



Specifications

Architectural, Mechanical,
Electrical

Specifications for
SIR OLIVER MOWAT COLLEGIATE INSTITUTE
Accessibility Upgrades
TR-25-0951

5400 Lawrence Ave, East
Scarborough
Ontario
M1C 2C6

for the
Toronto District School Board
5050 Yonge St, North York,
Ontario
M2N 5N8

Prime Consultant:

Kingsland + Architects Inc.
110 Cumberland Street, Suite 262
Toronto, Ontario
M5R 3V5

Issued for Tender
Project No. A25007

April, 2026



This seal does not govern the following materials bound into these Specifications.

- **DIVISION 26 to 27 MECHANICAL, ELECTRICAL**
- **APPENDIX "B" REPORTS**

END OF SECTION

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1.0 GENERAL

1.1. SECTION INCLUDES

- .1 Connecting to existing services
- .2 Special scheduling requirements
- .3 TDSB Specific Requirements

1.2. RELATED SECTIONS

- .1 Section 01 53 00 - Temporary Construction.
- .2 Section 01 33 00 - Submittal Procedures.
- .3 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3. EXISTING SERVICES

- .1 Notify Owner and Consultant and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Consultant and Owner, forty-eight (48) hours of notice for necessary interruption of mechanical or electrical service throughout course of work.
 - .1 Keep duration of interruptions minimum.
 - .2 Perform interruptions after normal working hours of occupants, preferably on weekends.
- .3 Provide for vehicular, pedestrian and personnel traffic.
- .4 Construct barriers in accordance with Section 01 53 00.

1.4. AFTER HOURS WORK

- .1 Schedule Work with school staff through the Board's contact so as to limit disruption to school operations. Include for any overtime, to ensure orderly and continuous progression of Work and operation of school.
- .2 Direct calls from Contractors to Board staff to adjust alarms and to arrange for access will not be accepted. All correspondence must be through the Project Manager.
- .3 Arrange 48 hours in advance with Board to obtain an access card and adjust security alarms for after hours Work.
- .4 Bidders are cautioned that the Board will be compensated by the Contractor for false alarms. Any costs associated with each false alarm will be levied against the Contractor for false fire alarm activation or security alarm activation. These costs may include, but are not limited to:
 - .1 Fines or penalties imposed by the local Fire Services,
 - .2 Fines or penalties imposed by the local Police Services,
 - .3 Overtime costs borne by the Board.
- .5 Contractors are responsible for ensuring doors and windows are secured prior to leaving school.
- .6 Unless specifically stated otherwise school activities take precedence over Contractor's activities.

1.5. SPECIAL REQUIREMENTS

- .1 Schedule and perform work in occupied areas to Board Representative's approval.
- .2 Schedule and perform noise generating work to Board Representative's approval.
- .3 Submit schedule of special requirements or disruptions in accordance with Section 01 33 00.

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

1.6. TDSB SPECIFIC SUPPLEMENTARY REQUIREMENTS

Following are TDSB specific SUPPLEMENTARY requirements which are to be read in conjunction with Division 1 in its entirety.

1.1. COMMUNICATION (TDSB SPECIFIC REQUIREMENTS)

- .1 At the outset of the project the Contractor shall provide to the Board Project Manager all relevant contact information for the Site Superintendent and GC Project Manager including names and cell phone numbers.
- .2 The Contractor shall provide at least one “emergency contact” telephone number at which the Contractor’s representative can be reached directly during all work hours.
- .3 The Site Superintendent must have the ability to be reached directly during all times or a contact provided that can be provided during all times.
- .4 In the event of a safety issue requiring contractual clarification or action (i.e. Change Notice, etc.), the contractor shall ensure that, where applicable, the action is followed up with appropriate documentation.

1.2. OPERATION OF MOTOR VEHICLES (TDSB SPECIFIC REQUIREMENTS)

- .1 Vehicles shall not enter, be parked or operate at school sites without first obtaining authorization from the assigned project manager.
- .2 Such vehicles shall be always operated with due caution while on school property on or near school grounds, conforming to all posted traffic controls such as speed limit, stop signs, etc.
- .3 Vehicles or equipment are not permitted on school yards without prior approval from the project manager. Should approval be granted, vehicles and equipment operated in the school yard are not permitted within 30 minutes of school bell times, during recess, lunch hour or other times of outdoor activity.
- .4 Must employ flag person to manage all operations of vehicles and equipment on site at all times they are in operation.
- .5 Vehicles or equipment must never be left unattended with the engine running. Engines must not be left idling unnecessarily.

1.3. SITE SAFETY SIGNAGE (TDSB SPECIFIC REQUIREMENTS)

- .1 Standardized Safety Signage is required at all construction entrances authorization
- .2 If not designated in the Contract Documents, the location of the Safety Signage shall be confirmed with the Board Project Manager and Consultant at the outset of the Project and before the placement of hoarding and fencing.

- .3 Total surface area of signage is to avoid exceeding municipal standards that would require a separate signage permit.

1.4. WORKING HOURS (TDSB SPECIFIC REQUIREMENTS)

- .1 Are to comply with the requirements of the City of Toronto by-law
- .2 From June 26, 2026, to August 28, 2026, Work can be completed anytime, if it complies with the City of Toronto by-law.
- .3 It is the Successful Bidder's responsibility to schedule shift work (as required) to meet Project schedule deadlines; this may mean daytime as well as after-hours Work.
- .4 Prior to June 26, 2026, and after August 28, 2026, all Work must be completed outside of school operational hours of 8:00AM – 6:30PM and on weekends.
- .5 Prior to June 29, 2026, and after August 28, 2026, all Work which would cause a disturbance or safety hazard (including Work that generates odours, any asbestos abatement, any environmental demolition, or cutting/coring) must be completed prior to 8:00 AM or after 6:30 PM Monday to Friday, or anytime on weekends.
- .6 Prior to June 26, 2026, and after August 28, 2026, all tools, equipment, and materials must be brought into or taken out of the construction space(s) prior to 8:00 AM and/or after 6:30 PM.
- .7 A TDSB Caretaker must always be on the premises while construction works are being completed. Caretaking hours are from 6:00am to 11:00pm Monday to Friday, excluding holidays and board closures.

1.5. SIGN-IN REQUIREMENTS (TDSB SPECIFIC REQUIREMENTS)

- .1 The Contractor shall obtain identification badges by filling out the "Request for Issue of Identification Badges for Consultant/Contractor" form and submitting, along with badge deposit (\$75.00 each). **Contact information will be provided during the pre-construction meeting**
- .2 The Contractor is required to sign-in themselves, their subcontractors or any other person associated with the project at school main office to record their arrival time.
- .3 The Contractor will compile a sign-in sheet with for all forces working on the project and submit to the main office at the start of each day.
- .4 ID badges shall be worn at all times while on Board property. It shall be the Bidder's responsibility to assign and track each badge. The wearing of badges by all personnel shall be strictly enforced.
- .5 At the end of each day the Contractor shall obtain the sign-in sheet previously submitted to the main office, record the departure times of themselves, Subcontractors or any other person associated with the project and return the sign-in sheet to the main office.
- .6 The Bidder's inability to access the site due to not having current badges will not absolve the Bidder of not being able to complete the project by the stipulated date.

1.6. USE OF EXISTING FACILITIES (TDSB SPECIFIC REQUIREMENTS)

- .1 Use of school washrooms, both student and staff is strictly prohibited at all times. It is the responsibility of the Contractor to provide appropriate washroom facilities as per the regulations set out by the Authority Having Jurisdiction for all staff, subcontractors and delivery drivers associated with the construction project and coordinate such location with the project supervisor. The contractor is responsible to secure any portable toilet facilities

to mitigate vandalism, security issues, etc. and is responsible for the ongoing maintenance of such facility.

- .2 Use of existing school elevators by the Contractor, Subcontractor, Suppliers or another individual associated with the project is prohibited. The Contractor will not be permitted to utilize the elevator for moving of materials, equipment or personnel while carrying out the works.
- .3 Use of existing school services, including but not necessarily limited too; Water, Hydro, Internet, Phones/Fax and heat are not permitted. The contractor will include in their contract price all temporary services required to carry out the works.

1.7. CONTRACTOR PARKING (TDSB SPECIFIC REQUIREMENTS)

- .1 Contractor parking is not available. The contractor will need to make all arrangements for offsite parking in accordance to all applicable By-law, zoning, etc.

1.8. CONSTRUCTION STAGING (TDSB SPECIFIC REQUIREMENTS)

- .1 No storage is available on site for the contractor. The contractor must make all necessary arrangements for storage containers as needed and ensure security of such.
- .2 Prior to construction start, the contract must provide the Board and Consultant a copy of their construction staging plan. The plan is to include a site plan identifying location of proposed fencing, location of portable toilets, storage containers, etc. The plan is to identify which doors the contractor will be using to enter the school, path of travel for equipment deliveries etc. The Board and consultant reserve the right to request any changes to the plan to ensure the safety of students, staff and maintaining the ongoing operations of the school.

1.9. BOARD HEALTH & SAFETY DEPARTMENT REP (TDSB SPECIFIC REQUIREMENTS)

- .1 A representative of the Board's Health, & Safety Dept. ('Environment, Health and Safety Officer') may visit site at any anytime throughout the duration of the Contract to review the site, as it relates to the safety of the occupied areas of the site. Such site review shall neither constitute an inspection or approval for the Contractor.
- .2 Concerns or issues identified by the representative from the Board's Health, Wellness & Safety Dept. shall be communicated through the Board Project Manager and the school Principal for corrective action.
- .3 Contractor shall ensure full access to all site areas, at all times, for the Board's Health, Wellness & Safety Department Representative.

1.10. INCIDENT REPORTING (TDSB SPECIFIC REQUIREMENTS)

- .1 If at the workplace an accident, explosion, or fire causes a person injured (where they cannot perform their regular duties), a death or a critical injury the Contractor must follow all applicable regulations with respects to reporting. When reporting to the authority having jurisdiction the Board's Project Supervisor and Health & Safety Representative will be copied on the correspondence.

1.11. SITE MEETINGS (TDSB SPECIFIC REQUIREMENTS)

- .1 The Contractors Site Supervisor and Project Manager are required at all site meetings during the course of the project.
- .2 The Contractor shall record minutes of each meeting and promptly distribute copies to be received by all participants not later than three days after meeting has been held. Distribute minutes of meetings to all Consultants, whether in attendance or not.

1.12. DOCUMENTS ON SITE (TDSB SPECIFIC REQUIREMENTS)

- 1 Contractor's field office shall at all times contain a complete set of Contract Documents (Drawings and Specifications) with all addenda, site instructions, change orders, reviewed shop drawings and samples, colour schedule, paint materials schedules, hardware list, progress reports and meeting minutes.

1.13. CASH FLOW CHART (TDSB SPECIFIC REQUIREMENTS)

- 1 Within 7 days after award of Contract, submit, in form approved by Consultant, cash flow chart broken down on a monthly basis in an approved manner. Cash flow chart shall indicate anticipated Contractor's monthly progress billings from commencement of work until completion.
- .2 Update cash flow chart whenever changes occur to scheduling and in manner and at times satisfactory to Consultant.
- .3 The Consultant reserves the right to receive from the Contractor at any time, upon request, copies of actual purchase or work orders of any material or products to be supplied for the work.
- .4 If materials and products have not been placed on order, the Consultant may instruct such items to be placed on order, if direct communication in writing from the manufacturer or prime suppliers is not available indicating that delivery of said material will be made in sufficient time for the orderly completion of the Work.
- .5 The Consultant's review of purchase orders or other related documentation shall in no way release the Contractor, or his subcontractors and suppliers from their responsibility for ensuring the timely ordering of all materials and items required, including the necessary expediting, to complete the work as scheduled in accordance with the Contract Documents.

END OF SECTION

1.0 GENERAL

1.1. RELATED DOCUMENTS

- .1 This section describes requirements applicable to all sections within Divisions 02 to 49.

1.2. WORDS AND TERMS

- .1 Conform to definitions and their defined meanings in the Agreement and Definitions portion of CCDC 2 for Supplementary Words and Terms listed in Section 00 56 13.

1.3. COMPLEMENTARY DOCUMENTS

- .1 Generally, drawings indicate graphically, the dimensions and location of components and equipment. Specifications indicate specific components, assemblies, and identify quality.
- .2 Drawings, specifications, diagrams and schedules are complementary, each to the other, and what is required by one, to be binding as if required by all.
- .3 Should any conflict or discrepancy appear between documents, which leaves doubt as to the intent or meaning, apply the Precedence of Documents article below or obtain guidance or direction from Consultant.
- .4 Examine all discipline drawings, specifications, schedules, diagrams and related Work to ensure that Work can be satisfactorily executed.
- .5 All specification sections of the Project Manual and Drawings are affected by requirements of Division 01 sections.

1.4. PRECEDENCE OF DOCUMENTS

- .1 In the event of conflict within and between the Contract Documents, the order of priority within specifications and drawings for this project are - from highest to lowest:
 - .1 the Agreement and Definitions between the Owner and the Construction
 - .2 the Defined Terms, Definitions;
 - .3 Supplementary Conditions;
 - .4 the General Conditions;
 - .5 Sections of Division 01 of the specifications;
 - .6 Technical specifications Sections of Divisions 02 through 49 of the specifications.
 - .7 Schedules and Keynotes:
 - .1 Material and finishing schedules within the specifications, then;
 - .2 Material and finishing schedules on drawings, then;
 - .3 Keynotes and definitions thereto, then;
 - .8 Drawings:
 - .1 Drawings of larger scale shall govern over those of smaller scale of the same date, then;
 - .2 Dimensions shown on drawings shall govern over dimensions scaled from drawings, then;
 - .3 Location of utility outlets indicated on architectural detail drawings takes precedence over positions or mounting heights located on mechanical or electrical Drawings.
 - .9 Later dated documents shall govern over earlier documents of the same type.

1.5. SPECIFICATION GRAMMAR

- .1 Specifications are written in the imperative command mode, in an abbreviated form.
- .2 Imperative language of the technical sections is always directed to the Contractor identified as a primary constructor, as sole executor of the Contract, unless specifically noted otherwise.
 - .1 This form of imperative command mode statement requires the primary constructor to perform such action or Work.
 - .2 Perform all requirements of the Contract Documents whether stated imperatively or otherwise.
- .3 Division of the Work among subcontractors, suppliers, or others is solely the prime constructor's responsibility. The Consultant(s) and specification authors assume no responsibility to function or act as an arbiter to establish subcontract scope or limits between sections or divisions of Work.

END OF SECTION

1.0 GENERAL

1. Allowances included herein are for items of Work which could not be fully quantified prior to Bidding.
2. Expend each allowance as directed by the Consultant. Work covered by allowances shall be performed for such amounts and by such persons as directed by Consultant.
3. Funds will be expended by means of Cash Allowance allocations and contingency allowance allocations.
4. Progress payments for Work and Products authorized under allowances will be made in accordance with the payment terms set out in the Conditions of the Contract.
5. The Contractor shall bid the work involved and submit the Bids received to the Consultant and the Board, for approval
6. The Contractor shall submit 3 bids unless directed by the Board.

2.0 CASH ALLOWANCES

1. Cash allowances, unless otherwise specified, cover the net cost to the Contractor of services, products, construction machinery and equipment, freight, handling, unloading, storage, installation where indicated, and other authorized expenses incurred in performing the Work. Cash allowances shall not be included by a subcontractor in the amount for their subcontract work.
2. Supply only allowances shall include:
 - .1 Net cost of Products.
 - .2 Delivery to Site.
 - .3 Applicable taxes and duties, excluding HST.
3. Supply and install allowances shall include:
 - .1 Net cost of Products.
 - .2 Delivery to Site.
 - .3 Unloading, storing, handling or products on site.
 - .4 Installation, finishing and commissioning of products.
 - .5 Applicable taxes and duties, excluding HST.
4. Inspection and testing allowances shall include:
 - .1 Net cost of inspection and testing services.
 - .2 Applicable taxes and duties, excluding HST.
5. Other costs related to work covered by cash allowances are not covered by the allowance, but shall be included in the Contract Price.
6. Where costs under a cash allowance exceed the amount of the allowance, the Contractor will be compensated for any excess incurred and substantiated plus an allowance for overhead and profit as set out in the Contract Documents.
7. Progress payments on accounts of work authorized under cash allowances shall be included in the monthly certificate for payment.
8. Submit, before application for final payment, copies of all invoices and statements from suppliers and subcontractors for work which has been paid from cash allowances.

3.0 ALLOWANCES SCHEDULE

- .1 Include in the Bid Price a total cash allowance as listed in the MonAvenir Invitation to Tender documents for the following work:

CA Table	
1	Independent Testing & Inspection (Including but not limited to soil, paving, concrete, mortar, structural steel, metal deck, , painting excluding mechanical & electrical Testing & Inspection) (As directed by the Consultant)
2	Additional hardware not previously identified in Contract Documents
3	Unforeseen site conditions
4	Unforeseen electrical work in existing building
TOTAL CASH ALLOWANCE CARRIED FOR ITEMS ABOVE	
\$90,000.00	

4.0 CONTINGENCY ALLOWANCE

4.1 NOT APPLICABLE

End of Section

1.0 GENERAL

1.1. RELATED SECTIONS

- .1 Section 01 32 00 - Construction Progress Documentation.
- .2 Section 01 33 00 - Submittal Procedures.
- .3 Section 01 53 00 – Temporary Construction Facilities
- .4 Section 01 61 00 – Product Requirements
- .5 Section 01 78 10 – Closeout Submittals and Requirements
- .6 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.2. PROJECT COORDINATION

- .1 Perform coordination of progress schedules, submittals, use of site, temporary utilities, construction facilities and construction Work, with progress of Work of other contractors, under instructions of the Consultant.
- .2 The Contractor shall have total control of the Work and shall effectively direct and supervise the Work so as to ensure conformity with the Contract Documents and within the Contract Time.
- .3 The Contractor shall be solely responsible for the construction means, methods, sequences, and procedures and for coordinating parts of the Work under the contract.
- .4 Co-ordinate progress of the Work, progress schedules, submittals, use of site, temporary utilities, construction facilities, safety regulations and fire protection, as per authorities having jurisdiction codes.
- .5 The Consultant has the authority to stop the Work:
 - .1 whenever they observe or are made aware of unsafe conditions.
 - .2 whenever it is deemed necessary to protect the interests of the Board,
 - .3 whenever materials or workmanship are in contravention to the Contract Documents

1.3. SITE SUPERVISOR AND PROJECT MANAGER

- .1 If requested, the Contractor shall provide the Consultant, in writing, the name of the Project Manager and Site Supervisor, and proof of competent experience in similar projects.
- .2 Performance of the Contractors Project Manager and Site Supervisor
 - .1 If the Board and or the Consultant become concerned with any of: Site Safety, Project Schedule, or general compliance with the tender documents due to the performance of the Site Supervisor or Project Manager, the Consultant and or the Board will identify the concerns in writing to the Contractor.
 - .2 The Contractor shall respond in writing to the Board and Consultant with a corrective action for each item within 24 hours.
 - .3 If it is found that any of the corrections are not immediately implemented, the Consultant and the Board shall meet with the General Contractor to review the credentials including curriculum vitae and comparable experience of a replacement Site Supervisor and or Project Manager proposed by that Contractor.
 - .4 All outstanding concerns initiating the replacement of the personnel will be immediately addressed to the satisfaction of the Consultant and the Board.
- .3 If the Board and or the Consultant become concerned with site safety, project schedule or general compliance with the tender documents due to the performance of the Site Supervisor or the Project Manager, the Consultant or the Board will issue the concerns in writing to the Contractor. The Contractor shall respond in writing within 24 hours to the

Consultant and the Board. If any of the corrections are not immediately implemented, the Consultant or the Board will schedule a meeting with the Consultant, General Contractor and the Board. At this meeting the Contractor will introduce the new Project Manager, and or Site Supervisor and present the Curriculum Vitae for each showing proof of comparable experience in similar projects. The Contractor will then address the outstanding concerns to the satisfaction of the Consultant and the Board.

- .4 The Project Manager, and/or Site Supervisor shall not be replaced by the Contractor without prior written approval from the Board and the Consultant.

1.4. PERMITS

- .1 **The Board will obtain & pay for all building permits, but the Contractor is responsible for all other permits, including electrical inspection and fire alarm verification.**

1.5. CONSTRUCTION DOCUMENTS

- .1 The Consultant will provide the Contractor with PDF copies of both the drawings and the specification and CAD format files of the drawings at no charge to the Contractor. All printing will be at the cost of the Contractor including the AS-BUILT documents.

1.6. PRECONSTRUCTION MEETING

- .1 Immediately prior to construction and upon notification by the Consultant of a time and date, the Contractor shall attend the preconstruction meeting at a location as determined by the Consultant, along with authoritative representatives of certain key subcontractors as specifically indicated in the conference notice. Agenda to include following:
 - .1 Appointment of official representative of participants in Work.
 - .2 Project communications procedures
 - .3 Schedule of Work, progress scheduling (including long lead items, cash allowance items) as specified in Section 01 32 00.
 - .4 Schedule of submission of shop drawings, samples, colour chips as specified in Section 01 33 00.
 - .5 Requirements for temporary facilities, washrooms, refuse bin, site sign, offices, storage sheds, utilities, fences as specified in Section 01 53 00.
 - .6 Delivery schedule of specified equipment as specified in Section 01 61 00.
 - .7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, and administrative requirements.
 - .8 Owner furnished products.
 - .9 Record drawings as specified in Section 01 78 10.
 - .10 Maintenance material and data as specified in Section 01 78 10.
 - .11 Take-over procedures, acceptance, and warranties as specified in Section 01 78 10.
 - .12 Monthly progress claims, administrative procedures, photographs, and holdbacks.
 - .13 Appointment of inspection and testing agencies
 - .14 Insurances and transcript of policies.
 - .15 Review Vendor Performance Evaluation for the Contractor and Subcontractors
 - .16 Hot Work Permit Process
 - .17 Security Access, Fire Alarm shut down procedures
 - .18 Any other items as required by owner, contractor or Consultant.

1.7. ON-SITE DOCUMENTS

- .1 Maintain at job site at all times, one copy (written or digital) each of the following:
 - .1 Complete set of Contract drawings.
 - .2 Specifications.
 - .3 All Addenda.
 - .4 Site Instructions and Sketches
 - .5 Reviewed shop drawings and samples.
 - .6 Change Orders and Contemplated Change Orders.
 - .7 Other modifications to Contract.
 - .8 Site Instructions
 - .9 Colour schedule
 - .10 Hardware List
 - .11 Field test reports.
 - .12 Copy of approved Work schedule.
 - .13 Manufacturers' installation and application instructions.
 - .14 Progress reports and meeting minutes.
 - .15 Approved building permit documents.
 - .16 Copy of current Ontario Building Code and National Building Code.
 - .17 CSA Standard, CGSB Specifications. ASTM Documents and other standards referenced to in the specifications.
 - .18 Labour conditions and wage schedules.
 - .19 Applicable current editions of municipal regulations and by-laws. Current building codes, complete with addenda bulletins applicable to the Place of the Work.

1.8. SCHEDULES

- .1 Within three weeks following the award of the Contract, submit a detailed, trade by trade progress schedule for the work in a bar chart form acceptable to the Consultant.
- .2 Submit preliminary construction progress schedule as specified in Section 01 32 00 to Consultant coordinated with Consultant's project schedule.
- .3 After review, revise and resubmit schedule to comply with revised project schedule.
- .4 During progress of Work revise and resubmit as directed by Consultant.
- .5 Provide schedule updates every month with request for Payment, for duration of Contract.

1.9. CONSTRUCTION PROGRESS MEETINGS

- .1 Prior to the commencement of the Work, the Contractor together with the Consultant shall mutually agree to a sequence for holding regular "on site meetings".
- .2 The Contractor will organize site meetings. Ensure persons, whose presence is required, are present and relative information is available to allow meetings to be conducted efficiently.
- .3 Contractor, major subcontractors and consultants involved in Work are to be in attendance.
- .4 Post and forward copies of progress schedules for advice of Subcontractors, Owner and Consultant.
- .5 Notify parties minimum five (5) days prior to meetings.
- .6 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within two (2) days after meeting.
- .7 Agenda to include 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 effect on construction schedule and on completion date.
- .12 Review site security issues.
- .13 Other business.
- .8 Schedule additional meetings, to expedite progress, should work require it.
- .9 Keep Owner and Consultant informed of progress, of delays and potential delays during all stages of Work. Do everything possible to meet progress schedule
- .10 Schedule and administer pre-installation meetings when specified in sections and when required to coordinate related or affected Work.

