibrous Material</u>			

**NIST-NVLAP No. 101165-0**

**NY-DOH No. 11021**

**AIHA Lab No. 100188**

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**Analysis Performed By:** L. Solebello

**Date:** 10/19/2006

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London ON N6L 1E3

**Report Date:** 10/20/2006  
**Project:** FederalBldgs.-457RichmondSt  
**Project No.:** 06-3580

### BULK SAMPLE ANALYSIS SUMMARY

<b>Lab No.:</b> 2733995	<b>Description / Location:</b> Grey Plaster (016)
<b>Client No.:</b> 02-02	Location 014
<u>% Asbestos</u>	<u>Type</u>
None Detected	None Detected
<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>
None Detected	None Detected
<u>% Non-Fibrous Material</u>	100

<b>Lab No.:</b> 2733996	<b>Description / Location:</b> Grey Plaster (016)
<b>Client No.:</b> 02-03	Location 030
<u>% Asbestos</u>	<u>Type</u>
None Detected	None Detected
<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>
None Detected	None Detected
<u>% Non-Fibrous Material</u>	100

<b>Lab No.:</b> 2733997	<b>Description / Location:</b> Grey Plaster (016)
<b>Client No.:</b> 02-04	Location 043
<u>% Asbestos</u>	<u>Type</u>
None Detected	None Detected
<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>
None Detected	None Detected
<u>% Non-Fibrous Material</u>	100

<b>Lab No.:</b> 2733998	<b>Description / Location:</b> Grey Plaster (016)
<b>Client No.:</b> 02-05	Location 803
<u>% Asbestos</u>	<u>Type</u>
None Detected	None Detected
<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>
None Detected	None Detected
<u>% Non-Fibrous Material</u>	100

**NIST-NVLAP No. 101165-0**

**NY-DOH No. 11021**

**AIHA Lab No. 100188**

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**Analysis Performed By:** L. Solebello

**Date:** 10/19/2006

## CERTIFICATE OF ANALYSIS

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N6L 1E3

**Report Date:** 10/20/2006

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**Project No.:** 06-3580

### BULK SAMPLE ANALYSIS SUMMARY

**Lab No.:** 2733999

**Client No.:** 02-06

**Description / Location:** Grey Plaster (016)

Location 802

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

**Lab No.:** 2734000

**Client No.:** 02-07

**Description / Location:** Grey Plaster (016)

Location 803

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

**Lab No.:** 2734001

**Client No.:** 03-01

**Description / Location:** White Plaster (016)

Location 007

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

**Lab No.:** 2734002

**Client No.:** 03-02

**Description / Location:** White/Grey Plaster (016)

Location 018

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

**NIST-NVLAP No. 101165-0**

**NY-DOH No. 11021**

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**Analysis Performed By:** L. Solebello

**Date:** 10/19/2006

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4056MeadowBrookDr.;Unit130  
London ON N6L 1E3

**Report Date:** 10/20/2006  
**Project:** FederalBldgs.-457RichmondSt  
**Project No.:** 06-3580

### BULK SAMPLE ANALYSIS SUMMARY

<b>Lab No.:</b> 2734003	<b>Description / Location:</b> White/Grey Plaster (016)			
<b>Client No.:</b> 03-03	Location 105			
<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

<b>Lab No.:</b> 2734004	<b>Description / Location:</b> White/Grey Plaster (016)			
<b>Client No.:</b> 03-04	Location 705			
<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	Trace	Hair	100

<b>Lab No.:</b> 2734005	<b>Description / Location:</b> White/Grey Plaster (016)			
<b>Client No.:</b> 03-05	Location 324			
<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	Trace	Hair	100

<b>Lab No.:</b> 2734006	<b>Description / Location:</b> Off-White Plaster (016)			
<b>Client No.:</b> 03-06	Location 410			
<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

**NIST-NVLAP No. 101165-0**

**NY-DOH No. 11021**

**AIHA Lab No. 100188**

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**Analysis Performed By:** L. Solebello

**Date:** 10/19/2006

## CERTIFICATE OF ANALYSIS

**Client:** Advanced Environ. Consultants  
4056MeadowBrookDr.;Unit130  
London ON N6L 1E3

**Report Date:** 10/20/2006  
**Project:** FederalBldgs.-457RichmondSt  
**Project No.:** 06-3580

### BULK SAMPLE ANALYSIS SUMMARY

<b>Lab No.:</b> 2734007	<b>Description / Location:</b> Off-White Plaster (016)			
<b>Client No.:</b> 03-07	Location 501			
<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

<b>Lab No.:</b> 2734008	<b>Description / Location:</b> White/Tan Ceiling Tile #1			
<b>Client No.:</b> 04-01	Location 013			
<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	30	Cellulose	30
		30	Fibrous Glass	
		10	Wollastonite	

<b>Lab No.:</b> 2734009	<b>Description / Location:</b> White/Tan Ceiling Tile #1			
<b>Client No.:</b> 04-02	Location 037			
<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	30	Cellulose	30
		30	Fibrous Glass	
		10	Wollastonite	

<b>Lab No.:</b> 2734010	<b>Description / Location:</b> White/Tan Ceiling Tile #1			
<b>Client No.:</b> 04-03	Location 037			
<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	30	Cellulose	30
		30	Fibrous Glass	
		10	Wollastonite	

**NIST-NVLAP No. 101165-0**

**NY-DOH No. 11021**

**AIHA Lab No. 100188**

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**Analysis Performed By:** L. Solebello

**Date:** 10/19/2006

## CERTIFICATE OF ANALYSIS

**Client:** Advanced Environ. Consultants  
4056MeadowBrookDr.;Unit130  
London ON N6L 1E3

**Report Date:** 10/20/2006  
**Project:** FederalBldgs.-457RichmondSt  
**Project No.:** 06-3580

### BULK SAMPLE ANALYSIS SUMMARY

**Lab No.:** 2734011 **Description / Location:** White/Tan Ceiling Tile #2  
**Client No.:** 05-01 Location 023

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	30	Cellulose	30
		35	Fibrous Glass	
		5	Wollastonite	

**Lab No.:** 2734012 **Description / Location:** White/Tan Ceiling Tile #2  
**Client No.:** 05-02 Location 308

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	30	Cellulose	30
		35	Fibrous Glass	
		5	Wollastonite	

**Lab No.:** 2734013 **Description / Location:** White/Tan Ceiling Tile #2  
**Client No.:** 05-03 Location 717

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	30	Cellulose	30
		35	Fibrous Glass	
		5	Wollastonite	

**Lab No.:** 2734014 **Description / Location:** Grey Plaster (016)  
**Client No.:** 06-01 Location 026

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

**NIST-NVLAP No. 101165-0**

**NY-DOH No. 11021**

**AIHA Lab No. 100188**

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**Analysis Performed By:** L. Solebello

**Date:** 10/19/2006

## CERTIFICATE OF ANALYSIS

**Client:** Advanced Environ. Consultants

4056MeadowBrookDr.;Unit130

London

ON

N6L 1E3

**Report Date:** 10/20/2006

**Project:** FederalBldgs.-457RichmondSt

**Project No.:** 06-3580

### BULK SAMPLE ANALYSIS SUMMARY

**Lab No.:** 2734015

**Client No.:** 06-02

**Description / Location:** Grey Plaster (016)

Location 322

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

**Lab No.:** 2734016

**Client No.:** 06-03

**Description / Location:** Grey Plaster (016)

Location 505

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

**Lab No.:** 2734017

**Client No.:** 06-04

**Description / Location:** Grey Plaster (016)

Location 609

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

**Lab No.:** 2734018

**Client No.:** 06-05

**Description / Location:** Grey Plaster (016)

Location 615

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

**NIST-NVLAP No. 101165-0**

**NY-DOH No. 11021**

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**Analysis Performed By:** L. Solebello

**Date:** 10/19/2006

## CERTIFICATE OF ANALYSIS

**Client:** Advanced Environ. Consultants

4056MeadowBrookDr.;Unit130

London

ON

N6L 1E3

**Report Date:** 10/20/2006

**Project:** FederalBldgs. -457RichmondSt

**Project No.:** 06-3580

### BULK SAMPLE ANALYSIS SUMMARY

**Lab No.:** 2734019

**Client No.:** 06-06

**Description / Location:** Grey Plaster (016)

Location 801

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

**Lab No.:** 2734020

**Client No.:** 06-07

**Description / Location:** Grey Plaster (016)

Location 803

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	None Detected	None Detected	100

**Lab No.:** 2734021

**Client No.:** 07-01

**Description / Location:** Brown Insulation (035)

Location 028

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	85	Cellulose	15

**Lab No.:** 2734022

**Client No.:** 07-02

**Description / Location:** Brown Insulation (035)

Location 028

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	80	Cellulose	20

**NIST-NVLAP No. 101165-0**

**NY-DOH No. 11021**

**AIHA Lab No. 100188**

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Analysis Method: EPA 600/R-93/116

**Comments:** (PC) Indicates Stratified Point Count Method performed. Method not performed unless stated. Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, negative PLM results cannot be guaranteed. Electron Microscopy can be used as a confirming technique. Regulatory Limit is based upon the sample matrix. Quantification at <0.25% by volume is possible with this method. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed.

**Analysis Performed By:** L. Solebello

**Date:** 10/19/2006

## CERTIFICATE OF ANALYSIS

**Client:** Advanced Environ. Consultants  
4056MeadowBrookDr.;Unit130  
London ON N6L 1E3

**Report Date:** 10/20/2006  
**Project:** FederalBldgs.-457RichmondSt  
**Project No.:** 06-3580

### BULK SAMPLE ANALYSIS SUMMARY

<b>Lab No.:</b> 2734023	<b>Description / Location:</b> Brown Insulation (035)
<b>Client No.:</b> 07-03	Location 028
<u>% Asbestos</u>	<u>Type</u>
None Detected	None Detected
<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>
90	Cellulose
<u>% Non-Fibrous Material</u>	
	10

<b>Lab No.:</b> 2734024	<b>Description / Location:</b> Grey Insulation (031)
<b>Client No.:</b> 08-01	Parging Cement-Location 104
<u>% Asbestos</u>	<u>Type</u>
80	Chrysotile
<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>
None Detected	None Detected
<u>% Non-Fibrous Material</u>	
	20

<b>Lab No.:</b> 2734025	<b>Description / Location:</b> Off-White Insulation
<b>Client No.:</b> 09-01	Fibrous Fireproofing (011)-Location 322
<u>% Asbestos</u>	<u>Type</u>
None Detected	None Detected
<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>
90	Fibrous Glass
<u>% Non-Fibrous Material</u>	
	10

<b>Lab No.:</b> 2734026	<b>Description / Location:</b> Off-White Insulation
<b>Client No.:</b> 09-02	Fibrous Fireproofing (011)-Location 322
<u>% Asbestos</u>	<u>Type</u>
None Detected	None Detected
<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>
90	Fibrous Glass
<u>% Non-Fibrous Material</u>	
	10

**NIST-NVLAP No. 101165-0**

**NY-DOH No. 11021**

**AIHA Lab No. 100188**

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Analysis Method: EPA 600/R-93/116

**Comments:** (PC) Indicates Stratified Point Count Method performed. Method not performed unless stated. Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, negative PLM results cannot be guaranteed. Electron Microscopy can be used as a confirming technique. Regulatory Limit is based upon the sample matrix. Quantification at <0.25% by volume is possible with this method. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed.

**Analysis Performed By:** L. Solebello

**Date:** 10/19/2006

## CERTIFICATE OF ANALYSIS

**Client:** Advanced Environ. Consultants

4056MeadowBrookDr.;Unit130

London

ON

N6L 1E3

**Report Date:** 10/20/2006

**Project:** FederalBldgs.-457RichmondSt

**Project No.:** 06-3580

## BULK SAMPLE ANALYSIS SUMMARY

**Lab No.:** 2734027

**Description / Location:** Off-White Insulation

**Client No.:** 09-03

Fibrous Fireproofing (011)-Location 322

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	90	Fibrous Glass	10

**Lab No.:** 2734028

**Description / Location:** Brown Insulation (010)

**Client No.:** 10-01

Cementitious Fireproofing-Location 602

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	5	Cellulose	80
		15	Fibrous Glass	

Several analytical protocols exist for the analysis of asbestos in vermiculite. These analytical approaches vary depending upon the nature of the vermiculite mineral being tested (e.g. un-processed gangue, homogeneous exfoliated books of mica, or mixed mineral composites).

IATL recommends initial testing using the EPA 600/R-93/116 method. This method is specifically designed for the analysis of asbestos in bulk building materials. It provides an acceptable starting point for primary screening of the vermiculite for possible asbestos.

Results from this testing may be inconclusive. EPA suggests proceeding to a multi-tiered analysis involving wet separation techniques in conjunction with PLM and TEM gravimetric analysis (EPA 600/R-04/004). Please call for more information and pricing.

**NIST-NVLAP No. 101165-0**

**NY-DOH No. 11021**

**AIHA Lab No. 100188**

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Analysis Method: EPA 600/R-93/116

**Comments:** (PC) Indicates Stratified Point Count Method performed. Method not performed unless stated. Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, negative PLM results cannot be guaranteed. Electron Microscopy can be used as a confirming technique. Regulatory Limit is based upon the sample matrix. Quantification at <0.25% by volume is possible with this method. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed.

**Analysis Performed By:** L. Solebello

**Date:** 10/19/2006

## CERTIFICATE OF ANALYSIS

**Client:** Advanced Environ. Consultants

4056MeadowBrookDr.;Unit130

London

ON

N6L 1E3

**Report Date:** 10/20/2006

**Project:** FederalBldgs.-457RichmondSt

**Project No.:** 06-3580

### BULK SAMPLE ANALYSIS SUMMARY

**Lab No.:** 2734029

**Description / Location:** Brown Insulation (010)

**Client No.:** 10-02

Cementitious Fireproofing-Location 602

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	5	Cellulose	80
		15	Fibrous Glass	

Several analytical protocols exist for the analysis of asbestos in vermiculite. These analytical approaches vary depending upon the nature of the vermiculite mineral being tested (e.g. un-processed gänge, homogeneous exfoliated books of mica, or mixed mineral composites).

IATL recommends initial testing using the EPA 600/R-93/116 method. This method is specifically designed for the analysis of asbestos in bulk building materials. It provides an acceptable starting point for primary screening of the vermiculite for possible asbestos.

Results from this testing may be inconclusive. EPA suggests proceeding to a multi-tiered analysis involving wet separation techniques in conjunction with PLM and TEM gravimetric analysis (EPA 600/R-04/004). Please call for more information and pricing.

**Lab No.:** 2734030

**Description / Location:** Brown Insulation (010)

**Client No.:** 10-03

Cementitious Fireproofing-Location 602

<u>% Asbestos</u>	<u>Type</u>	<u>% Non-Asbestos Fibrous Material</u>	<u>Type</u>	<u>% Non-Fibrous Material</u>
None Detected	None Detected	5	Cellulose	80
		15	Fibrous Glass	

Several analytical protocols exist for the analysis of asbestos in vermiculite. These analytical approaches vary depending upon the nature of the vermiculite mineral being tested (e.g. un-processed gänge, homogeneous exfoliated books of mica, or mixed mineral composites).

IATL recommends initial testing using the EPA 600/R-93/116 method. This method is specifically designed for the analysis of asbestos in bulk building materials. It provides an acceptable starting point for primary screening of the vermiculite for possible asbestos.

Results from this testing may be inconclusive. EPA suggests proceeding to a multi-tiered analysis involving wet separation techniques in conjunction with PLM and TEM gravimetric analysis (EPA 600/R-04/004). Please call for more information and pricing.

**NIST-NVLAP No. 101165-0**

**NY-DOH No. 11021**

**AIHA Lab No. 100188**

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Analysis Method: EPA 600/R-93/116

**Comments:** (PC) Indicates Stratified Point Count Method performed. Method not performed unless stated. Small asbestos fibers may be missed by PLM due to resolution limitations of the optical microscope. Therefore, negative PLM results cannot be guaranteed. Electron Microscopy can be used as a confirming technique. Regulatory Limit is based upon the sample matrix. Quantification at <0.25% by volume is possible with this method. Analysis includes all distinct separable layers in accordance with EPA 600 Method. If not reported or otherwise noted, layer is either not present or the client has specifically requested that it not be analyzed.

**Analysis Performed By:** L. Solebello

**Date:** 10/19/2006



**APPENDIX II**

**ROOM-BY-ROOM ASBESTOS MATERIALS SUMMARY**

## **ASBESTOS ASSESSMENT ACCESSIBILITY AND ACTION CODES**

### ***ACCESSIBILITY CODES***

- A Accessible to all occupants of the building;
- B Accessible to maintenance staff without a ladder;
- C Accessible to maintenance staff with a ladder; and,
- D Not accessible without demolition or removal of fixed building components or building systems.

### ***ACTION CODES***

- 1. Immediate cleanup of debris that is likely to be disturbed.
- 2. Use Type 2 asbestos procedures to enter an area (other than a ceiling space).
- 3. Remove asbestos for compliance with the regulations.
- 4. Require Type 2 asbestos procedures for ceiling entry where friable ACM debris is present on top of a ceiling system.
- 5. Remove asbestos in order to simplify asbestos management.
- 6. Repair of asbestos containing material.
- 7. Monitor condition of ACM.
- 8. Suspect material that may contain asbestos but sampling was not completed to confirm.

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
<b>Building Number : W500249</b>		<b>Building Name : Dominion Public Building</b>					<b>Survey Date : 10/04/2006</b>		
<b>Level : 0 - Basement</b>		<b>Room : LOC 001 - Storage Room</b>					<b>Asbestos Present : Yes</b>		
Ceiling	Non-Asbestos Plaster								02-01
Duct	Fibreglass								
Floor	Concrete								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Asbestos Drywall Compound	1,000.0 SF	Good	Chrysotile 1.80%	A	7	Yes	No	01-01
Wall	Masonry								
Wall	Wood								
<b>Comments:</b>									
<b>Level : 0 - Basement</b>		<b>Room : LOC 002 - Storage Room</b>					<b>Asbestos Present : No</b>		
Ceiling	Non-Asbestos Plaster								V02
Duct	Fibreglass								
Floor	Concrete								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Piping	Uninsulated								
Structure	Concrete								
Wall	Masonry								
Wall	Wood								

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
<b>Comments:</b>									
<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 003 - Storage Room				<b>Asbestos Present :</b> Yes			
Ceiling	Non-Asbestos Plaster								V02
Duct	Uninsulated								
Floor	Concrete								
Mechanical	Not Found								
Piping	Uninsulated								
Structure	Concrete								
Wall	Asbestos Drywall Compound	400.0 SF	Good	Chrysotile 1.80%	A	7	Yes	No	V01
Wall	Masonry								
<b>Comments:</b>									
<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 004 - Security Room				<b>Asbestos Present :</b> No			
Ceiling	Non-Asbestos Plaster								V02
Duct	Not Found								
Floor	Vinyl Floor Tile								
Mechanical	Not Found								
Piping	Not Found								
Structure	Concrete								
Wall	Masonry								
Wall	Non-Asbestos Drywall Compound								

## Comments:

Floor tile and drywall on walls are new - not sampled - no ACM.

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Level : 0 - Basement		Room : LOC 005 - Storage Room			Asbestos Present : No				
Ceiling	Non-Asbestos Plaster								V02
Duct	Fibreglass								
Floor	Concrete								
Mechanical	Not Found								
Piping	Fibreglass								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Masonry								
Comments:									
Level : 0 - Basement		Room : LOC 006 - Storage Room			Asbestos Present : No				
Ceiling	Non-Asbestos Plaster								V02
Duct	Not Found								
Floor	Concrete								
Mechanical	Not Found								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Masonry								
Comments:									
Level : 0 - Basement		Room : LOC 007 - Stairwell			Asbestos Present : Potentially				

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Ceiling	Non-Asbestos Plaster								V03
Duct	Inaccessible								
Floor	Terrazzo								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Non-Asbestos Plaster								03-01

**Comments:** No access above ceiling.

<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 008 - Storage Room			<b>Asbestos Present :</b> No				
Ceiling	Non-Asbestos Plaster								V02
Duct	Fibreglass								
Floor	Concrete								
Mechanical	Not Found								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Masonry								

**Comments:**

<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 009 - LAN Room			<b>Asbestos Present :</b> No				
Ceiling	Non-Asbestos Plaster								V02
Duct	Fibreglass								
Floor	Vinyl Floor Tile								

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Mechanical	Not Found								
Structure	Concrete								
Wall	Masonry								
Wall	Non-Asbestos Drywall Compound								

## Comments:

Floor tile and drywall are new - not sampled - no ACM.

Level : 0 - Basement		Room : LOC 010 - Storage Room					Asbestos Present : Yes				
Duct	Fibreglass										
Floor	Concrete										
Piping	Fibreglass										
Piping	Fibreglass Straight Run										
Piping	Uninsulated										
Structure	Concrete										
Wall	Asbestos Drywall Compound	32.0	SF	Good	Chrysotile	1.80%	C	7	Yes	No	V01
Wall	Non-Asbestos Drywall Compound										

## Comments:

Drywall on wall is new. Drywall over door is ACM.

Level : 0 - Basement		Room : LOC 011 - Storage Room				Asbestos Present : Yes			
Ceiling	Not Found								
Floor	Rubber			Good					
Mechanical	Not Found								
Piping	Fibreglass Fitting								

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type		Access.	Action	Visible	Friable	Sample
Piping	Fibreglass Straight Run										
Piping	Uninsulated										
Structure	Concrete										
Wall	Asbestos Drywall Compound	1,000.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V01
Wall	Masonry										
Wall	Wood										

## Comments:

SNC storage.

<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 012 - Office				<b>Asbestos Present :</b> Yes					
Ceiling	Non-Asbestos 2 x 4 Lay-in Tile										V04
Duct	Uninsulated										
Floor	Carpet										
Mechanical	Not Found										
Piping	Fibreglass										
Structure	Concrete										
Wall	Asbestos Drywall Compound	400.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V01
Wall	Wood										

## Comments:

<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 013 - Office				<b>Asbestos Present :</b> No					
Ceiling	Non-Asbestos 2 x 4 Lay-in Tile										04-01
Duct	Uninsulated										
Floor	Carpet										

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Mechanical	Not Found								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Masonry								
Wall	Wood								
<b>Comments:</b>									
<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 014 - Storage Room			<b>Asbestos Present :</b> Potentially				
Ceiling	Non-Asbestos Plaster								02-02
Duct	Fibreglass								
Duct	Uninsulated								
Floor	Concrete								
Mechanical	Not Found								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Masonry								
<b>Comments:</b>									
Firedoor at entrance.									
<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 015 - Storage Room			<b>Asbestos Present :</b> Potentially				
Ceiling	Non-Asbestos Plaster								V02
Duct	Fibreglass								

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Duct	Uninsulated								
Floor	Concrete								
Mechanical	Not Found								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Masonry								
Wall	Non-Asbestos Drywall Compound								

## Comments:

Firedoor at entrance.

Wall - drywall - new - not sampled - no asbestos.

Level : 0 - Basement		Room : LOC 016 - Storage Room				Asbestos Present : Yes					
Ceiling	Not Found										
Duct	Fibreglass										
Duct	Uninsulated										
Floor	Concrete										
Piping	Fibreglass Fitting										
Piping	Fibreglass Straight Run										
Structure	Concrete										
Wall	Asbestos Drywall Compound	600.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	01-02
Wall	Masonry										

## Comments:

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 017 - Storage Room			<b>Asbestos Present :</b> Potentially				
Ceiling	Not Found								
Duct	Fibreglass								
Duct	Uninsulated								
Floor	Rubber								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Masonry								
<b>Comments:</b>									
2 LF of water damage to fibreglass piping.									
<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 018 - Custodial Closet			<b>Asbestos Present :</b> Yes				
Ceiling	Non-Asbestos Plaster								V03
Duct	Fibreglass								
Duct	Uninsulated								
Floor	Ceramic Tile								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Asbestos Drywall Compound	100.0	SF	Good	Chrysotile 1.80%	A	7	Yes	No V01
Wall	Ceramic Tile								
Wall	Non-Asbestos Plaster								03-02

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
<b>Comments:</b> No access above ceiling.									
<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 019 - Custodial Closet				<b>Asbestos Present :</b> No			
Ceiling	Non-Asbestos 2 x 4 Lay-in Tile								V04
Ceiling	Non-Asbestos 2 x 4 Lay-in Tile								
Duct	Uninsulated								
Floor	Ceramic Tile								
Piping	Fibreglass								
Piping	Fibreglass Fitting								
Structure	Concrete								
Wall	Ceramic Tile								
Wall	Masonry								
Wall	Non-Asbestos Plaster								V03
<b>Comments:</b>									
<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 020 - Fan Room				<b>Asbestos Present :</b> No			
Ceiling	Not Found								
Duct	Fibreglass								
Duct	Uninsulated								
Floor	Concrete								
Mechanical	Exchanger								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type		Access.	Action	Visible	Friable	Sample
Wall	Masonry										
Comments:											
Level : 0 - Basement		Room : LOC 021 - Storage Room				Asbestos Present : Yes					
Ceiling	Not Found										
Duct	Fibreglass										
Floor	Concrete										
Mechanical	Not Found										
Piping	Uninsulated										
Structure	Concrete										
Wall	Asbestos Drywall Compound	200.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V01
Wall	Masonry										
Comments:											
Level : 0 - Basement		Room : LOC 022 - Mechanical Room				Asbestos Present : No					
Ceiling	Not Found										
Duct	Fibreglass										
Duct	Uninsulated										
Floor	Concrete										
Mechanical	Exchanger										
Piping	Fibreglass Fitting										
Piping	Fibreglass Straight Run										
Structure	Concrete										
Wall	Masonry										

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
<b>Comments:</b>									
<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 023 - Storage Room				<b>Asbestos Present :</b> No			
Ceiling	Non-Asbestos 2 x 4 Lay-in Tile								05-01
Duct	Uninsulated								
Floor	Concrete								
Mechanical	Not Found								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Masonry								
<b>Comments:</b>									
5 water damaged ceiling tiles.									
<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 024 - Storage Room				<b>Asbestos Present :</b> Potentially			
Ceiling	Non-Asbestos Plaster								V03
Duct	Inaccessible								
Floor	Concrete								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Masonry								
<b>Comments:</b> No access above ceiling.									