1.10. SUBMITTALS

- .1 Prepare and issue submittals to Consultant for review.
- .2 Submit preliminary Shop Drawings, product data and samples for review for compliance with Contract Documents; for field dimensions and clearances, for relation to available space, and for relation to Work of other contracts. After review, revise and resubmit for transmittal to Consultant.
- .3 Submit requests for payment for review, and for transmittal to Consultant.
- .4 Submit requests for interpretation of Contract Documents, and obtain instructions through Consultant.
- .5 Process substitutions through Consultant.
- .6 Process change orders through Consultant.
- .7 Deliver closeout submittals for review and preliminary inspections, for transmittal to Consultant.

1.11. RECORD (AS-BUILT) DOCUMENTS AND SAMPLES

- .1 Procedures for record as-built documents and samples as specified in Section 01 78 10.
- .2 Keep as-built documents and samples available for inspection by Consultant.

1.12. CLOSEOUT PROCEDURES

- .1 Take-over procedures, acceptance, and warranties as specified Section 01 78 10
- .2 Notify Consultant and Board when Work is considered ready for Substantial Performance.
- .3 Accompany Consultant and Board on preliminary inspection to determine items listed for completion or correction.
- .4 Comply with Consultant's instructions for correction of items of Work listed in executed certificate of Substantial Performance.
- .5 Notify Consultant of instructions for completion of items of Work determined in Consultant's final inspection.

END OF SECTION

1.0 GENERAL

1.1. RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.2. SCHEDULES

- .1 Within seven 7 days following the award of the Contract, submit a detailed cash flow chart broken down on a monthly basis, in a manner acceptable to the Consultant. Cash flow chart shall indicate anticipated Contractor's monthly progress billings from commencement of work until completion.
- .2 Update cash flow chart whenever changes occur to scheduling and in manner and at times satisfactory to Consultant.
- .3 Submit schedule of values at least fourteen (14) days before the first application
- .4 Submit schedules as follows:
 - .1 Submittal Schedule for Shop Drawings and Product Data.
 - .2 Submittal Schedule for Samples.
 - .3 Submittal Schedule for timeliness of Owner-furnished Products.
 - .4 Product Delivery Schedule.
 - .5 Cash Allowance Schedule for acquiring Products and Installation.
 - .6 Shutdown or closure activity.

1.3. CONSTRUCTION PROGRESS SCHEDULING

- .1 Submit initial schedule to the Consultant and the Board in duplicate within seven (7) days after following the award.
- .2 Schedule Format.
 - .1 Prepare schedule in form of a horizontal bar chart.
 - .2 Split horizontally for projected and actual performance.
 - .3 Provide horizontal time scale identifying each Working Day of each week.
- .3 Schedule Submission.
 - .1 Consultant will review schedule and return reviewed copies within five (5) days after receipt.
 - .2 Submit schedules in electronic format, forward to the Consultant and Owner as a pdf. file.
 - .3 Resubmit finalized schedule within five (5) days after return of review copy.
 - .4 Submit revised progress schedule with each application for payment.
 - .5 Distribute copies of revised schedule to:
 - .1 Job site office.
 - .2 Subcontractors.
 - .3 Other concerned parties.
 - .6 Instruct Consultant to report to Contractor within ten (10) days, any problems anticipated by timetable shown in schedule.
- .4 Submit revised schedules with Application for Payment, identifying changes since previous version.
- .5 Select either of the following paragraphs to identify the type and format of schedule required.

- .6 Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.
- .7 Indicate estimated percentage of completion for each item of Work at each submission.
- .8 Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates, including those furnished by Owner and required by Allowances.
- .9 Include dates for commencement and completion of each major element of construction:
- .10 Indicate projected percentage of completion of each item as of first day of month.
- .11 Indicate progress of each activity to date of submission schedule.
- .12 Indicate changes occurring since previous submission of schedule:
 - .1 Major changes in scope.
 - .2 Activities modified since previous submission.
 - .3 Revised projections of progress and completion.
 - .4 Other identifiable changes.
- .13 Provide a written report to define:
 - .1 Problem areas, anticipated delays, and impact on schedule.
 - .2 Corrective action recommended and its effect.
 - .3 Effect of changes on schedules of other subcontractors.

1.4. PROGRESS PHOTOGRAPHS

- .1 Digital Photography:
 - .1 Submit electronic copy of progress photographs of project, Digital format, minimum 300 in megapixel resolution.
 - .2 Identification: Name and number of project and date of exposure indicated.
 - .3 Provide both interior and exterior photographs.
 - .4 Number of Viewpoints: Locations of viewpoints determined by Consultant.
 - .5 Frequency: Monthly with progress statement. Provide the required number of pictures to accurately reflect the submitted progress percentage.

1.5. SHOP DRAWING SUBMITTAL SCHEDULE

- .1 Include schedule for submitting shop drawings, product data, samples
- .2 Indicate dates for submitting, review time, resubmission time, and last date for meeting fabrication schedule.
- .3 Include dates when shop drawings and samples will be required for Owner-furnished products.
- .4 Include dates when reviewed submittals will be required from Consultant.
- .5 Provide final signed off copies of the shop drawings in digital format to the Board.

END OF SECTION

1.0 GENERAL

1.1. RELATED SECTIONS

- .1 Section 01 32 00 - Construction Progress Documentation.
- .2 Section 01 78 10 - Closeout Submittals.
- .3 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.2. ADMINISTRATIVE

- .1 Submit to Consultant submittals listed for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work. Failure to submit 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.
- .2 Work affected by submittal shall not proceed until review is complete.
- .3 Present Shop Drawings, product data, samples and mock-ups in Metric (SI) units. Shop drawings containing imperial measurements will be rejected.
- .4 Where items or information is not manufactured or produced in SI Metric units, converted values within the metric measurement to the next largest imperial size available. Tolerances of .0625 acceptable.
- .5 Review submittals prior to submission to Consultant. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents.
- .6 Submittals not stamped, signed, dated, identified as to specific project, and attesting to their being reviewed will be returned without being examined and shall be considered rejected.
- .7 Shop drawings which require the approval of a legally constituted authority having jurisdiction shall be submitted by Contractor to such authority for approval. Such shop drawings shall receive final approval of authority having jurisdiction before Consultant's final review.
- .8 No work, requiring a shop drawing submission, shall be commenced until the submission has received Consultant's final review. Only shop drawings bearing Consultant's review stamp are to be sent and used on the job site.
- .9 Notify Consultant, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .10 Shop drawings shall not contain substituted materials unless such substitutions have been requested in advance and approved by Consultant.
- .11 Verify field measurements and affected adjacent Work are coordinated.
- .12 Contractor's responsibility for errors and omissions in submission is not relieved by Consultant's review of submittals.
- .13 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Consultant review.
- .14 Keep one (1) reviewed copy of each submission on site.

1.3. 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 The term "design team" means Consultant and Sub-consultants whether Sub-consultants are employees of Consultant or not, and includes structural, mechanical, electrical, etc.

- .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 coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow fourteen (14) days for Consultant's review of each submission.
- .5 Adjustments made on Shop Drawings by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.
- .6 Make changes in Shop Drawings as Consultant may require, consistent with Contract Documents. When resubmitting, notify Consultant in writing of any revisions other than those requested.
- .7 Accompany submissions with transmittal letter, 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 other parts of the Work.
- .9 After Consultant's review, distribute copies.
- .10 Submit Shop Drawings in Pdf. format for each requirement requested in specification Sections and as consultant may reasonably request.
- .11 Submit product data sheets or brochures in Pdf. format for requirements requested in specification sections and as requested by Consultant where Shop Drawings will not be prepared due to standardized manufacture of product.

- .12 Delete information not applicable to project.
- .13 Supplement standard information to provide details applicable to project.
- .14 If upon review by Consultant, no errors or omissions are discovered or if only minor corrections are made, the drawings will be stamped as reviewed or reviewed as modified and will be returned. At this point fabrication and installation of Work may proceed. If Shop Drawings are rejected, noted copy will be returned and re-submission of corrected Shop Drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .15 Signed drawings shall be returned to and retained by Contractor who is then responsible for distribution of copies of corrected shop drawing to appropriate Subcontractors for appropriate action and to municipal building department for their records of those subjects required by authorities.
- .16 The Consultant's review is for the sole purpose of ascertaining conformance with the general design concept. This review shall not mean the Consultant approves the detail design inherent in the shop drawings, responsibility for which shall remain with the Contractor submitting same, and this review shall not relieve the Contractor of his responsibility for meeting the requirements of the Contract Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site for information that pertains solely to fabrication processes or to techniques of construction and installation and for coordination of the work of all subtrades.

1.4. SAMPLES

- .1 Submit for review to the Consultant three (3) samples as requested in respective specification Sections.
- .2 Submit samples with identifying labels bearing material or component description, manufacturer's name and brand name, Contractor's name, project name, location in which material or component is to be used, and date.
- .3 Deliver samples prepay any shipping charges involved for delivering samples to destination point and returning to point of origin if required.
- .4 Provide samples of special products, assemblies, or components when so specified.
- .5 No work requiring a sample submission shall commence until submission has received Consultant's final review.
- .6 Notify Consultant in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .7 Where colour, pattern or texture is criterion, submit full range of samples.
- .8 Adjustments made on samples by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.
- .9 Make changes in samples which Consultant may require, consistent with Contract Documents.
- .10 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.5. MOCK-UP

- .1 Erect mock-ups to Section 01 45 00.

1.6. CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after award of Contract, and prior to commencing the work submit the performance bond and the labour and materials payment bond as described in the bid documents.
- .2 Submit transcription of certified true copies of insurance immediately after award of Contract.
- .3 A current WSIB clearance certificate
- .4 The bidder's health and safety policy for the project.
- .5 A copy of the notice of project issued by the ministry of labour for the project
- .6 Building materials, components and elements specified without the use of trade or proprietary names shall meet requirements specified. If requested by Consultant, submit evidence of meeting requirements specified. Evidence shall consist of certification based on tests carried out by an independent testing agency. Certification based on previous tests for same materials, components or elements is acceptable. Certification shall be in form of written test reports prepared by testing agency.

END OF SECTION

1.0 GENERAL

1.1. RELATED SECTIONS

- .1 Section 01 14 00 – Work Restrictions.
- .2 Section 01 31 00 - Project Managing and Coordination.
- .3 Section 01 33 00 - Submittal Procedures.
- .4 Section 01 35 23 – Health and Safety
- .5 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.2. FIRE SAFETY PLAN

- .1 Contractors and their personnel will be familiar with this section and its requirements.
- .2 The contractor must take all necessary precautions during the carrying out of the work to prevent the possibility of fire occurring.

1.3. FIRE PROTECTION

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by the governing codes, regulations and bylaws.
- .2 The contractor will, at all times, when welding, brazing and performing any operation with an open flame, combustible adhesives or flammable solvents keep a portable, operable fire extinguisher within 3 meters of the operation.

1.4. HOT WORK

- .1 Take all precautions to Work safely and to provide the necessary protection to persons and property from Hot Work. This includes, but is not limited to Brazing, Cutting, Grinding, Soldering, Thawing Pipe, Torch Applied Roofing and Welding. With all such activity these steps are to be followed:
 - .1 Whenever possible, complete Hot Work in a welding shop or out of doors at the school.
 - .2 Flammable liquids, dust lint and oily deposits to be removed from within 50-ft (15m) of Work. Remove other combustibles where possible. Otherwise protect with fire-resistive tarpaulins or metal shields.
 - .3 Explosive atmosphere in area eliminated. Floors swept clean. Combustible floors wet down, covered with damp sand or fire-resistive tarpaulins.
 - .4 All wall and floor openings covered. Fire-resistive tarpaulins suspended beneath Work.
 - .5 For on-site Work (indoor and out of doors), advise the Head Custodian, Principal, Consultant (if assigned) and Project Coordinator prior to Work being performed, and of related dangers.
 - .6 Where the Fire Alarm system is required to be set to stand-by to discourage false alarms from smoke detectors provide a firewatch throughout the building or structure being worked on. NEVER put the fire alarm system in stand-by mode when the building is occupied by staff or students.
 - .7 In the event of a fire as a result of the Hot Work, notify the fire department immediately. Report incident to the head custodian, the Consultant, if assigned, and Project Coordinator immediately, whether extinguished or not. Provide a fire incident report to the Board.

- .8 Barriers must be set up to protect staff and students (i.e. pylons, shields, and caution tape) from exposure to arc flash and smoke migration.
- .9 Have all necessary doors, windows and/or drapes closed. Confer with the Head Custodian to shut down all fan systems in the area to reduce or eliminate smoke distribution.
- .10 Provide and keep fire extinguishers handy and in good Working condition. Temporarily cover all smoke detectors in area during time of Work.
- .11 Provide a fire watch/spot check for several hours after Work is completed. Uncover smoke detectors.
- .12 On new construction, the requirements of the Hot Work permit may be waived, until such time as either Substantial Completion or Occupancy is granted, whichever comes first.
- .13 On additions to existing buildings, the requirements for Hot Work permits shall remain in place.

1.5. HOT WORK PERMIT

- .1 **A sample Hot Work Permit is attached to the specifications –**
- .2 Each permit is valid for seven (7) days only and must be renewed prior to its expiration date
- .3 The contractor must obtain Hot Work Permits from the School Board's representative prior to the start of work.
- .4 The contractor must complete the form as required and must keep the form on site.
- .5 Return each completed form to the School Board's representative on date of expiration.
- .6 The most current version of the Permit and it's requirements shall be used for the purposes of the Work.

1.6. FIRE PROTECTION SYSTEMS

- .1 Any Modifications to Fire Alarm system and it's devices including service, additions and changes in device location must be performed only by a Certified Fire Alarm Technician as per the Ontario Fire Code section 1.1, subsection 1.1.5.
- .2 The Contractor will receive from the Board's contact a contact number for the monitoring service and a school system number.
- .3 Bidders are cautioned that the Board will be reimbursed for the cost of false alarms. Refer to Section 01 14 00 Work Restrictions, Para. 1.4.4.
- .4 An approved inspection firm shall verify all new fire alarm devices, in accordance to CSA regulations. Certificate of Verification is required before occupancy.

1.7. FIRE ALARM SHUT-DOWN PROCEDURE

- .1 Do not shut the system down unless necessary. Plan the operation required to reduce system down time to the least amount possible.
- .2 Wherever possible, shut down only the zone needing Work and schedule this down time in unoccupied school hours. Allow for this in your bid pricing.
- .3 Discuss the possible down time with the head custodian and principal prior to any partial or whole system shut down.
- .4 The school or building administration shall advise all staff of fire alarm system shut down. This will include instructions to call 911 if they see a fire and when system is back on line.
- .5 Prior to alarm system shutdown and upon restoring the fire alarm system individuals supervising the shut down must contact Direct Detect at 519-741-2494 and have on hand

the School System Account Number (this number can be found on the decal on the fire alarm panel). The School System Account Number will start with the prefix 209

- .1 The Contractor shall provide full detail to the monitoring company as requested including building number and name (as identified on the fire alarm monitoring panel), contact name, company name, length of time system is down. Call shall be placed just prior to any shut down.
- .6 A fire patrol will need to be established and will include the following at the Contractor's expense:
 - .1 Patrol all halls and high-risk areas affected.
 - .2 Fire patrol shall have access to a phone and call 911 if they see a fire.
 - .3 Report all other problems they encounter.
 - .4 Remain on patrol until system is back on.
- .7 Contact Direct Detect at 519-741-2494 and inform them when the system is put back on line.
- .8 An activated system must not be reset until authorized by the Fire Department and the cause of the alarm has been investigated.

1.8. FIRE PROTECTION EQUIPMENT IMPAIRMENT

- .1 Fire Protection Equipment referred to in this section includes sprinkler systems, special fire suppression systems, and kitchen hood suppression systems.
- .2 The Contractor will take all precautions including restrict all Hot Work operations and shut down hazardous processes during all Fire protection equipment impairment.
- .3 Do not shut the Fire protection equipment down unless necessary Plan the operation required to reduce system impairment time to the least amount possible.
- .4 Wherever possible, shut down only the Fire protection equipment needing Work and schedule this impairment time for unoccupied school hours. Allow for this in your bid pricing.
- .5 Discuss the possible down time with the head custodian and principal prior to any partial or whole system impairment.
- .6 The school administration shall advise all staff of Fire protection equipment shut down. This will include instructions to call 911 if they see a fire and when system is back on line
- .7 The Contractor will plan to use temporary protection such as extra extinguishers, charged hose lines and temporary sprinkler protection during all Fire protection equipment impairment.
- .8 If the sprinkler system is restorable, either in whole or in part, the Contractor or sub-Contractor shall assign someone to restore the system promptly in the event of a fire.
- .9 A fire patrol may need to be established and will include the following at the Contractor's expense:
 - .1 Patrol all halls and high-risk areas affected.
 - .2 Fire patrol shall have access to a phone and call 911 if they see a fire.
 - .3 Report all other problems they encounter.
 - .4 Remain on patrol until system is back on.
- .10 The Contractor shall inform all sub trades that the Board has a Red Tag Permit System and it shall be used for all Fire protection equipment impairment.
- .11 For ease of use, a Factory Mutual hanging wall kit has been place at all Board Fire protection equipment locations. Supplies of Red Tag Permits are provided there.

1.9. FIRE ALARM MODIFICATIONS AND MAINTENANCE

- .1 Very important changes to Ontario Building Code as they relate to the Standard for the Verification of Fire Alarm Systems CAN/ULC-S537-M have taken effect December 24, 1999. (Minister's Ruling 99-BC-01)
 - .1 Clause 5.1; "Addition of conventional field device(s), or modification(s), to existing input circuit(s) or output circuit(s) shall require re-verification of all devices served by those input circuit(s) or output circuit(s)." If one device is added to a zone, the entire zone or in the case of a single zone panel the entire system is to be verified.
 - .2 Clause 5.2 "Addition of input circuit(s) or output circuit(s) to an existing fire alarm system shall require verification of the new circuit(s) in accordance with this standard, and shall also require all previously existing circuit(s) to be tested as follows:
 - .3 TEST: One conventional field device on each circuit shall be operated to confirm activation of all output circuits in accordance with the systems design." Even though no other zones have been touched, one device per input zone is to be tested when the Fire Alarm system is modified.
 - .4 Clause 5.5 "Where a transponder is added to an existing system, the transponder shall be verified in accordance with subsections 3.2, Wiring; and subsection 3.3 Control Units; and with CAN/ULC-S536, Standard for the Inspection and Testing of Fire Alarm Systems as well as re-verification of existing field devices and verification of new conventional field devices." If a new addressable device is added to a system, the new device is to be tested; as well a test must be conducted on all addressable devices on the loop.
 - .5 Clause 5.6 "Where an existing fire alarm system control unit is replaced with a new control unit, it shall be verified in accordance with CAN/ULC-S536, Standard for the Inspection and Testing of Fire Alarm Systems. Replacement of any control panel will require the testing of all existing fire alarm devices.
- .2 The Contractor and sub-Contractors shall include in the bid price for the above ULC Standards requirements referenced in the Ontario Building Code.

1.10. INSTALLATION AND/OR REPAIR OF ROOFING

- .1 The Contractor will review with the Consultant and the Board's representative of the location of any asphalt kettles and the dates the kettles will be in use. The Contractor, in the course of performing roofing work, will ensure all personnel utilize the following precautions:
 - .1 Use only kettles equipped with thermometers or gauges in good working order.
 - .2 Locate kettles in a safe place outside of building.
 - .3 Maintain continuous supervision while kettles are in operation and provide metal covers for the kettles to smother any flames in case of fire.
 - .4 All roofing materials stored in locations no closer than 15 meters to any structures.

1.11. FIRE DEPARTMENT ACCESS

- .1 Designated fire routes must be maintained. Fire Department must be advised of any work that would impede fire apparatus response.

1.12. SMOKING PRECAUTIONS

- .1 Smoking is not permitted anywhere on Board properties. Workers who wish to smoke must leave the property, and not within sight of students. Any worker found to be in contravention of the Ontario Smoke Free Act will be subject to legislated fines.

1.13. FLAMMABLE LIQUIDS

- .1 The handling and storage on site of flammable liquids are to be governed by the current National Fire Code of Canada.
- .2 Flammable liquids such as gasoline, kerosene and naphtha may be kept for ready use in quantities not exceeding 10 imperial gallons provided they are stored in approved safety cans bearing the Underwriter's Laboratory of Canada or Factory Mutual seal of approval.
- .3 Transfer of flammable liquids is prohibited within buildings.
- .4 Transfer of flammable liquids must not be carried out in the vicinity of open flame or any type of heat producing devices.
- .5 Flammable liquids having a flash point below 100° F (37.7°C) such as naphtha or gasoline must not be used as solvents or cleaning agents.
- .6 Flammable waste liquids, for disposal, must be stored in approved containers located in a safe ventilated area. Quantities are to be kept to a minimum.

END OF SECTION

1.0 GENERAL

1.1. RELATED SECTIONS

- .1 Section 01 31 00 - Project Managing and Coordination.
- .2 Section 01 33 00 - Submittal Procedures.
- .3 Section 01 35 17 – Fire Safety Requirements
- .4 Section 01 41 00 – Regulatory Requirements
- .5 Section 01 53 00 – Temporary Construction Facilities
- .6 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.2. REFERENCES

- .1 Province of Ontario, including requirements for a "Prime Contractor" as defined by the Act.

1.3. SAFETY PLAN

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to commencing any site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Consultant may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.
- .3 Be governed by pertinent safety requirements of Federal or Provincial Governments and of municipal bodies having authority, particularly the Ontario Construction Safety Act, The Occupational Health and Safety Act for Ontario, and regulations of Ontario Ministry of Labour, and work in conjunction with proper safety associations operating under the authority of Ontario Workers' Compensation Act. Protect Owner, Owner's employees, the public and those employed on the Work from bodily injury and to protect adjacent public and private property and Owner's property from damage. Furnish and maintain protection, such as warning signs, tarpaulins, guard rails, barriers, guard lights, night lights, railings around shafts, pits and stairwells, etc. as required. Remove temporary protective measures when no longer required.

1.4. TEMPORARY WORK

- .1 Temporary work requiring engineering proficiency for the design, erection, operation maintenance and removal shall be designed and bear stamp of the registered professional Engineer or Architect. Detail drawings will be submitted to the Consultant for review prior to commencing any work.
- .2 Before a temporary structure is used, person responsible for design, or their representative, shall inspect structure and certify it has been constructed according to their design.

1.5. RESPONSIBILITY

- .1 The "Prime Contractor" according applicable local jurisdiction, is 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 Should any unforeseen or peculiar safety-related factor, hazard, or condition become evident during performance of Work, and follow procedures in place for Employee's Right to

Refuse Work in accordance with Acts and Regulations of Health and Safety Act having jurisdiction. Advise the Board and the Consultant verbally and in writing.

- .4 The Contractor shall make their own arrangements for emergency treatment of accidents. Any accidents shall be reported immediately to the Board contact.
- .5 The Contractor agrees to hold the Board harmless of any and all liability of every nature and description, which may be suffered through bodily injuries, involving deaths of any persons, by reasons of negligence of the Contractor, his agents, employees, or his sub-Contractors.

1.6. SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00.
- .2 Submit site-specific Health and Safety Plan: Within ten (10) 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
- .3 Submit one (1) copy of Contractor's authorized representative's work site health and safety inspection reports to Consultant and Owner.
- .4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Submit Material Safety Data Sheets (MSDS) to Consultant.
- .7 Consultant'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 Medical Surveillance: Where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Consultant.
- .9 On-site Contingency and Emergency Response Plan: Address standard operating procedures to be implemented during emergency situations.
- .10 File Notice of Project with the Ministry of Labour prior to commencement of Work.