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 025 - Stairwell			<b>Asbestos Present :</b> Potentially				
Ceiling	Non-Asbestos Plaster								V03
Duct	Inaccessible								
Floor	Terrazzo								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Non-Asbestos Plaster								V03
<b>Comments:</b> No access above ceiling.									
<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 026 - Electrical Room			<b>Asbestos Present :</b> No				
Ceiling	Not Found								
Duct	Not Found								
Floor	Concrete								
Mechanical	Not Found								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Masonry								
Wall	Non-Asbestos Drywall Compound								
Wall	Non-Asbestos Plaster								06-01

**Comments:**

Drywall - wall - new - not sampled - no asbestos.

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 027 - Mechanical Room			<b>Asbestos Present :</b> No				
Ceiling	Not Found								
Duct	Fibreglass								
Floor	Concrete								
Floor	Metal								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Steel								
<b>Comments:</b>									
<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 028 - Electrical Room			<b>Asbestos Present :</b> Potentially				
Ceiling	Not Found								
Duct	Fibreglass								
Floor	Concrete								
Mechanical	Not Found								
Piping	Cellulose								07-01/02/03
Structure	Concrete								
Wall	Masonry								
<b>Comments:</b>									
Fire door at entrance.									
<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 029 - Stairwell			<b>Asbestos Present :</b> Potentially				
Ceiling	Non-Asbestos Plaster								V03

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Duct	Inaccessible								
Floor	Concrete								
Floor	Metal								
Mechanical	Inaccessible								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Inaccessible								
Wall	Masonry								

**Comments:** No access above ceiling.

<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 030 - Vacant Room				<b>Asbestos Present :</b> No			
Ceiling	Non-Asbestos Plaster								02-03
Duct	Not Found								
Floor	Concrete								
Mechanical	Not Found								
Piping	Uninsulated								
Structure	Concrete								
Wall	Masonry								

**Comments:**

<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 031 - Vacant Room				<b>Asbestos Present :</b> No			
Ceiling	Non-Asbestos Plaster								02-03
Duct	Not Found								
Floor	Concrete								

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Mechanical	Not Found								
Piping	Uninsulated								
Structure	Concrete								
Wall	Masonry								
<b>Comments:</b>									
<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 032 - Vacant Room				<b>Asbestos Present :</b> No			
Ceiling	Non-Asbestos Plaster								02-03
Duct	Not Found								
Floor	Concrete								
Mechanical	Not Found								
Piping	Uninsulated								
Structure	Concrete								
Wall	Masonry								
<b>Comments:</b>									
<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 033 - Vacant Room				<b>Asbestos Present :</b> Potentially			
Ceiling	Non-Asbestos Plaster								V03
Duct	Inaccessible								
Floor	Concrete								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Masonry								

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
<b>Comments:</b> No access above ceiling.									
<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 034 - Stairwell				<b>Asbestos Present :</b> Potentially			
Ceiling	Non-Asbestos Plaster								V03
Duct	Inaccessible								
Floor	Concrete								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Masonry								
<b>Comments:</b> No access above ceiling.									
<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 035 - Corridor				<b>Asbestos Present :</b> Yes			
Ceiling	Non-Asbestos 2 x 4 Lay-in Tile								V05
Duct	Fibreglass								
Duct	Uninsulated								
Floor	Concrete								
Mechanical	Not Found								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Asbestos Drywall Compound	100.0	SF	Good	Chrysotile 1.80%	A	7	Yes	No V01
Wall	Masonry								

**Comments:**

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 036 - Custodial Office			<b>Asbestos Present :</b> Yes				
Ceiling	Non-Asbestos Plaster								V03
Duct	Inaccessible								
Floor	Ceramic Tile								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Asbestos Drywall Compound	150.0 SF	Good	Chrysotile 1.80%	A	7	Yes	No	V01
Wall	Non-Asbestos Plaster								V03
<b>Comments:</b> No access above ceiling.									
<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 037 - Women's Washroom			<b>Asbestos Present :</b> No				
Ceiling	Non-Asbestos 2 x 4 Lay-in Tile								04-02/04-03
Duct	Uninsulated								
Floor	Ceramic Tile								
Mechanical	Not Found								
Piping	Fibreglass								
Structure	Concrete								
Wall	Ceramic Tile								
<b>Comments:</b>									
<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 038 - Men's Washroom			<b>Asbestos Present :</b> No				
Ceiling	Non-Asbestos 2 x 4 Lay-in Tile								04-02/04-03

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Duct	Uninsulated								
Floor	Ceramic Tile								
Mechanical	Not Found								
Piping	Fibreglass								
Structure	Concrete								
Wall	Ceramic Tile								
<b>Comments:</b>									
<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 039 - Corridor			<b>Asbestos Present :</b> No				
Ceiling	Non-Asbestos 2 x 4 Lay-in Tile								V04
Duct	Uninsulated								
Floor	Ceramic Tile								
Mechanical	Not Found								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Ceramic Tile								
Wall	Non-Asbestos Plaster								V03
<b>Comments:</b>									
3 water damaged ceiling tiles.									
<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 040 - Custodial Closet			<b>Asbestos Present :</b> Potentially				
Ceiling	Non-Asbestos Plaster								V03
Duct	Uninsulated								

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Floor	Ceramic Tile								
Mechanical	Not Found								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Piping	Uninsulated								
Structure	Concrete								
Wall	Ceramic Tile								
Wall	Non-Asbestos Plaster								V03

**Comments:** No access above ceiling.

<b>Level :</b> 0 - Basement	<b>Room :</b> LOC 041 - Workshop	<b>Asbestos Present :</b> No
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Ceiling	Not Found
Duct	Not Found
Floor	Concrete
Mechanical	Not Found
Piping	Fibreglass Fitting
Piping	Fibreglass Straight Run
Structure	Concrete
Wall	Masonry

**Comments:**

<b>Level :</b> 0 - Basement	<b>Room :</b> LOC 042 - Stairwell	<b>Asbestos Present :</b> No
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Ceiling	Not Found
Duct	Not Found

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Floor	Terrazzo								
Mechanical	Not Found								
Piping	Not Found								
Structure	Concrete								
Wall	Non-Asbestos Plaster								V03

## Comments:

<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 043 - Storage Room			<b>Asbestos Present :</b> No				
Ceiling	Non-Asbestos Plaster								02-04
Duct	Not Found								
Floor	Concrete								
Mechanical	Not Found								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Masonry								

## Comments:

<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 044 - Vacant Room			<b>Asbestos Present :</b> Potentially				
Floor	Not Accessible								
<b>Comments:</b> No access.									
<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 045 - File Room			<b>Asbestos Present :</b> No				
Ceiling	Non-Asbestos Plaster								V03

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Duct	Not Found								
Floor	Concrete								
Mechanical	Not Found								
Piping	Not Found								
Structure	Concrete								
Wall	Masonry								
<b>Comments:</b>									
<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 046 - Storage Room			<b>Asbestos Present :</b> No				
Ceiling	Non-Asbestos Plaster								V03
Duct	Not Found								
Floor	Concrete								
Mechanical	Not Found								
Piping	Not Found								
Structure	Concrete								
Wall	Masonry								
<b>Comments:</b>									
<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 047 - Elevator Lobby			<b>Asbestos Present :</b> No				
Ceiling	Non-Asbestos 2 x 4 Lay-in Tile								V05
Duct	Uninsulated								
Floor	Concrete								
Mechanical	Not Found								
Piping	Fibreglass Fitting								

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Masonry								
<b>Comments:</b>									
2 water damaged ceiling tiles.									
<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 048 - Corridor			<b>Asbestos Present :</b> No				
Ceiling	Non-Asbestos 2 x 4 Lay-in Tile								V05
Duct	Uninsulated								
Floor	Concrete								
Mechanical	Not Found								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Masonry								
<b>Comments:</b>									
2 water damaged ceiling tiles.									
<b>Level :</b> 0 - Basement		<b>Room :</b> LOC 049 - Pipe Chase			<b>Asbestos Present :</b> Yes				
Floor	Not Accessible								
<b>Comments:</b>									
Innaccessible asbestos-containing mechanical insulation present in wall cavities.									
<b>Level :</b> 1 - First Floor		<b>Room :</b> LOC 101 - Loading Dock			<b>Asbestos Present :</b> No				
Ceiling	Non-Asbestos Parging Cement Patch								V03

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Duct	Fibreglass								
Duct	Uninsulated								
Floor	Concrete								
Mechanical	Exchanger								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Inaccessible								
Wall	Masonry								

**Comments:** No access above ceiling.

<b>Level :</b> 1 - First Floor		<b>Room :</b> LOC 102 - Elevator Lobby				<b>Asbestos Present :</b> Potentially			
Ceiling	Non-Asbestos Drywall Compound								
Duct	Inaccessible								
Floor	Carpet								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Non-Asbestos Drywall Compound								
Wall	Non-Asbestos Plaster								V03

**Comments:** No access above ceiling.

Drywall - new - not sampled - no asbestos.

<b>Level :</b> 1 - First Floor		<b>Room :</b> LOC 103 - Vacant Area				<b>Asbestos Present :</b> Yes			
Ceiling	Non-Asbestos Drywall Compound								

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type		Access.	Action	Visible	Friable	Sample
Ceiling	Non-Asbestos Lay-in Tile										
Duct	Fibreglass										
Floor	Non-Asbestos Vinyl Flooring										
Mechanical	Not Found										
Piping	Fibreglass Fitting										
Piping	Fibreglass Straight Run										
Structure	Concrete										
Wall	Asbestos Drywall Compound	100.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V01
Wall	Non-Asbestos Drywall Compound										

## Comments:

Wall - asbestos drywall compound (Sample V01) is an exterior wall.  
Vinyl sheet flooring (not sampled) - new - no asbestos.  
Ceiling tile - new - not sampled - no asbestos.

Level : 1 - First Floor		Room : LOC 104 - Vacant Room		Asbestos Present : No							
Ceiling	Non-Asbestos Drywall Compound										
Ceiling	Non-Asbestos Lay-in Tile										
Floor	Non-Asbestos Vinyl Flooring										
Piping	Fibreglass Straight Run										
Structure	Concrete										
Wall	Non-Asbestos Drywall Compound										
Wall	Non-Asbestos Drywall Compound										

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
<b>Comments:</b>									
Drywall and ceiling tiles are new - not sampled. Sheet flooring new in 2005. Parging cement fitting removed in 2011. Previous sample # (08-01)									
<b>Level :</b> 1 - First Floor		<b>Room :</b> LOC 105 - Vacant Area				<b>Asbestos Present :</b> Yes			
Ceiling	Non-Asbestos Lay-in Tile								
Duct	Fibreglass								
Duct	Uninsulated								
Floor	Carpet								
Floor	Terrazzo								
Floor	Wood								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Asbestos Drywall Compound	100.0	SF	Good	Chrysotile 1.80%	A	7	Yes	No
Wall	Non-Asbestos Drywall Compound								
Wall	Non-Asbestos Plaster								03-03

## Comments:

Partial drywall and ceiling tiles are new - not sampled - no asbestos.  
3 water damaged ceiling tiles.

<b>Level :</b> 1 - First Floor		<b>Room :</b> LOC 106 - Closet				<b>Asbestos Present :</b> Potentially			
Ceiling	Non-Asbestos Plaster								V03
Duct	Inaccessible								

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Floor	Carpet								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Non-Asbestos Plaster								V03

**Comments:** No access above ceiling.

<b>Level :</b> 1 - First Floor		<b>Room :</b> LOC 107 - Vacant Area				<b>Asbestos Present :</b> Yes			
Ceiling	Non-Asbestos Drywall Compound								
Ceiling	Non-Asbestos Lay-in Tile								
Duct	Fibreglass								
Duct	Uninsulated								
Floor	Wood								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Asbestos Drywall Compound	100.0	SF	Good	Chrysotile 1.80%	A	7	Yes	No V05
Wall	Non-Asbestos Drywall Compound								

**Comments:**

Drywall and ceiling tiles not sampled - new - no asbestos.

<b>Level :</b> 1 - First Floor		<b>Room :</b> LOC 108 - Lobby				<b>Asbestos Present :</b> Potentially			
Ceiling	Non-Asbestos Plaster								V03
Duct	Inaccessible								

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Floor	Terrazzo								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Marble								
<b>Comments:</b> No access above ceiling.									
<b>Level :</b> 1 - First Floor		<b>Room :</b> LOC 109 - Elevator Lobby			<b>Asbestos Present :</b> Potentially				
Ceiling	Non-Asbestos Plaster								V03
Ceiling	Wood								
Duct	Inaccessible								
Floor	Terrazzo								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Marble								
<b>Comments:</b> No access above ceiling.									
<b>Level :</b> 1 - First Floor		<b>Room :</b> LOC 110 - Office			<b>Asbestos Present :</b> Yes				
Ceiling	Non-Asbestos Drywall Compound								
Ceiling	Non-Asbestos Lay-in Tile								
Duct	Fibreglass								
Duct	Uninsulated								
Floor	Carpet								

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type		Access.	Action	Visible	Friable	Sample
Mechanical	Not Found										
Piping	Fibreglass Fitting										
Piping	Fibreglass Straight Run										
Piping	Uninsulated										
Structure	Concrete										
Wall	Asbestos Drywall Compound	200.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V01

## Comments:

Ceiling tiles and some drywall compound are new - not sampled - no asbestos.

<b>Level :</b> 1 - First Floor		<b>Room :</b> LOC 111 - Lunch Room				<b>Asbestos Present :</b> Yes					
Ceiling	Non-Asbestos Lay-in Tile										
Duct	Fibreglass										
Floor	Non-Asbestos Vinyl Flooring										
Mechanical	Not Found										
Piping	Fibreglass Fitting										
Piping	Fibreglass Straight Run										
Structure	Concrete										
Wall	Asbestos Drywall Compound	100.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V01
Wall	Non-Asbestos Plaster										V03

## Comments:

Vinyl sheet flooring and ceiling tiles are new - not sampled - no asbestos.

<b>Level :</b> 1 - First Floor		<b>Room :</b> LOC 112 - Closet				<b>Asbestos Present :</b> Potentially					
Ceiling	Non-Asbestos Plaster										V03

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Duct	Inaccessible								
Floor	Carpet								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Non-Asbestos Plaster								V03
<b>Comments:</b> No access above ceiling.									
<b>Level :</b> 1 - First Floor		<b>Room :</b> LOC 113 - Vestibule			<b>Asbestos Present :</b> Potentially				
Ceiling	Non-Asbestos Plaster								V03
Duct	Inaccessible								
Floor	Carpet								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Marble								
<b>Comments:</b> No access above ceiling.									
<b>Level :</b> 1 - First Floor		<b>Room :</b> LOC 114 - Men's Washroom			<b>Asbestos Present :</b> No				
Ceiling	Non-Asbestos 2 x 2 Lay-in Tile								
Duct	Fibreglass								
Duct	Uninsulated								
Floor	Ceramic Tile								
Mechanical	Not Found								

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Ceramic Tile								
Wall	Non-Asbestos Drywall Compound								
Wall	Non-Asbestos Plaster								V03

## Comments:

Ceiling tiles and drywall - not sampled - new - no asbestos.

<b>Level :</b> 1 - First Floor		<b>Room :</b> LOC 115 - Custodial Closet			<b>Asbestos Present :</b> No				
Ceiling	Non-Asbestos 2 x 4 Lay-in Tile								
Duct	Uninsulated								
Floor	Terrazzo								
Mechanical	Not Found								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Ceramic Tile								
Wall	Non-Asbestos Drywall Compound								
Wall	Non-Asbestos Plaster								V03
<b>Comments:</b>									
Drywall and ceiling tiles - new - not sampled - no asbestos.									
<b>Level :</b> 1 - First Floor		<b>Room :</b> LOC 116 - Women's Washroom			<b>Asbestos Present :</b> No				

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Ceiling	Non-Asbestos 2 x 2 Lay-in Tile								
Duct	Fibreglass								
Duct	Uninsulated								
Floor	Ceramic Tile								
Mechanical	Not Found								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Ceramic Tile								
Wall	Non-Asbestos Drywall Compound								
Wall	Non-Asbestos Plaster								V03

## Comments:

Ceiling tiles and drywall - not sampled - new - no asbestos.

<b>Level :</b> 1 - First Floor		<b>Room :</b> LOC 117 - Office		<b>Asbestos Present :</b> No					
Ceiling	Non-Asbestos Drywall Compound								
Ceiling	Non-Asbestos Lay-in Tile								
Duct	Uninsulated								
Floor	Carpet								
Mechanical	Not Found								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Non-Asbestos Drywall Compound								

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Wall	Non-Asbestos Plaster								V03
<b>Comments:</b>									
Drywall and ceiling tiles not sampled - new - no asbestos.									
<b>Level :</b> 1 - First Floor		<b>Room :</b> LOC 118 - Vestibule			<b>Asbestos Present :</b> No				
Ceiling	Non-Asbestos Drywall Compound								
Ceiling	Non-Asbestos Lay-in Tile								
Duct	Uninsulated								
Floor	Carpet								
Mechanical	Not Found								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Non-Asbestos Drywall Compound								
Wall	Non-Asbestos Plaster								V03
<b>Comments:</b>									
Drywall and ceiling tiles not sampled - new - no asbestos.									
<b>Level :</b> 1 - First Floor		<b>Room :</b> LOC 120 - Vestibule			<b>Asbestos Present :</b> Potentially				
Ceiling	Non-Asbestos Plaster								V03
Duct	Inaccessible								
Floor	Carpet								
Mechanical	Inaccessible								
Piping	Inaccessible								

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Structure	Inaccessible								
Wall	Marble								
<b>Comments:</b> No access above ceiling.									
<b>Level :</b> 1 - First Floor		<b>Room :</b> LOC 121 - LAN Room			<b>Asbestos Present :</b> Potentially				
Floor	Not Accessible								
<b>Comments:</b> No access.									
<b>Level :</b> 1 - First Floor		<b>Room :</b> LOC 122 - Stairwell			<b>Asbestos Present :</b> Potentially				
Ceiling	Non-Asbestos Plaster								V03
Duct	Inaccessible								
Floor	Terrazzo								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Non-Asbestos Plaster								V03
<b>Comments:</b> No access above ceiling.									
<b>Level :</b> 1 - First Floor		<b>Room :</b> LOC 123 - Closet			<b>Asbestos Present :</b> Potentially				
Ceiling	Non-Asbestos Plaster								V03
Duct	Inaccessible								
Floor	Terrazzo								
Mechanical	Inaccessible								
Piping	Inaccessible								

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Structure	Concrete									
Wall	Non-Asbestos Plaster									V03
<b>Comments:</b> No access above ceiling.										
<b>Level :</b> 1 - First Floor			<b>Room :</b> LOC 124 - Safe			<b>Asbestos Present :</b> Yes				
Ceiling	Asbestos Drywall Compound	80.0	SF	Good	Chrysotile 1.80%	C	7	Yes	No	01-03
Ceiling	Non-Asbestos Plaster									V03
Duct	Inaccessible									
Floor	Ceramic Tile									
Mechanical	Inaccessible									
Piping	Inaccessible									
Structure	Inaccessible									
Wall	Masonry									
<b>Comments:</b> No access above ceiling.										
Asbestos drywall - ceiling is a bulkhead.										
<b>Level :</b> 1 - First Floor			<b>Room :</b> LOC 125 - Telephone Room			<b>Asbestos Present :</b> Yes				
Ceiling	Not Found									
Duct	Fibreglass									
Floor	Wood									
Mechanical	Not Found									
Piping	Fibreglass Fitting									
Piping	Fibreglass Straight Run									
Structure	Concrete									

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Wall	Asbestos Drywall Compound	1,000.0 SF	Good	Chrysotile 1.80%	A	7	Yes	No	V01
Wall	Non-Asbestos Plaster								V03

## Comments:

<b>Level :</b> 1 - First Floor		<b>Room :</b> LOC 126 - Safe		<b>Asbestos Present :</b> Potentially					
Ceiling	Non-Asbestos Plaster								V03
Duct	Inaccessible								
Floor	Ceramic Tile								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Masonry								

**Comments:** No access above ceiling.

<b>Level :</b> 1 - First Floor		<b>Room :</b> LOC 127 - Stairwell		<b>Asbestos Present :</b> Potentially					
Ceiling	Non-Asbestos Plaster								V03
Duct	Inaccessible								
Floor	Terrazzo								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Marble								

**Comments:** No access above ceiling.

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
<b>Level :</b> 1 - First Floor		<b>Room :</b> LOC 128 - Stairwell			<b>Asbestos Present :</b> Potentially				
Ceiling	Non-Asbestos Plaster								V03
Duct	Inaccessible								
Floor	Terrazzo								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Non-Asbestos Plaster								V03
<b>Comments:</b> No access above ceiling.									
<b>Level :</b> 1 - First Floor		<b>Room :</b> LOC 129 - Office Space			<b>Asbestos Present :</b> Yes				
Ceiling	Non-Asbestos Drywall Compound								
Ceiling	Non-Asbestos Lay-in Tile								
Duct	Fibreglass								
Duct	Uninsulated								
Floor	Carpet								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Asbestos Drywall Compound	400.0	SF	Good	Chrysotile 1.80%	A	7	Yes	No V01
Wall	Non-Asbestos Drywall Compound								
Wall	Non-Asbestos Plaster								V03

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
<b>Comments:</b>									
Ceiling tiles and some drywall are new - not sampled - no asbestos.									
<b>Level :</b> 1 - First Floor		<b>Room :</b> LOC 130 - LAN Room				<b>Asbestos Present :</b> Yes			
Ceiling	Non-Asbestos Lay-in Tile								
Duct	Fibreglass								
Duct	Uninsulated								
Floor	Non-Asbestos Vinyl Tile								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Asbestos Drywall Compound	100.0	SF	Good	Chrysotile 1.80%	A	7	Yes	No V01
Wall	Non-Asbestos Drywall Compound								
Wall	Non-Asbestos Plaster								V03

## Comments:

Ceiling tiles, floor tiles and some drywall are new - not sampled - no asbestos.

<b>Level :</b> 1 - First Floor		<b>Room :</b> LOC 132 - Office Space				<b>Asbestos Present :</b> Yes			
Ceiling	Non-Asbestos Drywall Compound								
Ceiling	Non-Asbestos Lay-in Tile								
Duct	Fibreglass								
Duct	Uninsulated								
Floor	Carpet								
Piping	Fibreglass Fitting								

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type		Access.	Action	Visible	Friable	Sample
Piping	Fibreglass Straight Run										
Structure	Concrete										
Wall	Asbestos Drywall Compound	200.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V01
Wall	Non-Asbestos Drywall Compound										
Wall	Non-Asbestos Plaster										V03

## Comments:

Ceiling tiles and some drywall are new - not sampled - no asbestos.

<b>Level :</b> 1 - First Floor		<b>Room :</b> LOC 133 - Women's Washroom				<b>Asbestos Present :</b> Yes					
Ceiling	Asbestos Drywall Compound	100.0	SF	Good	Chrysotile	1.80%	C	7	Yes	No	V01
Duct	Inaccessible										
Floor	Non-Asbestos Vinyl Flooring										
Mechanical	Inaccessible										
Piping	Inaccessible										
Structure	Inaccessible										
Wall	Asbestos Drywall Compound	100.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V01

## Comments:

No access above ceiling.  
Flooring - new - not sampled - no asbestos.

<b>Level :</b> 1 - First Floor		<b>Room :</b> LOC 134 - Men's Washroom				<b>Asbestos Present :</b> Yes					
Ceiling	Asbestos Drywall Compound	100.0	SF	Good	Chrysotile	1.80%	C	7	Yes	No	V01
Duct	Inaccessible										
Floor	Non-Asbestos Vinyl Flooring										
Mechanical	Inaccessible										

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type		Access.	Action	Visible	Friable	Sample
Piping	Inaccessible										
Structure	Inaccessible										
Wall	Asbestos Drywall Compound	400.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V01
Wall	Non-Asbestos Plaster										V03
<b>Comments:</b> No access above ceiling. Flooring - new - not sampled - no asbestos.											
<b>Level :</b> 1 - First Floor			<b>Room :</b> LOC 136 - Pipe Chase				<b>Asbestos Present :</b> Yes				
Floor	Not Accessible										
<b>Comments:</b> Inaccessible asbestos containing mechanical insulation present behind wall cavities.											
<b>Level :</b> 1 - Ground Floor			<b>Room :</b> LOC 119 - Washroom				<b>Asbestos Present :</b> Yes				
Ceiling	Non-Asbestos 2 x 4 Lay-in Tile										V05
Duct	Uninsulated										
Floor	Ceramic Tile										
Mechanical	Not Found										
Piping	Fibreglass Fitting										
Piping	Fibreglass Straight Run										
Structure	Concrete										
Wall	Asbestos Drywall Compound										V01
Wall	Non-Asbestos Plaster										V03
<b>Comments:</b>											
<b>Level :</b> 2 - Second Floor			<b>Room :</b> LOC 201 - Mechanical Room				<b>Asbestos Present :</b> Yes				

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Ceiling	Not Found								
Duct	Fibreglass								
Duct	Uninsulated								
Floor	Concrete								
Floor	Wood								
Mechanical	Exchanger								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Asbestos Drywall Compound	1,000.0 SF	Good	Chrysotile 1.80%	A	7	Yes	No	V01
Wall	Masonry								
Wall	Non-Asbestos Plaster								V03

## Comments:

<b>Level :</b> 2 - Second Floor		<b>Room :</b> LOC 202 - Office Space		<b>Asbestos Present :</b> Yes					
Ceiling	Non-Asbestos Drywall Compound								
Ceiling	Non-Asbestos Lay-in Tile								
Duct	Fibreglass								
Duct	Uninsulated								
Floor	Carpet								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Wall	Asbestos Drywall Compound	2,000.0 SF	Good	Chrysotile 1.80%	A	7	Yes	No	V01
Wall	Non-Asbestos Drywall Compound								
Wall	Non-Asbestos Plaster								V03

## Comments:

Ceiling tiles and some drywall are new - not sampled - no asbestos.  
2 water damaged ceiling tiles.  
3 SF of water damage to drywall.

<b>Level :</b> 2 - Second Floor	<b>Room :</b> LOC 203 - Kitchen	<b>Asbestos Present :</b> No
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Ceiling	Non-Asbestos Lay-in Tile
Duct	Uninsulated
Floor	Non-Asbestos Vinyl Flooring
Mechanical	Not Found
Piping	Fibreglass Fitting
Piping	Fibreglass Straight Run
Structure	Concrete
Wall	Non-Asbestos Drywall Compound

## Comments:

Flooring, ceiling tiles and drywall are all new - not sampled - no asbestos.

<b>Level :</b> 2 - Second Floor	<b>Room :</b> LOC 204 - Handicapped Washroom	<b>Asbestos Present :</b> Yes
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Ceiling	Asbestos Drywall Compound	80.0 SF	Good	Chrysotile 1.80%	C	7	Yes	No	V01
Duct	Uninsulated								
Floor	Ceramic Tile								
Mechanical	Not Found								

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type		Access.	Action	Visible	Friable	Sample
Piping	Fibreglass Fitting										
Piping	Fibreglass Straight Run										
Structure	Concrete										
Wall	Asbestos Drywall Compound	400.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V01
Wall	Non-Asbestos Plaster										V03

## Comments:

<b>Level :</b> 2 - Second Floor		<b>Room :</b> LOC 205 - Women's Washroom				<b>Asbestos Present :</b> Yes					
Ceiling	Asbestos Drywall Compound	150.0	SF	Good	Chrysotile	1.80%	C	7	Yes	No	V01
Duct	Uninsulated										
Floor	Ceramic Tile										
Mechanical	Not Found										
Piping	Fibreglass Fitting										
Piping	Fibreglass Straight Run										
Structure	Concrete										
Wall	Marble										

## Comments:

<b>Level :</b> 2 - Second Floor		<b>Room :</b> LOC 206 - Custodial Closet				<b>Asbestos Present :</b> Potentially					
Ceiling	Non-Asbestos Plaster										V03
Duct	Inaccessible										
Floor	Terrazzo										
Mechanical	Inaccessible										
Piping	Inaccessible										

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Structure	Inaccessible								
Wall	Ceramic Tile								
Wall	Non-Asbestos Plaster								
<b>Comments:</b> No access above ceiling.									
<b>Level :</b> 2 - Second Floor		<b>Room :</b> LOC 207 - Closet				<b>Asbestos Present :</b> Yes			
Ceiling	Non-Asbestos Lay-in Tile								
Duct	Uninsulated								
Floor	Terrazzo								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Asbestos Drywall Compound	80.0	SF	Good	Chrysotile 1.80%	A	7	Yes	No V01
Wall	Non-Asbestos Plaster								V03
<b>Comments:</b>									
Ceiling tiles not sampled - new - no asbestos.									
<b>Level :</b> 2 - Second Floor		<b>Room :</b> LOC 208 - Men's Washroom				<b>Asbestos Present :</b> Yes			
Ceiling	Asbestos Drywall Compound	150.0	SF	Good	Chrysotile 1.80%	C	7	Yes	No V01
Duct	Uninsulated								
Floor	Ceramic Tile								
Mechanical	Not Found								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Structure	Concrete								
Wall	Marble								

## Comments:

<b>Level :</b> 2 - Second Floor		<b>Room :</b> LOC 209 - Electrical Room				<b>Asbestos Present :</b> Potentially			
Ceiling	Not Found								
Duct	Uninsulated								
Floor	Concrete								
Floor	Suspect Vinyl Floor Tile	30.0	SF	Good		A	8	Yes	No
Mechanical	Not Found								
Piping	Uninsulated								
Structure	Concrete								
Wall	Asbestos Drywall Compound	60.0	SF	Good	Chrysotile 1.80%	A	7	Yes	No

## Comments:

<b>Level :</b> 2 - Second Floor		<b>Room :</b> LOC 210 - Stairwell				<b>Asbestos Present :</b> Potentially			
Ceiling	Non-Asbestos Plaster								V03
Duct	Inaccessible								
Floor	Concrete								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Non-Asbestos Plaster								V03

**Comments:** No access above ceiling.

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
<b>Level :</b> 2 - Second Floor		<b>Room :</b> LOC 211 - Electrical Room			<b>Asbestos Present :</b> No				
Ceiling	Not Found								
Duct	Uninsulated								
Floor	Terrazzo								
Piping	Uninsulated								
Structure	Concrete								
Wall	Ceramic Tile								
Wall	Non-Asbestos Plaster								V03
<b>Comments:</b>									
<b>Level :</b> 2 - Second Floor		<b>Room :</b> LOC 212 - Pipechase			<b>Asbestos Present :</b> Yes				
Other	Transite on Door	14.0	SF	Good		B	7	Yes	No
Piping	Fibreglass								
<b>Comments:</b> No access.									
Sheet of Transite on pipechase door.									
<b>Level :</b> 2 - Second Floor		<b>Room :</b> LOC 213 - Women's Washroom			<b>Asbestos Present :</b> Yes				
Ceiling	Asbestos Drywall Compound	150.0	SF	Good	Chrysotile 1.80%	C	7	Yes	No
Duct	Uninsulated								V01
Floor	Ceramic Tile								
Mechanical	Not Found								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Structure	Concrete								
Wall	Marble								
<b>Comments:</b>									
<b>Level :</b> 2 - Second Floor		<b>Room :</b> LOC 214 - Stairwell				<b>Asbestos Present :</b> Potentially			
Ceiling	Non-Asbestos Plaster								V03
Duct	Inaccessible								
Floor	Terrazzo								
Mechanical	Inaccessible								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Inaccessible								
Wall	Non-Asbestos Plaster								V03
<b>Comments:</b> No access above ceiling.									
<b>Level :</b> 2 - Second Floor		<b>Room :</b> LOC 215 - Corridor				<b>Asbestos Present :</b> Yes			
Ceiling	Non-Asbestos Drywall Compound								
Ceiling	Non-Asbestos Lay-in Tile								
Duct	Uninsulated								
Floor	Non-Asbestos Vinyl Tile								
Piping	Fibreglass								
Structure	Concrete								
Wall	Asbestos Drywall Compound	600.0	SF	Good	Chrysotile 1.80%	A	7	Yes	No V01
Wall	Non-Asbestos Plaster								V03

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
<b>Comments:</b>									
Vinyl flooring and drywall ceiling bulkhead - new - not sampled - no asbestos.									
<b>Level :</b> 2 - Second Floor		<b>Room :</b> LOC 216 - Stairwell			<b>Asbestos Present :</b> Potentially				
Ceiling	Non-Asbestos Plaster								V03
Duct	Inaccessible								
Floor	Terrazzo								
Mechanical	Inaccessible								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Inaccessible								
Wall	Non-Asbestos Plaster								V03
<b>Comments:</b> No access above ceiling.									
<b>Level :</b> 2 - Second Floor		<b>Room :</b> LOC 217 - Elevator Lobby			<b>Asbestos Present :</b> Potentially				
Ceiling	Non-Asbestos Drywall Compound								
Duct	Inaccessible								
Floor	Terrazzo								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Non-Asbestos Drywall Compound								
Wall	Non-Asbestos Plaster								V03
<b>Comments:</b> No access above ceiling.									
Drywall - not sampled - new - no asbestos.									

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
<b>Level : 2 - Second Floor</b>		<b>Room : LOC 218 - Pipe Chase</b>			<b>Asbestos Present : Yes</b>				
Floor	Not Accessible								
<b>Comments:</b>									
Inaccessible asbestos containing mechanical insulation present behind wall cavities.									
<b>Level : 3 - Second Floor</b>		<b>Room : LOC 301 - Elevator Lobby</b>			<b>Asbestos Present : Potentially</b>				
Ceiling	Non-Asbestos Drywall Compound								
Duct	Inaccessible								
Floor	Terrazzo								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Non-Asbestos Drywall Compound								
Wall	Non-Asbestos Plaster								V03
<b>Comments:</b> No access above ceiling.									
Drywall - not sampled - new - no asbestos.									
<b>Level : 3 - Second Floor</b>		<b>Room : LOC 302 - Stairwell</b>			<b>Asbestos Present : Potentially</b>				
Ceiling	Non-Asbestos Plaster								V03
Duct	Inaccessible								
Floor	Terrazzo								
Mechanical	Inaccessible								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Inaccessible								

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Wall	Non-Asbestos Plaster								V03

**Comments:** No access above ceiling.

**Level :** 3 - Third Floor

**Room :** LOC 303 - Office

**Asbestos Present :** Yes

Ceiling	Non-Asbestos Drywall Compound								
Ceiling	Non-Asbestos Lay-in Tile								
Duct	Fibreglass								
Duct	Uninsulated								
Floor	Carpet								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Asbestos Drywall Compound	80.0	SF	Good	Chrysotile 1.80%	A	7	Yes	No V01
Wall	Non-Asbestos Plaster								V03

**Comments:**

Ceiling tiles and drywall ceiling bulkhead - not sampled - new - no asbestos.

**Level :** 3 - Third Floor

**Room :** LOC 304 - Office

**Asbestos Present :** Yes

Ceiling	Non-Asbestos Drywall Compound
Ceiling	Non-Asbestos Lay-in Tile
Duct	Fibreglass
Duct	Uninsulated
Floor	Carpet
Piping	Fibreglass Fitting

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type		Access.	Action	Visible	Friable	Sample
Piping	Fibreglass Straight Run										
Structure	Concrete										
Wall	Asbestos Drywall Compound	80.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V01
Wall	Non-Asbestos Plaster										V03

## Comments:

Ceiling tiles and drywall ceiling bulkhead - not sampled - new - no asbestos.

<b>Level :</b> 3 - Third Floor		<b>Room :</b> LOC 305 - Office				<b>Asbestos Present :</b> Yes					
Ceiling	Non-Asbestos Drywall Compound										
Ceiling	Non-Asbestos Lay-in Tile										
Duct	Fibreglass										
Duct	Uninsulated										
Floor	Carpet										
Piping	Fibreglass Fitting										
Piping	Fibreglass Straight Run										
Structure	Concrete										
Wall	Asbestos Drywall Compound	80.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V01
Wall	Non-Asbestos Plaster										V03

## Comments:

Ceiling tiles and drywall ceiling bulkhead - not sampled - new - no asbestos.

<b>Level :</b> 3 - Third Floor		<b>Room :</b> LOC 306 - Office				<b>Asbestos Present :</b> Yes					
Ceiling	Non-Asbestos Drywall Compound										
Ceiling	Non-Asbestos Lay-in Tile										

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type		Access.	Action	Visible	Friable	Sample
Duct	Fibreglass										
Duct	Uninsulated										
Floor	Carpet										
Piping	Fibreglass Fitting										
Piping	Fibreglass Straight Run										
Structure	Concrete										
Wall	Asbestos Drywall Compound	100.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V01
Wall	Non-Asbestos Plaster										V03

## Comments:

Ceiling tiles and drywall ceiling bulkhead - not sampled - new - no asbestos.

Level : 3 - Third Floor		Room : LOC 307 - Meeting Room				Asbestos Present : Yes					
Ceiling	Non-Asbestos Drywall Compound										
Ceiling	Non-Asbestos Lay-in Tile										
Duct	Uninsulated										
Floor	Carpet										
Piping	Fibreglass Fitting										
Piping	Fibreglass Straight Run										
Structure	Concrete										
Wall	Asbestos Drywall Compound	100.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V01
Wall	Non-Asbestos Plaster										V03

## Comments:

Ceiling tiles and some drywall not sampled - new - no asbestos.

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Level : 3 - Third Floor		Room : LOC 308 - Washroom			Asbestos Present : No				
Ceiling	Non-Asbestos 2 x 4 Lay-in Tile								05-02
Duct	Uninsulated								
Floor	Ceramic Tile								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Marble								
Wall	Non-Asbestos Plaster								V03
Comments:									
Level : 3 - Third Floor		Room : LOC 309 - Meeting Room			Asbestos Present : No				
Ceiling	Non-Asbestos 2 x 4 Lay-in Tile								05-02
Duct	Uninsulated								
Floor	Ceramic Tile								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Marble								
Wall	Non-Asbestos Plaster								V03
Comments:									
Level : 3 - Third Floor		Room : LOC 310 - Office			Asbestos Present : No				

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Ceiling	Non-Asbestos 2 x 4 Lay-in Tile								05-02
Duct	Uninsulated								
Floor	Ceramic Tile								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Marble								
Wall	Non-Asbestos Plaster								V03

## Comments:

<b>Level :</b> 3 - Third Floor		<b>Room :</b> LOC 311 - Office		<b>Asbestos Present :</b> No					
Ceiling	Non-Asbestos 2 x 4 Lay-in Tile								05-02
Duct	Uninsulated								
Floor	Ceramic Tile								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Marble								
Wall	Non-Asbestos Plaster								V03

## Comments:

<b>Level :</b> 3 - Third Floor		<b>Room :</b> LOC 312 - Office		<b>Asbestos Present :</b> Yes					
Ceiling	Non-Asbestos Drywall Compound								
Ceiling	Non-Asbestos Lay-in Tile								

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type		Access.	Action	Visible	Friable	Sample
Duct	Fibreglass										
Duct	Uninsulated										
Floor	Carpet										
Piping	Fibreglass Fitting										
Piping	Fibreglass Straight Run										
Structure	Concrete										
Wall	Asbestos Drywall Compound	400.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V01

## Comments:

Ceiling tiles and drywall ceiling bulkhead not sampled - new - no asbestos.

<b>Level :</b> 3 - Third Floor		<b>Room :</b> LOC 313 - Women's Washroom				<b>Asbestos Present :</b> Yes					
Ceiling	Asbestos Drywall Compound	150.0	SF	Good	Chrysotile	1.80%	C	7	Yes	No	V01
Duct	Inaccessible										
Floor	Ceramic Tile										
Floor	Terrazzo										
Mechanical	Inaccessible										
Piping	Inaccessible										
Structure	Inaccessible										
Wall	Non-Asbestos Plaster										V03

**Comments:** No access above ceiling.

<b>Level :</b> 3 - Third Floor		<b>Room :</b> LOC 314 - Pipe Room				<b>Asbestos Present :</b> Yes					
Ceiling	Not Found										
Duct	Uninsulated										

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type		Access.	Action	Visible	Friable	Sample
Floor	Concrete										
Mechanical	Not Found										
Piping	Fibreglass Fitting										
Piping	Fibreglass Straight Run										
Structure	Inaccessible										
Wall	Asbestos Drywall Compound	80.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V01

## Comments:

<b>Level :</b> 3 - Third Floor		<b>Room :</b> LOC 315 - Custodial Closet				<b>Asbestos Present :</b> Potentially					
Ceiling	Non-Asbestos Plaster										V03
Duct	Inaccessible										
Floor	Terrazzo										
Mechanical	Inaccessible										
Piping	Inaccessible										
Structure	Inaccessible										
Wall	Ceramic Tile										
Wall	Non-Asbestos Plaster										V03

**Comments:** No access above ceiling.

<b>Level :</b> 3 - Third Floor		<b>Room :</b> LOC 316 - Stairwell				<b>Asbestos Present :</b> Potentially					
Ceiling	Non-Asbestos Plaster										V03
Duct	Inaccessible										
Floor	Terrazzo										
Mechanical	Inaccessible										

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Non-Asbestos Plaster								V03
<b>Comments:</b> No access above ceiling.									
<b>Level :</b> 3 - Third Floor		<b>Room :</b> LOC 317 - Telephone Room				<b>Asbestos Present :</b> No			
Ceiling	Not Found								
Duct	Not Found								
Floor	Terrazzo								
Mechanical	Not Found								
Piping	Uninsulated								
Structure	Concrete								
Wall	Ceramic Tile								
Wall	Non-Asbestos Plaster								V03
<b>Comments:</b>									
<b>Level :</b> 3 - Third Floor		<b>Room :</b> LOC 318 - LAN Room				<b>Asbestos Present :</b> Yes			
Ceiling	Not Found								
Duct	Uninsulated								
Floor	Non-Asbestos Vinyl Tile								
Mechanical	Not Found								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Asbestos Drywall Compound	200.0	SF	Good	Chrysotile 1.80%	A	7	Yes	No V01

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Wall	Non-Asbestos Drywall Compound								
Wall	Non-Asbestos Plaster								V03

## Comments:

Vinyl floor tiles and some drywall not sampled - new - no asbestos.

Level : 3 - Third Floor		Room : LOC 319 - Staff Lounge				Asbestos Present : Yes						
Ceiling	Fibrous Fireproofing Debris											
Ceiling	Non-Asbestos Drywall Compound											
Ceiling	Non-Asbestos Lay-in Tile											
Duct	Uninsulated											
Floor	Carpet											
Mechanical	Not Found											
Piping	Fibreglass Fitting											
Structure	Concrete											
Wall	Asbestos Drywall Compound	200.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V01	
Wall	Non-Asbestos Plaster										V03	

## Comments:

Ceiling tiles and some drywall not sampled - new - no asbestos.

<b>Level :</b> 3 - Third Floor		<b>Room :</b> LOC 320 - LAN Room				<b>Asbestos Present :</b> Yes			
Ceiling	Non-Asbestos Drywall Compound								
Ceiling	Non-Asbestos Lay-in Tile								
Duct	Uninsulated								
Floor	Suspect Vinyl Sheet Flooring	200.0	SF	Good		A	8	Yes	No

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Mechanical	Not Found									
Piping	Fibreglass Straight Run									
Structure	Concrete									
Wall	Asbestos Drywall Compound	200.0	SF	Good	Chrysotile 1.80%	A	7	Yes	No	V01

## Comments:

Ceiling tiles and drywall ceiling bulkhead not sampled - new - no asbestos.

<b>Level :</b> 3 - Third Floor		<b>Room :</b> LOC 321 - Mechanical Room				<b>Asbestos Present :</b> Yes				
Ceiling	Not Found									
Duct	Uninsulated									
Floor	Concrete									
Floor	Wood									
Mechanical	Exchanger									
Piping	Fibreglass Fitting									
Piping	Fibreglass Straight Run									
Structure	Concrete									
Wall	Asbestos Drywall Compound	300.0	SF	Good	Chrysotile 1.80%	A	7	Yes	No	V01
Wall	Non-Asbestos Plaster									V03

## Comments:

<b>Level :</b> 3 - Third Floor		<b>Room :</b> LOC 322 - Pipe Room				<b>Asbestos Present :</b> No				
Ceiling	Not Found									
Duct	Uninsulated									
Floor	Metal									

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Mechanical	Not Found								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Non-Asbestos Fireproofing								09-01/02/03
Wall	Non-Asbestos Plaster								06-02

## Comments:

Level : 3 - Third Floor		Room : LOC 323 - Men's Washroom			Asbestos Present : Yes						
Ceiling	Asbestos Drywall Compound	150.0	SF	Good	Chrysotile	1.80%	C	7	Yes	No	V01
Duct	Inaccessible										
Floor	Ceramic Tile										
Mechanical	Inaccessible										
Piping	Inaccessible										
Structure	Inaccessible										
Wall	Marble										
Wall	Non-Asbestos Plaster										V03

Comments: No access above ceiling.

Level : 3 - Third Floor		Room : LOC 324 - Stairwell			Asbestos Present : Potentially						
Ceiling	Non-Asbestos Plaster										V03
Duct	Inaccessible										
Floor	Terrazzo										
Mechanical	Inaccessible										
Piping	Inaccessible										

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Structure	Inaccessible									
Wall	Non-Asbestos Plaster									03-05
<b>Comments:</b> No access above ceiling.										
<b>Level :</b> 3 - Third Floor		<b>Room :</b> LOC 325 - Stairwell				<b>Asbestos Present :</b> Yes				
Ceiling	Non-Asbestos Drywall Compound									
Ceiling	Non-Asbestos Lay-in Tile									
Duct	Uninsulated									
Floor	Non-Asbestos Vinyl Tile									
Piping	Fibreglass									
Structure	Concrete									
Wall	Asbestos Drywall Compound	80.0	SF	Good	Chrysotile 1.80%	A	7	Yes	No	V01
Wall	Non-Asbestos Plaster									V03
<b>Comments:</b>										
Vinyl flooring and drywall ceiling bulkhead - new - not sampled - no asbestos.										
<b>Level :</b> 3 - Third Floor		<b>Room :</b> LOC 326 - Office Space				<b>Asbestos Present :</b> Yes				
Ceiling	Non-Asbestos Drywall Compound									
Ceiling	Non-Asbestos Lay-in Tile									
Duct	Uninsulated									
Floor	Carpet									
Mechanical	Not Found									
Piping	Fibreglass Fitting									
Piping	Fibreglass Straight Run									

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type		Access.	Action	Visible	Friable	Sample
Structure	Concrete										
Wall	Asbestos Drywall Compound	1,000.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V01
Wall	Non-Asbestos Drywall Compound										
Wall	Non-Asbestos Plaster										V03

## Comments:

Ceiling tiles and some drywall not sampled - new - no asbestos

<b>Level :</b> 4 - Fourth Floor		<b>Room :</b> LOC 401 - Office Space				<b>Asbestos Present :</b> Yes					
Ceiling	Non-Asbestos Drywall Compound										
Ceiling	Non-Asbestos Lay-in Tile										
Duct	Fibreglass										
Duct	Uninsulated										
Floor	Carpet										
Mechanical	Exchanger										
Piping	Fibreglass Fitting										
Piping	Fibreglass Straight Run										
Structure	Concrete										
Wall	Asbestos Drywall Compound	200.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V01
Wall	Non-Asbestos Drywall Compound										
Wall	Non-Asbestos Plaster										V03

## Comments:

Ceiling tiles and some drywall not sampled - new - no asbestos.