1.7. SAFETY ACTIVITIES

- .1 Perform site specific safety hazard assessment related to project.
- .2 Schedule and administer Health and Safety meeting with Consultant prior to commencement of Work.
- .3 Perform Work in accordance with Section 01 41 00 - Regulatory Requirements and this section.

1.8. HEALTH AND SAFETY COORDINATOR

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Coordinator. Health and Safety Coordinator must:
 - .1 have previous experience as a Health & Safety coordinator,
 - .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, and

.5 be on site during execution of Work.

1.9. 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 Health and Safety Act having jurisdiction, and in consultation with Consultant.

1.10. CORRECTION OF NON-COMPLIANCE

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

1.11. PROJECT/SITE CONDITIONS

- .1 Work at site will involve contact with:
 - .1 Refer to Section 01 35 43 Hazardous Materials

1.12. HAZARDOUS WORK

- .1 Blasting or other use of explosives is not permitted at the place of work.

1.13. 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.

1.14. LOCKOUT PROCEDURES

- .1 All Work to be done on electrical systems or machinery, where the unexpected switching on of the system or machinery could result in personal injury to a student, staff, employee, or the Contractor's employee, must be done in accordance with the Contractor's standard lockout procedure.
- .2 The Contractor shall provide his/her own locks for the above procedure.
- .3 The lock shall include contact information for the person(s) locking out such device.

1.15. OVERHEAD LIFTING

- .1 Under no circumstances will a crane or lifting device be used over a occupied space.
- .2 When working adjacent to occupied spaces, ensure a clearance of one (empty) classroom, or a minimum of 10m between any occupied space and the furthest possible reach of the crane.

1.16. WARNING SIGNS AND NOTICES

- .1 Notices shall be posted advising of the hazard but will not be considered a substitute for providing approved protection, separation, and space from the hazard.

1.17. FIRE PROTECTION

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by the governing codes, regulations and bylaws.

- .2 Burning rubbish and construction waste materials is not permitted on site.
- .3 Maintain placed or installed Fire Protection to protect the portions of the Work during construction.

1.18. SCENT-FREE ENVIRONMENT

- .1 The Board requires that, where advised, a building may be deemed scent-free and as such, the wearing of scented products is prohibited.
- .2 Any methods or materials that are found to create negative responses in staff or students shall cease and be removed under advisement of the Consultant and or the Board, until alternate methods can be determined.

END OF SECTION

1.0 GENERAL

1.1. SECTION INCLUDES

- .1 References and standards.
- .2 Standards producing industry organizations and their addresses.

1.2. RELATED SECTIONS

- .1 Section 01 61 00 – Product Requirements.
- .2 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3. REFERENCES

- .1 For Products or quality specified by association, trade, or other references or consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- .2 Conform to reference standard by Ontario Building Code except where a specific date is established or required by code.
- .3 Obtain copies of standards where required by product specification sections.
- .4 Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Consultant shall be altered from the Contract Documents by mention or inference otherwise, in any reference document.

1.4. STANDARDS

- .1 The following associations and organizations are cited in specification sections. Acronym, name, address, and Internet URL addresses are as follows:
- .2 **Canadian Organizations:**
 - .1 **ACEC** - Association of Consulting Engineers of Canada, 130 Albert Street, Suite 616, Ottawa, ON K1P 5G4; URL: <http://www.acec.ca>.
 - .2 **AWMAC** - Architectural Woodwork Manufacturers Association of Canada, 516-4 Street West, High River, AB T1V 1B6; URL: <http://www.awmac.com>.
 - .3 **Canada Green Building Council**, 330 - 55 rue Murray Street, Ottawa, ON. K1N5M3; Tel: 613-241-1184, Fax: 613-241-5750; URL: <http://www.cagbc.org>.
 - .4 **CCA** - Canadian Construction Association, 75 Albert St., Suite 400, Ottawa, ON K1P 5E7; URL: <http://www.cca-acc.com>.
 - .5 **CCDC** – Canadian Construction Documents Committee, Refer to ACEC, CCA, CSC or RAIC; URL: <http://www.CCDC.org>.
 - .6 **CGA** - Canadian Gas Association, 20 Eglinton Avenue West, Suite 1305, Toronto, ON M4R 1K8; URL: <http://www.cga.ca..>
 - .7 **CGSB** - Canadian General Standards Board, Place du Portage, Phase III, 6B1, 11 Laurier Street, Hull, QC K1A 0S5; URL: <http://w3.pwgsc.gc.ca/cgsb>.
 - .8 **CISC** - Canadian Institute of Steel Construction, 201 Consumers Road, Suite 300, Willowdale, ON M2J 4G8; URL: <http://www.cisc-icca.ca>.
 - .9 **CLA** - Canadian Lumbermen's Association, 27 Goulburn Avenue, Ottawa, ON K1N 8C7; URL: <http://www.cla-ca.ca>.
 - .10 **CNLA** - Canadian Nursery Landscape Association, RR #4, Stn. Main, 7856 Fifth Street, Milton, ON L9T 2X8; URL: <http://www.canadanursery.com>.
 - .11 **CRCA** - Canadian Roofing Contractors Association, 155 Queen Street, Suite 1300, Ottawa, ON K1P 6L1; URL: <http://www.roofingcanada.com>.
 - .12 **CSA** - Canadian Standards Association International, 178 Rexdale Blvd., Toronto, ON M9W 1R3; URL: <http://www.csa-international.org>.

- .13 **CSC** - Construction Specifications Canada, 120 Carlton Street, Suite 312, Toronto, ON M5A 4K2; URL: <http://www.csc-dcc.ca>.
- .14 **CSDMA** - Canadian Steel Door Manufacturers Association, One Yonge Street, Suite 1801, Toronto, ON M5E 1W7; URL: <http://www.csdma.org>.
- .15 **CSPI** - Corrugated Steel Pipe Institute, 652 Bishop Street N, Unit 2A, Cambridge, ON N3H 4V6; URL: <http://www.cspi.ca>.
- .16 **CSSBI** - Canadian Sheet Steel Building Institute, 652 Bishop St. N., Unit 2A, Cambridge, ON N3H 4V6; URL: <http://www.cssbi.ca>.
- .17 **CUFCA** - Canadian Urethane Foam Contractor's Association, Box 3214, Winnipeg, MB R3C 4E7; URL: <http://www.cufca.ca>.
- .18 **CWC** - Canadian Wood Council, 1400 Blair Place, Suite 210, Ottawa, ON. K1J 9B8; URL: <http://www.cwc.ca>.
- .19 **EC** - Environment Canada, Conservation and Protection, Inquiry Centre, 351 St. Joseph Blvd, Hull, QC K1A 0H3; URL: <http://www.ec.gc.ca>.
- .20 **EFC** - Electro Federation of Canada, 5800 Explorer Drive, Suite 200, Mississauga, ON L4W 5K9; URL: <http://www.electrofed.com>.
- .21 **MPI** - The Master Painters Institute, 4090 Graveley Street, Burnaby, BC V5C 3T6; URL: <http://www.paintinfo.com>.
- .22 **NABA** - National Air Barrier Association, PO Box 2747, Winnipeg, MB R3C 4E7; URL: <http://www.naba.ca>.
- .23 **NLGA** - National Lumber Grades Authority, 406-First Capital Place, 960 Quayside Drive, New Westminster, BC V3M 6G2; URL: <http://www.nlga.org>.
- .24 **NRC** - National Research Council, Building M-58, 1200 Montreal Road, Ottawa, ON K1A 0R6; URL: <http://www.nrc.gc.ca>.
- .25 **QPL** - Qualification Program List, c/o Canadian General Standards Board, Place du Portage, Phase III, 6B1, 11 Laurier Street, Hull, QC K1A 1G6; URL: <http://www.pwgsc.gc.ca/cgsb>.
- .26 **RAIC** - Royal Architectural Institute of Canada, 55 Murray Street, Suite 330, Ottawa, ON K1N 5M3; URL: <http://www.raic.org>.
- .27 **SCC** - Standards Council of Canada, 270 Albert Street, Suite 2000, Ottawa, ON K1P 6N7; URL: <http://www.scc.ca>.
- .28 **TTMAC** - Terrazzo, Tile and Marble Association of Canada, 30 Capston Gate, Unit 5 Concord, ON L4K 3E8; URL: <http://www.ttmac.com>.
- .29 **ULC** - Underwriters' Laboratories of Canada, 7 Crouse Road, Toronto, ON M1R 3A9; URL: <http://www.ulc.ca>.
- .3 **USA Organizations:**
 - .1 **AA** - Aluminum Association, 900 19th Street N.W., Washington, DC 20006; URL: <http://www.aluminum.org>.
 - .2 **AASHTO** - American Association of State Highway and Transportation Officials, 444 N Capitol Street N.W., Suite 249, Washington, DC 20001; URL: <http://www.aashto.org>.
 - .3 **AHA** - American Hardboard Association, 1210W Northwest Hwy, Palatine, IL 60067; URL: <http://www.hardboard.org>.
 - .4 **AITC** - American Institute of Timber Construction, 7012 S. Revere Parkway, Suite 140, Englewood, CO 80112; URL: <http://www.aitc-glulam.org>.
 - .5 **AMCA** - Air Movement and Control Association Inc., 30 West University Drive, Arlington Heights, IL 60004-1893; URL: <http://www.amca.org>.

- .6 **ANSI** - American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, NY 10036; URL: <http://www.ansi.org>.
- .7 **APA** - The Engineered Wood Association, P.O. Box 11700, Tacoma, WA 98411-0700; URL: <http://www.apawood.org>.
- .8 **API** - American Petroleum Institute, 1220 L St. Northwest, Washington, DC 20005-4070; URL: <http://www.api.org>.
- .9 **ARI** - Air Conditioning and Refrigeration Institute, 4100 N Fairfax Drive, Suite 200, Arlington, VA 22203; URL: <http://www.ari.org>.
- .10 **ASHRAE** - American Society of Heating, Refrigeration and Air-Conditioning Engineers, 1791 Tullie Circle NE, Atlanta, GA 30329; URL: <http://www.ashrae.org>.
- .11 **ASME** - American Society of Mechanical Engineers, ASME Headquarters, 3 Park Avenue, New York, NY 10016-5990; URL: <http://www.asme.org>.
- .12 **ASTM International**, 100 Barr Harbor Drive West, Conshohocken, PA 19428-2959; URL: <http://www.astm.org>.
- .13 **AWCI** - Association of the Wall and Ceiling Industries International, 803 West Broad Street, Suite 600, Falls Church, VA 22046; URL: <http://www.awci.org>.
- .14 **AWPA** - American Wire Producer's Association, 801 N Fairfax Street, Suite 211, Alexandria, VA 22314-1757; URL: <http://www.awpa.org>.
- .15 **AWPA** - American Wood Preservers' Association, P.O. Box 5690, Granbury TX 76049-0690; URL: <http://www.awpa.com>
- .16 **AWS** - American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126; URL: <http://www.amweld.org>.
- .17 **AWWA** - American Water Works Association, 6666 W. Quincy Avenue, Denver, CO 80235; URL: <http://www.awwa.org>.
- .18 **EIMA** - EIFS Industry Manufacturer's Association, 3000 Corporate Center Drive, Suite 270, Morrow, GA 30260; URL: <http://www.eima.com>.
- .19 **ISAP** - International Society for Asphalt Paving, 400 Selby Avenue, Suite 1, St. Paul, MN 55102; URL: <http://www.asphalt.org>.
- .20 **IEEE** - Institute of Electrical and Electronics Engineers, IEE Corporate Office, 3 Park Avenue, 17th Floor, New York, NY 10016-5997; URL: <http://www.ieee.org>
- .21 **MSS** - Manufacturers Standardization Society of the Valve and Fittings Industry, 127 Park Street, N.E., Vienna, VA 22180-4602; URL: <http://www.mss-hq.com>.
- .22 **NAAMM** - National Association of Architectural Metal Manufacturers, 8 South Michigan Avenue, Suite 1000, Chicago, IL 60603; URL: <http://www.naamm.org>.
- .23 **NEMA** - National Electrical Manufacturers Association, 1300 N 17th Street, Suite 1847, Rosslyn, VA 22209; URL: <http://www.nema.org>.
- .24 **NFPA** - National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101 Quincy, MA 02269-9101; URL: <http://www.nfpa.org>.
- .25 **NFSA** - National Fire Sprinkler Association, P.O. Box 1000, Patterson, NY 12563; URL: <http://www.nfsa.org>.
- .26 **NHLA** - National Hardwood Lumber Association, 6830 Raleigh-La Grange Road, Memphis, TN 38184-0518; URL: <http://www.natlhardwood.org>.
- .27 **NSPE** - National Society of Professional Engineers, 1420 King Street, Alexandria, VA 22314-2794; URL: <http://www.nspe.org>.
- .28 **PCI** - Prestressed Concrete Institute, 209 W. Jackson Blvd., Suite 500, Chicago, IL 60606-6938; URL: <http://www.pci.org>.

- .29 **PEI** - Porcelain Enamel Institute, PO Box 920220, Norcross, GA 30010; URL: <http://www.porecelainenamel.com>.
- .30 **SSPC** - The Society for Protective Coatings, 40 24th Street, 6th Floor, Pittsburgh, PA 15222-4656; URL: <http://www.sspc.org>.
- .31 **TPI** - Truss Plate Institute, 583 D'Onofrio Drive, Suite 200, Madison, WI 53719; URL: <http://www.tpinst.org>.
- .32 **UL** - Underwriters' Laboratories, 333 Pfingsten Road, Northbrook, IL60062-2096; URL: <http://www.ul.com>.

END OF SECTION

1.0 GENERAL

1.1. RELATED SECTIONS

- .1 Section 01 21 00 - Allowances.
- .2 Section 01 78 10 – Closeout Submittals and Requirements
- .3 Section 01 79 00 – Demonstration and Training
- .4 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.2. REFERENCES

- .1 **ISO/IEC 17025-2005** - General Requirements for the Competence of Testing and Calibration Laboratories.
- .2 **SCC** (Standards Council of Canada).

1.3. INSPECTION BY AUTHORITY

- .1 Allow Authorities Having Jurisdiction 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 whenever portions of the Work are designated for special tests, inspections or approvals, either when described in the Contract Documents or when required by law in the Place of the 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.

1.4. REVIEW BY CONSULTANT

- .1 Consultant may order any part of the Work to be reviewed or inspected if Work is suspected to be not in accordance with Contract Documents.
- .2 If, upon review such work is found not in accordance with Contract Documents, correct such Work and pay cost of additional review and correction.
- .3 If such Work is found in accordance with Contract Documents, The owner will pay cost of review and replacement.

1.5. INDEPENDENT INSPECTION AGENCIES

- .1 Independent Inspection and Testing Agencies will be engaged by Contractor for purpose of inspecting and testing portions of Work.
- .2 The Board may, at their discretion, request that the Consultant direct the Contractor to engage independent inspecting and or testing agencies to review or test the Work.
- .3 Allocate Costs for inspections and testing to Section 01 21 00.
- .4 Provide equipment required for executing inspection and testing by appointed agencies.
- .5 Employment of inspection and testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .6 If defects are revealed during inspection and/or testing, the appointed agency will request additional inspection and testing to ascertain full degree of defect. Correct defect and irregularities as advised by Consultant at no cost to Owner. Contractor shall pay costs directly to the inspection agency for retesting and re-inspection.

1.6. ACCESS TO WORK

- .1 Allow inspection and testing agencies access to Work, off site manufacturing and fabrication plants.
- .2 Cooperate to provide reasonable access and facilities for such access.

1.7. CONTRACTOR RESPONSIBILITIES

- .1 Notify appropriate agency minimum 48 hours in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and 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.

1.8. DUTIES & AUTHORITY OF TESTING AGENCY

- .1 Testing agency is expected to do the following:
 - .1 Act in a professional and unprejudiced basis and carry out inspection and testing functions to establish compliance with requirements of Contract Documents.
 - .2 Check work as it progresses and prepare reports stating results of tests and conditions of work and state in each report whether specimens tested conform to requirements of Contract Documents, specifically noting deviations.
 - .3 Distribute reports as follows
 - .1 Consultant
 - .2 Owner
 - .3 Contractor
- .2 Testing agency is not authorized to amend or release any requirements of Contract Documents, nor to approve or accept any portion of work.

1.9. REJECTED WORK

- .1 The Contractor shall 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 Consultant 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, it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, the Owner may choose to accept the condition. The difference in value between Work performed and that called for by Contract Documents shall be deducted from the Contract value via Change Order. The amount of this change shall be determined by Consultant. The Contractor shall warrant the work performed for the time period specified as if it were performed in accordance with the Contract Documents.

1.10. TESTING OF EXCAVATION & BACK FILL

- .1 Not Applicable

1.11. CONCRETE STRENGTH TESTS

- .1 Not Applicable

1.12. INSPECTION OF STRUCTURAL STEEL

- .1 Ensure all steel has mill test reports that comply with the Specification prior to purchase.
- .2 Inspect fabrication of steel in plant.
- .3 Inspect erection work at site including fit-up, placing, plumbing, levelling, temporary bracing, field cutting and alterations.
- .4 Shop and field inspect welded and bolted connections and painting.
- .5 High strength bolts - the installation and testing of bolts shall conform to the requirements of CSA S16-1969. Check one representative connection in ten by torque testing every bolt, and check each bolt in every connection with a tap of hammer for soundness. Enforce requirements of connection type.
- .6 Examine visually all welded joints for inclusions, porosity, lack of fusion penetration or even contour, undercuts and cracks. Root passes shall be checked for penetration and cracks from the back of the joint. Any suspect welds shall be checked ultrasonically.

1.13. INSPECTION OF METAL DECK

- .1 Not Applicable

1.14. INSPECTION AND TESTING OF PAVING

- .1 Not Applicable

1.15. BUILDING THERMOGRAPHIC SCAN

- .1 Upon completion of the Work, the Consultant and/or Owner may arrange for an independent agency to carry out a thermographic scan of the building to determine acceptability of thermal performance of the building envelope.
- .2 Contractor shall carry out remedial work as required to bring quality of any rejected portion of the building envelope to that of the sample area. Contractor shall pay for costs of any follow-up thermographic scans required to determine acceptability of remedial work. This procedure shall be repeated until all parts of the building envelope have been accepted.

1.16. 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 Consultant and may be authorized as recoverable.

1.17. MOCK-UP

- .1 Prepare mock-up for Work specifically requested in specifications. Include for Work of all Sections required to provide mock-ups.
- .2 Prepare mock-ups for Consultants review with reasonable promptness and in an orderly sequence, so as not to cause any delay in Work.
- .3 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.
- .4 If requested, Consultant will assist in preparing a schedule fixing dates for preparation.

- .5 Remove mock-up at conclusion of Work or when acceptable to Consultant. Repair any damage and clean-up at place of mock-up.
- .6 Approved mock-up may remain as part of Work.

1.18. EQUIPMENT AND SYSTEMS

- .1 Submit adjustment and balancing reports for mechanical and electrical systems to the consultant.
- .2 Refer to Sections 01.78.10 and 01.79.00 for definitive requirements.

END OF SECTION

1.0 GENERAL

1.1. RELATED SECTIONS

- .1 Section 01 52 00 - Construction Facilities.
- .2 Section 01 53 00 - Temporary Construction.
- .3 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.2. INSTALLATION AND REMOVAL

- .1 Provide temporary utilities controls in order to execute work expeditiously.
- .2 Location of temporary facilities shall be subject to Consultant's approval.
- .3 Salvage and assist in recycling products for potential reuse wherever possible.
- .4 Remove temporary facilities from site when directed by consultant.

1.3. DEWATERING

- .1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water. Provide necessary pumps (including spare pumps) and temporary drainage for keeping the Work free of water throughout construction period. Locate sumps away from foundation elements. Control grading around excavation to prevent surface water from draining into excavation and from damaging adjoining property.
- .2 Provide dry mix low slump concrete mud slabs as required to provide suitable barrier for installation of concrete footings and to maintain construction schedule. Consult with Geotechnical Engineer prior to installation.

1.4. WATER SUPPLY

- .1 Provide continuous supply of potable water for construction use until such time as permanent municipal water supply is available.
- .2 Hose extensions to be provided by subcontractors requiring them.
- .3 Arrange for connection with appropriate utility company and pay all costs for installation, maintenance, removal and usage costs until occupancy has been achieved.

1.5. TEMPORARY HEATING AND VENTILATION

- .1 Provide temporary heating, including all unit rental costs and maintenance required during construction period including for winter protection.
- .2 Provide temporary heating fuel until such time as a permanent natural gas line is installed. The Contractor shall provide all connections and piping between the permanent fuel source and the heating appliance(s).
- .3 Provide temporary heat and ventilation in enclosed areas as required to:
 - .1 Facilitate progress of Work.
 - .2 Protect Work and products against dampness and cold including winter protection.
 - .3 Prevent moisture condensation on surfaces.
 - .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
 - .5 Provide adequate ventilation to meet health regulations for safe working environment.
- .4 Maintain temperatures of minimum:
 - .1 10 degrees C in areas where construction is in progress, until takeover by Board. Contractor to ensure temporary enclosures remain sealed and penetrations are repaired or closed in a timely fashion.

- .2 16 degrees C in areas where finishes are in progress.
- .3 16 degrees C in building once it is enclosed.
- .4 Refer to other Sections for intermittent heating requirements up to 21 degrees C. Provide insulated tarp enclosures for openings as required to enclose the building after completion of main building shell components and roof.
- .5 If the Contractor fails to ensure the temporary enclosures remained sealed (including temp doors when not in use) the Consultant and or the Board shall require the contractor to pay 40% of that months usage charge
- .5 Use forced hot air heaters. Open-flame type heaters or salamanders are not permitted. Ventilate direct fired heating units to the outside.
- .6 Uniformly distribute heat to avoid hot and cold areas and to prevent excessive drying.
- .7 Early heating of the building shell will be required to expedite interior finishing to meet the project schedule.
- .8 Ventilating:
 - .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
 - .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.
 - .7 Provide minimum 1 air change per hour for enclosed areas receiving architectural finishes.
 - .8 Do not allow excessive build-up of moisture inside building.
- .9 The permanent mechanical systems for the new building, when installed in safe operating conditions, may be used for temporary heating or cooling if approved in writing by the Consultant, without penalty to the warranty.
- .10 Follow the requirements of "Temporary Use of New Permanent Services and Equipment" if the permanent heating system installed under the contract is intended to be used for temporary heating during the construction.
- .11 Provide competent persons to operate and maintain permanent systems for duration of temporary use period.
- .12 Perform required repairs and maintenance immediately after each inspection. Pay for operating costs. Upon termination of temporary use period, services and equipment shall be inspected, tested, adjusted, fitters replaced, balanced, cleaned and lubricated.
- .13 Permanent services and equipment shall be turned over to Owner in new and perfect operating condition.
- .14 Use of permanent systems and equipment as temporary facilities shall not affect the guarantee conditions and guarantee period for such systems and equipment. Make due allowance to ensure Owner will receive full benefits of equipment manufacturer's warranty from the date of Substantial Performance.
- .15 Ensure date of Substantial Performance of the Work and Warranties for heating system do not commence until entire system is in as near original condition as possible and is certified by Consultant.