<b>Level :</b> 4 - Fourth Floor		<b>Room :</b> LOC 402 - Stairwell				<b>Asbestos Present :</b> Potentially					
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# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Ceiling	Non-Asbestos Plaster								V03
Duct	Inaccessible								
Floor	Terrazzo								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Non-Asbestos Plaster								V03

**Comments:** No access above ceiling.

<b>Level :</b> 4 - Fourth Floor		<b>Room :</b> LOC 403 - Office Space		<b>Asbestos Present :</b> Yes					
Ceiling	Non-Asbestos Drywall Compound								
Ceiling	Non-Asbestos Lay-in Tile								
Duct	Fibreglass								
Duct	Uninsulated								
Floor	Carpet								
Mechanical	Exchanger								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Asbestos Drywall Compound	1,000.0 SF	Good	Chrysotile 1.80%	A	7	Yes	No	V01
Wall	Non-Asbestos Drywall Compound								
Wall	Non-Asbestos Plaster								V03

**Comments:**

Ceiling tiles and some drywall not sampled - new - no asbestos.

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
<b>Level :</b> 4 - Fourth Floor		<b>Room :</b> LOC 404 - Men's Washroom				<b>Asbestos Present :</b> Yes				
Ceiling	Asbestos Drywall Compound	150.0	SF	Good	Chrysotile 1.80%	C	7	Yes	No	V01
Duct	Uninsulated									
Floor	Terrazzo									
Mechanical	Not Found									
Piping	Fibreglass Fitting									
Piping	Fibreglass Straight Run									
Structure	Concrete									
Wall	Marble									
Wall	Non-Asbestos Plaster									V03

## Comments:

<b>Level :</b> 4 - Fourth Floor		<b>Room :</b> LOC 405 - Pipeway				<b>Asbestos Present :</b> No				
Ceiling	Not Found									
Duct	Uninsulated									
Floor	Concrete									
Mechanical	Not Found									
Piping	Fibreglass Fitting									
Piping	Fibreglass Straight Run									
Structure	Concrete									
Wall	Masonry									

## Comments:

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
<b>Level :</b> 4 - Fourth Floor		<b>Room :</b> LOC 406 - Mechanical Room				<b>Asbestos Present :</b> Yes				
Ceiling	Not Found									
Duct	Uninsulated									
Floor	Suspect Vinyl Floor Tile	300.0	SF	Good		A	8	Yes	No	
Mechanical	Exchanger									
Piping	Fibreglass Fitting									
Piping	Fibreglass Straight Run									
Structure	Concrete									
Wall	Asbestos Drywall Compound	300.0	SF	Good	Chrysotile 1.80%	A	7	Yes	No	01-04
Wall	Non-Asbestos Plaster									V06
<b>Comments:</b>										
<b>Level :</b> 4 - Fourth Floor		<b>Room :</b> LOC 407 - Pipe Room				<b>Asbestos Present :</b> No				
Ceiling	Not Found									
Duct	Not Found									
Floor	Concrete									
Piping	Fibreglass Straight Run									
Structure	Concrete									
Wall	Masonry									
<b>Comments:</b>										
<b>Level :</b> 4 - Fourth Floor		<b>Room :</b> LOC 408 - Custodial Closet				<b>Asbestos Present :</b> Potentially				
Ceiling	Non-Asbestos Plaster									V03

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Duct	Inaccessible								
Floor	Terrazzo								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Ceramic Tile								
Wall	Non-Asbestos Plaster								V03
<b>Comments:</b> No access above ceiling.									
<b>Level :</b> 4 - Fourth Floor		<b>Room :</b> LOC 409 - Stairwell			<b>Asbestos Present :</b> Potentially				
Ceiling	Non-Asbestos Plaster								V03
Duct	Inaccessible								
Floor	Terrazzo								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Non-Asbestos Plaster								V03
<b>Comments:</b> No access above ceiling.									
<b>Level :</b> 4 - Fourth Floor		<b>Room :</b> LOC 410 - Hydro Closet			<b>Asbestos Present :</b> No				
Ceiling	Not Found								
Ceiling	Texture Finished (Coat)								
Duct	Uninsulated								
Mechanical	Not Found								

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Ceramic Tile								
Wall	Non-Asbestos Plaster								03-06

## Comments:

<b>Level :</b> 4 - Fourth Floor	<b>Room :</b> LOC 411	<b>Asbestos Present :</b> Potentially
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Floor Not Accessible

**Comments:** No access.

<b>Level :</b> 4 - Fourth Floor	<b>Room :</b> LOC 412 - Women's Washroom	<b>Asbestos Present :</b> Yes
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Ceiling	Asbestos Drywall Compound	150.0	SF	Good	Chrysotile 1.80%	C	7	Yes	No	V01
Duct	Uninsulated									
Floor	Terrazzo									
Mechanical	Not Found									
Piping	Fibreglass Fitting									
Piping	Fibreglass Straight Run									
Structure	Concrete									
Wall	Marble									
Wall	Non-Asbestos Plaster									V03

## Comments:

4 SF of waetr damage to drywall ceiling.

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type		Access.	Action	Visible	Friable	Sample
<b>Level :</b> 4 - Fourth Floor		<b>Room :</b> LOC 413 - Storage Room				<b>Asbestos Present :</b> Yes					
Ceiling	Non-Asbestos Parging Cement Patch										
Duct	Uninsulated										
Floor	Non-Asbestos Vinyl Flooring										
Piping	Fibreglass										
Structure	Concrete										
Wall	Non-Asbestos Drywall Compound										
Wall	Non-Asbestos Drywall Compound	100.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V05
Wall	Non-Asbestos Plaster										V03

## Comments:

Floor, ceiling tiles and drywall are new - not sampled - no asbestos.

<b>Level :</b> 4 - Fourth Floor		<b>Room :</b> LOC 414 - LAN Room				<b>Asbestos Present :</b> No					
Ceiling	Not Found										
Duct	Uninsulated										
Floor	Non-Asbestos Vinyl Tile										
Mechanical	Not Found										
Piping	Not Found										
Structure	Concrete										
Wall	Asbestos Drywall Compound	20.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V-05
Wall	Masonry										
Wall	Non-Asbestos Plaster										V03

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
<b>Comments:</b>									
Floor tiles not sampled - new - no asbestos.									
<b>Level :</b> 4 - Fourth Floor		<b>Room :</b> LOC 415 - Corridor				<b>Asbestos Present :</b> Yes			
Ceiling	Non-Asbestos Drywall Compound								
Ceiling	Non-Asbestos Lay-in Tile								
Duct	Uninsulated								
Floor	Non-Asbestos Vinyl Flooring								
Mechanical	Not Found								
Piping	Fibreglass								
Structure	Concrete								
Wall	Asbestos Drywall Compound	300.0	SF	Good	Chrysotile 1.80%	A	7	Yes	No V01
<b>Comments:</b>									
Ceiling tiles and ceiling drywall - not sampled - new - no asbestos.									
<b>Level :</b> 4 - Fourth Floor		<b>Room :</b> LOC 416 - Stairwell				<b>Asbestos Present :</b> Potentially			
Ceiling	Non-Asbestos Plaster								V03
Duct	Inaccessible								
Floor	Non-Asbestos Vinyl Tile								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Non-Asbestos Plaster								V03

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
<b>Comments:</b> No access above ceiling.									
Vinyl floor tiles - not sampled - new - no asbestos.									
<b>Level :</b> 4 - Fourth Floor		<b>Room :</b> LOC 417 - Pipe Chase			<b>Asbestos Present :</b> Yes				
Floor	Not Accessible								
<b>Comments:</b>									
Inaccessible asbestos containing mechanical insulation present behind wall cavities.									
<b>Level :</b> 5 - Fifth Floor		<b>Room :</b> LOC 501 - Board Room			<b>Asbestos Present :</b> No				
Ceiling	Non-Asbestos Drywall Compound								
Ceiling	Non-Asbestos Lay-in Tile								
Duct	Fibreglass								
Duct	Uninsulated								
Floor	Carpet								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Non-Asbestos Drywall Compound								
Wall	Non-Asbestos Plaster								
<b>Comments:</b>									
Ceiling tiles and drywall are new - not sampled - no asbestos.									
<b>Level :</b> 5 - Fifth Floor		<b>Room :</b> LOC 502 - Office			<b>Asbestos Present :</b> No				
Ceiling	Non-Asbestos Drywall Compound								
Ceiling	Non-Asbestos Lay-in Tile								

03-07

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Duct	Fibreglass								
Duct	Uninsulated								
Floor	Carpet								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Non-Asbestos Drywall Compound								
Wall	Non-Asbestos Plaster								03-07

## Comments:

Ceiling tiles and drywall are new - not sampled - no asbestos.

<b>Level :</b> 5 - Fifth Floor		<b>Room :</b> LOC 503 - Vacant Room		<b>Asbestos Present :</b> No					
Ceiling	Non-Asbestos Drywall Compound								
Ceiling	Non-Asbestos Lay-in Tile								
Duct	Uninsulated								
Floor	Carpet								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Non-Asbestos Drywall Compound								
<b>Comments:</b>									
Ceiling tiles and drywall are new - not sampled - no asbestos.									
<b>Level :</b> 5 - Fifth Floor		<b>Room :</b> LOC 504 - Washroom		<b>Asbestos Present :</b> No					

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Ceiling	Non-Asbestos Drywall Compound								
Duct	Uninsulated								
Floor	Ceramic Tile								
Mechanical	Not Found								
Piping	Fibreglass								
Piping	Fibreglass Fitting								
Structure	Concrete								
Wall	Marble								
Wall	Non-Asbestos Plaster								V07

## Comments:

Drywall is new - not sampled - no asbestos.

<b>Level :</b> 5 - Fifth Floor		<b>Room :</b> LOC 505 - Pipechase		<b>Asbestos Present :</b> No					
Ceiling	Not Found								
Duct	Uninsulated								
Floor	Steel								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Concrete								
Wall	Non-Asbestos Plaster								06-03

## Comments:

<b>Level :</b> 5 - Fifth Floor		<b>Room :</b> LOC 506 - Custodial Closet		<b>Asbestos Present :</b> Potentially					
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# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Ceiling	Non-Asbestos Plaster								V03
Duct	Inaccessible								
Floor	Terrazzo								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Ceramic Tile								
Wall	Non-Asbestos Plaster								V03

**Comments:** No access above ceiling.

<b>Level :</b> 5 - Fifth Floor		<b>Room :</b> LOC 507 - Mechanical Room				<b>Asbestos Present :</b> Yes			
Ceiling	Not Found								
Duct	Uninsulated								
Floor	Ceramic Tile								
Mechanical	Not Found								
Piping	Fibreglass Fitting								
Piping	Fibreglass Fitting								
Structure	Concrete								
Wall	Asbestos Drywall Compound	300.0	SF	Good	Chrysotile 1.80%	A	7	Yes	No 01-05
Wall	Non-Asbestos Plaster								V03

**Comments:**

<b>Level :</b> 5 - Fifth Floor		<b>Room :</b> LOC 508 - Stairwell				<b>Asbestos Present :</b> Potentially			
Ceiling	Non-Asbestos Plaster								V03

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Duct	Inaccessible								
Floor	Terrazzo								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Non-Asbestos Plaster								V03
<b>Comments:</b> No access above ceiling.									
<b>Level :</b> 5 - Fifth Floor		<b>Room :</b> LOC 509 - Pipe Room			<b>Asbestos Present :</b> No				
Ceiling	Not Found								
Duct	Uninsulated								
Floor	Steel								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Concrete								
Wall	Non-Asbestos Plaster								06-03
<b>Comments:</b>									
<b>Level :</b> 5 - Fifth Floor		<b>Room :</b> LOC 510 - Women's Washroom			<b>Asbestos Present :</b> No				
Ceiling	Non-Asbestos Drywall Compound								
Duct	Uninsulated								
Floor	Ceramic Tile								
Mechanical	Not Found								

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Piping	Fibreglass								
Piping	Fibreglass Fitting								
Structure	Concrete								
Wall	Marble								
Wall	Non-Asbestos Plaster								V07

## Comments:

Drywall is new - not sampled - no asbestos.

<b>Level :</b> 5 - Fifth Floor		<b>Room :</b> LOC 511 - LAN Room			<b>Asbestos Present :</b> Potentially				
Ceiling	Non-Asbestos Plaster								V03
Duct	Inaccessible								
Floor	Ceramic Tile								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Masonry								
Wall	Non-Asbestos Plaster								V03

**Comments:** No access above ceiling.

<b>Level :</b> 5 - Fifth Floor		<b>Room :</b> LOC 512 - Washroom			<b>Asbestos Present :</b> Potentially				
Ceiling	Non-Asbestos Drywall Compound								
Floor	Ceramic Tile								
Mechanical	Inaccessible								
Piping	Inaccessible								

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Structure	Inaccessible								
Wall	Non-Asbestos Plaster								
<b>Comments:</b> No access above ceiling. Water damage at ceiling vent.									
<b>Level :</b> 5 - Fifth Floor		<b>Room :</b> LOC 513 - LAN Room				<b>Asbestos Present :</b> No			
Ceiling	Not Found								
Duct	Uninsulated								
Floor	Non-Asbestos Vinyl Tile								
Mechanical	Not Found								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Non-Asbestos Drywall Compound								
<b>Comments:</b> Floor tile and drywall are new - not sampled - no asbestos.									
<b>Level :</b> 5 - Fifth Floor		<b>Room :</b> LOC 515 - Office				<b>Asbestos Present :</b> No			
Ceiling	Non-Asbestos Drywall Compound								
Ceiling	Non-Asbestos Lay-in Tile								
Duct	Uninsulated								
Floor	Carpet								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
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Structure	Concrete
Wall	Non-Asbestos Drywall Compound

## Comments:

Drywall and ceiling tiles are new - not sampled - no asbestos.

<b>Level :</b> 5 - Fifth Floor	<b>Room :</b> LOC 516 - Office	<b>Asbestos Present :</b> No
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Ceiling	Non-Asbestos Drywall Compound
Ceiling	Non-Asbestos Lay-in Tile
Duct	Uninsulated
Floor	Carpet
Piping	Fibreglass Fitting
Piping	Fibreglass Straight Run
Structure	Concrete
Wall	Non-Asbestos Drywall Compound

## Comments:

Drywall and ceiling tiles are new - not sampled - no asbestos.

<b>Level :</b> 5 - Fifth Floor	<b>Room :</b> LOC 517 - Office Space	<b>Asbestos Present :</b> No
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Ceiling	Non-Asbestos Drywall Compound
Ceiling	Non-Asbestos Lay-in Tile
Duct	Uninsulated
Floor	Carpet
Piping	Fibreglass Fitting
Piping	Fibreglass Straight Run

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Structure	Concrete								
Wall	Non-Asbestos Drywall Compound								
Wall	Non-Asbestos Plaster								V03

## Comments:

Drywall and ceiling tiles are new - not sampled - no asbestos.

<b>Level :</b> 5 - Fifth Floor		<b>Room :</b> LOC 518 - Office			<b>Asbestos Present :</b> No				
Ceiling	Non-Asbestos Drywall Compound								
Ceiling	Non-Asbestos Lay-in Tile								
Duct	Fibreglass								
Duct	Uninsulated								
Floor	Carpet								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Non-Asbestos Drywall Compound								
Wall	Non-Asbestos Plaster								03-07

## Comments:

Ceiling tiles and drywall are new - not sampled - no asbestos.

<b>Level :</b> 5 - Fifth Floor		<b>Room :</b> LOC 519 - Office Space			<b>Asbestos Present :</b> No				
Ceiling	Non-Asbestos Drywall Compound								
Ceiling	Non-Asbestos Lay-in Tile								
Duct	Uninsulated								

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Floor	Carpet								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Non-Asbestos Drywall Compound								
Wall	Non-Asbestos Plaster								V03

## Comments:

Drywall and ceiling tiles are new - not sampled - no asbestos.

<b>Level :</b> 5 - Fifth Floor	<b>Room :</b> LOC 520 - Office Space	<b>Asbestos Present :</b> No
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Ceiling	Non-Asbestos Drywall Compound								
Ceiling	Non-Asbestos Lay-in Tile								
Duct	Uninsulated								
Floor	Carpet								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Non-Asbestos Drywall Compound								
Wall	Non-Asbestos Plaster								V03

## Comments:

Drywall and ceiling tiles are new - not sampled - no asbestos.

<b>Level :</b> 5 - Fifth Floor	<b>Room :</b> LOC 521 - Vacant Room	<b>Asbestos Present :</b> Yes
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Ceiling	Non-Asbestos Drywall Compound								
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# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type		Access.	Action	Visible	Friable	Sample
Ceiling	Non-Asbestos Lay-in Tile										
Duct	Uninsulated										
Floor	Carpet										
Piping	Fibreglass Fitting										
Piping	Fibreglass Straight Run										
Structure	Concrete										
Wall	Asbestos Drywall Compound	100.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V01
Wall	Non-Asbestos Plaster										V03

## Comments:

Ceiling tiles and some drywall are new - not sampled - no asbestos.

<b>Level :</b> 5 - Fifth Floor		<b>Room :</b> LOC 522 - Stairwell				<b>Asbestos Present :</b> Potentially					
Ceiling	Non-Asbestos Plaster										V03
Duct	Inaccessible										
Floor	Terrazzo										
Mechanical	Inaccessible										
Piping	Inaccessible										
Structure	Inaccessible										
Wall	Non-Asbestos Plaster										V03

**Comments:** No access above ceiling.

<b>Level :</b> 5 - Fifth Floor		<b>Room :</b> LOC 523 - Elevator Lobby				<b>Asbestos Present :</b> Yes					
Ceiling	Non-Asbestos Drywall Compound										
Ceiling	Non-Asbestos Lay-in Tile										

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type		Access.	Action	Visible	Friable	Sample
Duct	Uninsulated										
Floor	Non-Asbestos Vinyl Flooring										
Floor	Terrazzo										
Piping	Fibreglass Fitting										
Piping	Fibreglass Straight Run										
Structure	Concrete										
Wall	Asbestos Drywall Compound	200.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V01
Wall	Non-Asbestos Plaster										V03

## Comments:

Vinyl flooring, ceiling tiles and some drywall are new - not sampled - no asbestos.

<b>Level :</b> 5 - Fifth Floor	<b>Room :</b> LOC 523 - Pipe Chase	<b>Asbestos Present :</b> Yes
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Floor Not Accessible

## Comments:

Inaccessible asbestos containing mechanical insulation present behind wall cavities.

<b>Level :</b> 6 - Sixth Floor	<b>Room :</b> LOC 601 - Elevator Lobby	<b>Asbestos Present :</b> Yes
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Ceiling	Non-Asbestos Drywall Compound
Duct	Inaccessible
Floor	Carpet
Floor	Terrazzo
Mechanical	Inaccessible
Piping	Inaccessible
Structure	Inaccessible

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type		Access.	Action	Visible	Friable	Sample
Wall	Asbestos Drywall Compound	200.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V01
Wall	Non-Asbestos Drywall Compound										
Wall	Non-Asbestos Plaster										V03

**Comments:** No access above ceiling.

Some drywall is new - not sampled - no asbestos.

<b>Level :</b> 6 - Sixth Floor		<b>Room :</b> LOC 602 - Vacant Room				<b>Asbestos Present :</b> Yes					
Ceiling	Non-Asbestos Drywall Compound										
Ceiling	Non-Asbestos Lay-in Tile										
Duct	Not Found										
Floor	Carpet										
Mechanical	Not Found										
Structure	Concrete										
Structure	Non-Asbestos Fireproofing										10-01/02/03
Structure	Steel Beam										
Wall	Asbestos Drywall Compound	150.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	01-06
Wall	Non-Asbestos Plaster										V03

**Comments:**

Ceiling tiles are new - not sampled - no asbestos.

<b>Level :</b> 6 - Sixth Floor		<b>Room :</b> LOC 603 - Lunch Room				<b>Asbestos Present :</b> Yes					
Ceiling	Non-Asbestos Drywall Compound										
Ceiling	Non-Asbestos Lay-in Tile										
Floor	Carpet										

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type		Access.	Action	Visible	Friable	Sample
Structure	Concrete										
Structure	Non-Asbestos Fireproofing										10-01/02/03
Structure	Steel Beam										
Wall	Asbestos Drywall Compound	150.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	01-06
Wall	Non-Asbestos Plaster										V03

## Comments:

Ceiling tiles are new - not sampled - no asbestos.

<b>Level :</b> 6 - Sixth Floor		<b>Room :</b> LOC 604 - Stairwell				<b>Asbestos Present :</b> Potentially					
Ceiling	Non-Asbestos Plaster										V03
Duct	Inaccessible										
Floor	Terrazzo										
Mechanical	Inaccessible										
Piping	Inaccessible										
Structure	Inaccessible										
Wall	Non-Asbestos Plaster										V03

**Comments:** No access above ceiling.

<b>Level :</b> 6 - Sixth Floor		<b>Room :</b> LOC 605 - Office Space				<b>Asbestos Present :</b> Yes					
Ceiling	Non-Asbestos Drywall Compound										
Ceiling	Non-Asbestos Lay-in Tile										
Duct	Uninsulated										
Floor	Carpet										
Mechanical	Not Found										

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type		Access.	Action	Visible	Friable	Sample
Piping	Fibreglass Fitting										
Piping	Fibreglass Straight Run										
Structure	Concrete										
Wall	Asbestos Drywall Compound	100.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V01
Wall	Non-Asbestos Drywall Compound										
Wall	Non-Asbestos Plaster										V03

## Comments:

Ceiling tiles and some drywall are new - not sampled - no asbestos.

<b>Level :</b> 6 - Sixth Floor		<b>Room :</b> LOC 606 - Office				<b>Asbestos Present :</b> Yes					
Ceiling	Non-Asbestos Drywall Compound										
Ceiling	Non-Asbestos Lay-in Tile										
Duct	Uninsulated										
Floor	Carpet										
Piping	Fibreglass Fitting										
Piping	Fibreglass Straight Run										
Structure	Concrete										
Wall	Asbestos Drywall Compound	200.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V01
Wall	Non-Asbestos Drywall Compound										

## Comments:

Ceiling tiles and some drywall are new - not sampled - no asbestos.

<b>Level :</b> 6 - Sixth Floor		<b>Room :</b> LOC 607 - Office				<b>Asbestos Present :</b> Yes					
Ceiling	Non-Asbestos Drywall Compound										

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type		Access.	Action	Visible	Friable	Sample
Ceiling	Non-Asbestos Lay-in Tile										
Duct	Uninsulated										
Floor	Carpet										
Piping	Fibreglass Fitting										
Piping	Fibreglass Straight Run										
Structure	Concrete										
Wall	Asbestos Drywall Compound	100.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V01
Wall	Non-Asbestos Drywall Compound										

## Comments:

Ceiling tiles and some drywall are new - not sampled - no asbestos.

<b>Level :</b> 6 - Sixth Floor		<b>Room :</b> LOC 608 - Office		<b>Asbestos Present :</b> Yes							
Ceiling	Non-Asbestos Drywall Compound										
Ceiling	Non-Asbestos Lay-in Tile										
Duct	Uninsulated										
Floor	Carpet										
Piping	Fibreglass Fitting										
Piping	Fibreglass Straight Run										
Structure	Concrete										
Wall	Asbestos Drywall Compound			Good	Chrysotile	1.80%	A	7	Yes	No	V01
Wall	Non-Asbestos Drywall Compound										

## Comments:

Ceiling tiles and some drywall are new - not sampled - no asbestos.

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
<b>Level :</b> 6 - Sixth Floor		<b>Room :</b> LOC 609 - Vacant Room				<b>Asbestos Present :</b> No			
Ceiling	Non-Asbestos Drywall Compound								
Ceiling	Non-Asbestos Lay-in Tile								
Ceiling	Non-Asbestos Plaster								06-04
Floor	Carpet								
Structure	Concrete Beam, Deck								
Structure	Non-Asbestos Fireproofing								V
Structure	Steel Beam								
Wall	Non-Asbestos Drywall Compound								
Wall	Non-Asbestos Plaster								V03

## Comments:

Ceiling tiles and drywall are new - not sampled - no asbestos.

<b>Level :</b> 6 - Sixth Floor		<b>Room :</b> LOC 610 - Storage Room				<b>Asbestos Present :</b> Yes			
Ceiling	Non-Asbestos Lay-in Tile								
Duct	Uninsulated								
Floor	Non-Asbestos Vinyl Flooring								
Piping	Not Found								
Structure	Concrete Beam, Deck								
Wall	Asbestos Drywall Compound	200.0	SF	Good	Chrysotile 1.80%	A	7	Yes	No V01
Wall	Non-Asbestos Drywall Compound								

## Comments:

Vinyl flooring, ceiling tiles and some drywall are new - not sampled - no asbestos.