- .16 Maintain strict supervision of operation of temporary heating and 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.
- .17 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.6. TEMPORARY POWER AND LIGHT

- .1 Provide temporary electrical service and system including lighting and power system for use by all Sections.
- .2 Contractor will provide a source for, and pay the costs of temporary power during construction for temporary lighting and operating of power tools until such time as permanent source is available.
- .3 Contractor to ensure that the use of power from a source provided by the Board shall not exceed the capacity of the current use required for the operation of any existing facility.
- .4 Install and maintain temporary electrical service and systems in accordance with Construction Safety Association's "Temporary Wiring Standards on Construction Sites", the Ontario Electrical Code and other authorities having jurisdiction.
- .5 Provide at least one temporary panel on each floor with service capacity suitable for construction requirements and to authorities and utilities approval.
- .6 Provide temporary wiring with lighting to all areas of each floor to provide adequate lighting.
 - .1 Lighting levels must be maintained at a minimum of 10 foot candles, or to suit the particular location or operation, whichever is greater.
 - .2 Do not use materials of the temporary service in permanent installation.
 - .3 Increase lighting levels equivalent to the final requirements when finishing operations are underway.
- .7 Extension cords, lights, etc., required by various subcontractors and run from above outlet positions will be supplied and maintained by the party or parties requiring same.
- .8 Follow requirements of "Temporary Use of New Permanent Services and Equipment" if electrical power and lighting systems installed under the contract are intended to be used for temporary electricity and lighting during the construction.
- .9 Electrical power and lighting systems installed under this contract can be used for construction provided damages are made good and all lamps that have been used for more than two months are replaced with new lamps.
- .10 For New Builds arrange for connection with appropriate utility company and pay all costs for installation, maintenance, removal and usage costs until occupancy has been achieved.
- .11 For Additions and renovations the contractor can use existing Board service unless noted otherwise.
- .12 Provide and pay for temporary power for electric cranes and other equipment requiring temporary power in excess of above noted requirements.
- .13 Provide and pay for temporary power for electric cranes and other equipment requiring temporary power in excess of above noted requirements.
- .14 Where Contractor elects to use diesel or gas fueled generators to provide temporary power, Contractor will be responsible for all costs incurred including but not limited to temporary

pad, fuel, unit rental costs, and provision of robust soundproof enclosures or barriers to minimize noise transfer to immediate neighbors.

1.7. TEMPORARY COMMUNICATION FACILITIES

- .1 Contractor to provide and pay for temporary Phone, e-mail and printer hook up, for the duration of contract until completion for use by the contractor.
- .2 The site superintendent is to have e-mail access and a printer on site.

END OF SECTION

1.0 GENERAL

1.1. RELATED SECTIONS

- .1 Section 01 51 00 - Temporary Utilities.
- .2 Section 01 35 23 – Health and Safety
- .3 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.2. INSTALLATION AND REMOVAL

- .1 Provide temporary construction facilities in order to execute work expeditiously.
- .2 Remove temporary facilities from site when directed by Consultant.

1.3. 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.

1.4. PROTECTION OF SURROUNDING WORK

- .1 Provide protection for finished and partially finished Work from damage.
- .2 Provide necessary cover and protection.
- .3 Be responsible for damage incurred due to lack of or improper or inappropriate protection.

1.5. ROOF AND STRUCTURE PROTECTION

- .1 Ensure no part of Work or existing structures are subjected to a load, which will endanger its safety or will cause permanent deformation.
- .2 The Contractor when indicated by the Board Contact or Consultant shall provide roof protection. Ensure all precautions are taken to avoid liability for roof damage.
- .3 Typical roof protection shall consist of a layer of 1inch rigid foam insulation set directly on the roof surface and a layer of 19 mm (3/4 inch) plywood in all places under scaffold legs, ladder legs and in areas of foot traffic or falling debris.

1.6. WORK SITE ENCLOSURE & SAFETY BARRIERS

- .1 Erect and maintain for the duration of the work:
 - .1 a minimum 1800 mm high chain link fence or self-supporting, heavy duty, interconnected fence panels (commonly referred to as Insta-fence) for a temporary site enclosure (hoarding) completely around perimeter of work site,
 - .2 any temporary posts shall be completely removed by the contractor prior to occupancy,
 - .3 under no circumstance shall t-bar posts be used on board property
 - .4 any additional safety devices including full hoarding as required and noted on the drawings, to protect the students, staff, public and private property from injury and damage,
 - .5 any additional requirements as regulated by authorities having jurisdiction, local by-laws and zoning.
- .2 The Contractor is to assume full responsibility for any injury or damage caused due to failure to comply with Paragraph 1 above.
- .3 Any hazardous conditions identified outside of the main fenced area will be barricaded with a fence complying to the above.

- .4 Provide lockable truck entrance gate/gates and at least one (1) pedestrian door as directed and conforming to applicable traffic restrictions on adjacent streets. Equip gates with locks and keys with restricted availability, in the project office.
- .5 Erect and maintain pedestrian walkways including roof and side covers, complete with signs and electrical lighting as required by law.
- .6 Provide barriers around trees and plants designated to remain.
- .7 Protect from damage by equipment and construction procedures.

1.7. TREE PROTECTION

- .1 Protect all existing trees to remain from damage during construction period. Make good, at Contractor's expense, trees damaged during construction.
- .2 Confine movement of heavy equipment, storage of same, and storage of materials to a predetermined area. Do not store materials or place equipment over root systems of any existing trees to remain.
- .3 Install fencing or approved equal at limits of drip line of existing trees to remain unless directed otherwise. Where this case is not practical, and only if approved by the Consultant, the trunks shall be protected with an approved tree guard.
- .4 No rigging cables shall be wrapped around or installed in trees. Do not flush concrete trucks or cement mixing machines over root systems or near trees. Flush concrete trucks or cement mixing machines in areas approved by Consultant.
- .5 Areas where root systems of trees are exposed directly adjacent to a structure will be backfilled with good loam only.
- .6 Whenever excavating is required within branch spread of trees that are to remain, the contractor shall contact the consultant for direction prior to the start of work.
- .7 If any existing tree to remain is injured and does not survive the following year, it will, as determined by the Board, be removed in its entirety and be replaced with a tree of similar size and value, as directed by the Consultant.
- .8 Should the destroyed tree be of such a size or shape that it cannot be feasibly replaced, the Contractor shall compensate the Owner for the minimum sum of five thousand dollars (\$5,000.00) per destroyed tree.

1.8. GUARD RAILS AND BARRIERS

- .1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs.
- .2 Erect and maintain for the duration of the Work, safety devices and barricades including hoarding, as required, to protect the staff, students, public and private property, from injury and damage.
- .3 The Contractor is to ensure that all requirements from authorities having jurisdiction and all requirements from the Owner are met.
- .4 The Contractor is to assume full responsibility for any damage caused due to his failure to comply with paragraph 2 above.
- .5 Hazardous conditions on the exterior shall be fenced.

1.9. WEATHER ENCLOSURES

- .1 Provide weather tight closures to unfinished door and window openings, tops of shafts and other openings in floors and roofs.

- .2 Close off floor areas where walls are not finished; seal off other openings; enclose building interior work for temporary heat.
- .3 Provide heated enclosures required for winter protection of all work already completed or underway.
- .4 Design enclosures to withstand wind pressure.

1.10. DUST TIGHT BARRIERS

- .1 Provide dust tight barriers and screens or 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.
- .3 Where required adjust air handling units to eliminate migration of dust.

1.11. SCAFFOLDING

- .1 Erect scaffolding independent of walls and use in such a manner limiting interference with other work. When not in use, move scaffolding as necessary to permit installation of other work. Construct and maintain scaffolding in a rigid, secure and safe manner. Remove it promptly when no longer required. Protect surface on which scaffolding is bearing.

1.12. SHORING, BRACING, PILING

- .1 Provide shoring, bracing, piling, sheeting and sheet piling and underpinning required to support soil banks, existing work and property in accordance with Construction Safety Act and other applicable regulations. Maintain shoring until building is strong enough and sufficiently braced to withstand pressure of backfilling. Make construction aids free of permanent work so they may be removed entirely when no longer required, without damaging the Work. Locate construction aids so adequate room is left for damp-proofing foundation walls, laying substructure drainage and other work.
- .2 Shoring and false work over one tier in height shall be designed and shall bear the stamp of a registered professional engineer, having experience in this field.

1.13. HOISTING

- .1 Provide, operate and maintain services required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for use thereof.
- .2 Machinery shall be operated by qualified operator.

1.14. OVERHEAD LIFTING

- .1 Any condition requiring the use of a crane or lifting device over a Board structure must follow the requirements of Health and Safety Section 01 35 23, Paragraph 1.15 Overhead Lifting.

1.15. ELEVATORS/LIFTS - Reserved

1.16. USE OF THE WORK

- .1 Confine work and operations of employees 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.

1.17. CONSTRUCTION PARKING

- .1 Construction personnel vehicle parking, to be confined to the work site enclosure, or.
- .2 Permission to park vehicles on site does not imply any liability or responsibility for safe keeping of vehicles and contents thereof by the School Board.

1.18. ACCESS TO SITE

- .1 Provide and maintain adequate access to project site.
- .2 Build and maintain temporary roads where necessary and provide snow removal within the area of work, and access to the work, during period of Work. The area shall be restored to the satisfaction of the Board at the completion of the project.
- .3 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractors' use of roads.
- .4 Clean roadways and taxi areas where used by Contractor's equipment.

1.19. SECURITY

- .1 The Contractor shall ensure the security of the work site, contents, and built structures for the duration of the project.
- .2 The Contractor shall be responsible to provide and pay for security personnel to guard site and contents of site after working hours and during holidays as required.
- .3 Notify the Board of the use of security guards or systems.
- .4 The Board shall not be responsible for the loss, theft, or vandalism.

1.20. OFFICES

- .1 Provide and maintain, until completion of Contract, for Contractor's use, a temporary office, large enough to accommodate site administrative activities and site meetings, complete with light, heat, air conditioning, ventilation, table and chairs. Do not store materials in office area; keep clean and tidy.
- .2 Provide a clearly marked and fully stocked first-aid case in a readily available location.
- .3 Subcontractors may provide their own offices as necessary. Direct location of these offices.

1.21. EQUIPMENT, TOOL AND MATERIALS STORAGE

- .1 Provide and maintain, in a clean and orderly condition, lockable weatherproof sheds and platforms for storage of tools, equipment and materials.
- .2 Review storage areas on site with the Consultant. Store materials and equipment to ensure preservation of quality of product and fitness for the Work. Store materials and equipment on wooden platforms or other hard, clean surfaces, raised above the ground or in water tight storage sheds of sufficient size for storage of materials and equipment which might be damaged by storage in open. Locate stored materials and equipment to facilitate prompt inspection.
- .3 Store packaged materials and equipment undamaged, in their original wrappings or containers, with manufacture's labels and seals intact.
- .4 Locate materials not required to be stored in weatherproof sheds on site in a manner to cause least interference with work activities.
- .5 Storage sheds required by subcontractors shall be provided by them.

1.22. SANITARY FACILITIES

- .1 Provide weatherproof temporary toilet/sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Service temporary toilet/sanitary facilities as required by authorities but not less than weekly.
- .3 Post notices and take such precautions as required by local health authorities.
- .4 Except where connected to municipal sewer system, periodically remove wastes from Site.
- .5 Keep toilet/sanitary facilities clean and sanitary and protect from freezing.
- .6 Keep sanitary facilities clean and fully stocked with the necessary supplies at all times.

END OF SECTION

1.0 GENERAL

1.1. RELATED SECTIONS

- .1 This section describes requirements applicable to all Sections within Divisions 02 to 49.
- .2 Section 01 31 00 – Project Managing and Coordination

1.2. TERMINOLOGY

- .1 New: Produced from new materials.
- .2 Renewed: Produced or rejuvenated from an existing material to like-new condition to serve a new or existing service.
- .3 Defective: A condition determined exclusively by the Consultant.

1.3. PRODUCT QUALITY

- .1 The term 'new' in the following paragraph does not exclude re-manufactured products that have some or all of the materials recycled from other sources. Preference in recycling is for post-consumer recycled materials.
- .2 Products, materials, equipment, parts or assemblies (referred to as Products) incorporated in Work:
- .3 New Product, not damaged or defective, of best quality (compatible with specification requirements) for purpose intended. If requested, provide evidence as to type, source and quality of Products provided.
- .4 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.
- .5 Should any dispute arise as to quality or fitness of Products, decision rests strictly with Consultant.
- .6 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.

1.4. AVAILABILITY

- .1 Immediately upon receipt of Boards Purchase Order, review Product delivery requirements and anticipate foreseeable supply delays for any items.
- .2 Immediately upon receipt of Boards Purchase Order the Contractor shall issue Purchase Orders and or Contracts to all Sub-trades. Provide proof to the Consultant and the Board within 3 days. The Sub-Contractors shall identify in writing any delivery issues within 14 days of receiving the Contractors purchase order or contract. The Schedule noted in 01-31 00 1.7.1 shall incorporate all deliveries and installation.
- .3 If delays in supply of Products are foreseeable, notify Consultant of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
- .4 In event of failure to notify Consultant at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Consultant reserves right to substitute more readily available Products of similar character, at no increase in Contract Price or Contract Time.

1.5. STORAGE AND PROTECTION

- .1 Store and protect Products in accordance with manufacturers' written instructions.
- .2 Store with seals and labels intact and legible.
- .3 Store sensitive Products in weather tight, climate controlled, enclosures in an environment favourable to Product.
- .4 For exterior storage of fabricated Products, place on sloped supports above ground.
- .5 Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of Products.
- .6 Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- .7 Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.
- .8 Arrange storage of Products to permit access for inspection. Periodically inspect to verify Products are undamaged and are maintained in acceptable condition.

1.6. TRANSPORTATION AND HANDLING

- .1 Transport and handle Products in accordance with manufacturer's written instructions.
- .2 Promptly inspect shipments to ensure that Products comply with requirements, quantities are correct, and Products are undamaged.
- .3 Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.
- .4 Suitably pack, crate and protect products during transportation to site to preserve their quality and fitness for the purpose intended.
- .5 Store products in original, undamaged condition with manufacturer's labels and seals intact until they are being incorporated into completed work.
- .6 Protect materials from damage by extreme temperatures or exposure to the weather.

1.7. EXISTING UTILITIES

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to the owner.
- .2 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.

1.8. MANUFACTURER'S WRITTEN INSTRUCTIONS

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

1.9. QUALITY OF WORK

- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Consultant if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. Consultant and or Board reserves right to require dismissal from site any workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Consultant, whose decision is final.
- .4 Products, materials, systems and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the applicable manufacturer's printed directions.
- .5 Where specified requirements are in conflict with manufacturer's written directions, follow manufacturer's directions. Where specified requirements are more stringent than manufacturer's directions, comply with specified requirements.

1.10. COORDINATION

- .1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.
- .3 Contractor is responsible to ensure suppliers or distributors of materials specified or alternatives accepted, which he intends to use, have materials with original schedule, and similarly it shall be the responsibility of all subcontractors and suppliers to so inform the Contractor.
- .4 Contractor shall contact Consultant immediately upon receipt of information indicating materials or items, will not be available on time, in accordance with the latest approved schedule, and similarly it shall be the responsibility of all subcontractors and suppliers to so inform the Contractor.
- .5 The above, in no way releases the Contractor, or their subcontractors and suppliers of their responsibility for ensuring timely ordering of materials and items required, including the necessary expediting, to complete the Work as scheduled in accordance with the Contract Documents including temp accommodations and or materials to ensure occupancy date is achieved.

1.11. CONCEALMENT

- .1 In finished areas, conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
- .2 Before installation, inform Consultant if there is interference. Install as directed by Consultant at no additional cost to the Board.

1.12. 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.

1.13. LOCATION OF FIXTURES

- .1 Inform Consultant of conflicting installation. Install as directed.

1.14. FASTENINGS - EQUIPMENT

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use Type 304 or 316 stainless steel for exterior areas.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.15. PROTECTION OF WORK IN PROGRESS

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

END OF SECTION

1.0 GENERAL

1.1. RELATED SECTIONS

- .1 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.2. REFERENCES

- .1 Owner's identification of existing survey control points and property limits.

1.3. SUBMITTALS

- .1 Submit name and address of Surveyor to Consultant.
- .2 On request of Consultant, submit documentation to verify accuracy of field engineering work.
- .3 Submit certificate signed by surveyor certifying that elevations and locations of completed Work conforms with Contract Documents.

1.4. QUALIFICATIONS OF SURVEYOR

- .1 Qualified registered land surveyor, licensed to practise in the Place of the Work.

1.5. SURVEY REFERENCE POINTS

- .1 Existing base horizontal and vertical control points are designated on Drawings.
- .2 Locate, confirm and protect control points prior to starting site Work. Preserve permanent reference points during construction.
- .3 Make no changes or relocations without prior written notice to Consultant.
- .4 Report to Consultant when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
- .5 Require surveyor to replace control points in accordance with original survey control.

1.6. SURVEY REQUIREMENTS

- .1 Establish existing and new permanent bench marks on site, referenced to established bench marks by survey control points.
- .2 Record locations, with horizontal and vertical data in Project Record Documents.
- .3 Establish lines and levels, locate and lay out, by instrumentation.
- .4 Establish pipe invert elevations.
- .5 Stake batter boards
- .6 Establish foundation and floor elevations.
- .7 Establish lines and levels for mechanical and electrical work.

1.7. SUBSURFACE CONDITIONS

- .1 Promptly notify Consultant in writing if discovered surface or subsurface conditions at Place of Work differ materially from those indicated in Contract Documents.
- .2 Advise the Consultant of a reasonable assumption of probable conditions when determined.
- .3 After prompt investigation, should Consultant determine that conditions do differ materially, instructions will be issued for changes in Work.

1.8. EXAMINATION

- .1 The Contractor is expected to be totally familiar with site conditions and shall assume full responsibility for the cost involved in repairing any damage to the building, site and

services, city property, adjacent buildings, etc., during general construction, regardless of the extent of the damage.

- .2 Inspect existing conditions, including elements or adjacent Work subject to irregularities, damage, movement, including Work during cutting and patching.
- .3 The Contractor shall provide all equipment necessary to make a full and detailed site evaluation. This shall include but not be limited to ladders, flashlights and hand tools.
- .4 The Contractor expressly agrees that conditions above existing suspended acoustic ceilings, but below fixed structure, unless obscured by an additional ceiling above, shall be considered exposed conditions for the purposes of making findings under the provisions of the Contract. There shall be no claims for extra costs for extra Work in these areas.
- .5 After uncovering, inspect conditions affecting performance of the Work.
- .6 Beginning of cutting or patching means acceptance of existing conditions.

1.9. PREPARATION

- .1 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.
- .2 Provide protection from elements for areas which may be exposed by uncovering work; maintain excavations free of water.

1.10. EXISTING SERVICES

- .1 Before commencing work, establish location and extent of service lines in area of Work and notify Consultant of findings.
- .2 Remove abandoned service lines running through within existing and new structures. Cap or seal lines at cut-off points as directed by Consultant.

1.11. LOCATION OF EQUIPMENT AND FIXTURES

- .1 Inform Consultant of conflicting installations, install as directed.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3 Inform Consultant of impending installation and obtain approval for actual location.
- .4 Submit field drawings to indicate relative position of various services and equipment when required by Consultant.

1.12. SURVEY RECORD

- .1 Maintain a complete, accurate log of control and survey work as it progresses.
- .2 On completion of foundations and major site improvements, prepare a certified survey showing dimensions, locations, angles and elevations of Work.
- .3 Record locations of maintained, re-routed and abandoned service lines.

END OF SECTION

1.0 GENERAL

1.1. RELATED SECTIONS

- .1 Section 01 32 00 - Construction Progress Documentation: Submittals and scheduling.
- .2 Section 01 61 00 - Product Requirements.
- .3 Section 01 70 00 – Examination and Preparation
- .4 Individual Product Specification Sections:
 - .1 Cutting and patching incidental to work of the section.
 - .2 Advance notification to other sections of openings required in Work of those sections.

1.2. SUBMITTALS

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

1.3. TOLERANCES

- .1 Monitor fabrication and installation tolerance control of Products to produce acceptable Work.
- .2 Do not permit tolerances to accumulate beyond effective or practical limits.
- .3 Comply with manufacturers' tolerances. In case of conflict between manufacturers' tolerances and Contract Documents, request clarification from Consultant before proceeding.
- .4 Adjust Products to appropriate dimensions; position and confirm tolerance acceptability, before permanently securing Products in place.

2.0 PRODUCTS

2.1. MATERIALS

- .1 Primary Products: Those required for original installation.
- .2 Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 33 00.

3.0 EXECUTION

3.1. EXAMINATION

- .1 Examine existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.
- .2 After uncovering existing Work, assess conditions affecting performance of work.
- .3 Beginning of cutting or patching means acceptance of existing conditions.

3.2. PREPARATION

- .1 Provide temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.
- .2 Provide protection from elements for areas which may be exposed by uncovering work.
- .3 Maintain excavations free of water.

3.3. CUTTING

- .1 Execute cutting and fitting as needed to complete the Work. Prior to any cutting and or coring of concrete floors the contractor shall confirm the area is free of services or rebar. Notify the Consultant of any interferences.
- .2 Uncover work to install improperly sequenced work.
- .3 Remove and replace defective or non-conforming work.
- .4 Remove samples of installed work for testing for Hazardous materials.
- .5 Provide openings in the Work for penetration of mechanical and electrical work.
- .6 Employ experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- .7 Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
- .8 Do all cutting, patching and making good, to leave a finished condition and to make the several parts of the work come together properly. Coordinate work to keep cutting and patching to a minimum.
- .9 Make cuts with clean, true, smooth edges. Fit unit to tolerance established by test standard practice for applicable work. Make patches invisible in final assembly.
- .10 Cutting shall be done in a manner to keep patching to minimum. Obtain Consultant's approval of method to be used to conceal new mechanical and electrical services before beginning cutting. Chasing of concrete surfaces is not permitted.
- .11 Cutting or coring of any structural concrete is to be reviewed and approved by the Consultant.
- .12 Do not endanger any work by cutting, digging or otherwise altering, and do not cut nor alter any load bearing element without written authorization by Consultant. Provide bracing, shoring and temporary supports as required to keep construction safely supported at all times
- .13 Any cost caused by omission or ill-timed work shall be borne by party responsible therefore.
- .14 Regardless of which Section of work is responsible for any portion of cutting and patching, in each case tradesmen qualified in work being cut and patched shall be employed to ensure it is correctly done.

3.4. PATCHING

- .1 Execute patching to complement adjacent Work.
- .2 Fit Products together to integrate with other Work.
- .3 Execute work by methods to avoid damage to other Work, and which will provide appropriate surfaces to receive patching and finishing.
- .4 Employ original installer to perform patching for weather exposed and moisture resistant elements, and sight-exposed surfaces.
- .5 Restore work with new Products in accordance with requirements of Contract Documents.
- .6 Fit work with adequate support to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .7 At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with firestop material.
- .8 Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
- .9 Complete and tightly fit all construction to pipes, ducts and conduits which pass through construction to completely prevent the passage of air.
- .10 Patching and making good shall be done by trade specialists in material to be treated, and shall be made undetectable in finished work when viewed from distance of 1.5m under normal lighting.

END OF SECTION

1.0 GENERAL

1.1. RELATED SECTIONS

- .1 Common Work by All Trades
- .2 This section describes requirements applicable to all Sections within Divisions 02 to 49.
- .3 Conduct cleaning and disposal operations to comply with local ordinances and environmental protection legislation.
- .4 Store volatile wastes in covered metal containers, and remove from premises at end of each working day.
- .5 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

2.0 PRODUCTS

2.1. CLEANING PRODUCTS

- .1 Cleaning Agents and Materials: Low VOC content wherever possible. The Consultant and the Board shall be notified prior to use of any exception.