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type		Access.	Action	Visible	Friable	Sample
<b>Level :</b> 6 - Sixth Floor		<b>Room :</b> LOC 611 - Office				<b>Asbestos Present :</b> Yes					
Ceiling	Non-Asbestos Drywall Compound										
Ceiling	Non-Asbestos Lay-in Tile										
Duct	Uninsulated										
Floor	Suspect Vinyl Sheet Flooring			Good			A	8	Yes	No	
Mechanical	Not Found										
Structure	Concrete										
Wall	Asbestos Drywall Compound	100.0	SF	Good	Chrysotile 1.80%		A	7	Yes	No	V01
Wall	Non-Asbestos Drywall Compound										

## Comments:

Cieling tiles and some drywall are new - not sampled - no asbestos.

<b>Level :</b> 6 - Sixth Floor		<b>Room :</b> LOC 612 - Board Room				<b>Asbestos Present :</b> Yes					
Ceiling	Non-Asbestos Lay-in Tile										
Ceiling	Non-Asbestos Plaster										
Duct	Uninsulated										
Floor	Carpet										
Piping	Fibreglass Fitting										
Piping	Fibreglass Straight Run										
Structure	Concrete										
Wall	Asbestos Drywall Compound	300.0	SF	Good	Chrysotile 1.80%		A	7	Yes	No	V01
Wall	Non-Asbestos Plaster										

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
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## Comments:

Plaster and ceiling tiles are new - not sampled - no asbestos.

<b>Level :</b> 6 - Sixth Floor	<b>Room :</b> LOC 613 - Mechanical Room	<b>Asbestos Present :</b> Yes
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Ceiling	Not Found								
Duct	Uninsulated								
Floor	Concrete								
Mechanical	Not Found								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Asbestos Drywall Compound		Good	Chrysotile 1.80%	A	7	Yes	No	V01
Wall	Non-Asbestos Plaster								V03

## Comments:

<b>Level :</b> 6 - Sixth Floor	<b>Room :</b> LOC 614 - Custodial Closet	<b>Asbestos Present :</b> Potentially
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Ceiling	Non-Asbestos Plaster								V03
Duct	Inaccessible								
Floor	Terrazzo								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Non-Asbestos Plaster								V03

**Comments:** No access above ceiling.

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
<b>Level :</b> 6 - Sixth Floor		<b>Room :</b> LOC 615 - Pipe Room			<b>Asbestos Present :</b> No				
Ceiling	Not Found								
Duct	Uninsulated								
Floor	Metal								
Mechanical	Not Found								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Concrete								
Wall	Masonry								
Wall	Non-Asbestos Plaster								06-05
<b>Comments:</b>									
<b>Level :</b> 6 - Sixth Floor		<b>Room :</b> LOC 616 - Washroom			<b>Asbestos Present :</b> Potentially				
Ceiling	Non-Asbestos Drywall Compound								
Duct	Inaccessible								
Floor	Ceramic Tile								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Marble								
Wall	Non-Asbestos Plaster								V03

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
<b>Comments:</b> No access above ceiling.										
Drywall is new - not sampled - no asbestos.										
Level : 6 - Sixth Floor		Room : LOC 617 - Stairwell				Asbestos Present : Potentially				
Ceiling	Non-Asbestos Plaster									V03
Duct	Inaccessible									
Floor	Terrazzo									
Mechanical	Inaccessible									
Piping	Inaccessible									
Structure	Inaccessible									
Wall	Non-Asbestos Plaster									V03
<b>Comments:</b> No access above ceiling.										
Level : 6 - Sixth Floor		Room : LOC 618 - Handicapped Washroom				Asbestos Present : Yes				
Ceiling	Asbestos Drywall Compound	80.0	SF	Good	Chrysotile 1.80%	C	7	Yes	No	V01
Duct	Inaccessible									
Floor	Ceramic Tile									
Mechanical	Inaccessible									
Piping	Inaccessible									
Structure	Inaccessible									
Wall	Asbestos Drywall Compound	300.0	SF	Good	Chrysotile 1.80%	A	7	Yes	No	V01
Wall	Non-Asbestos Plaster									V03
<b>Comments:</b> No access above ceiling.										

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type		Access.	Action	Visible	Friable	Sample
<b>Level :</b> 6 - Sixth Floor		<b>Room :</b> LOC 619 - Men's Washroom				<b>Asbestos Present :</b> Potentially					
Ceiling	Asbestos Drywall Compound	150.0	SF	Good	Chrysotile	1.80%	C	7	Yes	No	V01
Duct	Inaccessible										
Floor	Ceramic Tile										
Mechanical	Inaccessible										
Piping	Inaccessible										
Structure	Inaccessible										
Wall	Marble										
Wall	Non-Asbestos Plaster										V03
<b>Comments:</b> No access above ceiling.											
Drywall is new - not sampled - no asbestos.											
<b>Level :</b> 6 - Sixth Floor		<b>Room :</b> LOC 620 - Pipe Room				<b>Asbestos Present :</b> Yes					
Ceiling	Not Found										
Duct	Uninsulated										
Floor	Concrete										
Floor	Metal										
Piping	Fibreglass Fitting										
Piping	Fibreglass Straight Run										
Structure	Concrete										
Wall	Asbestos Drywall Compound	2.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V01
Wall	Masonry										
Wall	Non-Asbestos Plaster										V06

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
<b>Comments:</b>									
<b>Level :</b> 6 - Sixth Floor		<b>Room :</b> LOC 621 - Electrical Room			<b>Asbestos Present :</b> No				
Ceiling	Not Found								
Duct	Uninsulated								
Floor	Terrazzo								
Mechanical	Not Found								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Ceramic Tile								
Wall	Non-Asbestos Plaster								V03
<b>Comments:</b>									
<b>Level :</b> 6 - Sixth Floor		<b>Room :</b> LOC 622 - Office			<b>Asbestos Present :</b> No				
Ceiling	Non-Asbestos Drywall Compound								
Ceiling	Non-Asbestos Lay-in Tile								
Duct	Uninsulated								
Floor	Terrazzo								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Non-Asbestos Drywall Compound								
Wall	Non-Asbestos Plaster								V03

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
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## Comments:

Ceiling tiles and drywall are new - not sampled - no asbestos.

**Level :** 6 - Sixth Floor

**Room :** LOC 623 - Office Space

**Asbestos Present :** No

Ceiling	Non-Asbestos Drywall Compound
Ceiling	Non-Asbestos Lay-in Tile
Duct	Uninsulated
Floor	Carpet
Piping	Fibreglass Fitting
Piping	Fibreglass Straight Run
Structure	Concrete
Wall	Non-Asbestos Drywall Compound

## Comments:

Ceiling tiles and drywall are new - not sampled - no asbestos.  
1 SF of water damage to drywall ceiling

**Level :** 6 - Sixth Floor

**Room :** LOC 624 - Office

**Asbestos Present :** No

Ceiling	Non-Asbestos Lay-in Tile
Duct	Uninsulated
Floor	Carpet
Mechanical	Not Found
Piping	Fibreglass Fitting
Piping	Fibreglass Straight Run
Structure	Concrete
Wall	Non-Asbestos Drywall Compound

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Wall	Non-Asbestos Plaster								V06

## Comments:

Ceiling tiles and drywall are new - not sampled - no asbestos.

<b>Level :</b> 6 - Sixth Floor	<b>Room :</b> LOC 625 - Office	<b>Asbestos Present :</b> No
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Ceiling	Non-Asbestos Lay-in Tile	
Duct	Uninsulated	
Floor	Carpet	
Mechanical	Not Found	
Piping	Fibreglass Fitting	
Piping	Fibreglass Straight Run	
Structure	Concrete	
Wall	Non-Asbestos Drywall Compound	
Wall	Non-Asbestos Plaster	V06

## Comments:

Ceiling tiles and drywall are new - not sampled - no asbestos.

<b>Level :</b> 6 - Sixth Floor	<b>Room :</b> LOC 626 - Kitchen	<b>Asbestos Present :</b> Yes
--------------------------------	---------------------------------	-------------------------------

Ceiling	Non-Asbestos Drywall Compound	
Ceiling	Non-Asbestos Lay-in Tile	
Duct	Uninsulated	
Floor	Non-Asbestos Vinyl Flooring	
Piping	Fibreglass Fitting	
Piping	Fibreglass Straight Run	

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type		Access.	Action	Visible	Friable	Sample
Structure	Concrete										
Wall	Asbestos Drywall Compound	200.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V01
Wall	Non-Asbestos Plaster										V03

## Comments:

Vinyl flooring, ceiling tiles and some drywall are new - not sampled - no asbestos.

**Level :** 6 - Sixth Floor

**Room :** LOC 627 - LAN Room

**Asbestos Present :** No

Ceiling	Non-Asbestos Drywall Compound										
Ceiling	Non-Asbestos Lay-in Tile										
Duct	Fibreglass										
Floor	Non-Asbestos Vinyl Tile										
Piping	Fibreglass										
Piping	Fibreglass Straight Run										
Structure	Concrete										
Wall	Non-Asbestos Drywall Compound										
Wall	Non-Asbestos Plaster										V06

## Comments:

Vinyl floor tiles, ceiling tiles and drywall are new - not sampled - no asbestos.

**Level :** 6 - Sixth Floor

**Room :** LOC 628 - Elevator Lobby

**Asbestos Present :** Potentially

Ceiling	Non-Asbestos Drywall Compound
Duct	Inaccessible
Floor	Non-Asbestos Vinyl Flooring
Piping	Inaccessible

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Structure	Inaccessible									
Wall	Non-Asbestos Drywall Compound									
Wall	Non-Asbestos Plaster									V03
<b>Comments:</b> No access above ceiling.										
Vinyl flooring and drywall are new - not sampled - no asbestos.										
<b>Level :</b> 6 - Sixth Floor		<b>Room :</b> LOC 629 - Stairwell				<b>Asbestos Present :</b> Potentially				
Ceiling	Non-Asbestos Plaster									V03
Duct	Inaccessible									
Floor	Suspect Vinyl Floor Tile	40.0	SF	Good		A	8	Yes	No	
Mechanical	Inaccessible									
Piping	Inaccessible									
Structure	Inaccessible									
Wall	Non-Asbestos Plaster									V03
<b>Comments:</b> No access above ceiling.										
<b>Level :</b> 6 - Sixth Floor		<b>Room :</b> LOC 630 - Pipe Chase				<b>Asbestos Present :</b> Yes				
Floor	Not Accessible									
<b>Comments:</b>										
Inaccessible asbestos containing mechanical insulation present behind wall cavities.										
<b>Level :</b> 7 - Seventh Floor		<b>Room :</b> LOC 701 - Elevator Lobby				<b>Asbestos Present :</b>				
Ceiling	Non-Asbestos Plaster									V06
Duct	Inaccessible									

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Floor	Terrazzo								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Non-Asbestos Plaster								V06

**Comments:** No access above ceiling.

<b>Level :</b> 7 - Seventh Floor	<b>Room :</b> LOC 702 - Mechanical Room	<b>Asbestos Present :</b> No
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Ceiling	Not Found
Duct	Uninsulated
Floor	Concrete
Mechanical	Not Found
Piping	Fibreglass Fitting
Piping	Fibreglass Straight Run
Structure	Steel
Wall	Metal

**Comments:**

<b>Level :</b> 7 - Seventh Floor	<b>Room :</b> LOC 703 - Elevator Lobby	<b>Asbestos Present :</b> Potentially
----------------------------------	--	---------------------------------------

Ceiling	Non-Asbestos Plaster	V03
Duct	Inaccessible	
Floor	Terrazzo	
Mechanical	Inaccessible	
Piping	Inaccessible	

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Structure	Inaccessible									
Wall	Non-Asbestos Plaster									V03
<b>Comments:</b> No access above ceiling.										
<b>Level :</b> 7 - Seventh Floor		<b>Room :</b> LOC 704 - Corridor				<b>Asbestos Present :</b> Yes				
Ceiling	Non-Asbestos Plaster									V06
Ceiling	Not Found									
Duct	Not Found									
Fitting	Parging Cement	2.0	EA	Good		A	5	Yes	Yes	
Floor	Concrete									
Piping	Aircell	5.0	LF	Good		A	5	Yes	Yes	
Piping	Fibreglass Fitting									
Piping	Fibreglass Straight Run									
Structure	Concrete									
Wall	Concrete									
Wall	Masonry									
<b>Comments:</b>										
Piping and parging cement insulation assumed to contain asbestos.										
<b>Level :</b> 7 - Seventh Floor		<b>Room :</b> LOC 705 - Office Space				<b>Asbestos Present :</b> Yes				
Ceiling	Non-Asbestos 2 x 4 Lay-in Tile									V05
Duct	Not Found									
Floor	Carpet									
Mechanical	Not Found									

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity		Cond.	Asbestos type		Access.	Action	Visible	Friable	Sample
Piping	Fibreglass Straight Run										
Structure	Concrete										
Wall	Asbestos Drywall Compound	400.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	01-07
Wall	Non-Asbestos Plaster										03-04

## Comments:

<b>Level :</b> 7 - Seventh Floor				<b>Room :</b> LOC 706 - Office				<b>Asbestos Present :</b> Yes			
Ceiling	Non-Asbestos 2 x 4 Lay-in Tile										V05
Duct	Not Found										
Floor	Carpet										
Piping	Not Found										
Structure	Concrete										
Wall	Asbestos Drywall Compound	300.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V01
Wall	Non-Asbestos Plaster										V03

## Comments:

<b>Level :</b> 7 - Seventh Floor				<b>Room :</b> LOC 707 - Office				<b>Asbestos Present :</b> Yes			
Ceiling	Non-Asbestos 2 x 4 Lay-in Tile										V05
Duct	Not Found										
Floor	Carpet										
Piping	Not Found										
Structure	Concrete										
Wall	Asbestos Drywall Compound	300.0	SF	Good	Chrysotile	1.80%	A	7	Yes	No	V01
Wall	Non-Asbestos Plaster										V03

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
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**Comments:**

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<b>Level :</b> 7 - Seventh Floor		<b>Room :</b> LOC 708 - Vacant Room				<b>Asbestos Present :</b> Yes			
----------------------------------	--	-------------------------------------	--	--	--	-------------------------------	--	--	--

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Ceiling	Non-Asbestos 2 x 4 Lay-in Tile								V05
Duct	Not Found								
Floor	Carpet								
Mechanical	Not Found								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Asbestos Drywall Compound	400.0	SF	Good	Chrysotile 1.80%	A	7	Yes	No 01-07
Wall	Non-Asbestos Plaster								03-04

**Comments:**

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<b>Level :</b> 7 - Seventh Floor		<b>Room :</b> LOC 709 - Stairwell				<b>Asbestos Present :</b> Potentially			
----------------------------------	--	-----------------------------------	--	--	--	---------------------------------------	--	--	--

---

Ceiling	Non-Asbestos Plaster								V03
Duct	Inaccessible								
Floor	Terrazzo								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Non-Asbestos Plaster								V03

**Comments:** No access above ceiling.

---

<b>Level :</b> 7 - Seventh Floor		<b>Room :</b> LOC 710 - Pipe Chase				<b>Asbestos Present :</b> Yes			
----------------------------------	--	------------------------------------	--	--	--	-------------------------------	--	--	--

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# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Floor	Not Accessible								
<b>Comments:</b>									
Inaccessible asbestos containing mechanical insulation present behind wall cavities.									
<b>Level :</b> 8 - Eighth Floor		<b>Room :</b> LOC 801 - Corridor				<b>Asbestos Present :</b> No			
Ceiling	Non-Asbestos Plaster								06-06
Duct	Uninsulated								
Floor	Concrete								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Concrete								
<b>Comments:</b>									
<b>Level :</b> 8 - Eighth Floor		<b>Room :</b> LOC 802 - Vacant Room				<b>Asbestos Present :</b> Yes			
Ceiling	Non-Asbestos Plaster								02-06
Duct	Uninsulated								
Floor	Concrete								
Piping	Fibreglass Fitting								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Asbestos Drywall Compound	10.0	SF	Good	Chrysotile	1.80%	A	7	Yes No V01
Wall	Masonry								

**Comments:**

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
<b>Level :</b> 8 - Eighth Floor		<b>Room :</b> LOC 803 - Elevator Lobby			<b>Asbestos Present :</b> Yes				
Ceiling	Non-Asbestos Plaster								02-05/02-07
Ceiling	Non-Asbestos Plaster								06-07
Duct	Uninsulated								
Floor	Concrete								
Mechanical	Not Found								
Piping	Fibreglass Straight Run								
Structure	Concrete								
Wall	Asbestos Drywall Compound	40.0 SF	Good	Chrysotile 1.80%	A	7	Yes	No	V01
Wall	Masonry								
<b>Comments:</b>									
<b>Level :</b> 8 - Eighth Floor		<b>Room :</b> LOC 804 - Stairwell			<b>Asbestos Present :</b> Potentially				
Ceiling	Non-Asbestos Plaster								V03
Duct	Inaccessible								
Floor	Terrazzo								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Non-Asbestos Plaster								V03
<b>Comments:</b> No access above ceiling.									
<b>Level :</b> 9 - Eighth Floor		<b>Room :</b> LOC 904 - Stairwell			<b>Asbestos Present :</b> Potentially				

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Ceiling	Non-Asbestos Plaster								V03
Duct	Inaccessible								
Floor	Terrazzo								
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Non-Asbestos Plaster								V03

**Comments:** No access above ceiling.

<b>Level :</b> 9 - Ninth Floor		<b>Room :</b> LOC 901 - Elevator Machine Room			<b>Asbestos Present :</b> Yes				
Ceiling	Not Found								
Duct	Not Found								
Floor	Concrete								
Mechanical	Elevator Motor								
Piping	Parging Cement Roof Hopper	1.0	SF	Poor		B	3	Yes	Yes
Piping	Uninsulated								
Structure	Steel								
Wall	Masonry								

**Comments:**

<b>Level :</b> 9 - Ninth Floor		<b>Room :</b> LOC 902 - Elevator Machine Room			<b>Asbestos Present :</b> Potentially				
Ceiling	Non-Asbestos Plaster								V03
Duct	Inaccessible								
Floor	Concrete								

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING'

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
Mechanical	Inaccessible								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Masonry								
<b>Comments:</b> No access above ceiling.									

<b>Level :</b> 9 - Ninth Floor		<b>Room :</b> LOC 903 - Fan Room				<b>Asbestos Present :</b> Potentially			
Ceiling	Non-Asbestos Plaster								V03
Duct	Uninsulated								
Floor	Concrete								
Mechanical	Exchanger								
Piping	Inaccessible								
Structure	Inaccessible								
Wall	Masonry								
<b>Comments:</b> No access above ceiling.									

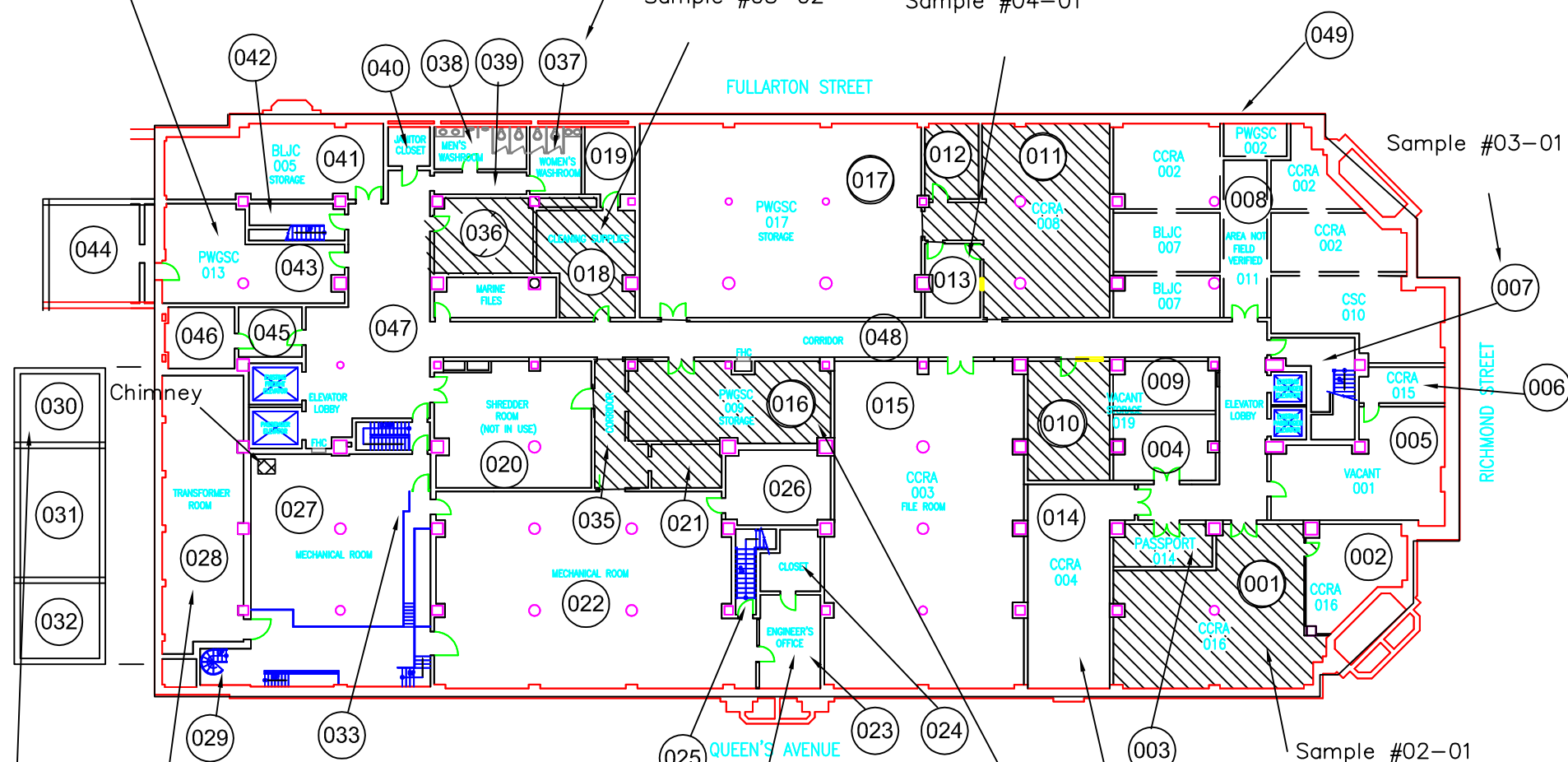
**APPENDIX III**  
**BUILDING DRAWINGS**