3.0 EXECUTION

3.1. CLEANING DURING CONSTRUCTION

- .1 Maintain the Work in tidy condition, free from accumulation of waste products and debris, other than that caused by the Owner or other Contractors.
- .2 Remove waste material and debris from the work areas and deposit in waste container at the end of each working day.
- .3 Vacuum clean interior areas prior to start of finishing work. Maintain areas free of dust and other contaminants during finishing operations.
- .4 Individual Subcontractors are responsible for the daily clean-up and removal of debris related to, or generated by, their own work. The overall responsibility for project cleanliness rests with the Contractor.
- .5 The Contractor shall be responsible for snow removal within the construction area.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 Wherever possible recycle materials
- .8 Containers:
 - .1 Provide adequate number and sizes of on-site garbage and recycling containers within designated work site as required for collection of waste materials and debris on a daily basis.
 - .2 Provide additional waste containers when extent of work warrants.
 - .3 Provide and use clearly marked, separate bins for recycling.
- .9 Dispose of waste materials and debris at registered waste disposal and recycling facility.
- .10 Remove oily rags, waste and other hazardous substances from premises at close of each day, or more often when required.
- .11 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

3.2. WASTE MANAGEMENT

- .1 Audit, separate and dispose of construction waste generated by new construction or by demolition of existing structures in whole or in part, in accordance with Ontario Regulations 102/94 and 103/94 made under the Environmental Protection Act.
- .2 Containers:
 - .1 Provide adequate number and sizes of on-site garbage and recycling containers within designated work site as required for collection of waste materials and debris on a daily basis.
 - .2 Provide additional waste containers when extent of work warrants.
 - .3 Provide and use clearly marked, separate bins for recycling.
- .3 Fires, and burning of rubbish or waste on site is strictly prohibited.
- .4 Burying of rubbish or waste materials on site is strictly prohibited.
- .5 Disposal of waste or volatile materials such as mineral spirits, oil, gasoline or paint thinner into ground, waterways, or sewer systems is prohibited.
- .6 Empty waste containers on a regular basis to prevent contamination of site and adjacent properties by wind-blown dust or debris

3.3. PREPARATION FOR FINAL CLEANING

- .1 Prior to final cleaning the General Contractor shall:
 - .1 remove all surplus products, tools, construction machinery and equipment not required for the performance of remaining work, and thereafter remove any remaining materials, equipment, waste and debris,
 - .2 replace all filters installed on any equipment in operation in the area of work,
 - .3 remove all paint spots or overspray from all affected surfaces, and

3.4. FINAL CLEANING PRIOR TO ACCEPTANCE: INTERIOR

- .1 Prior to applying for Substantial Performance of the Work, or, prior to Owner occupancy of the building or portion of the building affected by the Work, whichever comes first, conduct full and complete final cleaning operations for the areas to be occupied.
- .2 Final cleaning operations shall be performed by an experienced professional cleaning company, possessing equipment and personnel sufficient to perform full building cleaning operations. Contractors "broom cleaning" is not acceptable as a "Final Clean". The cleaning contractor shall:
 - .1 clean interiors of all millwork and surfaces of any furniture and equipment present,
 - .2 use only cleaning materials recommended by the manufacturer of the surface to be cleaned,
 - .3 remove all stains, spots, scuff marks, dirt, dust, remaining labels, adhesives or other surface imperfections,
 - .4 clean and polish all glass and mirrors and remove remaining manufacturer's and safety "X" labels,
 - .5 clean and polish all finished metal surfaces such as enamelled or stainless steel, chrome, aluminum, brass, and bronze,
 - .6 clean and polish all vitreous surfaces such as plumbing fixtures, ceramic tile, porcelain enamel, or other such materials,
 - .7 clean all ceramic tile surfaces in accordance with the manufacturer's instructions,
 - .8 vacuum, clean and dust behind grilles, louvres and screens,

- .9 steam clean all unprotected carpets immediately prior occupancy by Owner, and
- .10 clean all equipment and fixtures to a sanitary condition.
- .3 For any areas to be occupied after the owner's initial occupancy, provide full cleaning operations as outlined above prior to turning over to owner,
- .4 The Board's supplies and equipment must not be used for any cleaning operations including, but not limited to: garbage cans, mops, brooms, rags, ladders, chemicals etc.

3.5. FINAL CLEANING PRIOR TO ACCEPTANCE: EXTERIOR

- .1 For areas effected by construction final exterior cleaning operations shall be performed by the General Contractor or competent sub-contractor. Contractor's "broom cleaning" only is not acceptable.
- .2 Final exterior cleaning shall include:
 - .1 broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds,
 - .2 remove dirt and other disfiguration from exterior surfaces,
 - .3 sweep and wash clean paved areas,
 - .4 replace filters of mechanical equipment for all equipment that was in use during construction,
 - .5 clean all roofs, gutters, downspouts, areaways, drywells, and drainage systems,
 - .6 remove debris and surplus materials from crawl areas and other accessible concealed spaces.
 - .7 remove overspray

END OF SECTION

1.0 GENERAL

1.1. RELATED SECTIONS

- .1 Section 01 78 10 – Appendix 1 and 2 – Warranty Card

1.2. TAKE-OVER PROCEDURES

- .1 Take over procedures will be in strict accordance with the requirements as set out in this Section.

1.3. SUBSTANTIAL PERFORMANCE

- .1 Prior to requesting a Substantial Performance deficiency inspection submit 2 hard copies, 1 digital copy of the Operating and Maintenance Manuals for Consultants approval.
- .2 Application for Substantial Performance must include.
 - .1 One (1) electronic copy of inspection and acceptance certificates required from regulatory agencies, including but not limited to.
 - .1 Certificates of Approval of the Work by the local Building Department.
 - .2 Electrical Inspection Certificate of Inspection.
 - .3 Fire Alarm Verification Certificate.
- .3 Advise Consultant in writing, when project has been substantially completed. If Consultant agrees this stage has been reached, the Consultant shall prepare a complete list of deficiencies and submit copies of this list to Contractor and the Board.

1.4. COMMENCEMENT OF LIEN PERIODS

- .1 The date of publication of the Certificate of Substantial Performance of the Work, provided to the contractor by the Consultant, shall be the date for commencement of the lien period.

1.5. TOTAL PERFORMANCE

- .1 Prior to requesting a final inspection submit written certificate that the following have been performed:
 - .1 Work has been completed and inspected for compliance with Contract Documents and is ready for final inspection
 - .2 Defects have been corrected and deficiencies have been completed.
 - .3 Equipment and systems have been tested and are fully operational. Submit two copies of the balancing reports
 - .4 Certificates required by the contractor have been submitted.
 - .5 Operation of systems have been demonstrated to Owner's personnel.
 - .6 Submit Record drawings.
 - .7 Submit maintenance materials.
 - .8 Provide certified site survey
- .2 When items noted above are completed, request final inspection of Work by consultant, and building inspector. If Work is deemed incomplete by Consultant, complete outstanding items and request re-inspection.

1.6. PAYMENT OF SUBSTANTIAL PERFORMANCE HOLDBACK

- .1 Prior to the release of lien holdback provide one copy of the following by the Contractor and each subcontractor:
 - .1 Statutory Declaration or Declaration of Last supply

- .2 Workplace Safety and Insurance Board "Certificate of Clearance".
- .2 The Contractor shall submit an application for payment of the holdback amount.
- .3 After the receipt of an application for payment which will include a Statutory Declaration and WSIB Clearance from the, the Consultant will issue a certificate for payment of the holdback amount.

1.7. FINAL PAYMENT

- .1 When the Contractor considers final deficiencies and defects have been corrected and it appears requirements of Contract have been completed, make application for final payment.
- .2 When the Consultant finds the Contractor's application for final payment valid, the Consultant will issue a final certificate of payment
- .3 The Board reserves the right to charge the Contractor for school access card(s) that have not been returned.
- .4 The cost to reprogram or replace the card(s) access system is estimated at \$50.00 (fifty dollars) for each card issued, \$30.00 (thirty dollars) for each keybox key, plus \$35.00 (thirty five dollars) administration fee.

1.8. CLOSEOUT SUBMITTALS

- .1 Prepare instructions and data using personnel experienced in maintenance and operation of described products and submit to Consultant for review.
- .2 Copy will be returned to contractor with Consultant's comments.
- .3 Revise content of documents as required prior to final submittal.
- .4 Two (2) weeks prior to Substantial Performance of the Work, submit to the Consultant, the final copies of operating and maintenance manuals.
- .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.

1.9. OPERATION AND MAINTENANCE MANUAL FORMAT

- .1 Provide two copies of operating and maintenance data, prepared on 215 X 280mm sheets in printed or typewritten form, contained in 3-ring binders with soft vinyl covers for materials and equipment which require special maintenance or operating procedures.
- .2 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder at the front of each volume.
- .3 Cover: Identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .4 Arrange content by the divisions of the specifications under Section numbers and sequence of Table of Contents.
- .5 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .6 Include the following in each manual:

- .1 Complete list of subcontractors and suppliers, their addresses and telephone numbers. Provide 24 hour emergency telephone number for such subcontractors as Plumbing, Electrical, Sprinklers, Fire System, Heating, etc.
- .2 Specified warranties for contractor, each subcontractor and supplier.
- .3 Boards Warranty Card
- .4 Copy of finish hardware list, complete with all amendments and revisions and lock manufacturer's descriptive and service literature.
- .5 Schedule of paints and coatings. Include sufficient explanation to fully identify each surface with the applicable paint or coating used. Enclose copy of colour schedule.
- .6 Maintenance instructions for finished surfaces.
- .7 Brochures, cuts of equipment and fixtures.
- .8 Operating and maintenance instructions for equipment.
- .9 Submit copies of letters from manufacturers of equipment and systems indicating their technical representatives have inspected and tested systems and are satisfied with methods of installation, connection and operations. These letters shall state names of persons present at testing, methods used and list of functions performed.
- .10 Submit one complete set of reviewed shop drawings of architectural, structural, mechanical and electrical items, folded to 215 x 280mm size, contained in heavy duty manila envelopes, numbered and labelled. Follow specification format with no more than one Section per envelope, hard copy and PDF.
- .11 Relevant certificates issued by authorities having jurisdiction
- .12 Computer disc or flash drive with all the above documentation in PDF format

1.10. RECORDING ACTUAL SITE CONDITIONS

- .1 Record information on set of black line opaque drawings, and within the Project Manual.
- .2 Annotate with coloured felt tip marking pens, maintaining separate colours for each major system, for recording changed information.
- .3 Record information concurrently with construction progress. Do not conceal Work of the Project until required information is accurately 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 Addenda and change orders.
- .6 Other Documents: Maintain warranties, test reports and samples required by individual specifications sections.

1.11. RECORD (AS-BUILT) DOCUMENTS AND SAMPLES

- .1 Store AS-BUILT documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.
- .2 Label AS-BUILT documents and file in accordance with section number listings in List of Contents of the Project Manual. Label each document AS-BUILT DOCUMENTS in neat, large, printed letters.
- .3 Maintain AS-BUILT documents in clean, dry and legible condition. Do not use as-built documents for construction purposes.
- .4 Keep as-built documents and samples available for inspection by Consultant.

1.12. RECORD DRAWINGS

- .1 Prior to Substantial Performance of the Work, update the marked up information from the AS-BUILT documents to a master set of drawing.
- .2 Submit one set of completed AS-BUILT documents to the Consultant for review.
- .3 Documents will be returned to contractor with Consultant's comments.
- .4 Revise content of documents as required prior to final submittal.
- .5 After the review is completed resubmit to the Consultant for Consultant to produce electronic record drawings for the owner to use.

1.13. 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 Receive and catalogue all items. Submit inventory listing to Consultant. Include approved listings in Maintenance Manual.
- .4 Obtain receipt for delivered products and submit prior to final payment.

1.14. REPLACEMENT (MAINTENANCE) MATERIALS

- .1 Deliver to site, unload and store where directed, replacement (maintenance) materials as required elsewhere in these Specifications. Obtain signed receipt from Owner's Representative for delivered materials and include copy of receipt in Operation and Maintenance manuals.
- .2 Package materials so they are protected from damage and loss of essential properties.
- .3 Label packaged materials for proper identification of contents.

1.15. 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 Receive and catalogue all items. Submit inventory listing to Consultant. Include approved listings in Maintenance Manual

1.16. FINAL SITE SURVEY

- .1 Submit final site survey certificate in accordance with Section 01 70 00, certifying that elevations and locations of completed Work are in conformance Contract Documents.

1.17. 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 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial Performance is determined. The date of Substantial Performance of the Work shall be the date for commencement of the warranty period.
- .4 Verify that documents are in proper form, contain full information, and are notarized.
- .5 Co-execute submittals when required.
- .6 Retain warranties and bonds until time specified for submittals.

END OF SECTION

1.0 GENERAL

1.1. SECTION INCLUDES

- .1 Procedures for demonstration and instruction of Products, equipment and systems to Owner's personnel.
- .2 Seminars and demonstrations.

1.2. RELATED SECTIONS

- .1 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3. DESCRIPTION

- .1 At Substantial Performance, at a time acceptable to Owner and Consultant, but not before operations and maintenance manual have been reviewed and accepted by the consultant; contractor shall give a complete demonstration in the presence of consultant; Sub-consultants, Owner and Owner's personnel of operation and maintenance of systems and equipment once they are 100% complete.
- .2 Owner will provide list of personnel to receive instructions and will coordinate their attendance at agreed-upon times.

1.4. COMPONENT DEMONSTRATION

- .1 Manufacturer to provide authorized representative to demonstrate operation of equipment and systems.
- .2 Instruct Owner's personnel, and provide written report that demonstration and instructions have been completed.

1.5. SUBMITTALS

- .1 Submit schedule of time and date for demonstration of each item of equipment and each system one (1) week prior to designated dates, for Consultant's approval.
- .2 Submit reports within forty eight (48) after completion of demonstration, that demonstration and instructions have been satisfactorily completed.
- .3 Give time and date of each demonstration, with list of persons present.

1.6. CONDITIONS FOR DEMONSTRATIONS

- .1 Equipment has been inspected and put into operation in accordance with manufacturer's instructions and contract requirements.
- .2 Testing, adjusting, and balancing have been performed in accordance with manufacturer's instructions and contract requirements, and equipment and systems are fully operational.
- .3 Provide information packages as required for use in demonstrations and instructions.

2.0 PRODUCTS

2.1. NOT USED

- .1 Not used.

3.0 EXECUTION

3.1. PREPARATION

- .1 Verify that suitable conditions for demonstration and instructions are available.
- .2 Verify that designated personnel are present.
- .3 Prepare agendas and outlines.
- .4 Establish seminar organization.
- .5 Explain component design and operational philosophy and strategy.
- .6 Develop equipment presentations.
- .7 Present system demonstrations.
- .8 Accept and respond to seminar and demonstration questions with appropriate answers.

3.2. PREPARATION OF AGENDAS AND OUTLINES

- .1 Prepare agendas and outlines including the following:
 - .1 Equipment and systems to be included in seminar presentations.
 - .2 Name of companies and representatives presenting at seminars.
 - .3 Outline of each seminar's content.
 - .4 Time and date allocated to each system and item of equipment.
 - .5 Provide separate agenda for each system.

3.3. SEMINAR ORGANIZATION

- .1 Coordinate content and presentations for seminars.
- .2 Coordinate individual presentations and ensure representatives scheduled to present at seminars are in attendance.
- .3 Arrange for presentation leaders familiar with the design, operation, maintenance and troubleshooting of the equipment and systems. Where a single person is not familiar with all aspects of the equipment or system, arrange for specialists familiar with each aspect.
- .4 Coordinate proposed dates for seminars with Owner and select mutually agreeable dates.

3.4. EXPLANATION OF DESIGN STRATEGY

- .1 Explain design philosophy of each system. Include following information:
 - .1 An overview of how system is intended to operate.
 - .2 Description of design parameters, constraints and operational requirements.
 - .3 Description of system operation strategies.
 - .4 Information to help in identifying and troubleshooting system problems.

3.5. DEMONSTRATION AND INSTRUCTIONS

- .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment.
- .2 Instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.
- .3 Instruct personnel on control and maintenance of sensory equipment and operational equipment associated with maintaining energy efficiency and longevity of service.
- .4 Review contents of manual in detail to explain all aspects of operation and maintenance. Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instructions.

END OF SECTION

1.0 GENERAL

1.1 SECTION INCLUDES

- .1 Alteration project procedures.
- .2 Removal of designated building equipment and fixtures.
- .3 Removal of designated construction.
- .4 Disposal of materials, Storage of removed materials.
- .5 Identification of utilities.
- .6 Refer to items scheduled at end of section, as indicated.

1.2 RELATED SECTIONS

- .1 Section 02 41 16 - Structure Demolition.
- .2 Section 01 74 00 – Cleaning and Waste Management

1.3 ALTERATION PROJECT PROCEDURES

- .1 Materials: As specified in Product sections; match existing Products and work for patching and extending work.
- .2 Employ skilled and experienced personnel to perform alteration work.
- .3 Provide materials, equipment and all shoring required to perform work of this section.
- .4 Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.
- .5 Remove, cut, and patch Work in a manner to minimize damage and to provide means of restoring Products and finishes to specified original condition.
- .6 Refinish existing visible surfaces to remain in renovated rooms and spaces, to renewed specified condition for each material, with a neat transition to adjacent finishes.
- .7 Where new Work abuts or aligns with existing, provide a smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.
- .8 When finished surfaces are cut so that a smooth transition with new Work is not possible, terminate existing surface along a straight line at a natural line of division and submit recommendation to Consultant for review.
- .9 Where a change of plane of 6 mm or 1/4 inch or more occurs, request instructions from Consultant, submit recommendation for providing a smooth transition; to Consultant for review.
- .10 Patch or replace portions of existing surfaces which are damaged, lifted, discoloured, or showing other imperfections.
- .11 Finish surfaces as specified in individual Product sections.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Scheduling: Schedule work to requirements of Section 01 31 00.
 - .1 Schedule Work to coincide with site excavation work, coincide with new construction, precede new construction, precede site excavation work.
 - .2 Describe demolition removal procedures and schedule.
- .2 Perform dusty, noisy, malodorous work:
 - .1 Between the hours of 7 A.M. and 4.PM
 - .2 On the following days: Monday to Friday.

1.5 SUBMITTALS FOR REVIEW

- .1 Section 01 33 00: Submission procedures.
- .2 Shop Drawings: Indicate removal sequence and location of salvageable items, demolition; location and construction of temporary work.
- .3 As required by authorities having jurisdiction and by other sections of this specification, submit for approval, drawings, diagrams, details and supporting data clearly showing sequence of demolition and removal work of building and shoring designed by a registered professional structural engineer licensed to practice in Ontario.

1.6 SUBMITTALS FOR INFORMATION

- .1 Section 01 33 00: Submission procedures.
- .2 Sustainable Design: **NOT APPLICABLE**
 - .1 Section 01 35 18: LEED documentation procedures. **If applicable**
 - .2 Provide required LEED documentation for Product regional materials, recycled content. **If applicable**
 - .3 Manufacturer's Certificate: Certify that Products meet or exceed, specified requirements.

1.7 CLOSEOUT SUBMITTALS

- .1 Section 01 78 10: Submission procedures.
- .2 Record Documentation: Accurately record actual locations of capped utilities, subsurface obstructions, and other significant details.
- .3 Sustainable Design Closeout Documentation: If applicable

1.8 REGULATORY REQUIREMENTS

- .1 Conform to applicable code for demolition work, dust control, products requiring electrical disconnection, reconnection.
- .2 Obtain required permits from authorities.
- .3 Do not close or obstruct egress width to any building or site exit.

- .4 Do not disable or disrupt building fire or life safety systems without three (3) days prior written notice to Owner.
- .5 Conform to applicable regulatory procedures when discovering hazardous or contaminated materials.

1.9 PROJECT CONDITIONS

- .1 Conduct demolition to minimize interference with adjacent and occupied building areas.
- .2 Cease operations immediately if structure appears to be in danger and notify Consultant. Do not resume operations until directed.
- .3 Visit the site and the existing building so as to fully understand all existing conditions and extent of work required. No increase in cost or extension of performance time will be considered for failure to know conditions.

1.10 PROTECTION

- .1 Prevent movement or settlement of adjacent work. Provide and place bracing or shoring and be responsible for safety and support of such work. Be liable for any such movement or settlement, and any damage or injury caused.
- .2 Cease operations and notify Project Manager if safety of any adjacent work or structure appears to be endangered. Take all precautions to support the structure. Do not resume operations until reviewed with Project manager.
- .3 Cease operations and notify the Minister immediately for special protective and disposal instructions when asbestos materials or other hazardous materials [, other than those identified,] are uncovered during the work of this project.
- .4 Prevailing weather conditions and weather forecasts shall be considered. Demolition work shall not proceed when weather conditions constitute a hazard to the workers and site.
- .5 Prevent debris from blocking surface drainage inlets and mechanical and electrical systems which remain in operation.
- .6 Temporarily suspended work that is without continuous supervision, shall be closed to prevent entrance of unauthorized persons.

2.0 EXECUTION

2.1 PREPARATION

- .1 Ensure that affected building areas are unoccupied and discontinued in use prior to start of demolition work.
- .2 Verify that existing services in areas affected by demolition work are disconnected, capped or removed, prior to start of work.
- .3 Provide, erect, and maintain temporary partitions, insulated partitions, barriers at locations indicated.
- .4 Erect and maintain weatherproof closures for exterior openings.
- .5 Erect and maintain temporary partitions to prevent spread of dust, odours, and noise to permit continued Owner occupancy.
- .6 Protect existing materials and structure which are not to be demolished.

- .7 Prevent movement of structure; provide bracing and shoring.
- .8 Notify affected utility companies before starting work and comply with their requirements.
- .9 Disconnect all electrical and telephone service lines in the areas to be demolished in accordance with rules and regulations of authorities having jurisdiction. Post warning signs on all electrical lines and equipment that must remain energized to serve other areas during period of demolition.
- .10 Disconnect and cap mechanical services in accordance with requirements of local authority having jurisdiction.
 - .1 Natural gas supply lines to be removed by qualified tradesman in accordance with gas company instructions.
 - .2 Remove sewer and water lines and cap to prevent leakage.
 - .3 Remove and cap other underground services.
 - .4 In each case notify the affected utility company in advance and obtain approval where required, before commencing with the work on main services.
- .11 Mark location and termination of utilities.
- .12 Do not disrupt active or energized utilities designated to remain undisturbed.
- .13 Provide appropriate temporary signage including signage for exit or building egress.

2.2 DEMOLITION

- .1 Carry out demolition work in accordance with CSA S350, unless otherwise specified.
- .2 Disconnect remove, cap, identify, designated utilities within demolition areas.
- .3 Demolish in an orderly and careful manner. Protect existing supporting structural members.
- .4 Remove from site all materials indicated to be demolished except where specifically noted otherwise. Do not burn or bury materials on site.
- .5 Remove materials as Work progresses. Upon completion of Work, leave areas in clean condition.
- .6 Carry out demolition in a manner to minimize inconvenience to adjacent occupied space.
- .7 Demolish work in a safe and systematic manner, from top to bottom.
- .8 Sprinkle exterior debris with water to prevent dust. Do not cause flooding, contaminated runoff or icing. Do not allow waste material, rubbish, and windblown debris to reach and contaminate adjacent properties.
- .9 Lower waste materials in a controlled manner; do not drop or throw materials from heights. Use chutes, conveyors, or hoisting equipment to lower materials.
- .10 Demolish masonry and concrete elements in small sections. Carefully remove and lower structural framing and other heavy and large objects.
- .11 At end of each work period, leave work in a safe condition, so that no part is in danger of toppling or falling.
- .12 Remove temporary Work.

2.3 SCHEDULES

- .1 Remove the equipment and materials for the Owner's retention. Refer to demolition drawings
- .2 Owner will remove and keep material and equipment noted on demolition drawings
- .3 Protect the materials and equipment remaining: Refer to demolition drawings

2.4 CLEAN UP

- .1 For clean up during demolition and for final cleaning , comply with requirements of Section 01 74 00.

END OF SECTION

ASEBSTOS ABATEMENT SPECIFICATIONS

Project:
Accessibility Upgrades
Sir Oliver Mowat Collegiate Institute
5400 Lawrence Avenue East, Toronto, Ontario

Sections:
Section 02 82 13.0 – Asbestos Abatement Scope of Work
Section 02 82 13.1 – Type 1 Asbestos Abatement
Section 02 82 13.2 – Type 2 Asbestos Abatement
Section 02 82 13.3 – Type 3 Asbestos Abatement

Prepared by:
Safetech Environmental Limited
14-3045 Southcreek Road
Mississauga, Ontario
L4X 2X7

Prepared for:

Sandra Chen, OAA
Assistant Design Coordinator

Toronto District School Board
15 Oakburn Crescent,
North York, ON
M2N 2T5

March 2026

Part 1 GENERAL

1.1 GENERAL REQUIREMENTS

1. Conform to Sections of Division 1 as applicable.

1.2 RELATED SECTIONS

1. Section 02 82 13.1 – Type 1 Asbestos Abatement
2. Section 02 82 13.2 – Type 2 Asbestos Abatement
3. Section 02 82 13.3 – Type 3 Asbestos Abatement

1.3 SITE CONDITIONS

1. Types of asbestos present (confirmed or suspected) and recommended abatement procedures, as per the specified project, outlined in Table 1 below. The Contractor is responsible for all quantities of asbestos-containing materials designated for removal.

Table 1

Asbestos-Containing Material	Abatement Procedure
Cinderblock Filler (Paint)	Type 2 & HEPA Filtered Drilling Section 02 82 13.2

2. Materials identified to contain Asbestos can be found within the Safetech Environmental Limited report titled Designated Substances and Hazardous Materials Assessment Report, Accessibility Upgrade, Sir Oliver Mowat Collegiate Institute, 5400 Lawrence Avenue East, Toronto, Ontario” issued on March 20, 2026.
3. Comply with Ontario Regulation 278/05 (O. Reg. 278/05), “Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations” as made under the Occupational Health and Safety Act, as amended, and local requirements pertaining to asbestos. In case of conflict with these Specifications, the most stringent requirements shall apply.
4. Handle and dispose of contaminated waste as required by R.R.O. 1990, Regulation 347, “General – Waste Management”, as amended, made under The Environmental Protection Act.

END OF SECTION

Part 1 GENERAL

1.1 GENERAL REQUIREMENTS

1. Conform to Sections of Division 1 as applicable.

1.2 RELATED SECTIONS

1. Section 02 82 13.0 – Asbestos Abatement Scope of Work
2. Section 02 82 13.2 – Type 2 Asbestos Abatement
3. Section 02 82 13.3 – Type 3 Asbestos Abatement

1.3 SITE CONDITIONS

1. Types of asbestos present: Chrysotile may be present within project areas but not limited to cinderblock filler (paint).
2. Materials identified to contain Asbestos can be found within the Safetech Environmental Limited report titled “Designated Substances and Hazardous Materials Assessment Report, Accessibility Upgrade, Sir Oliver Mowat Collegiate Institute, 5400 Lawrence Avenue East, Toronto, Ontario” issued on March 20, 2026.
3. Removal or disturbance of asbestos-containing materials must be conducted in accordance with Ontario Regulation 278/05 (O. Reg. 278/05), “Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations” as made under the Occupational Health and Safety Act.

1.4 DESCRIPTION OF WORK

1. The following area classified as Type 1 Operations:
 1. Installing or removing non-friable asbestos-containing material, other than ceiling tiles, if the material is installed or removed without being broken, cut, drilled, abraded, ground, sanded or vibrated.
 2. Breaking, cutting, drilling, abrading, grinding, sanding or vibrating non-friable asbestos-containing material if,
 1. the material is wetted to control the spread of dust or fibres, and
 2. the work is done only by means of non-powered hand-held tools.
 3. Removing less than one square metre of drywall in which joint-filling compounds that are asbestos-containing material have been used. O. Reg. 278/05, s. 12 (2).
2. Perform removal of asbestos-containing window frame caulking in accordance with Section 02 82 13.1.
3. Non-friable asbestos handling shall be performed by firms and workers fully experienced in asbestos control.
4. Handle non-friable asbestos materials required to be removed as specified herein.
5. Seal all surfaces from which asbestos has been cleaned or removed with slow drying sealer.
6. Obtain and submit copy of necessary permits for transporting and disposal of asbestos waste.

7. Protect surfaces in asbestos work area(s) and prevent spread of asbestos dust by use of drop sheets and polyethylene sheeting or other acceptable material.
8. During, and at the completion of work, clean asbestos work area(s) as specified.

1.5 DEFINITIONS

1. **Asbestos Work Area(s):** Area(s) where work takes place which will, or may, disturb asbestos-containing material.
2. **Authorized Visitor(s):** Owner's Consultant or person(s) representing regulatory agencies, and person(s) authorized by them.
3. **HEPA Filter:** High Efficiency Particulate Aerosol filter at least 99.97 percent efficient in collecting 0.3 micrometer aerosol.
4. **Non-Friable Material:** Material that when dry cannot be crumbled, pulverized or powdered by hand pressure. Includes, but not limited to, following asbestos containing products: vinyl asbestos floor tiles, resilient sheet flooring, acoustic ceiling and wall tiles, gaskets, seals, packings, friction products, drywall joint compounds and asbestos cement panels, shingles and piping.
5. **Polyethylene Sheeting:** Polyethylene sheeting of 0.15 mm (6 mil) minimum thickness with tape seals along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide continuous membrane protection.

1.6 REGULATIONS

1. Comply with Ontario Regulation 278/05 (O. Reg. 278/05), "Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations" as made under the Occupational Health and Safety Act, as amended, and local requirements pertaining to asbestos. In case of conflict with these Specifications, the most stringent requirements shall apply.
2. Handle and dispose of contaminated waste as required by R.R.O. 1990, Regulation 347, "General – Waste Management", as amended, made under The Environmental Protection Act.

1.7 WORKER PROTECTION

1. Respirators are not mandatory for Type 1 work with non-friable asbestos-containing materials, however, if requested by workers, provide half-face air-purifying respirator with N-, R-, or P-100 filters in accordance with Table 2 of O. Reg. 278/05. Provide proper instruction to workers in use of respirators including qualitative fit testing. Replace filters as necessary, according to manufacturer's instructions. Workers shall not wear facial hair that affects seal between respirator and face. Contractor to post on job bulletin Owner instructions, procedures and information pertaining to abatement work.
2. Provide, and insist on using, facilities for washing of hands and face by every worker when leaving asbestos work area. Prohibit smoking, eating and drinking in asbestos work area.

Part 2 PRODUCTS

2.1 MATERIALS

1. **Asbestos Waste Receptors:** 2 separate containers of which 1 shall consist of 0.15 mm (6 mil) minimum thickness sealable polyethylene bag. Other container may be 0.15 mm (6 mil) minimum thickness polyethylene bag or rigid sealable container such as cardboard or metal or fibre drum or wood box. Other container shall be adequate to prevent perforating rips or tears in first container during filling, transport or disposal. Containers must be acceptable to disposal site selected and Ministry of the Environment, Conservation and Parks. Containers shall be labelled in accordance with Ministry of the Environment, Conservation and Parks regulations.
2. **HEPA Vacuum:** Vacuum with all necessary fittings, tools and attachments. Air must pass HEPA filter before discharge.
3. **Sprayer:** Garden-type portable manual sprayer, low velocity, capable of producing mist or fine spray.
4. **Polyethylene Sheeting:** 0.15 mm (6mil) minimum thickness unless otherwise specified; in sheet size to minimize joints.
5. **Tape:** Tape suitable for sealing polyethylene to surface encountered under wet conditions using amended water and under dry conditions.
6. **Amended Water:** Water with non-ionic water wetting agent added.

Part 3 PART 3 - EXECUTION

3.1 PREPARATION

1. Before disturbing non-friable asbestos materials, cover ground below work with polyethylene sheeting.
2. Wherever dust on surfaces within designated asbestos work areas is likely to be disturbed, remove beforehand with HEPA vacuum or damp cloth.

3.2 REMOVAL OF NON-FRIABLE MATERIALS

1. Asbestos-containing materials will be sprayed with amended water prior to disturbance.
2. Using hand tools, sections of non-friable asbestos-containing materials will be removed.
3. Exposed asbestos-containing debris materials will be sprayed with amended water to prevent release of airborne fibres during removal.
4. Waste will be immediately placed in asbestos waste receptors in close proximity to work area.
5. 3.2.1 through 3.2.4 will be repeated until all asbestos-containing materials have been removed.
6. Drop sheets will be disposed of as asbestos waste. The will not be reused.

3.3 WASTE TRANSPORT AND DISPOSAL

1. Conform to requirements of Regulation 347 (as amended), made under The Environmental Protection Act for Waste Management, transporting and disposal of hazardous waste.
2. Check with dump operator to determine type of waste containers acceptable.
3. Ensure shipment of containers to dump is taken by waste hauler licensed to transport asbestos waste.
4. Each load requires completion of bill of lading showing type and weight of hazardous waste being transported.
5. Co-operate with Ministry of the Environment, Conservation and Parks inspectors and immediately carry out instructions for remedial work at dump to maintain environment, at no additional cost to Owner.
6. Ensure dump operator is fully aware of hazardous material being dumped.
7. Ensure that containers used for dumping are locked and covered at all times.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

1. Conform to Sections of Division 1 as applicable.

1.2 RELATED SECTIONS

1. Section 02 82 13.0 – Asbestos Abatement Scope of Work
2. Section 02 82 13.1 – Type 1 Asbestos Abatement
3. Section 02 82 13.3 – Type 3 Asbestos Abatement

1.3 SITE CONDITIONS

1. Types of asbestos present: Chrysotile present within but not limited to cinderblock filler (paint).
2. Materials identified to contain Asbestos can be found within the Safetech Environmental Limited report titled “Designated Substances and Hazardous Materials Assessment Report, Accessibility Upgrade, Sir Oliver Mowat Collegiate Institute, 5400 Lawrence Avenue East, Toronto, Ontario” issued on March 20, 2026.
3. Removal or disturbance of asbestos-containing materials must be conducted in accordance with Ontario Regulation 278/05 (O. Reg. 278/05), “Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations” as made under the Occupational Health and Safety Act.

1.4 DESCRIPTION OF WORK

1. The following are classified as **Type 2 operations** under O. Reg. 278/05:
 1. Removing all or part of a false ceiling to obtain access to a work area, if asbestos-containing material is likely to be lying on the surface of the false ceiling.
 2. The removal or disturbance of one square metre or less of friable asbestos-containing material during the repair, alteration, maintenance or demolition of all or part of machinery or equipment or a building, aircraft, locomotive, railway car, vehicle or ship.
 3. Enclosing friable asbestos-containing material.
 4. Applying tape or a sealant or other covering to pipe or boiler insulation that is asbestos-containing material.
 5. Installing or removing ceiling tiles that are asbestos-containing material, if the tiles cover an area of 7.5 square metres or more and are installed or removed without being broken, cut, drilled, abraded, ground, sanded or vibrated.
 6. Breaking, cutting, drilling, abrading, grinding, sanding or vibrating non-friable asbestos-containing material if,
 1. the material is not wetted to control the spread of dust or fibres, and
 2. the work is done only by means of non-powered hand-held tools.
 7. Removing one square metre or more of drywall in which joint filling compounds that are asbestos-containing material have been used.

8. Breaking, cutting, drilling, abrading, grinding, sanding or vibrating non-friable asbestos-containing material if the work is done by means of power tools that are attached to dust-collecting devices equipped with HEPA filters.
 9. Removing insulation that is asbestos-containing material from a pipe, duct or similar structure using a glove bag.
 10. Type 2 Glove Bag operations can be applied for the removal of asbestos containing mechanical pipe straight insulation and fittings. Glove bag removal will only be permitted where materials noted for removal are in good condition and no asbestos-containing debris is present. Include all jacketing or covering on insulation.
 11. Cleaning or removing filters used in air handling equipment in a building that has sprayed fireproofing that is asbestos-containing material.
 12. An operation that,
 1. is not mentioned in 1.41.1 through 1.41.11,
 2. may expose a worker to asbestos, and
 3. is not classified as a Type 1 or Type 3 operation.
2. If removing 1.0m² or less of asbestos-containing texture coat finish, perform all work in accordance with Section 02 82 13.2 (Type 2 Asbestos Abatement).
 3. Maintain electrical and mechanical services passing through asbestos work area.
 4. Seal all surfaces from which asbestos has been cleaned or removed with slow drying sealer.
 5. Dispose of temporary enclosures, disposable equipment and any asbestos-containing or contaminated materials removed, as asbestos waste.
 6. All work will be subject to inspection and air monitoring both inside and outside asbestos work area by Owner's Consultant. Any contamination of surrounding areas (indicated by visual inspection or air monitoring) shall necessitate complete enclosure and clean-up of affected areas.

1.5 DEFINITIONS

1. **Asbestos Work Area(s):** Area(s) where work takes place which will, or may disturb asbestos-containing material, including overspray and fallen material, or settled dust that may contain asbestos.
2. **Airlock:** 2 curtained doorways spaced minimum of 2 m (6') apart.
3. **Authorized Visitor(s):** Construction Manager or person(s) representing regulatory agencies, and person(s) authorized by them.
4. **Curtained Doorway:** Device to allow ingress or egress from enclosure while permitting minimal air movement, typically constructed by placing 2 overlapping flaps of polyethylene sheeting (2 sheets of polyethylene per flap) attached to head and 1 jamb of existing or temporarily constructed door frame. Secure vertical edge of 1 flap along 1 vertical side of door frame, and vertical edge of other flap along opposite vertical side of door frame. Reinforce free edges of polyethylene with duct tape.
5. **Glove Bag:** Prefabricated, 0.25 mm (10 mil) minimum thickness polyvinyl-chloride bag with integral 0.25 mm (10 mil) thick polyvinyl-chloride gloves and elasticized ports. Bag equipped with reversible double-pull double throw zipper on top to facilitate installation on pipe and progressive movement along pipe and with straps for sealing ends to bag around pipe.

6. **Friable Material:** Material that when dry can be crumbled, pulverized or powdered by hand pressure and includes such material that is crumbled, pulverized or powdered.
7. **HEPA Filter:** High Efficiency Particulate Aerosol filter at least 99.97 percent efficient in collecting 0.3 micrometer aerosol.
8. **Negative Pressure:** Reduced pressure within asbestos work area(s) established by extracting air directly from work area, and discharging directly to exterior of building. Discharged air first passes through HEPA filter. Extract sufficient air to ensure constant reduced pressure at perimeter of work area with respect to surrounding areas.
9. **Polyethylene Sheeting:** Polyethylene sheeting 0.15 mm (6 mil) minimum thickness; with tape seals along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide continuous polyethylene membrane protection.

1.6 QUALITY ASSURANCE

1. Ensure work proceeds to Schedule and meets all requirements of this Section. Perform work so airborne asbestos, asbestos waste or water run off does not contaminate areas outside asbestos work enclosure.
2. Pay cost to Owner of inspection and air monitoring performed as result of failure to perform work satisfactorily.
3. Use only skilled and qualified workers for all trades required for this work.

1.7 REGULATIONS

1. Comply with Ontario Regulation 278/05, "Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations" made under Occupational Health and Safety Act (as amended) and local requirements pertaining to asbestos. In case of conflict with these specifications, the most stringent requirements shall apply.
2. Handle and dispose of contaminated waste as required by R.R.O. 1990, "General – Waste Management" made under The Environmental Protection Act (as amended).

1.8 SUBMITTALS

1. Before Commencing Work:
 1. Obtain and submit all necessary permits for transporting and disposal of asbestos waste.
 2. Submit names of supervisory personnel who will be responsible for asbestos work area(s). One of supervisors must remain on Site at all times while asbestos removal or clean-up is occurring. Submit proof that supervisory personnel have attended training course on asbestos control (two-day minimum duration) and have performed supervisory function on at least two other asbestos control projects.
 3. Submit proposed schedule showing phasing and proposed workforce related to each work area enclosure or repair operation.
 4. Submit list of existing damage for acceptance.

1.9 WORKER AND VISITOR PROTECTION

1. Instructions: Before entering asbestos work area(s), instruct workers and visitors in use of respirators, entry and exit procedures, and all aspects of work procedures and protective

measures. Instruction shall be provided by competent person as defined by Occupational Health and Safety Act.

2. **Respiratory Protection**

1. Provide appropriate respiratory equipment for all persons within asbestos work area including authorized visitors. Type of respirator (full-face or half-face APR) depends on the classification of Type 2 operation.
 1. **Half-Face Air-Purifying Respirator (APR)**
 1. Half-face APR is required for asbestos operations not specified in 1.92.1.2 below.
 2. **Full Face Air-Purifying Respirator (APR)**
 1. Full-face APR is required for the following Type 2 operations
 1. Removing all or part of a false ceiling to obtain access to a work area, if asbestos-containing material is likely to be lying on the surface of the false ceiling.
 2. Breaking, cutting, drilling, abrading, grinding, sanding or vibrating non-friable asbestos-containing material if the work is done by means of power tools that are attached to dust-collecting devices equipped with HEPA filters **and** the material is not wetted.
 3. **Filters:** acceptable filters include N-, R-, or P-100 filters.
 1. Replace filters daily or test according to manufacturer's specifications and replace as indicated.
 2. Respirators shall be acceptable to Occupational Health Branch of Ministry of Labour, Immigration, Training and Skills Development.
 3. Provide proper instruction to workers and visitors on use of respirators, including qualitative fit testing.
 4. No supervisor, worker or authorized visitor shall wear facial hair which affects seal between respirator and face.
 5. Maintain respiratory protection equipment in proper functioning and clean condition, or remove from site
3. **Protective Clothing:** Provide workers and visitors in asbestos work area with full body coveralls with integral hoods. Once coveralls are worn in asbestos work area, treat and dispose of as asbestos contaminated waste. Workers and visitors shall also wear other protective apparel required by Ministry of Labour, Immigration, Training and Skills Development construction regulations.
4. Before entering asbestos work area, put on respirator with new or tested filters, clean coveralls and head covers. Wear coveralls with hoods up at all times.
5. Workers may leave asbestos work area, only after all disturbance of asbestos-containing materials is complete and work area has been cleaned-up. When leaving asbestos work area, workers and visitors must use HEPA vacuum to clean exterior of respirator to remove visible contamination, and remove gross contamination from coveralls and other protective equipment. Immediately upon leaving asbestos work area, workers and visitors shall remove coveralls, wash face and hands thoroughly with soap and water, and wet clean inside of respirator. Remove filters and dispose of or test filters according to manufacturer's

specifications. Place coveralls and used filters in receptacles for disposal with other asbestos contaminated materials. Coveralls can be reused, to maximum of 8 hours wear, if coveralls remain inside work area.

6. Do not eat, drink, smoke or chew gum or tobacco in asbestos work area.
7. Workers and visitors shall be fully protected as specified herein whenever possibility of disturbance of asbestos exists.

Part 2 Products

2.1 MATERIALS

1. Polyethylene Sheeting: 0.15 mm (6 mil) minimum thickness unless otherwise specified; in sheet size to minimize joints.
2. Rip-Proof Polyethylene: 0.20 mm (8 mil) fabric made up from 0.13 mm (5 mil) weave and 2 layers 0.04 mm (1.5 mil) poly laminate, in sheet size to minimize joints.
3. Tape: Tape suitable for sealing polyethylene to surface encountered under both wet conditions using amended water, and dry conditions.
4. Wetting Agent: Non-sudsing surface active agent; mixed with water in concentration to provide thorough wetting of asbestos fibre: Asbestos-Wet, distributed by Asbetec Distributors, Richmond Hill, Ontario.
5. Amended Water: Water with wetting agent added.
6. Asbestos Waste Receptors: 2 separate containers of which 1 shall consist of 0.15 mm (6 mil) minimum thickness polyethylene bag. Other container may be 0.15 mm (6 mil) minimum thickness polyethylene bag or rigid sealable container such as metal or cardboard, fibre drum or wood box. Other container shall be adequate to prevent perforating rips, or tears in first container during filling, transport or disposal. Containers must be acceptable to disposal Site selected and Ministry of the Environment, Conservation and Parks.
7. Sealer: Sealer for purpose of trapping residual fibre debris. Product must have flame spread and smoke development ratings both less than 25. Product shall leave no stain when dry: TC-55 (clear), A/D Fire Protection Systems Inc., Scarborough, Ontario. For mechanical equipment, pipes, boilers, etc. use high temperature sealer only: Chil-Abate CP210, Childers Products Company, Mississauga, Ontario.
8. Glove Bag: Prefabricated, 0.25 mm (10 mil) minimum thickness polyvinyl-chloride bag with integral 0.25 mm (10 mil) thick polyvinyl-chloride gloves and elasticized ports. Bag equipped with reversible double-pull double throw zipper on top to facilitate installation on pipe and progressive movement along pipe and with straps for sealing ends to bag around pipe: Safe-T-Strip manufactured by Hazmasters Equipment Inc., Pickering Ontario, in configurations suitable for work.
9. Sprayer: Garden-type portable manual sprayer, low velocity, capable of producing mist or fine spray.
10. HEPA Vacuum: Vacuum with all necessary fittings, tools and attachments. Air must pass HEPA filter before discharge.

Part 3 Execution

3.1 ASBESTOS WORK AREA(S) – FULL ENCLOSURE

1. Full enclosures must be constructed for Type 2 operations mentioned in 1.41.2 and 1.3 in Section 02 82 13.2 (Type 2 Asbestos Abatement).
2. Move equipment, tools, and stored materials which can be moved without disturbing asbestos-containing materials.
3. Remove elements which can be removed without disturbing asbestos-containing materials.
4. If working from within building, request building personnel to shut off air handling and ventilation systems supplying or exhausting from asbestos work area enclosure(s). Ensure air-handling systems remain shut off for duration of work.
5. Erect wood or metal framing between asbestos work area and remaining building area, as necessary to support polyethylene sheeting enclosures. Free standing enclosure shall have completely sealed polyethylene top.
6. Use sufficient layers to provide adequate protection. Protect floors with at least one layer of polyethylene sheeting. Where walls are protected with sheeting, cover floors first so that wall polyethylene overlaps floor layer by at least 300 mm (12").
7. Where applicable clean previously contaminated surfaces with HEPA vacuum before covering with sheeting.
8. If enclosure is used for more than 1 shift, construct airlock for entry to and exit from enclosure. Clean enclosure prior to exiting at completion of each shift.
9. Establish negative pressure in asbestos work area. Operate negative pressure units or HEPA vacuums continuously from this time until completion of contaminated work.
10. Provide soap, water and towels for washing of worker's face and hands when exiting enclosure.
11. Maintain emergency and fire exits from asbestos work area, or establish alternative exits satisfactory to authorities having jurisdiction.
12. Ensure existing power supply to asbestos work area is isolated and disconnected where necessary. Do not disrupt power supply to remainder of building.

3.2 ASBESTOS WORK AREA(S) [NO ENCLOSURE]

1. Establish asbestos work area with appropriate hoarding (partial enclosure, caution tape, fencing, etc.) to prevent unauthorized access to the asbestos work area.
2. Move equipment, tools, and stored materials which can be moved without disturbing asbestos-containing materials.
3. Remove elements which can be removed without disturbing asbestos material.
4. Request building personnel to shut off air handling and ventilation systems supplying or exhausting from asbestos work area(s). Ensure air-handling systems remain shut off for duration of work.
5. Use sufficient layers to provide adequate protection. Protect floors with at least one (1) layer of polyethylene sheeting.

6. Where applicable, clean previously contaminated surfaces with HEPA vacuum before covering with sheeting.
7. Provide soap, water and towels for washing of worker's face and hands when exiting enclosure.
8. Ensure existing power supply to asbestos work area is isolated and disconnected where necessary.

3.3 MAINTENANCE OF ASBESTOS WORK AREA(S)

1. Maintain asbestos work area in tidy condition.
2. Ensure barriers and polyethylene linings are effectively sealed and taped. Repair damaged barriers and remedy defects immediately upon discovery.
3. Visually inspect asbestos work area(s) at beginning of each working period.

3.4 COMMENCE ASBESTOS REMOVAL OR CLEANUP WORK WHEN

1. Arrangements have been made for disposal of waste.
2. Asbestos work area(s) and parts of building required to remain in use are effectively segregated.
3. Tools, equipment and materials waste receptors are inside asbestos work area(s).
4. Signs are displayed in all areas where access to sealed asbestos work areas possible. Signs shall read:

CAUTION
Asbestos Hazard Area
No Unauthorized Entry
Wear assigned protective equipment
Breathing asbestos dust may cause serious bodily harm.

5. Owner's Consultant has been notified of intention to proceed and has reviewed asbestos work area(s) and equipment.

3.5 REMOVAL OF FRIABLE MATERIALS ($\leq 1.0M^2$)

1. Before commencing work, prepare asbestos work area as described in 3.1 (full enclosure), 3.3, and 3.4.
2. Seal opening to enclosure with tape after entry of worker. Worker shall remain inside enclosure until disturbed asbestos-containing materials are removed and enclosure has been effectively cleaned.
3. Perform work required inside enclosure.
4. When cleaning or removing asbestos-containing material within enclosure, spray asbestos-containing material with amended water. Saturate asbestos to prevent release of airborne fibres during removal. Place fully saturated asbestos directly into waste containers.
5. Treat materials removed including used polyethylene sheeting as asbestos contaminated waste and dispose of as such.
6. Carefully place asbestos waste in inner bag of asbestos waste receptor. Clean inner bag surface of gross contamination and place in clean 6 mil outer bag. If waste is likely to tear

inner bag, then instead of outer bag, use fibre or metal drum, cardboard or wood box, or other suitably sturdy container

7. Following completion of work, clean surfaces from which asbestos has been disturbed with HEPA vacuum, or wet-sponge if appropriate to remove all visible material.
8. After wet-sponging or vacuuming to remove visible asbestos, wet clean entire enclosure. Apply coat of sealer to all surfaces from which asbestos has been disturbed. Apply thinned coat (sufficient to coat all surfaces) to interior of polyethylene enclosure prior to tear down.