Sample #02-04

Sample #04/02-03

Sample #03-02

Sample #04-01

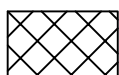


Sample #02-03

Sample #07/01-03

Sample #05-01

Sample #06-01

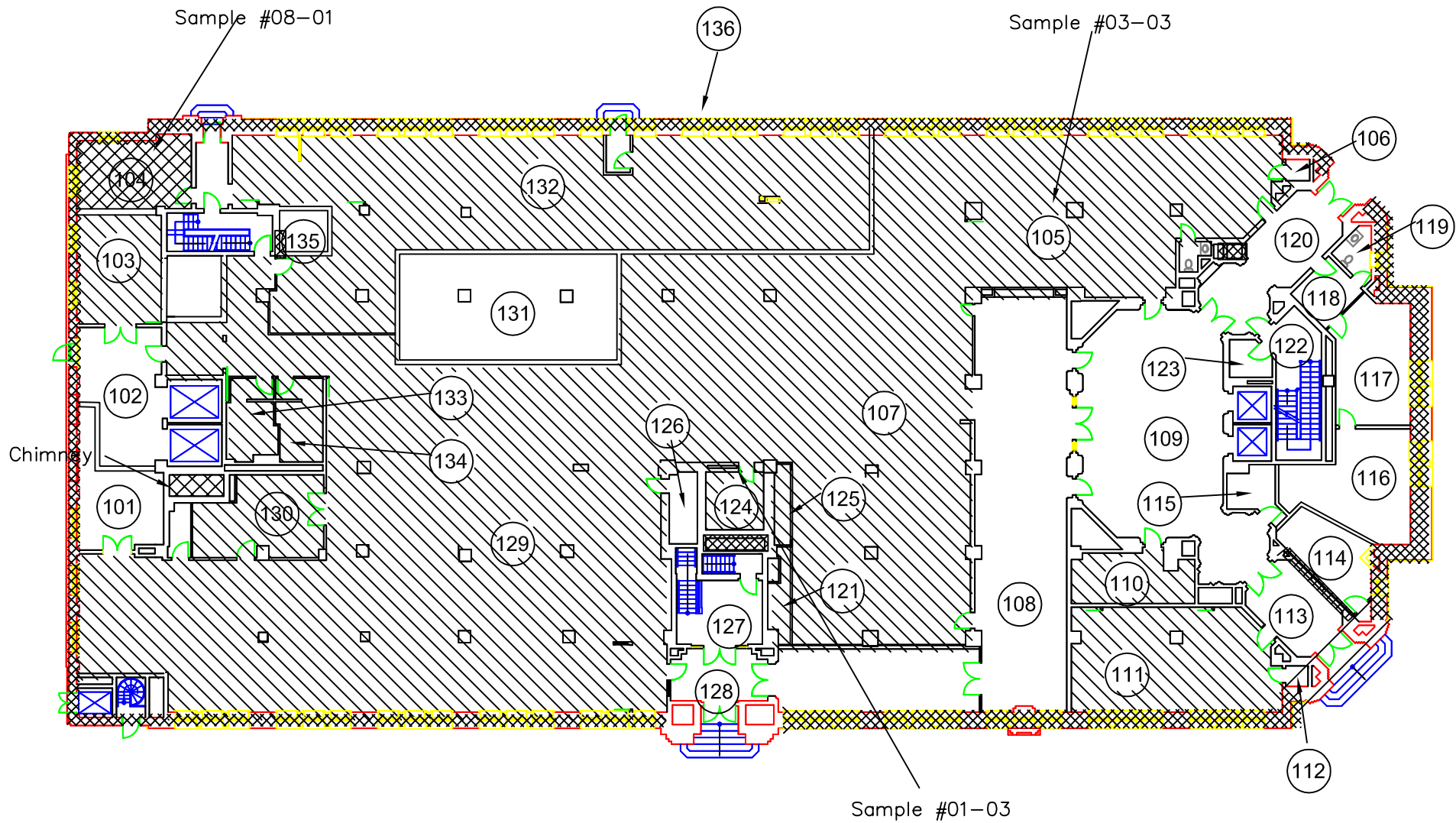



Locations with asbestos-containing chimney liner

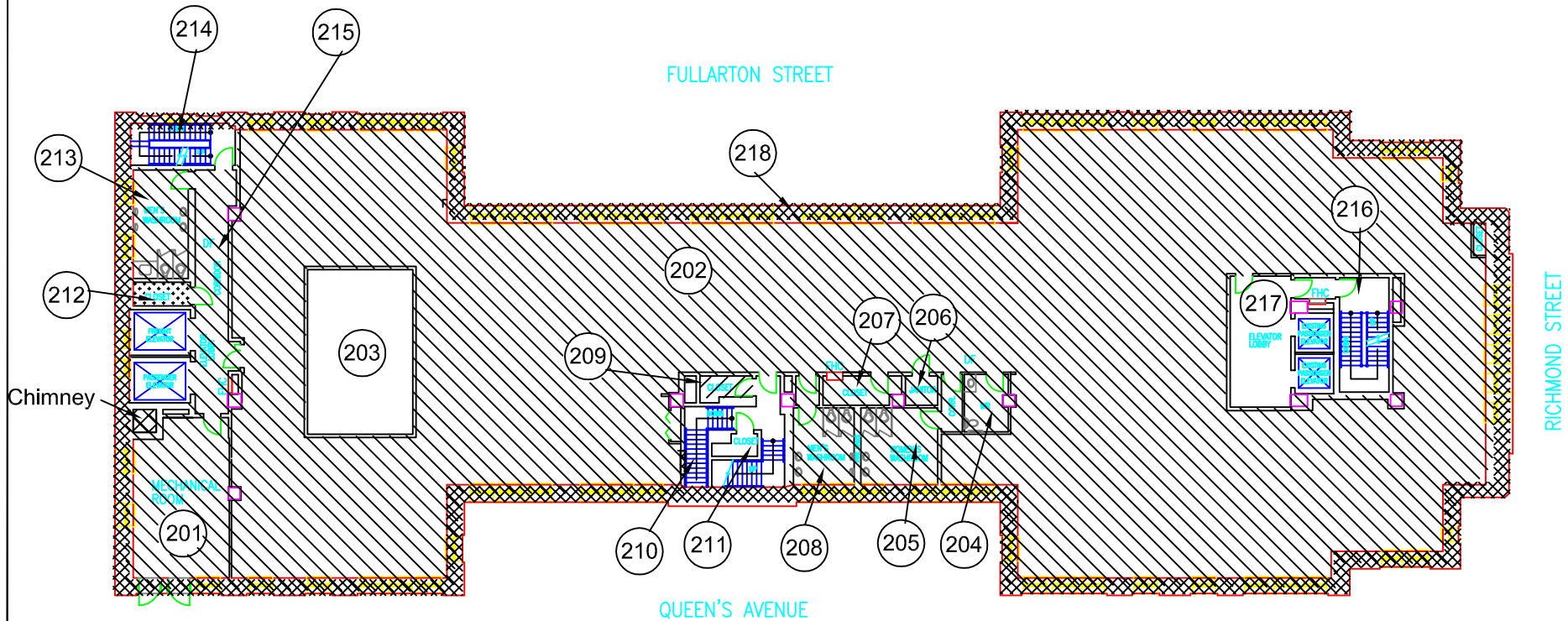




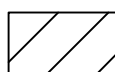
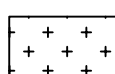
Asbestos-containing drywall joint compound


<p>exp. Services Inc. 15701 Robin's Hill Road, London ON N5V 0A5 Tel: (519) 963-3000 Fax: (519) 963-1152</p>		
<p><b>Asbestos Assessment Inspection and Sample Locations Basement</b></p>		
<p><b>Government of Canada Building</b> London, Ontario 457 Richmond Street</p>		
PROJECT: 11-5577	DATE: 11/05/12	01
SCALE: N.T.S.	DRAWING MODIFIED BY: AW	

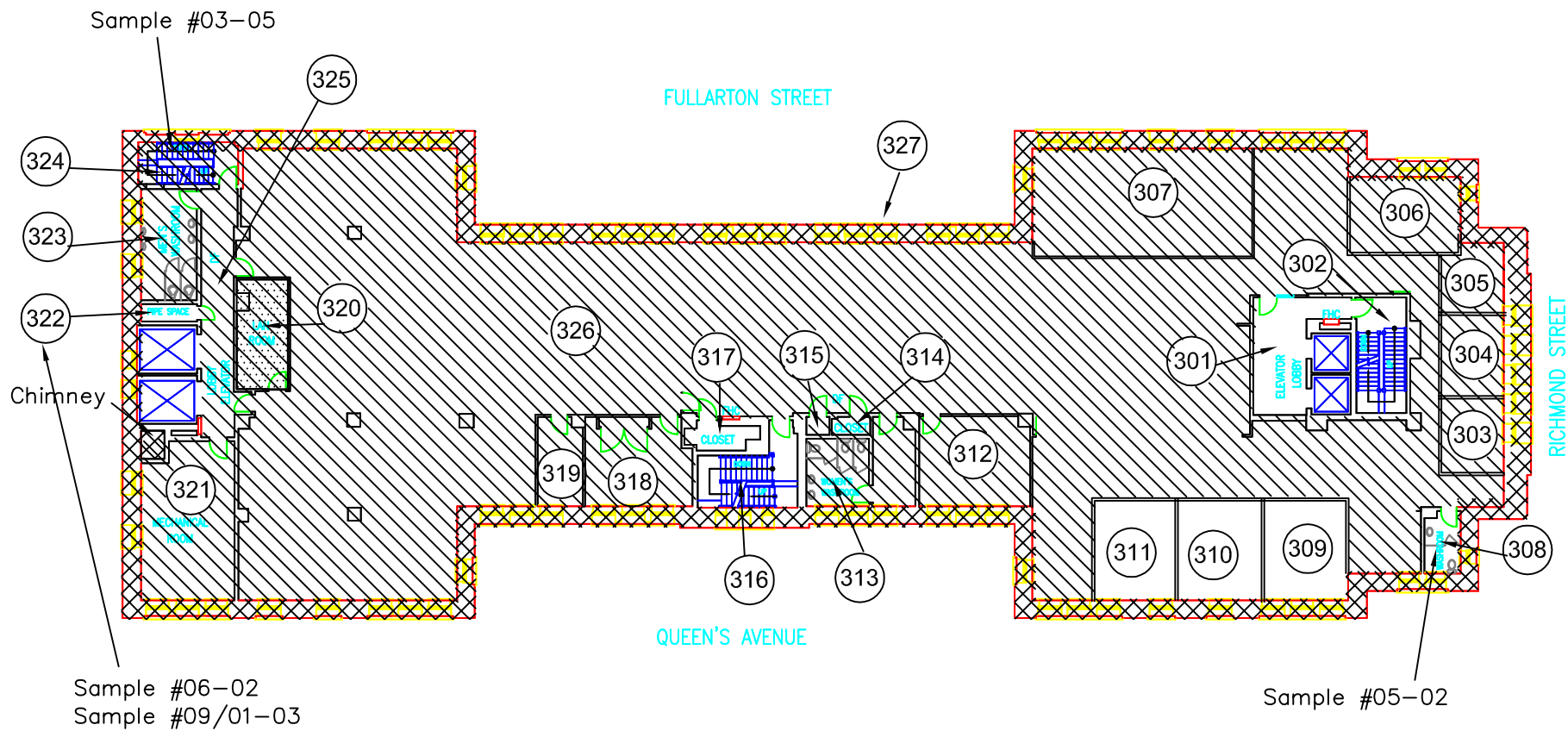


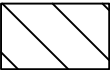
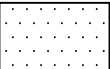

 exp.		exp. Services Inc. 15701 Robin's Hill Road, London ON N5V 0A5  Tel: (519) 963-3000 Fax: (519) 963-1152	
<b>Asbestos Assessment Inspection and Sample Locations First Floor Government of Canada Building Toronto, Ontario 457 Richmond Street</b>			
PROJECT:	11-5577	DATE:	11/05/12
SCALE:	N.T.S.	DRAWING MODIFIED BY:	AW




-  Asbestos-containing drywall joint compound
-  Locations with inaccessible mechanical insulation and/or chimney liner
-  Assumed asbestos-containing floor tiles
-  Transite Panel on Door

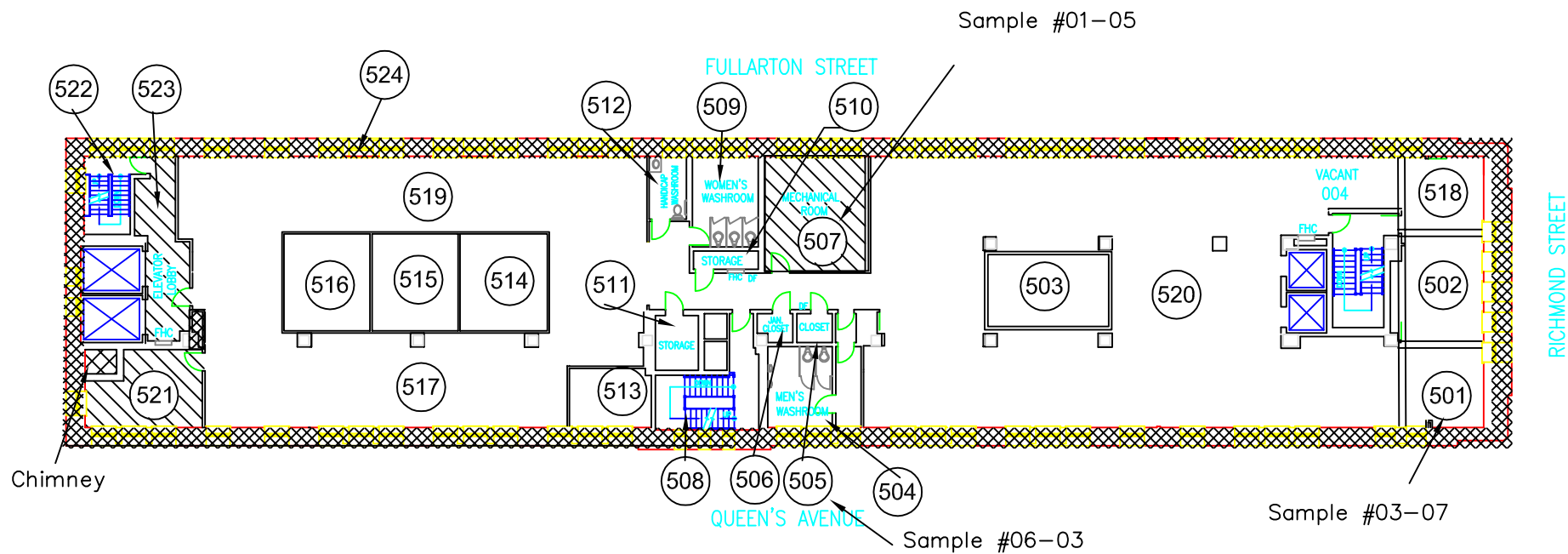
 <div> exp. Services Inc.  15701 Robin's Hill Road,  London ON  N5V 0A5  Tel: (519) 963-3000  Fax: (519) 963-1152 </div>		
Asbestos Assessment Inspection and Sample Locations Second Floor Government of Canada Building London, Ontario 457 Richmond Street		
PROJECT: 11 - 5577	DATE: 11/05/12	03
SCALE: N.T.S.	DRAWING MODIFIED BY: AW	




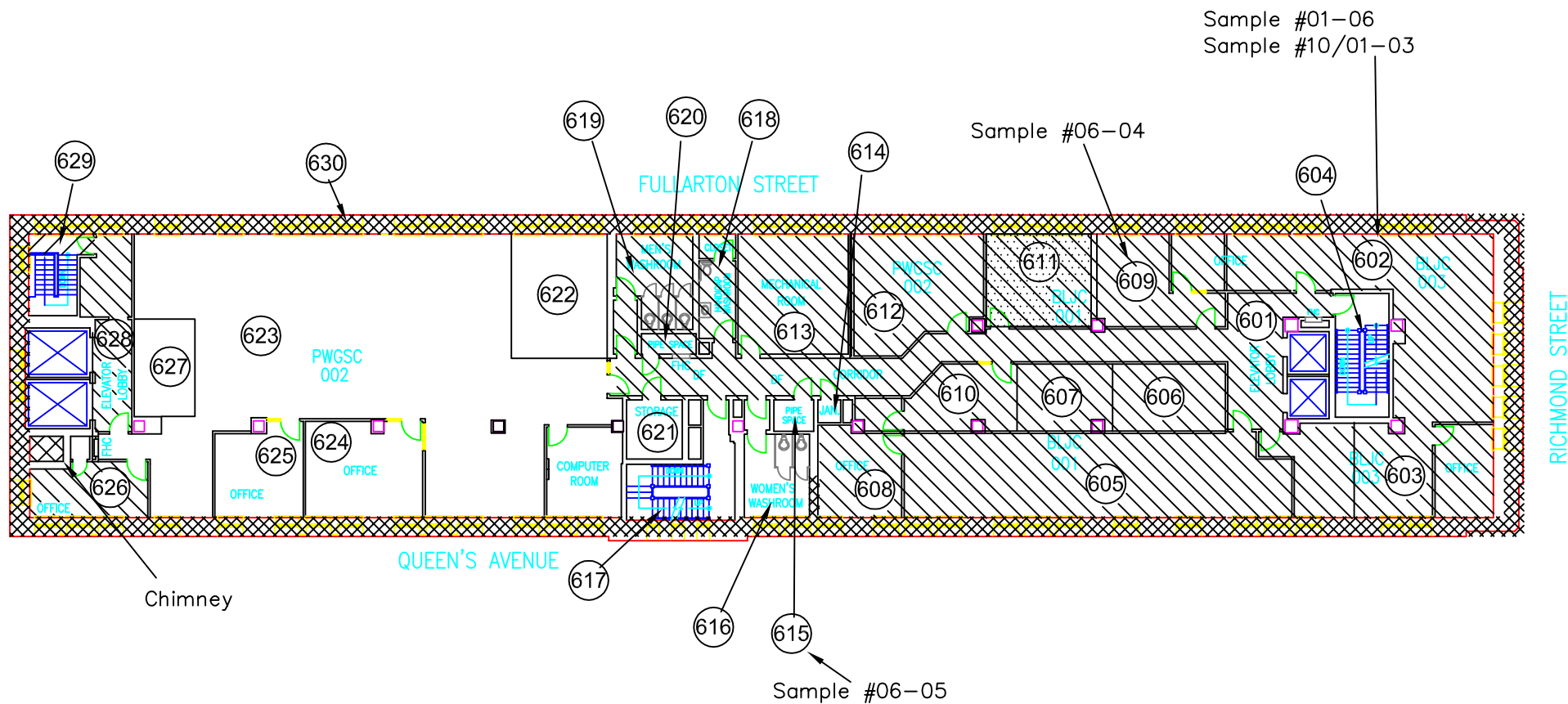
-  Asbestos-containing drywall joint compound
-  Assumed asbestos-containing vinyl sheet flooring
-  Locations with inaccessible mechanical insulation and/or chimney liner


		exp. Services Inc. 15701 Robin's Hill Road, London ON N5V 0A5 Tel: (519) 963-3000 Fax: (519) 963-1152
<b>Asbestos Assessment          Inspection and Sample Locations          Third Floor</b>		
<b>Government of Canada Building</b> London, Ontario 457 Richmond Street		
PROJECT:	DATE:	04
11-5577	11/05/12	
SCALE:	DRAWING MODIFIED BY:	
N.T.S.	AW	

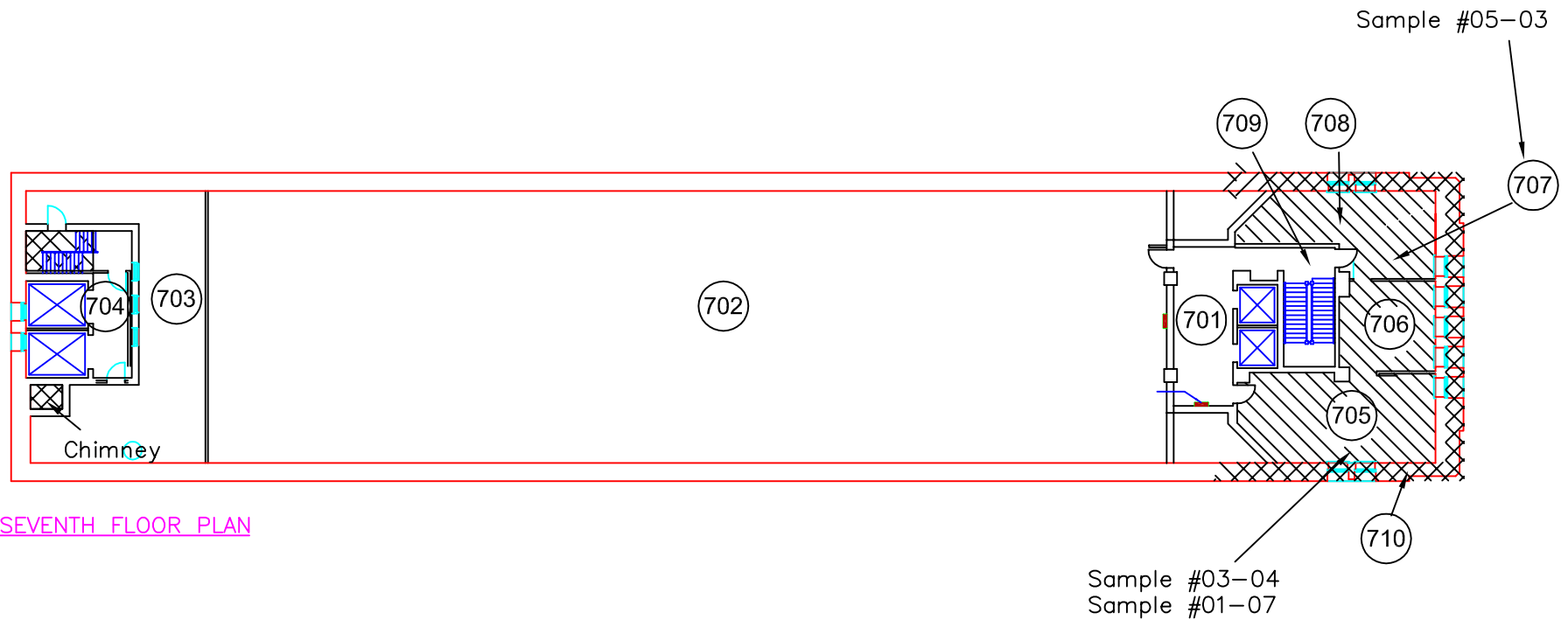




 <b>exp.</b>		exp. Services Inc. 15701 Robin's Hill Road, London ON N5V 0A5  Tel: (519) 963-3000 Fax: (519) 963-1152	
<b>Asbestos Assessment Inspection and Sample Locations Fifth Floor Government of Canada Building London, Ontario 457 Richmond Street</b>			
PROJECT:	<b>11-5577</b>	DATE:	<b>11/05/12</b>
SCALE:	<b>N.T.S.</b>	DRAWING MODIFIED BY:	<b>AW</b>
			<b>06</b>



 <p>exp. Services Inc. 15701 Robin's Hill Road, London ON N5V 0A5 Tel: (519) 963-3000 Fax: (519) 963-1152</p>		
<p><b>Asbestos Assessment Inspection and Sample Locations Sixth Floor</b></p>		
<p><b>Government of Canada Building</b> London, Ontario 457 Richmond Street</p>		
PROJECT: 11-5577	DATE: 11/05/12	07
SCALE: N.T.S.	DRAWING MODIFIED BY: AW	




SEVENTH FLOOR PLAN



Locations with inaccessible mechanical insulation and/or chimney liner



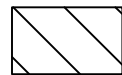
Asbestos-containing drywall joint compound

		exp. Services Inc. 15701 Robin's Hill Road, London ON N5V 0A5 Tel: (519) 963-3000 Fax: (519) 963-1152
<b>Asbestos Assessment</b> <b>Inspection and Sample Locations</b> <b>Seventh Floor</b> <b>Government of Canada Building</b> London, Ontario 457 Richmond Street		
PROJECT:	DATE:	08
11-5577	11/05/12	
SCALE:	DRAWING MODIFIED BY:	
N.T.S.	AW	

Sample #02-05  
 Sample #02-07  
 Sample #06-07



EIGHTH FLOOR PLAN



Asbestos-containing drywall joint compound



Locations with inaccessible mechanical insulation and/or chimney liner

**exp.**  
 exp. Services Inc.  
 15701 Robin's Hill Road,  
 London ON  
 N5V 0A5  
 Tel: (519) 963-3000  
 Fax: (519) 963-1152

**Asbestos Assessment  
 Inspection and Sample Locations  
 Eighth Floor  
 Government of Canada Building  
 London, Ontario  
 457 Richmond Street**


PROJECT: <b>11-5577</b>	DATE: <b>11/05/12</b>	<b>09</b>
SCALE: <b>N.T.S.</b>	DRAWING MODIFIED BY: <b>AW</b>	



Assumed asbestos-containing  
drywall joint compound



Locations with inaccessible mechanical  
insulation and/or chimney liner

 <div> exp. Services Inc.  15701 Robin's Hill Road,  London ON  N5V 0A5  Tel: (519) 963-3000  Fax: (519) 963-1152 </div>		
Asbestos Assessment Inspection and Sample Locations Ninth Floor Government of Canada Building London, Ontario 457 Richmond Street		
PROJECT: 11-5577	DATE: 11/05/12	10
SCALE: N.T.S.	DRAWING MODIFIED BY: AW	

**APPENDIX IV**  
**REQUIRED REMEDIAL WORK**

# Asbestos Status Report

(sorted by Building Number)

UPPER(BUILD:BuildingName) = 'DOMINION PUBLIC BUILDING' AND UPPER(Ar2:ActionCode)

Registered user: Advanced Environmental Corp.

Design	Description	Quantity	Cond.	Asbestos type	Access.	Action	Visible	Friable	Sample
<b>Building Number : W500249</b>		<b>Building Name : Dominion Public Building</b>				<b>Survey Date : 10/04/2006</b>			
<b>Level : 9 - Ninth Floor</b>		<b>Room : LOC 901 - Elevator Machine Room</b>				<b>Asbestos Present : Yes</b>			
Piping	Parging Cement Roof Hopper	1.0 SF	Poor		B	3	Yes	Yes	

**Comments:**

**APPENDIX V**  
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## **DESIGNATED SUBSTANCES ASSESSMENT**

### **GOVERNMENT OF CANADA BUILDING**

457 Richmond Street  
London, Ontario  
Building #5520114

Prepared for:

**SNC Lavalin O&M**  
**441 University Avenue West, Suite 212**  
**Windsor, Ontario**  
**N9A 5P9**

December 20<sup>th</sup>, 2012

OHS Project No.: 12-030

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## APPENDICES

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APPENDIX III	Building Drawings

## 1.0 INTRODUCTION

OH Solutions Inc (OHS) was retained by SNC Lavalin O&M to conduct a Designated Substances Assessment within 457 Richmond Street in London, Ontario (the Site).