3.6 TEAR DOWN OF PROTECTION

1. When dismantling enclosure, carefully roll polyethylene toward centre of enclosure. As polyethylene is rolled away, immediately remove any visible debris with HEPA vacuum.
2. Place polyethylene sheeting seals, tape, cleaning material, coveralls, and other contaminated waste in asbestos waste receptors for transport. Remove any debris fallen behind plastic with HEPA vacuum.
3. Clean up asbestos waste receptors and equipment used in work, and remove from asbestos work area(s) via drum and equipment decontamination enclosure systems, at appropriate time in sequence. Double bag waste immediately prior to transport from site to disposal bin.
4. Final review may be carried out by Owner's Consultant to ensure no dust or debris remains.

3.7 GLOVE BAG FITTING INSULATION REMOVAL

1. Isolate asbestos work area with tape barriers, saw-horses, or other barriers posted with notices marking area as asbestos removal area. Workers performing glove bag removal shall wear half face piece air purifying respirators with P100 HEPA filter cartridges.
2. Pre-clean surface of fitting of fallen or damaged insulation by HEPA vacuuming or damp wiping.
3. Spray areas of damaged jacketing with mist of amended water. Tape over damage, or wrap with polyethylene sheeting, to provide temporary repair.
4. If fitting insulation is not jacketed spray surface with mist of amended water and wrap entire length of fitting with 0.15 mm (6 mil) polyethylene sheeting taped in place.
5. Place tools necessary to remove insulation in tool pouch. Zip bag onto fitting and seal all openings to fitting with cloth securing straps. For valve bags seal valve cover with wire tie or equivalent.
6. Place hands into gloves and use necessary tools to remove insulation. Arrange insulation in bag to obtain full capacity of bag. Roll jacketing carefully to minimize possibility of ripping or puncturing bags.
7. Insert nozzle of spray pump into bag through valve and wash down fitting and interior of bag thoroughly. Use one hand to aid washing process. Wet surface of insulation in lower section of bag and exposed end of asbestos insulation remaining on fitting by spraying with water prior to moving bag.
8. If bag is to be moved along fitting, move bag, re-seal to fitting using double-pull zipper to pass hangers. Repeat stripping operation.
9. If bag is removed from fitting for use on new fitting, seal interior zip lock. Reinstall in new location before opening zip lock.

10. If glove bag is ripped, cut or opened in any way, cease work and repair with tape before continuing work. If opening is not easily repaired workers in area shall put on disposable coveralls. Clean spilled material with HEPA vacuum or wet washing.
11. To remove bag once filled, wash top section and tools thoroughly. Place tools in one hand (glove), pull hand out inverted, twist to create separate pouch, double tape to seal. Cut between tape and place pouch with tools in next glove bag; or into water bucket, open pouch underwater, clean tools and allow to dry.
12. Pull waste disposal bag over glove bag before removing from fitting. Remove securing straps. Unfasten zipper.
13. After removal of bag ensure fitting is clean of residue. If necessary, after removal of each section of asbestos, HEPA vacuum surfaces of fitting or wipe with wet cloth. Ensure that surfaces are kept free of wet sludge.
14. Before completion of shift, apply sealer to all surfaces of freshly-exposed fitting. Apply heavy coat of sealer to exposed ends of asbestos insulation to remain.
15. Once bag filled dispose of as contaminated waste. Do not reuse bag.

3.8 RE-ESTABLISHMENT OF OBJECTS AND SYSTEMS

1. When clean-up is complete reinstall items removed to facilitate asbestos related operation, in their proper positions. Reconstruction and reinstallation shall be by tradesmen qualified in work being reinstalled or reconstructed.
2. At completion of work make good all damage not identified in pre-removal survey referred to in para. 1.81.4.

3.9 INSPECTION

1. From commencement of work until completion of clean-up operations, Clients Consultant may be present.
2. If visual inspection indicates that areas outside current asbestos work area enclosures are contaminated these areas are to be cleaned in same manner as that applicable to asbestos work areas, at no cost to Client.
3. Pay cost to provide re-inspection of work found not to be in accordance with these specifications and requirements of authorities having jurisdiction.

3.10 WASTE TRANSPORT AND DISPOSAL

1. Conform to requirements of Regulation 347 (as amended) made under Environmental Protection Act for Waste Management, transporting and disposal of hazardous waste.
2. Obtain Certificate of Approval from Ministry of the Environment, Conservation and Parks for waste management disposal system for asbestos.
3. Check with dump operator to determine type of waste containers acceptable.
4. Ensure shipment of containers to dump is taken by waste hauler licensed to transport asbestos waste.
5. Each load requires completion of bill of lading showing type and weight of hazardous waste being transported.

6. Co-operate with Ministry of the Environment, Conservation and Parks inspectors and immediately carry out instructions for remedial work at dump to maintain environment, at no additional cost to Owner.
7. Ensure dump operator is fully aware of hazardous material being dumped.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

1. Conform to Sections of Division 1 as applicable.

1.2 RELATED SECTIONS

1. Section 02 82 13.0 – Asbestos Abatement Scope of Work
2. Section 02 82 13.1 – Type 1 Asbestos Abatement
3. Section 02 82 13.2 – Type 2 Asbestos Abatement

1.3 SITE CONDITIONS

1. Types of asbestos present: Chrysotile present within but not limited to cinderblock filler (paint).
2. Materials identified to contain Asbestos can be found in the following Safetech Environmental Limited report, “Designated Substances and Hazardous Materials Assessment Report, Accessibility Upgrade, Sir Oliver Mowat Collegiate Institute, 5400 Lawrence Avenue East, Toronto, Ontario” issued on March 20, 2026.

1.4 DESCRIPTION OF WORK

1. The following are classified as **Type 3 operations** under O. Reg. 278/05:
 1. The removal or disturbance of more than one square metre of friable asbestos-containing material during the repair, alteration, maintenance or demolition of all or part of a building, aircraft, ship, locomotive, railway car or vehicle or any machinery or equipment.
 2. The spray application of a sealant to friable asbestos-containing material.
 3. Cleaning or removing air handling equipment, including rigid ducting but not including filters, in a building that has sprayed fireproofing that is asbestos-containing material.
 4. Repairing, altering or demolishing all or part of a kiln, metallurgical furnace or similar structure that is made in part of refractory materials that are asbestos-containing materials.
 5. Breaking, cutting, drilling, abrading, grinding, sanding or vibrating non-friable asbestos-containing material, if the work is done by means of power tools that are not attached to dust-collecting devices equipped with HEPA filters.
 6. Repairing, altering or demolishing all or part of any building in which asbestos is or was used in the manufacture of products, unless the asbestos was cleaned up and removed before March 16, 1986.
2. If removing more than 1.0m² of asbestos-containing texture coat finish perform all work in accordance with Section 02 82 13.3 (Type 3 Asbestos Abatement).
3. Dispose of temporary enclosures, disposable equipment and any asbestos-containing or contaminated materials removed, as asbestos waste.

4. HEPA-filtered construction air handling units must be DOP-tested on-site.
5. Abatement contractor must provide a bill of lading for the disposal of asbestos waste.
6. Seal surfaces from which asbestos has been removed and surfaces potentially contaminated with asbestos, with sealer.
7. Maintain only emergency electrical and mechanical services passing through asbestos work area. All other services must be deactivated during abatement work.
8. All work will be subject to inspection and air monitoring inside and outside asbestos work area by the Owner's Consultant. Any contamination of surrounding areas, indicated by visual inspection or air monitoring, shall necessitate complete cleanup of affected areas at no additional cost to the Owner.
9. Protect surfaces remaining within asbestos work area.

1.5 REFERENCES

1. Canadian Standards Association (CSA): CSA Z180.1-19 Compressed breathing air and systems.
2. Canadian Standards Association (CSA): CSA-Z94.4-18 Selection, use, and care of respirators.

1.6 DEFINITIONS

1. **Authorized Visitor(s):** Owner's Consultant, person(s) representing regulatory agencies, or other authorized persons.
2. **Competent Person or Supervisor:** A person who is qualified because of knowledge, training and experience, to organize the work and its performance; is familiar with the Occupational Health and Safety Act and the regulations that apply to the work; and has knowledge of any potential or actual danger to health or safety in the workplace.
3. **Contractor:** Asbestos abatement contractor providing demolition, removal and cleaning services as defined in these specifications.
4. **Critical Barrier or Enclosure:** Minimum of two separate layers rip-proof polyethylene sheeting taped securely and separately over windows, doorways, diffusers, grilles and any other openings between Work Area and areas outside of the Work Area, including outside of the building.
5. **Curtained Doorway:** Device to allow ingress or egress from one room to another while permitting minimal air movement between rooms, typically constructed by placing two (2) overlapping sheets of polyethylene sheeting (two sheets of polyethylene sheeting per flap) attached to head and one jamb of existing or temporarily constructed door frame. Secure vertical edge of one flap along one vertical side of doorframe and vertical edge of other flap along opposite vertical side of doorframe. Reinforce free edges of polyethylene sheeting with duct tape.
6. **DOP Test:** A testing method employing dioctyl phthalate aerosol for purpose of leak testing negative air units.
7. **Friable Material:** Material that when dry can be crumbled, pulverized or powdered by hand pressure and includes such material that is crumbled pulverized or powdered.

8. **HEPA Filter:** High Efficiency Particulate Aerosol filter at least 99.97 percent efficient in collecting 0.3-micrometer aerosol.
9. **HVAC:** Heating, ventilating and air-conditioning system(s) which serve occupied areas. Includes, but is not limited to, air handling units, ductwork, terminal boxes and grilles.
10. **Polyethylene Sheeting:** Polyethylene sheeting of 0.15 mm (6 mil) minimum thickness with tape seals along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide continuous membrane protection
11. **Negative Pressure:** Reduced pressure within asbestos work area(s) established by extracting air directly from work area, and discharging it directly to exterior of building or to an adjacent area within the building outside of the Work Area. Discharged air first passes through HEPA filter. Extract sufficient air to ensure constant reduced pressure at perimeter of work area with respect to surrounding areas.
12. **Occupied Area:** Areas of the building or work site that are outside of the Work Area.
13. **Owner:** Toronto Community Housing and its representatives.
14. **Owner's Consultant:** Safetech Environmental Limited, the environmental consultant overseeing asbestos abatement.
15. **PPE:** Personal protective equipment.
16. **Work Area:** Specific area or location where actual asbestos abatement work is being performed or such other area of the building which it has been determine may be hazardous to public health as a result of asbestos abatement.

1.7 REGULATIONS

1. Comply with applicable Federal, Provincial, and Local laws and regulations in effect at time work is performed. In case of conflict among these requirements or with these specifications the more stringent requirement applies. Contractor shall observe all such laws and regulations and shall obtain and/or pay all permits, notices, fees, taxes, duties as may be required. If no regulations exist, follow guidelines most widely accepted by recognized professional organizations such as occupational hygienists, health professionals and environmental consultants as listed in paragraph 1.5 References.
2. Contractor shall ensure that the measures and procedures prescribed under the Occupational Health & Safety Act (the Act) are carried out and that every employee and worker on the project complies with applicable regulations (as amended) made under the Act, including (but not limited to):
 1. Ontario Regulation 213/91 – Construction Projects
 2. Ontario Regulation 278/05 – Designated Substance - Asbestos on Construction Projects and in Buildings and Repair Operations
 3. Ontario Regulation 297/13 – Occupational Health and Safety Awareness and Training
 4. Ontario Regulation 490/09 – Designated Substances
 5. Ontario Regulation 632/05 – Confined Spaces
 6. R.R.O. 1990, Regulation 860 – Workplace Hazardous Materials Information System (WHMIS)

3. Asbestos-containing waste or contaminated waste to be handled and disposed of in accordance with R.R.O. 1990, Regulation 347/90, "General – Waste Management" made under The Environmental Protection Act.

1.8 QUALITY ASSURANCE

1. Ensure work proceeds to schedule, and meets all requirements of this Section. Perform work so that airborne asbestos, asbestos waste, or water runoff do not contaminate areas outside asbestos work enclosure.
2. Pay cost to the Owner of inspection and air monitoring performed as result of failure to perform work satisfactorily regarding quality, safety, or schedule.
3. Use only skilled and qualified workers for all trades required for this work.
4. Contractor shall ensure that:
 1. Measures and procedures prescribed under the Occupational Health & Safety Act and regulations are carried out.
 2. Every employee and every worker on project complies with applicable act and regulations.
 3. Health & safety of workers and public is protected.
 4. All material handling, and associated equipment conform to and are operated in accordance with "Workplace Hazardous Materials Information System" (WHMIS).
 5. Advise the Owner whenever work is expected to be hazardous to employees and/or public.
5. Contractor may be requested to provide information on their health & safety record.

1.9 SUBMITTALS

1. Submit proof that all workers conducting abatement activities have successfully completed the **Asbestos Abatement Worker** Training Program approved by the Ministry of Labour, Immigration, Training and Skills Development and supervisors conducting abatement activities have successfully completed the **Asbestos Abatement Supervisor** Training Program approved by the Ministry of Labour, Immigration, Training and Skills Development as outlined in Section 20 of Ontario Regulation 278/05.
2. Submit names of supervisory personnel who will be responsible for asbestos work area(s). One of supervisors must remain on Site at all times while asbestos removal or clean-up is occurring. Submit proof that supervisory personnel have attended training course on asbestos control (2-day minimum duration) and have performed supervisory function on at least two other asbestos control projects.
3. Submit proof satisfactory to Owner's Consultant that workers have had instruction and training related to care and use of respirators in accordance with and have been fit-tested for the type(s) of respirator(s) to be used.
4. Submit Notice of Project [Form 0175] to the Ministry of Labour, Immigration, Training and Skills Development. Print and sign a copy of the Notice of Project and post or make it available at the project site.
 1. Not later than ten days before commencing asbestos work on this project, notify in writing Ontario Ministry of Labour, Immigration, Training and Skills

Development, Construction Health and Safety Branch located nearest to the area the abatement is being conducted. The information provided to the Ontario Ministry of Labour, Immigration, Training and Skills Development must comply with the requirements outlined in Section 11, subsection 3 of O. Reg. Orally notify them before commencing work.

5. Submit Material Safety Data Sheets (MSDSs) for all products to be used during asbestos abatement.
6. Obtain and submit all necessary permits for transporting and disposal of asbestos waste.
 1. Notify sanitary landfill site in accordance with requirements of Reg. 347.
7. Submit proposed schedule showing phasing and proposed workforce related to each work area enclosure or repair operation.
8. Submit list of existing damage for acceptance.
9. Submit proof that abatement contractor is a member of and in good standing with the Environmental Abatement Council of Ontario (EACO).
10. Submit proof of Contractors Liability Insurance for dealing with hazardous materials, specifically stating that asbestos is not excluded from the policy.
11. Submit confirmation of good standing with Workplace Safety and Insurance Board (WSIB).

1.10 WORKER AND VISITOR PROTECTION

1. **Instructions:** Before entering asbestos work area, instruct workers and visitors in use of respirators, dress, showers, entry and exit from asbestos work areas, and all aspects of work procedures and protective measures. Instruction shall be provided by Competent Person as defined by Occupational Health and Safety Act.
2. **Full-Face Air-Purifying Respirator:** During wet removal and cleanup in enclosed asbestos work area workers, supervisors, and authorized visitors shall be supplied with and use air-purifying full-face respirator (APR) with N-, R- or P-100 filters. Replace filters daily or test according to manufacturer's specifications and replace as indicated. Respirators shall be acceptable to Occupational Health Branch of Ministry of Labour, Immigration, Training and Skills Development. Provide proper instruction to workers and visitors in use of respirators, including qualitative fit testing. Maintain respiratory protection equipment in proper functioning and clean condition.
3. **Atmosphere Supplying Respirators:** Removal of more than 1.0 m² of sprayed applied asbestos-containing materials that contain a type of asbestos other than chrysotile or the dry removal of asbestos-containing materials indicated in paragraph 1.41 require the use of atmosphere supplying respirators as stipulated in O. Reg. 278/05.
 1. Prior to use, testing of the compressed air system used with supplied air respirators shall be completed to ensure it meets the standards set out in Table 1 of CSA Standard Z180.1-19, Compressed Breathing Air and Systems.

1. If an oil-lubricated compressor is used to supply breathing air, a continuous carbon monoxide monitor equipped with an alarm shall be provided.
2. If an ambient breathing air system is used, the air intake shall be located in accordance with Appendix B of CSA Standard Z180.1-19.
4. **Protective Clothing:** Provide workers and visitors in Work Area with full body coveralls with integral hoods. Once coveralls are worn in the Work Area, dispose of as contaminated waste. Workers and visitors shall wear other protective apparel required by Ministry of Labour, Immigration, Training and Skills Development regulations.
5. Before entering Work Area, remove street clothes in clean change room and put on respirator with new or tested filters, clean coveralls and head covers before entering equipment and access areas or Work Area. Store street clothes, uncontaminated footwear, towels etc. in clean change room.
6. Persons leaving Work Area shall remove gross contamination from clothing before entering dirty room of decontamination facility. Proceed to equipment and access area and remove all clothing except respirator. Place contaminated work suit in receptacles for disposal with other asbestos contaminated materials. Footwear, clothing, hardhats, protective eyewear, etc., shall be left in equipment and access area to dry for later use. Still wearing respirator proceed naked to showers. Clean respirator to ensure that visible contamination is removed. After having thoroughly washed hair and body with shampoo and soap, remove respirator. Remove filters and dispose of in container provided for this purpose or test filters according to manufacturer's recommendation. Dispose of filters as necessary. Wet clean inside of respirator. Upon completion of asbestos abatement, dispose of footwear as contaminated waste or clean before removing from equipment and access area, or carry in sealed plastic bag to next site.
7. Following showering, proceed to clean change room, dry off and dress in street clothes. Store respirators in fashion to allow them to be put on prior to entering asbestos work area at start of next shift without contaminating clean area. If re-entry to Work Area is to take place after having left for eating or drinking, follow procedures in para. 1.105.
8. Removal of waste and equipment from holding room of waste decontamination enclosure system shall be performed by workers entering from outside. These workers shall wear clean coveralls and half-face air-purifying respirator with P100 filters. No worker shall use this system as means to leave or enter Work Area.
9. Do not eat, drink smoke or chew gum or tobacco at work site. Tobacco products are not allowed on property.
10. Workers and visitors shall be fully protected as specified herein when possibility of disturbance of asbestos exists.

Part 2 Products

2.1 MATERIALS

1. **Polyethylene:** 0.15 mm (6 mil) minimum thickness unless otherwise specified.
2. **Rip-Proof Polyethylene:** 0.20 mm (8 mil) fabric made up from 0.13 mm (5 mil weave and 2 layers 0.04 mm (1.5 mil).

3. **Tape:** Tape suitable for sealing polyethylene to surface encountered, under both wet conditions using amended water, and dry conditions.
4. **Wetting Agent:** Non-foaming surface active agent; mixed with water in concentration to provide thorough wetting of asbestos fibre: Standard of Acceptance, Asbesto-Wet, distributed by Asbetec Distributors, or equivalent.
5. **Amended Water:** Water with wetting agent added.
6. **Asbestos Waste Receptors:** Two separate containers of which 1 shall consist of 0.15 mm (**true 6 mil**) minimum thickness sealable polyethylene bag. Other container may be 0.15 mm (**true 6 mil**) minimum thickness polyethylene bag. Outer container shall be adequate to prevent perforating rips, or tears during filling, transport or disposal. Containers must be acceptable to disposal site selected, and the Ministry of the Environment, Conservation and Parks, and shall be clearly marked to indicate that contents contain asbestos.
7. **Sealer:** Sealer for purpose of trapping residual fibre debris. Product must have flame spread and smoke development ratings both less than 25. Product shall leave no stain when dry: Standard of acceptance - TC-55 (clear), A/D Fire Protection Systems Inc., Scarborough, Ontario, or equivalent. For mechanical equipment, piping and boilers, etc. use high temperature sealer only: Standard of acceptance - Chil-Abate CP210, Childers Products Company, or equivalent.
8. **Ground Fault Panel:** Portable electrical panel equipped with ground fault circuit interrupters (5 mA protection) of sufficient capacity to power all electrical equipment and lights in asbestos work enclosure. Panel complete with ground fault interrupter lights, test switch to ensure unit is working, and reset switch
9. **HEPA Vacuum:** Vacuum with all necessary fittings, tools and attachments. Air must pass HEPA filter before discharge.
10. **Protective Coveralls:** Disposable full body coveralls complete with elasticized hoods made of spun polyolefin material Tyvek by Dupont or nonwoven material Kleenguard by Kimberley Clark (or equivalent).
11. **Flexible ducting:** Metal reinforced flexible ductwork, 12" diameter minimum.
12. **Negative Air Unit:** Portable air handling system, which extracts air directly from asbestos work area and discharges air outside building. Unit shall be fitted with prefilter and HEPA final filter. Air shall pass HEPA filter before discharge. Unit shall have pressure differential gauge to monitor filter loading. Unit shall have auto shut-off and warning system for HEPA filter failure. HEPA filter shall have separate hold down clamps to retain filter in place.
13. **Power Sprayer:** Standard of acceptance - Graco Maxi-wetter, or equivalent.
14. **Encapsulant:** Standard of acceptance - Ocean No. 666, Ocean Fire Retardants Inc., or equivalent, coloured bright red.

Part 3 Execution

3.1 PREPARATION

1. Occupants who will be impacted by the work will need to be temporarily relocated during the work.

2. Cover wall and floor surfaces with polyethylene sheeting sealed with tape. Provide two separately sealed layers of reinforced polyethylene sheeting. Separately seal floor drains or openings. Use sufficient layers (2) and necessary sheathing for walking surface to protect floors which may be damaged. Cover floors first so that polyethylene extends at least 300 mm (12") up walls then cover walls to overlap floor sheeting. Provide additional protection for floors likely to be damaged by amended water, by covering floor with rip-proof polyethylene sheeting sealed with tape.
3. Seal off openings such as doorways, windows, vents, service holes in walls and grilles to non-operating ducts with polyethylene sheeting with tape or with polyurethane foam as appropriate.
4. If applicable, cover with polyethylene sheeting, motors, heating units, fire apparatus, door closers, benches, shelving, storage racks, valves, taps, controllers, lights, and other fixtures and furnishings which are not being removed from asbestos work area and which could be damaged and/or which cannot be readily cleaned at completion of this work. Pre-clean surfaces potentially contaminated with asbestos, with HEPA vacuum or damp cloth prior to installing protection.
5. Install plywood enclosures, covered with rip-proof polyethylene sheeting to protect equipment or fixtures in asbestos work area(s) that may be damaged.
6. Establish negative pressure in asbestos work area as described in Para. 1.611. Negative pressure units shall have total rated capacity with filters in place sufficient to provide minimum one (1) air change every twenty (20) minutes in wet removal sites. Volume of air shall be sufficient to ensure airflow is maintained from clean areas into asbestos work area. Vent units to outside of building by removing, and later replacing, windows, and/or providing flexible ducting. Locate vents to discharge air away from building access points or sidewalks. Do not discharge air into building interior without obtaining approval from The Owner's Consultant. Leak test negative air units prior to commencement of abatement at operating position, using DOP method. Provide reports for unit efficiency test results within 48 hours of testing, including calibration certificates for testing equipment. Venting of exhaust air through occupied area shall be in rigid airtight ductwork. Operate negative pressure units continuously from this time until completion of final air monitoring. Replace pre-filters as necessary to maintain airflow. Maintain negative air pressure of 5 Pascal (0.02 inches water column) pressure reduction within asbestos enclosure with respect to surrounding areas.
7. Maintain emergency and fire exits from asbestos work area, or establish alternative exits satisfactory to authorities having jurisdiction.
8. Ensure existing power supply to asbestos work area is isolated and disconnected where necessary. Do not disrupt power supply to remaining areas of building. Provide ground fault electrical system where application of amended water is required for wetting asbestos containing materials. Supply all electrical apparatus from this ground fault system. Ensure safe installation of electrical lines and equipment.
9. Provide temporary lighting in asbestos work area to levels that will permit work to be done safely and well.
10. Provide fire extinguisher at each emergency exit, and in decontamination facilities. Protect extinguishers with polyethylene sheeting in manner that will not hamper emergency use.