This report was prepared to fulfil an Owner's requirements under Section 30 of the Ontario Occupational Health and Safety Act (as amended). Prior to tendering project work in buildings, the building owner or owner's agent must provide this report to constructors. The successful constructor must then provide this document to all future subcontractors prior to accepting bids.

"Designated Substance" as defined by the Ontario *Occupational Health & Safety Act* (OHSA) means "a biological, chemical or physical agent or combination thereof prescribed as a Designated Substance to which the exposure of a worker is prohibited, regulated, restricted, limited or controlled." Designated Substances include the following; asbestos, acrylonitrile, arsenic, benzene, coke oven emissions, ethylene oxide, isocyanates, lead, mercury, silica and vinyl chloride.

The sections below explain our survey methodology and summarize the Designated Substances found at the Site.

## 2.0 SURVEY METHODOLOGY

A thorough room by room inspection/walkthrough of all areas of the facility suspected of containing designated substances was conducted. Materials suspected of containing designated substances were visually identified, based on the surveyor's knowledge of the historic composition of building products. While on site OHS personnel conducted the following:

- Characterization the existing building data;
- Determined the approximate quantities, location and condition of accessible Designated Substances and;
- Conducted sampling of representative building materials and finishes

For the purposes of this assessment, OHS targeted the following Designated Substances:

- Lead
- Mercury
- Silica (free crystalline)

Sampling for both friable and non-friable suspected asbestos-containing materials has been previously conducted at this facility and therefore has not been included as part of this assessment. Please refer to the Asbestos Building Product Surveys for information regarding building products containing asbestos at this facility.

Concealed locations within the building such as areas above plaster or drywall ceilings, chases and bulkheads were not included as part of the assessment.

OHS collected visually distinct paint samples suspected of containing lead. Where possible, OHS removed all layers of paint down to the buildings components unpainted surface.

Several samples of suspected lead-containing paint samples were collected and subsequently submitted for analysis. The suspected lead-containing paints were analyzed using flame atomic absorption spectroscopy (F.A.A.S.). OHS has included samples collected during previous assessments.

OHS submitted samples of suspected asbestos-containing lead paint to International Asbestos Testing Laboratories (IATL) of Mt. Laurel, New Jersey, USA.

All other designated substances were identified based on visual assessment and historical usage.

In addition to Designated Substances, OHS scope of work included the identification of PCBs in florescent light fixtures. OHS visually inspected random fixtures/ballasts and compared model numbers, serial numbers and date codes to Environment Canada Report EPS 2/CC/2 (revised) August 1991 - Identification of Lamp Ballasts Containing PCB's.

### **3.0 REGULATORY REQUIREMENTS**

As outlined above, under Section 30 of the Occupational Health and Safety Act, the intent of this assessment is to fulfil the owner requirements to determine whether any Designated Substances are present at a project site during tendering and/or before beginning construction.

Designated Substances are regulated under Ontario Regulation 490/09. This regulation outlines the occupational exposure limits (OELs) for each Designated Substance. While construction projects are generally exempt, the OELs establish an Ontario standard for worker protection.

In addition to Ontario Regulation 490/09, Asbestos is regulated under O. Reg. 278/05, Asbestos on Construction Projects and in Buildings and Repair Operation, as

amended. Disposal of asbestos waste is subject to waste management regulations under Ontario Regulation 347/90 as amended.

The MOL does not have a standard to state what percentage of lead or silica a material must have to be considered lead or silica-containing. Procedures that provide an equivalent level of protection should, therefore, be implemented on construction projects where exposure to lead and silica is possible.

The Ministry of Labour has issued drafted guidelines for control of lead and silica exposures on construction projects. The Guideline for Lead on Construction Projects and the Guideline for Silica on Construction Projects should be adhered to during construction projects in order to protect the health and safety of workers.

The Federal Chlorobiphenyls Regulation, SOR/91-152 prohibits the use of PCBs in electrical transformers, capacitors and associated electrical equipment manufactured in or imported into Canada after July 1, 1980. The Federal Chlorobiphenyls Regulation SOR/92-507 and Ontario Regulation 362/90 outline the handling, storage and disposal of PCBs and PCB-containing equipment.

## **4.0 RESULTS**

The Site is a six-story building with three upper level mechanical floors and full basement. The building has a total footprint of approximately 9,000 square metres and appears to have been constructed in 1936.

### **4.1 *Asbestos-Containing Materials***

Please refer to the asbestos survey(s) for information regarding products suspected to contain asbestos within the building.

## 4.2 Lead

Paint samples were collected and subsequently submitted for laboratory analysis. Lead paint concentrations range from none detected to 4%. Laboratory results have been included within Appendix A. A summary of the current sampling is outlined below:

Sample #	Location	% Lead
P1	Green Wall Paint 001	2.1
P2	Basement Corridor White Wall	0.011
P3	Exterior Brown @ Loading Dock	2.9
P4	Red Floor Paint 020	4
P5	Peach With Grey Under Floor Paint Basement	0.29
P6	Yellow Wall And Column 020	0.16
P7	White Walls With Peach 018	0.013
P8	Grey Column 018	0.016
P9	Green Stair Basement	<0.0092
P10	Stairwell White With Green	0.31
P11	Neon Stairs Strip	<0.0077
P12	Green With White Cleaners 111	0.28
P13	Loading Dock Red	0.60
P14	Loading Dock White	0.062
P15	West Stairwell 2 <sup>nd</sup> Floor Beige Wall	0.016
P16	Bulkhead White 3 <sup>rd</sup> Floor	<0.012
P17	3 <sup>rd</sup> Floor Mechanical Room Taupe	<0.0082
P18	Top Of Column 4 <sup>th</sup> Floor Baby Blue	<0.013
P19	6 <sup>th</sup> Floor Mechanical Room White	<0.012
P20	Taupe 7 <sup>th</sup> Floor L/R	<0.0063
P21	Blue 7 <sup>th</sup> Floor Lunch Room	<0.012
P22	White With Blue Under 7 <sup>th</sup> Floor	<0.0063
P23	8 <sup>th</sup> Floor Taupe Ceiling	0.024
P24	9 <sup>th</sup> Floor Beige Ceiling	0.68

Lead is also suspected to be a component of the following:

- Solder on copper plumbing fixtures
- Mortar at brick veneer
- Lead wool or caulking in bell/spigot fittings on cast iron piping systems
- Lead-acid batteries

Sampling of the above was not conducted.

#### **4.3 Mercury**

Mercury is present in fluorescent light tubes. OHS did not observe any thermostats containing mercury however may be present within boiler and air handling unit control equipment and within laboratory drain pipes.

#### **4.4 Silica**

Common construction sand contains free crystalline silica will be present in concrete products, mortar, brick, etc found throughout building structures.

#### **4.5 Acrylonitrile, Benzene, Isocyanates, Arsenic, Ethylene Oxide, Vinyl Chloride and Coke Oven Emissions**

The presence of acrylonitrile, benzene, isocyanates, arsenic, ethylene oxide, vinyl chloride monomer or coke oven emissions are not expected at the Site.

#### **4.6 Polychlorinated Biphenyls (PCB)**

Florescent light ballasts are present in various locations within the facility. The building has undergone a lighting retrofit within the last few years. Of the ballasts inspected, none were suspected to contain PCB's.

### **5.0 RECOMMENDATIONS**

Asbestos-containing materials have been previously identified within the facility and therefore the building is subject to the requirement for an Asbestos Management Program, as specified under Ontario Regulation 278/05. Please refer to the existing on-site Asbestos Management Program and Survey(s) for recommendations regarding asbestos at this facility.

#### **5.1 Lead**

Lead is present in some painted surfaces and is suspected to be a component of solder on copper plumbing fixtures, mortar at brick veneer, wool or caulking in bell/spigot fittings on cast iron piping systems and within lead-acid batteries.

Elevated airborne lead levels can result when uncontrolled work procedures such as drilling, cutting, removing, grinding, etc. are used on lead-based materials. The control of dust levels during the demolition of the buildings can be accomplished through proper work practices to reduce overall dust levels and providing workers with proper personal protective equipment.

OHS recommends the work procedures and personal protective equipment outlined within the MOL document 'Guideline – Lead on Construction Projects' (2004) be utilized during the disturbance or handling of the material.

## **5.2 Mercury**

Mercury is present in florescent light tubes and may be present in may be present within boiler and air handling unit control equipment and within laboratory drain pipes.

Exposure to airborne mercury is regulated under the Designated Substances regulation titled, *Ontario Regulation 490/09, Designated Substances*. Mercury waste must be handled and disposed of according to Ontario Regulation 347, as amended, and may be subject to Leachate Criteria (Schedule 4) of this regulation.

## **5.3 Silica**

Disturbance of materials containing silica will occur during demolition activities. Elevated airborne silica levels can result when uncontrolled work procedures such as drilling, cutting, removing, grinding, etc. are used on silica-containing materials.

OHS recommends the work procedures and personal protective equipment outlined within the MOL document 'Guideline – Silica on Construction Projects' (2004) be utilized during the disturbance or handling of the material.

## **6.0 LIMITATIONS AND WARRANTY**

OHS has prepared this report for the exclusive use of the Client in evaluating the Site at the time of OHS's assessment. OHS will not be responsible for the use of this report by any third party, or reliance on or any decision to be made based on it without the prior written consent of OHS. OHS accepts no responsibility for damages, if any, by any third party because of decisions or actions based on this report.

The findings contained in this report are based upon conditions as they were observed at the time of investigation. No assurance is made regarding changes in conditions subsequent to the time of investigation.

If new information is developed in future work, OHS should be contacted to re-evaluate the conclusions of this report and to provide amendments as required.

Respectfully submitted,

**OH Solutions Inc.**



Jeff Doherty, BSc  
Senior Occupational Hygienist

## **APPENDIX I**

### **LEAD SAMPLING RESULTS**

## CERTIFICATE OF ANALYSIS

<b>Client:</b>	O H Solutions	<b>Report Date:</b>	8/15/2012
	233 Mitchell Ave	<b>Report Number:</b>	282424
	Dorchester ON N0L 1G3	<b>Project:</b>	457 Richmond
		<b>Project No.:</b>	12-030

### LEAD PAINT SAMPLE ANALYSIS SUMMARY

<u>Lab No.</u>	<u>Client No.</u>	<u>Location / Description</u>	<u>Concentration Lead By Weight (%)</u>
4751782	1	Green Wall Paint 001	2.1*
4751783	2	White Wall Paint Basement Corridor	0.011*
4751784	3	Brown Paint Exterior At Loading Dock	2.9
4751785	4	Red Floor Paint 020	4*
4751786	5	Peach Over Grey Floor Paint Basement	0.29
4751787	6	Yellow Paint 020 Wall And Column	0.16***
4751788	7	White With Peach Wall Paint 018	0.013
4751789	8	Grey Paint Column 018	0.016***
4751790	9	Green Paint Basement Stair	<0.0092
4751791	10	White With Green Paint Stairwell	0.31

**Accreditations:** **NATIONAL LEAD LABORATORY ACCREDITATION PROGRAM (NLLAP)**  
AIHA-LAP, LLC No. 100188 NYSDOH-ELAP No. 11021

**Analytical Methods:** ASTM D3335-85A "Standard Method To Test For Low Concentrations Of Lead In Paint By Atomic Absorption Spectrophotometry"  
EPA SW846-(3050B:7000B) "Standard Method To Test For Low Concentrations Of Lead In Soils, Sludges and Sediments By AAS"

**Comments:** Regulatory limit is 0.5% lead by weight (EPA/HUD guidelines). Recommend multiple sampling for all samples less than regulatory limit for confirmation. All results are based on the samples as received at the lab. IATL assumes that appropriate sampling methods have been used and the data upon which these results are based have been accurately supplied by the client. Method Detection Limit (MDL) per EPA Method 40CFR Part 136 Appendix B. Reporting Limit (RL) based upon Lowest Standard Determined (LSD) in accordance with AIHA-ELLAP policies. LSD=0.2 ppm MDL=0.0044% by weight. RL= 0.010% by weight (based upon 100 mg sampled). \* Insufficient sample provided to perform QC reanalysis (<200 mg) \*\* Not enough sample provided to analyze (<50 mg) \*\*\* Matrix / substrate interference possible. Sample results are not corrected for contamination by field or analytical blanks. This confidential report relates only to those item(s) tested and does not represent an endorsement by NIST-NVLAP, AIHA or any government agency. This report shall not be reproduced except in full, without written approval of the laboratory.

**Date Received:** 8/8/2012  
**Date Analyzed:** 8/15/2012  
**Analyst:** M. Stewart

**Approved By:** \_\_\_\_\_  
Frank E. Ehrenfeld, III  
Laboratory Director

## CERTIFICATE OF ANALYSIS

<b>Client:</b>	O H Solutions	<b>Report Date:</b>	8/15/2012
	233 Mitchell Ave	<b>Report Number:</b>	282424
	Dorchester ON N0L 1G3	<b>Project:</b>	457 Richmond
		<b>Project No.:</b>	12-030

### LEAD PAINT SAMPLE ANALYSIS SUMMARY

<u>Lab No.</u>	<u>Client No.</u>	<u>Location / Description</u>	<u>Concentration Lead By Weight (%)</u>
4751792	11	Neon Paint	<0.0077
		Stairs Strip	
4751793	12	Green With White Paint	0.28
		111 Cleaners	
4751794	13	Red Paint	0.60
		Loading Dock	
4751795	14	White Paint	0.062
		Loading Dock	
4751796	15	Beige Wall Paint	0.016
		2nd Floor Stairwell	
4751797	16	White Paint	<0.012*
		3rd Floor Bulkhead	
4751798	17	Taupe Paint	<0.0082
		3rd Floor Mechanical Room	
4751799	18	Baby Blue Paint	<0.013*
		4th Floor Top Of Column	
4751800	19	White Paint	<0.012*
		6th Floor Mechanical Room	
4751801	20	Taupe Paint	<0.0063
		7th Floor L/R	

**Accreditations:** **NATIONAL LEAD LABORATORY ACCREDITATION PROGRAM (NLLAP)**  
AIHA-LAP, LLC No. 100188 NYSDOH-ELAP No. 11021

**Analytical Methods:** ASTM D3335-85A "Standard Method To Test For Low Concentrations Of Lead In Paint By Atomic Absorption Spectrophotometry"  
EPA SW846-(3050B:7000B) "Standard Method To Test For Low Concentrations Of Lead In Soils, Sludges and Sediments By AAS"

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**Date Received:** 8/8/2012  
**Date Analyzed:** 8/15/2012  
**Analyst:** M. Stewart

## CERTIFICATE OF ANALYSIS

<b>Client:</b>	O H Solutions	<b>Report Date:</b>	8/15/2012
	233 Mitchell Ave	<b>Report Number:</b>	282424
	Dorchester ON N0L 1G3	<b>Project:</b>	457 Richmond
		<b>Project No.:</b>	12-030

### LEAD PAINT SAMPLE ANALYSIS SUMMARY

<u>Lab No.</u>	<u>Client No.</u>	<u>Location / Description</u>	<u>Concentration Lead By Weight (%)</u>
4751802	21	Blue Paint 7th Floor Lunch Room	<0.012*
4751803	22	White Over Blue Paint 7th Floor	<0.0063
4751804	23	Taupe Ceiling Paint 8th Floor	0.024***
4751805	24	Beige Ceiling Paint 9th Floor	0.68

**Accreditations:** **NATIONAL LEAD LABORATORY ACCREDITATION PROGRAM (NLLAP)**  
AIHA-LAP, LLC No. 100188 NYSDOH-ELAP No. 11021

**Analytical Methods:** ASTM D3335-85A "Standard Method To Test For Low Concentrations Of Lead In Paint By Atomic Absorption Spectrophotometry"  
EPA SW846-(3050B:7000B) "Standard Method To Test For Low Concentrations Of Lead In Soils, Sludges and Sediments By AAS"

**Comments:** Regulatory limit is 0.5% lead by weight (EPA/HUD guidelines). Recommend multiple sampling for all samples less than regulatory limit for confirmation. All results are based on the samples as received at the lab. IATL assumes that appropriate sampling methods have been used and the data upon which these results are based have been accurately supplied by the client. Method Detection Limit (MDL) per EPA Method 40CFR Part 136 Appendix B. Reporting Limit (RL) based upon Lowest Standard Determined (LSD) in accordance with AIHA-ELLAP policies. LSD=0.2 ppm MDL=0.0044% by weight. RL= 0.010% by weight (based upon 100 mg sampled). \* Insufficient sample provided to perform QC reanalysis (<200 mg) \*\* Not enough sample provided to analyze (<50 mg) \*\*\* Matrix / substrate interference possible. Sample results are not corrected for contamination by field or analytical blanks. This confidential report relates only to those item(s) tested and does not represent an endorsement by NIST-NVLAP, AIHA or any government agency. This report shall not be reproduced except in full, without written approval of the laboratory.

**Date Received:** 8/8/2012  
**Date Analyzed:** 8/15/2012  
**Analyst:** M. Stewart

## **APPENDIX II**

### **ROOM BY ROOM SUMMARY**

**Client:** SNC-LAVALIN O&M  
**Project:** Designated Substances Survey  
**Building:** 457 Richmond Street – London, Ontario (Building ##5520114)



Location / Room Description		Lead in Paint Description	Reference Sample No. (Lead Weight %)	Mercury Thermostats	PCB Suspected in Light Ballasts
Basement					
1	001 – Vacant	Taupe Ceiling Baby Blue Wall Yellow Wall	NA NA 0.16% (VL-06)	No	No
2	002 – CCRA	Yellow Ceiling Yellow Wall & Column	NA 0.16% (VL-06)	No	No
3	002- CCRA	Black Ceiling Yellow Wall & Column Red Floor	NA 0.16% (AL-06) 4% (AL-04)	No	No
4	003 – CCRA File Room	White Ceiling White Wall	NA 0.013% (VL-07)	No	No
5	008 - CCRA	White Ceiling White Wall	NA 0.013% (VL-07)	No	No
6	009- PWGSC Storage	White Ceiling Yellow Wall Grey Floor	NA 0.16% (AL-06) 0.29 (VL-05)	No	No
7	016 - Passport	White Ceiling White Wall	NA NA	No	No
8	Boiler Room	White Ceiling White Wall Floor (epoxy)	NA NA NA	No	No
9	017 - PWGSC	White Ceiling White Wall Grey Column Peach/Grey Floor	NA 0.013% (VL-07) 0.016% (AL-08) 0.29 (AL-05)	No	No
10	Stairwell	Green Stair White/Green Wall Neon Green	<0.0092 (AL-09) 0.31% (AL-10) <0.0077% (AL11)	No	No
11	Men's Washroom	Taupe Wall	NA	No	No

**Client:** SNC-LAVALIN O&M  
**Project:** Designated Substances Survey  
**Building:** 457 Richmond Street – London, Ontario (Building ##5520114)



Location / Room Description		Lead in Paint Description	Reference Sample No. (Lead Weight %)	Mercury Thermostats	PCB Suspected in Light Ballasts
12	Corridors	White Wall	0.011% (AL-02)	No	No
Main Floor					
13	Exterior/Loading Dock	Brown Wall (Exterior) White Wall Red Wall	2.9% (AL-03) 0.62% (AL-014) 0.60% (AL-013)	No	No
14	Stairwell	Taupe/Beige Wall	0.016 (VL-15)	No	No
15	Cleaners (111)	Green with White	0.28% (AL-12)	No	No
16	Office Area	Taupe Paint White Paint	<0.0063% (VL-20) <0.012% (VL-16)	No	No
17	Lobby (not sampled)	NA	NA	No	No
Second Floor					
18	Mechanical Room	Taupe Paint Wall White Paint Wall	<0.0082% (VL-17) <0.012% (VL-19)	No	No
19	Stairwell	Taupe/Beige Wall	0.016% (AL-15)	No	No
20	Office Area	Taupe Paint White Paint	<0.0063% (VL-20) <0.012% (VL-16)	No	No
Third Floor					
21	Mechanical Room	Taupe Paint Wall White Paint Wall	<0.0082% (AL-17) <0.012% (VL-19)	No	No
22	Stairwell	Taupe/Beige Wall	0.016% (AL-15)	No	No
23	Service Canada Office Area	Taupe Paint White Paint	<0.0063% (VL-20) <0.012% (AL-16)	No	No

**Client:** SNC-LAVALIN O&M  
**Project:** Designated Substances Survey  
**Building:** 457 Richmond Street – London, Ontario (Building ##5520114)



Location / Room Description		Lead in Paint Description	Reference Sample No. (Lead Weight %)	Mercury Thermostats	PCB Suspected in Light Ballasts
Fourth Floor					
24	Mechanical Room	Taupe Paint Wall White Paint Wall	<0.0082% (AL-17) <0.012% (VL-19)	No	No
26	Stairwell	Taupe/Beige Wall	0.016% (AL-15)	No	No
27	Service Canada Office Area	Taupe Paint White Paint Baby Blue Column	<0.0063% (VL-20) <0.012% (AL-16) <0.13% (AL-18)	No	No
Fifth Floor					
28	Mechanical Room	Taupe Paint Wall White Ceiling Wall	<0.0082% (VL-17) <0.012% (VL-19)	No	No
29	Stairwell	Taupe/Beige Wall	0.016% (VL-15)	No	No
30	Labour Canada Office Area	Taupe Paint White Paint	<0.0063% (VL-20) <0.012% (VL-16)	No	No
31	Service Canada Office Area	Taupe Paint White Paint	<0.0063% (VL-20) <0.012% (VL-16)	No	No
Sixth Floor					
31	Mechanical Room	Taupe Paint Wall White Ceiling	<0.0082% (VL-17) <0.012% (AL-19)	No	No
32	Boardrooms	Taupe Wall Blue Wall	<0.0063% (VL-20) <0.12% (VL-21)	No	No
33	Office Space	Taupe Wall Blue Wall White Paint	<0.0063% (VL-20) <0.12% (VL-21) <0.012% (VL-16)	No	No
34	Corridor	Green (2011)	NA	No	No
35	Stairwell	Taupe/Beige Wall	0.016% (VL-15)	No	No
Seventh Floor					

**Client:** SNC-LAVALIN O&M  
**Project:** Designated Substances Survey  
**Building:** 457 Richmond Street – London, Ontario (Building ##5520114)

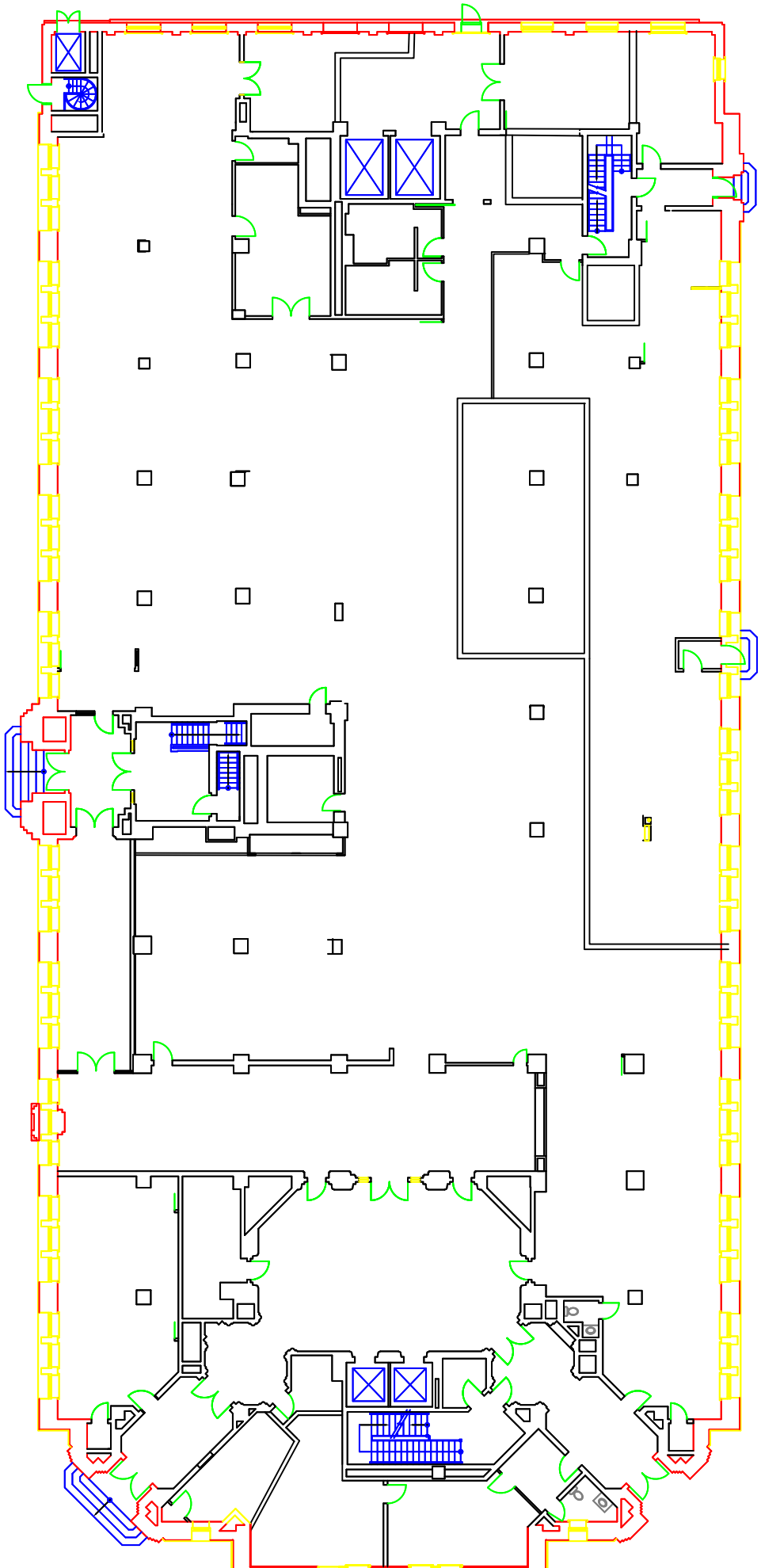



Location / Room Description		Lead in Paint Description	Reference Sample No. (Lead Weight %)	Mercury Thermostats	PCB Suspected in Light Ballasts
36	Lunchroom	Taupe Blue Wall	<0.0063% (AL-20) <0.12% (AL-21)	No	No
37	Office Space	White Wall	<0.0063% (AL-22)	No	No
Eighth Floor					
38	Mechanical Space	Taupe Ceiling	0.024% (AL-23)	No	No
Ninth Floor					
39	Mechanical Space	Beige Ceiling Grey Floor	0.68% (AL-24) NA	No	No
Penthouse					
40	No Painted Surfaces	NA	NA	No	No

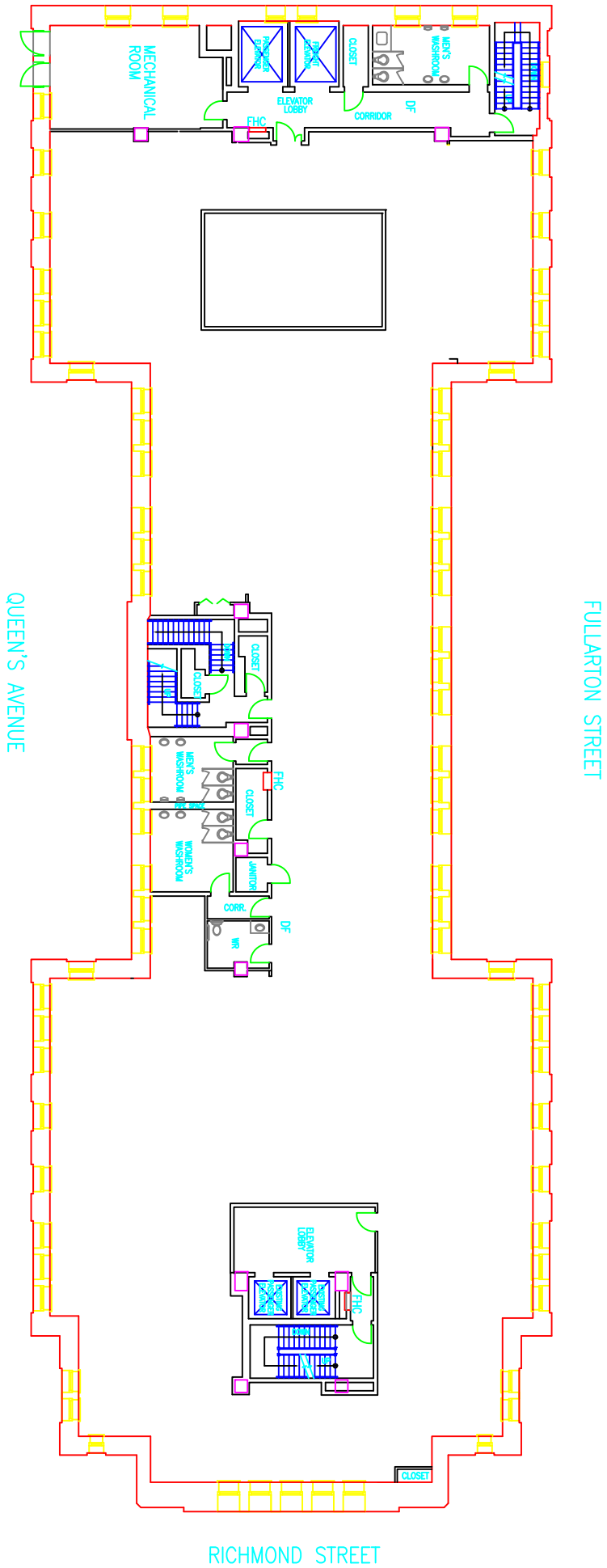
### **APPENDIX III**


### **BUILDING DRAWINGS**

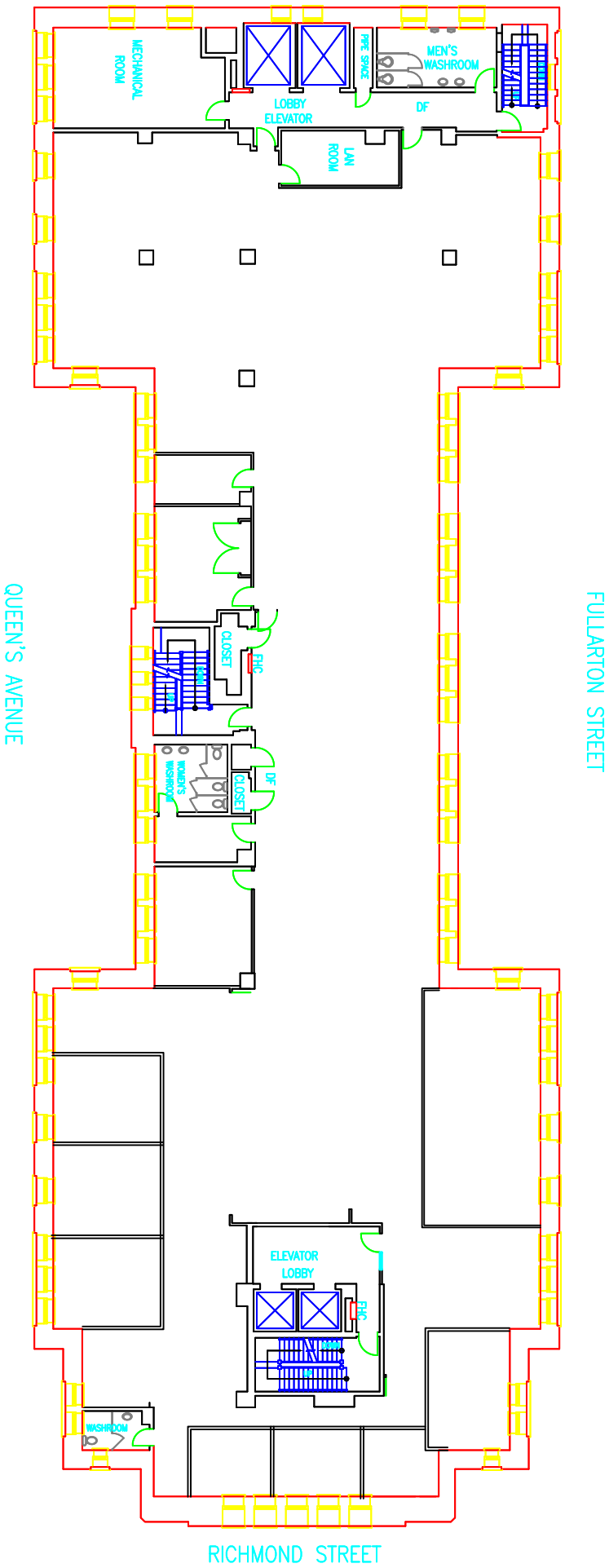





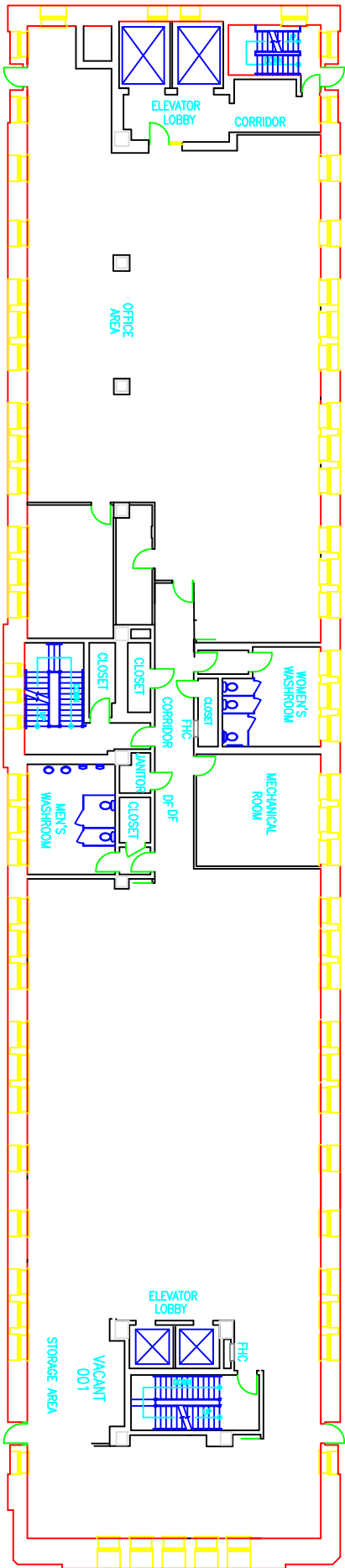
 OH solutions		OH Solutions Inc. 233 Mitchell Avenue Dorchester, Ontario N0L 1G3 Tel: (519) 288-2200 Fax: (866) 700-4975
Designated Substances Assessment		
Government of Canada Building		
457 Main Floor London, Ontario Building # 620114		
SCALE:	DATE:	
NTS	12/20/12	
DRAWING #:	002	12-030



		OH Solutions Inc. 233 Mitchell Avenue Dorchester, Ontario N0L 1G3 Tel: (519) 268-2200 Fax: (866) 700-4975
Designated Substances Assessment		
Government of Canada Building 457 Richmond Street London, Ontario Building # 5520114		
SCALE: NTS	DATE: 12/20/12	
DRAWING #: 003	DATE PLOTTED: 12-03-0	



 <b>OH SOLUTIONS</b> OH Solutions Inc. 233 Mitchell Avenue Dorchester, Ontario N0L 1G3 Tel: (519) 268-2200 Fax: (866) 700-4975	
Designated Substances Assessment	
Government of Canada Building Third Floor 457 Richmond Street London, Ontario Building # 5520114	
SCALE: NTS	DATE: 12/20/12
DRAWING #: 004	ONR PROJECT: 12-030



QUEEN'S AVENUE

FULLARTON STREET

RICHMOND STREET

	OH Solutions Inc.	
	233 Mitchell Avenue Dorchester, Ontario N0L 1G3 Tel: (519) 268-2200 Fax: (866) 700-4975	

Designated Substances Assessment

Government of Canada Building

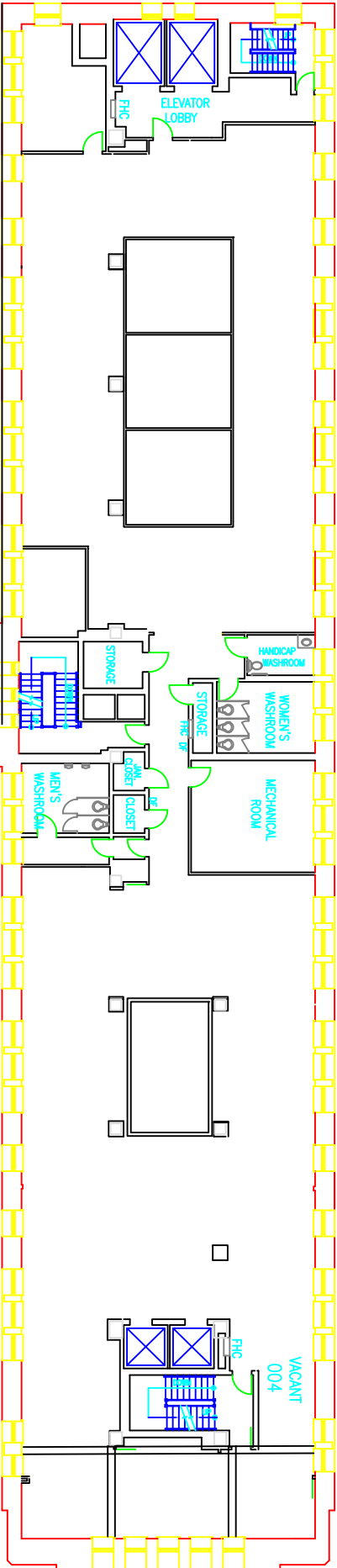
Fourth Floor  
457 Richmond Street  
London, Ontario  
Building # 5520114


SCALE:	DATE:
NTS	12/20/12
DRAWING #:	005
	012-030

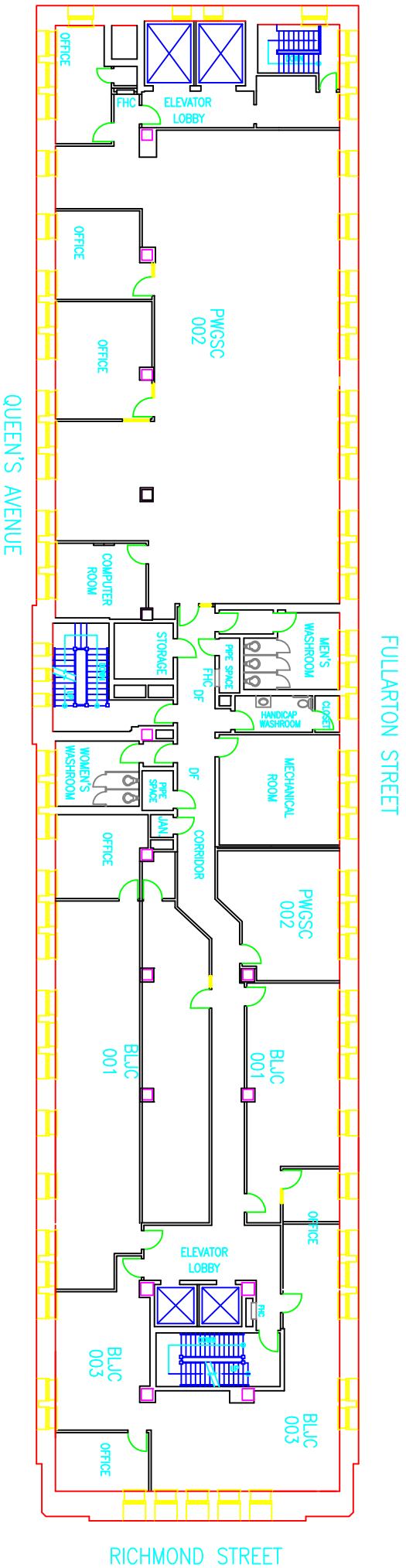
QUEEN'S AVENUE


FULLARTON STREET

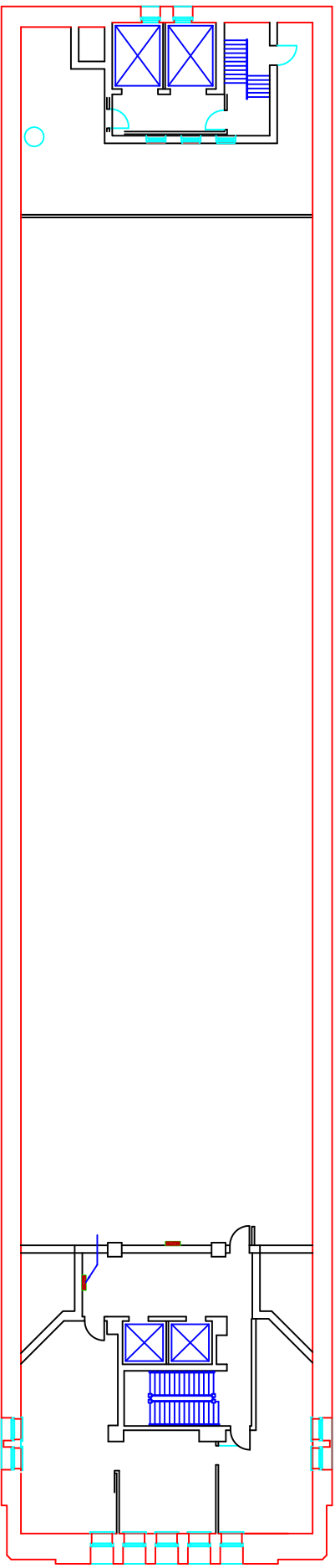
RICHMOND STREET




		OH Solutions Inc. 233 Mitchell Avenue Dorchester, Ontario N0L 1G3 Tel: (519) 288-2200 Fax: (866) 700-4975	
Designated Substances Assessment			
Government of Canada Building 5th Floor 457 Richmond Street London, Ontario Building # 5520114			
SCALE: NTS	DATE: 12/20/12		
DRAWING #: 006	OH PROJECT: 12-030		



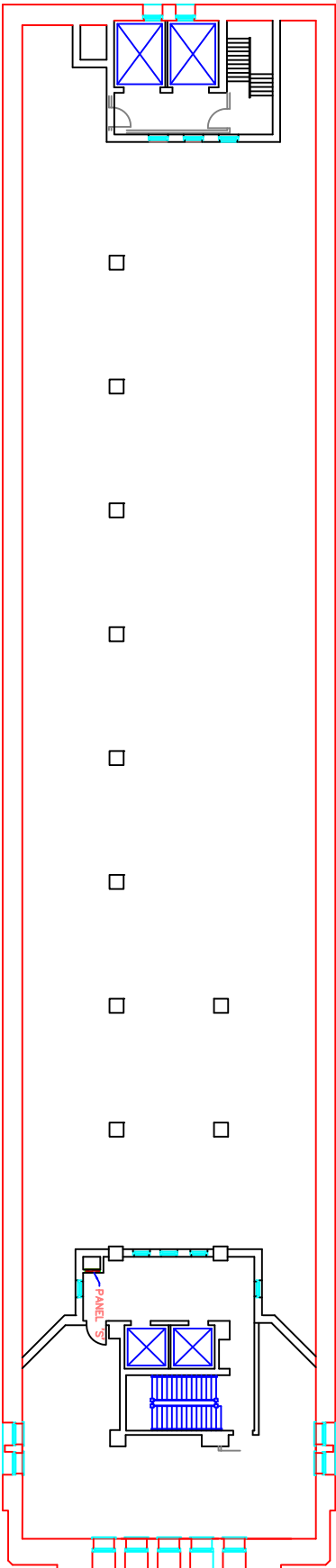
		OH Solutions Inc. 233 Mitchell Avenue Dorchester, Ontario N0L1G3 Tel: (519) 268-2200 Fax: (866) 700-4975	
Designated Substances Assessment			
Government of Canada Building			
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SCALE:	DATE:		
NTS	12/20/12		
DRAWING #:	ONE PROJECT		
007	12-030		




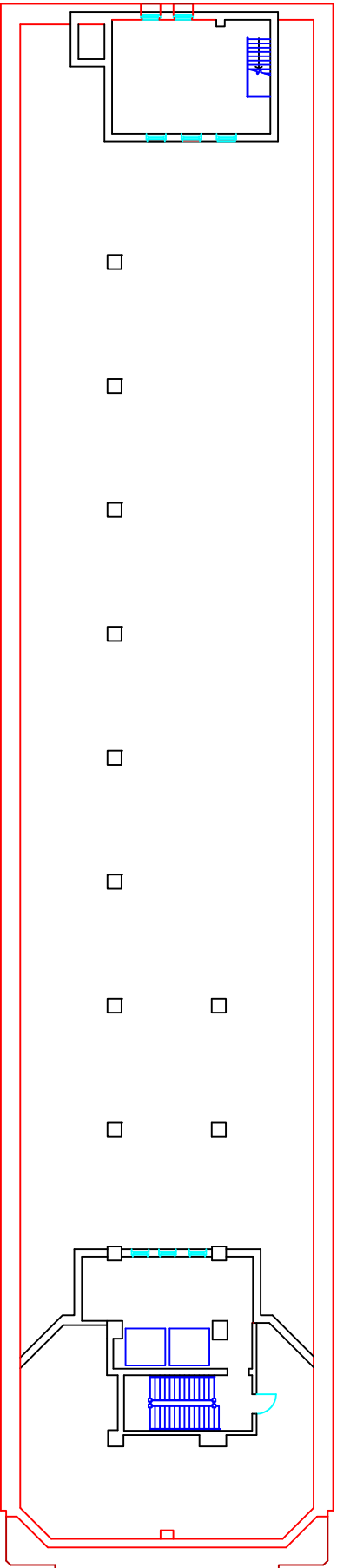
## SEVENTH FLOOR PLAN

 OH SOLUTIONS	OH Solutions Inc. 233 Mitchell Avenue Dorchester, Ontario N0L1G3 Tel: (519) 268-2200 Fax: (866) 704-6975	
	Designated Substances Assessment	
Government of Canada Building Seventh Floor 457 Richmond Street London, Ontario Building # 5520114		
SCALE:	DATE:	
NITS	12/20/12	
DRAWING # 008	GHS POLICY: 12-030	

EIGHTH FLOOR PLAN



 OH solutions		OH Solutions Inc. 233 Mitchell Avenue Dorchester, Ontario NO1 1G3 Tel: (519) 268-2200 Fax: (866) 700-4975	
Designated Substances Assessment			
Government of Canada Building Eighth Floor 457 Richmond Street London, Ontario Building # 5520114			
SCALE: NTS	DATE: 12/20/12	DATE: 12/20/12	
DRAWING # 009	DATE PROJECT: 12-030		

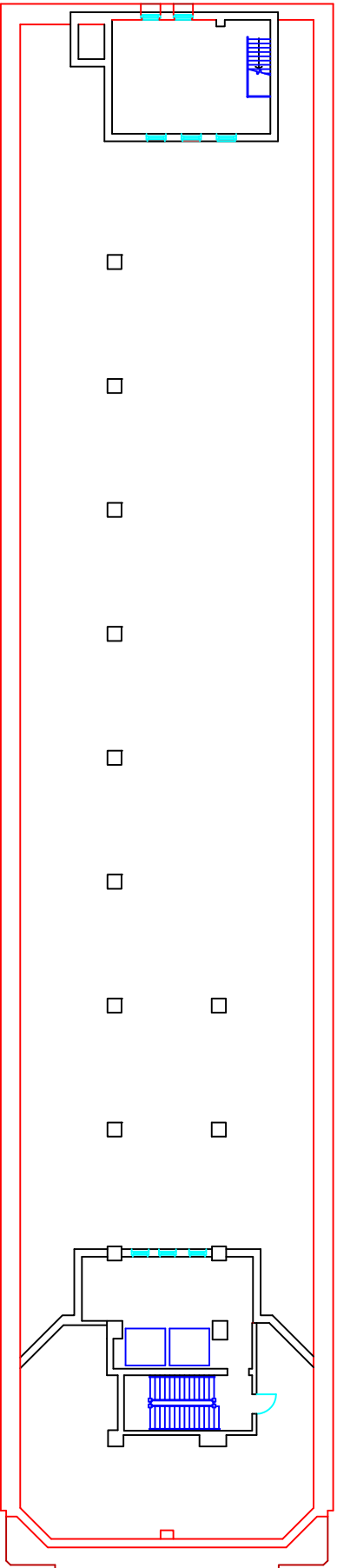


OH Solutions Inc.  
233 Mitchell Avenue  
Dorchester, Ontario N0L1G3  
Tel: (519) 268-2200  
Fax: (866) 700-4975

Designated Substances Assessment

Government of Canada Building  
Ninth Floor  
457 Richmond Street  
London, Ontario  
Building # 5520114

SCALE: NTS	DATE: 12/20/12
DRAWING #: 010	OH PROJECT: 12-030



OH Solutions Inc.  
233 Mitchell Avenue  
Dorchester, Ontario N0L1G3  
Tel: (519) 268-2200  
Fax: (866) 700-4975

Designated Substances Assessment

Government of Canada Building  
Ninth Floor  
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