3.2 WORKERS' DECONTAMINATION ENCLOSURE SYSTEM

1. Construct workers' decontamination enclosure at entrance to Work Area. Worker decontamination enclosure system shall comprise three interconnecting rooms as follows:
2. Provide a set of curtain doorways between each room, and at both dirty and clean entrances to enclosure systems.
3. **Equipment and Access Room:** Build room between shower room and Work Area. Install waste receptor, and storage facilities for worker's shoes and any protective clothing to be reworn in asbestos work areas. Equipment and access room shall be large enough to accommodate specified facilities, and other equipment needed, and at least one worker allowing sufficient space to undress comfortably. Minimum size 3 square metres (30 sq. ft.).
4. **Shower Room:** Build room between clean room and equipment and access room. Provide constant separate supplies of hot and cold water. Provide valves controllable at shower(s) to regulate water temperature. Provide rigid piping with watertight connections and connect to water sources and drains. Provide soap, clean towels and appropriate containers for disposal of used respirator filters. Direct wastewater to sanitary sewer drains via water filtering system consisting of a minimum 2-stage filtering system (25-micron and 5-micron filters).
5. **Clean Room:** Build room between shower room and clean areas outside of enclosures. At doorway to clean room, provide vented wood door, with locking passage set. Provide hangers for workers' street clothes and personal belongings. Provide storage for clean protective clothing and respiratory equipment. Install water heater, if required.

3.3 WASTE AND EQUIPMENT DECONTAMINATION ENCLOSURE SYSTEM

1. Construct system comprised of three linked rooms: Purpose of this system is to provide means to decontaminate drums, scaffolding, material containers, vacuum and spray equipment; and other tools and equipment for which worker decontamination system is not suitable. Provide curtain doorways between rooms, and at both dirty and clean entrances to Enclosure System.
2. **Staging Area:** Build staging area in asbestos work area for gross removal of dust and debris from waste containers and equipment, labeling and sealing of waste containers, and temporary storage pending removal to container cleaning room.
3. **Container Cleaning Room:** Build container cleaning room between staging area and holding room. Room shall be of sufficient size to allow proper washing of equipment and drums or double bagging of asbestos waste. Treat wash water as asbestos contaminated waste.
4. **Holding Room:** Build holding room between container cleaning room and uncontaminated area. Holding room shall be of sufficient size to accommodate largest item of equipment used and ten waste containers.

3.4 CONSTRUCTION OF DECONTAMINATION ENCLOSURES

1. **Floor:** Prior to erecting wall framing, lay 1 sheet of rip-proof polyethylene sheeting over floor area to be covered by enclosures. Turn 600 mm (24") of rip-proof polyethylene sheeting up outside of enclosure, overlapping with polyethylene sheeting covering perimeter walls. Provide second layer of rip-proof polyethylene sheeting to all floors, extending 600 mm up inside of enclosure walls.

2. **Walls:** Build load-bearing walls of 39 mm x 89 mm (2" x 4") wood framing, 400 mm (16") o.c. with continuous top and sill plates. Cover both sides walls with polyethylene sheeting. Walls exposed to asbestos work area shall be covered with min. 9 mm (3/8") plywood sheathing or hardboard. Caulk seal and tape plywood joints. Walls exposed to occupied area shall be covered with good one side 9 mm plywood.
3. **Roof:** Size of joists shall be determined by span, loads, use and Code. Use as a minimum 39 mm x 138 mm (2" x 6") joists. Cover joists with 19 mm (3/4") plywood sheathing. Seal and tape joints, and cover with two layers of rip-proof polyethylene sheeting. At underside of joists install one layer of polyethylene sheeting.
4. **Doorways:** Build curtain doorways designed so that when workers or drums and equipment move through doorway, one of two barriers comprising doorway always remains closed.

3.5 MAINTENANCE OF ENCLOSURES

1. Maintain enclosures in tidy condition.
2. Ensure barriers and polyethylene sheeting linings are effectively sealed and taped. Repair damaged barriers and remedy defects immediately upon discovery.
3. Visually inspect enclosures at beginning and end of each working period.

3.6 DO NOT COMMENCE ASBESTOS REMOVAL WORK UNTIL

1. Arrangements have been made for disposal of waste.
2. Asbestos work areas and decontamination enclosures are effectively segregated.
3. Negative pressure equipment is operating continuously.
4. Tools, equipment and waste materials receptors are on hand.
5. Signs are displayed in areas where access to sealed asbestos work area is possible. Signs shall read:

CAUTION
Asbestos Hazard Area
No Unauthorized Entry
Wear assigned protective equipment
Breathing asbestos dust may cause serious bodily harm.

6. Proof of notification to Ministry of Labour, Immigration, Training and Skills Development has been submitted.
7. The Owner's Consultant has been notified of intention to proceed and has reviewed enclosures, equipment and procedures.

3.7 CONTAMINATED PREPARATION

1. After work has been completed as described in 3.1 to 3.6, request inspection from Owner's Consultant before proceeding with Contaminated Preparation as described in 3.7.
2. Request building personnel to deactivate air handling and ventilation systems supplying or exhausting from asbestos work area(s).
3. Remove false ceiling (if required) and install upper seals (polyethylene seal from the top surface of the false ceiling to the structural deck) as necessary to allow polyethylene sheeting

to be fastened to structure. Each of two sheets forming wall of enclosure shall be fastened separately to deck using tape, spray adhesive, rapid setting foam or other suitable method. Provide suitable framing to support polyethylene sheeting. Seal holes in existing perimeter walls, columns, deck etc., to ensure an airtight asbestos work area.

4. Promptly seal holes or penetrations in structure above ceiling, ducts, etc. to provide airtight enclosure around asbestos work area(s).
5. Protect electrical, communication, life safety and control systems to remain in place in asbestos work area with polyethylene sheeting.
6. Seal joints and holes in uninsulated HVAC ductwork to remain operational through an asbestos work area, using tape and rip-proof polyethylene sheeting.

3.8 REMOVAL

1. Spray asbestos with amended water using airless spray equipment. Saturate asbestos to prevent release of airborne fibres during removal. Fully saturated asbestos may be scraped directly into waste containers or may be allowed to fall to floor.
2. Place asbestos waste into asbestos waste receptors. Double polyethylene bags are to be used, inner bag shall be cleaned of gross contamination and placed in a clean **6 mil** outer polyethylene bag in container cleaning room immediately prior to transfer from Site.
3. Treat all materials removed to expose asbestos, as asbestos-contaminated waste unless such materials are specified to be re-used.

3.9 CLEAN-UP

1. Clean surfaces from which asbestos has been removed with brushes and vacuum or wet-sponge to remove visible dust and debris.
2. Remove sealed and labeled asbestos waste receptors and dispose of in authorized disposal area in accordance with requirements of disposal authority.
3. After brushing and wet-sponging to remove visible asbestos, wet clean entire Work Area including equipment and access area, polyethylene sheeting and equipment used in process. Floor and wall surfaces, ducts, and similar items not covered with polyethylene sheeting must be wet cleaned.
4. Request visual inspection and acceptance. Following inspection and acceptance, apply heavy coat of slow drying sealer to all surfaces from which asbestos has been removed. Apply thinned coat (sufficient to coat all surfaces) to other surfaces in Work Area including all polyethylene sheeting and surfaces scheduled for demolition. Allow minimum of 12 hours flushing time with no disturbance of asbestos work area. Operate negative air units during this period.

3.10 DISMANTLING OF PROTECTION

1. If air sampling by The Owner's Consultant shows that levels in asbestos work area do not exceed 0.01 fibres/cc. as determined by NIOSH 7400 Method, A counting rules, proceed with final dismantling of Work Area.
2. Remove polyethylene sheeting exposed during contaminated work including upper surfaces plus any underlying sheeting contaminated by water leaks, rips, tears, or exposed by failure of upper layer. Wear half-face air-purifying respirator with P100 filters and disposable

coveralls during removal of sheeting. Carefully roll sheeting away from walls to center of Work Area. As sheeting is rolled away from walls and corners, HEPA vacuum visible debris.

3. While removing top layer of sheeting from surfaces protected by two layers of sheeting, cut lower sheeting so as to expose horizontal surfaces that may be contaminated with asbestos debris. HEPA vacuum any visible debris.
4. Place polyethylene sheeting, seals, tape, cleaning material, clothing, and other contaminated waste in asbestos waste receptors for transport. Remove with HEPA vacuum any debris which may have fallen behind sheeting.
5. Clean Work Area, equipment and access area, washing/showering room, and other enclosures that may have been contaminated during work.
6. Clean asbestos waste receptors and equipment used in work and remove from Work Area via drum and equipment decontamination enclosure system, at an appropriate time in sequence.
7. Remove hoardings, temporary lighting, equipment and facilities provided for work. A final review may be carried out by the Owner's Consultant to ensure that no dust or debris remains. Contractor responsible for inspecting and cleaning all adjacent spaces to the Work Area. Adjacent work areas to be left free of construction related dust and debris.

3.11 RE-ESTABLISHMENT OF OBJECTS AND SYSTEMS

1. When cleanup is complete re-establish mechanical and electrical systems to remain operative in proper working order. Arrange for, and pay costs of electrical or mechanical repairs needed due to work of this Section.
2. Make good all damage at completion of work not identified in pre-removal survey (para. 1.98).

3.12 AIR MONITORING

1. The Owner's Consultant will arrange for air samples to be taken from commencement of work until completion of cleaning operations, both inside and outside of Work Area in accordance with NIOSH methods.
2. If air monitoring (or visual inspection) shows that areas outside current asbestos work area(s) enclosure or decontamination facilities are contaminated above 0.05 fibre/cc., clean these areas in same manner as that applicable to asbestos work areas, at no cost to the Owner.
3. Air clearance sampling will be done in accordance with O. Reg. 278/05. The air clearance sampling will be conducted following aggressive air sampling methods as outlined in US Environmental Protection Agency "Guidance for Controlling Asbestos-Containing Materials in Buildings – Published June 1985 – Appendix M – Section M.1.5". A minimum of 2,400 L of air will be collected for each sample. An abatement area is deemed clear only if every air sample collected within the Work Area has a concentration of fibres that does not exceed 0.01 fibres/cc. The number of air clearance samples to be collected are based on Ontario Regulation. 278/05, Table 3.
4. If air monitoring in the Work Area shows airborne fibre levels exceed normal levels for wet removal, workers shall use positive pressure supplied air respirators with full-face piece.
5. If final air sampling by the Owner's Consultant shows that levels in completed Work Area do not exceed 0.01 fibres/cc. as determined by NIOSH 7400 Method - "A" counting rules, proceed with dismantling of Work Area.

6. Clearance level is < 0.01 f/cc.

3.13 INSPECTION

1. From commencement of work until completion of clean-up operations, the Owner's Consultant will be present on a full-time basis; both inside and outside Work Area. The following inspections will be conducted at a minimum:
 1. Pre-contamination inspection
 2. Inspection of upper seals and HVAC isolation measures
 3. Post-abatement inspection
 4. Clearance air sampling
2. If Work Area or adjacent areas are found unacceptable in accordance with standards specified or required by authorities having jurisdiction, correct such deficiencies at no cost to the Owner.
3. Pay cost to provide re-inspection of work found not to be in accordance with these specifications and requirements of authorities having jurisdiction.

3.14 WASTE TRANSPORT AND DISPOSAL

1. Conform to requirements of Regulation 347/90 (as amended) - General Waste Management under Environmental Protection Act for Waste Management, transporting and disposal of hazardous waste.
2. Check with dump operator to determine type of waste containers acceptable.
3. Ensure shipment of containers to dump is taken by waste hauler licensed to transport asbestos waste. Waste hauler in possession of valid Ministry of the Environment, Conservation and Parks Certificate of Approval to transport asbestos waste.
4. Each load requires completion of bill of lading showing type and weight of hazardous waste being transported. Provide copies of bill of lading indicating acceptance of waste at landfill.
5. Co-operate with Ministry of the Environment, Conservation and Parks inspectors and immediately carry out instructions for remedial work at dump to maintain environment, at no additional cost to the Owner.
6. Ensure dump operator is fully aware of hazardous material being dumped.
7. Ensure that containers used for dumping are locked and covered at all times.

END OF SECTION

PART 1 - GENERAL

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|-----|------------------------------------|----|--|
| 1.1 | <u>General Requirements</u> | .1 | Comply with requirements of Division 1. |
| 1.2 | <u>Related Sections</u> | .1 | Excavating, Backfilling and Grading: Section 02200 |
| 1.3 | <u>Existing Conditions</u> | .1 | Before commencing clearing, ensure by examination of site all possible factors concerning clearing are investigated, and the following are known in particular: <ul style="list-style-type: none">.1 Methods and means available for material handling, disposal, storage and transportation..2 Conformation and condition of ground surfaces..3 Location and elevation of existing services to remain..4 Location and/or limit of existing fences, pavement, trees and shrubs to remain..5 Character, quality and quantity of growth on site. |
| 1.4 | <u>Protection</u> | .1 | Protect public and private property adjacent to clearing performed by this Section. Make good and return property to original condition if damaged by clearing performed by this Section. |
| | | .2 | Do not damage root systems of existing trees, plants, and shrubs which are to remain, and future landscaped areas, by piling of surplus soil or debris over them, or by cutting when clearing. |
| | | .3 | Ensure locations of overhead and underground utility and other services have been established by an investigation conducted together with the utilities and maintenance staff of services concerned. Perform no clearing until locations of services have been verified and protective measures taken are satisfactory to all concerned. |
| | | .4 | Perform relocation, removal, protection and plugging of existing utility services only by the responsible utility, and of other services by licensed mechanics. |
| | | .5 | Immediately repair damage to trees, structures, buried and above ground services, benchmarks, and survey monuments should it occur as a result of clearing performed by this Section. Completely cover wounds of over 25.5mm diameter suffered by trees and shrubs with wound paint. |
| | | .6 | Protect and maintain established survey markers. If these markers are disturbed except where service connections have to be installed, the Contractor shall bear the cost to have them re-established by an Ontario Land Surveyor. |

PART 2 - PRODUCTS

- 2.1 **Materials**
- .1 Wound Paint: Bituminous paint specially prepared for use on trees and shrubs.
 - .2 Cleared and grubbed materials become property of Contractor, unless noted otherwise.

PART 3 - EXECUTION

- 3.1 **Clearing**
- .1 Clear site within limits of the Work site boundary and/or limit of works indicated on drawings, except for items specifically noted on drawings.
 - .2 Remove all pavements, concrete curb and walks, fences, surface debris, trees and shrubs to depth specified under 3.2 Grubbing.
 - .3 Remove trees, saplings, shrubs, bushes, vines and undergrowth to the following heights:
 - .1 150mm for trees over 150mm diameter.
 - .2 75mm for shrubs, saplings, bushes and trees under 150mm diameter.
 - .3 50mm for vines and undergrowth.
 - .4 Treat stumps over 100mm diameter below grubbing depth specified with herbicide applied in accordance with manufacturer's specifications to prevent regrowth.
- 3.2 **Grubbing**
- .1 Perform grubbing within the limits of the area cleared.
 - .2 Grub out and remove all stumps, roots over 100mm diameter and matted roots to the following depths:
 - .1 Remove completely under footings, walks, roads, parking areas, slab on grade or other constructions.
 - .2 200mm under lawns
 - .3 300mm under planting
 - .3 Do not use explosives unless approved.
 - .4 Leave root systems intact in areas where erosion may occur.
- 3.3 **Disposal**
- .1 **Disposal:**
 - .1 Remove and dispose of debris legally away from site daily, as it accumulates, materials and debris resulting from clearing performed by this Section, unless it has been specified for salvage. Do not accumulate materials on site from clearing performed outside of normal working hours for longer than 48 hours.
 - .2 Do not burn materials or debris at the site.
- 3.4 **Finished**
- .1 Leave ground surface in a condition suitable for immediate grading

Surface

operations.

End of Section

PART 1 - GENERAL

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|-----|--|-----|--|---------------|
| 1.1 | <u>General Requirements</u> | .1 | Comply with requirements of Division 1. | |
| 1.2 | <u>Related Sections</u> | .1 | Excavation, Trenching and Backfill | Section 02200 |
| | | .2 | Concrete Curbs and Paving | Section 02525 |
| 1.3 | <u>Reference Standards</u> | .1 | <u>Bituminous Concrete Paving</u> | |
| | | .1 | Conform to Ontario Provincial Standard Specifications (O.P.SS) as specified herein. | |
| 1.4 | <u>Qualifications</u> | .1 | The work of this section is to be done by a paving contractor of recognized standing who has personnel with minimum five years experience in this type of work and who has the necessary equipment to complete the work. | |
| 1.5 | <u>Guarantee</u> | .1 | Provide the following Guarantee in accordance with the General Conditions of the Contract, notwithstanding the time provisions therein. | |
| | | .1 | Two years on materials and labour | |
| 1.6 | <u>Inspection & Testing</u> | .1 | Comply with the requirements of Section 01400 Quality Control. | |
| | | .2 | The Owner may appoint and will pay for, out of the Allowances specified in Division 1 an independent inspection agency to conduct any or all of the following as directed by the Consultant. | |
| | | .1 | Carry out grain size analysis. | |
| | | .2 | Determine minimum and maximum moisture content of densities of granular fill. | |
| | | .3 | Determine on-site density, thickness and moisture content of compacted fills. | |
| | | .4 | Check properties of asphalt mixes, including aggregate gradation of asphalt content. | |
| | | .5. | Check suitability of equipment used. | |
| 1.7 | <u>Environmental Requirements</u> | .1 | Lay granular base courses and asphalt paving courses when weather is dry and only on dry bases. | |
| | | .2 | Place granular bases courses only when ambient temperature is above 0°C. Do not place granular materials while either material or subgrade is frozen. | |
| | | .3 | Place asphalt paving courses only when ambient temperature is 7°C or above. | |
| 1.8 | <u>Protection</u> | .1 | Prevent damage to buildings, landscaping, curbs, sidewalks, trees, and adjacent property. | |
| | | .2 | Provide access to building at all times. Arrange paving schedule so as not to interfere with normal use of premises. | |

- 1.8 **Protection (Cont'd)**
- .3 Make special provisions to minimize deterioration of subgrade, particularly when operating during unfavourable weather conditions or when working in wet soil. Use special designated traffic lanes, build temporary roads, reduce traffic to half-loads or take other suitable measures.
 - .4 Do not permit vehicular traffic on finished asphalt pavement until it has cooled and hardened and in no case sooner than 12 hours after completion.
 - .5 Provide barricades and warning devices to protect pavement.

PART 2 - PRODUCTS

- 2.1 **Materials**
- .1 Granular Base: Conforming to Class 'A' granular material OPSS 1010 clean, angular crusher run natural stone, free from silt, clay, friable materials, roots and vegetable matter and graded within following limits.

<u>Sieve Size (MTC)</u>		<u>Per Cent Passing</u>
37.5	mm	100
16	mm	62 - 100
9.5	mm	48 - 73
4.75	mm	33 - 55
1.18	mm	15 - 45
0.3	mm	5 - 22
0.075	mm	0 - 8

- .2 Granular Subbase: Conforming to Class 'B' granular material OPSS 1010 clean, natural sand and gravel material free from silt, clay, loan friable or soluble materials and vegetable matter and graded within following limits.

<u>Sieve Size (MTC)</u>		<u>Per Cent Passing</u>
106	mm	100
22.4	mm	57 - 100
4.75	mm	25 - 100
1.18	mm	10 - 85
0.300	mm	5 - 40
0.075	mm	0 - 8

- .3 Asphalt:
 - .1 Asphalt cement shall be penetration grade 85-100 and conform with OP.SS Specification Form 1101 and aggregates shall conform with OP.SS Form 1003.
 - .2 Asphalt base and surface course, as shown on the drawings shall conform to OP.SS Specification Form 310.
 - .3 Asphalt emulsions shall conform with OP.SS Specifications Form 1102.
 - .4 Tack coat between base and wearing course shall be SS-1 asphalt

emulsion diluted with an equal volume of water.

- PART 3 - EXECUTION**
- .4 Paint: To CGSB 1-GP-74M, alkyd traffic paint, colour yellow.
- 3.1 **Ex. Asphalt Paving Removal**
- .1 Remove existing asphalt paving, including 150 mm depth of existing granular base (for full depth) where shown and noted on drawings for existing asphalt paving to be removed and replaced.
- .2 Dispose of all surplus materials off site at an approved and authorized registered dumpsite licensed to receive these materials
- .3 Proof roll and compact existing sub-base to remain and proceed with replacement of granular base and asphalt paving as specified in this section for new asphalt paving.
- 3.2 **Preparation of Subgrade**
- .1 Examine rough graded subgrade over which asphalt paving system is to be installed to ensure it is suitable for installation. Start of work shall imply acceptance of conditions.
- .2 Fine grade subgrade as required to bring it to required levels and slopes. Meet compaction densities and fill material requirements specified in Section 02200. Slope fine graded subgrade to permit drainage.
- .3 Thoroughly compact subgrade to minimum 98% Standard Proctor Density for at least the uppermost 300 mm. Sub-excavate soft spots that develop during compaction and bring to proper grade by the addition of fill material and then thoroughly compact until satisfactory, adding more fill material as required.
- .4 In the event subgrade cannot be made stable or be compacted with a roller the Consultant will decide if local soft spots are to be excavated and backfilled with 50 mm crusher limestone.
- 3.2 **Granular Base & Subbase**
- .1 Over compacted subgrade place granular base and subbase in layers not exceeding 150 mm thickness. Compact each layer to 100% Standard Proctor Density unless otherwise indicated.
- .2 Compact granular base and subbase by rolling with power rollers capable of reversing without backlash. Use hand tamping or mechanical hand compaction equipment in areas inaccessible to rollers.
- .3 Add water as required to obtain optimum density and to control dust.
- 3.3 **Paving**
- .1 Obtain approval of granular base and subbase, by Consultant, prior to installing asphalt paving. Lay asphalt as soon as base is approved.
- .2 The Contractor shall inform the Consultant at least 48 hours prior to commencing asphalt paving operations or resuming same after a delay of more than one week, in order that the Consultant may inspect the base before asphalt is applied.

- .3 No asphalt shall be laid on a surface which is wet, or covered by snow or ice, or if the temperature of the air is below 7°C, or if the ground is frozen.
- .4 Slope paving away from building minimum 1%. Slope paving minimum 1% for drainage in all locations unless specifically indicated otherwise on Drawings. Bumps or "bird baths" will not be accepted.
- .5 Finish surface true to grade and free from deviations exceeding 1:1000 when measured with a 3m straight edge.
- .6 In all cases where asphalt base course layer has been in place for a period of two or more months, tack coat shall be placed prior to the placing of asphalt top course layer or at the discretion of the Consultant.
- .7 Minimum asphalt mixture temperature when spread, 118°C.
- .8 Maximum asphalt mixture temperature at anytime, 149°C.
- .9 Compact each course layer with roller when it can support roller mass without undue cracking or displacement, until all roller marks are eliminated.
- .10 Compact each asphalt paving course to 97% Marshall density to ASTM D1559-76.
- .11 Keep roller speed slow enough to avoid mixture displacement.
- .12 Moisten roller wheels to prevent mixture adhesion.
- .13 Compact mixture with hot tampers in areas inaccessible to roller and all exposed edges.

3.4 **Joints**

- .1 Transverse and longitudinal joints in successive courses shall be offset at least 300 mm from each other.
- .2 All joints shall be coated with tack coat prior to placement of adjacent asphalt if the previous section has been in place for more than two hours.
- .3 Transverse joints shall be cut back at least 300 mm and painted with tack coat before paving proceeds.
- .4 Where tack coat has been applied, it shall be allowed to dry to a tacky texture before new asphalt is laid against it.

3.5 **Repairs**

- .1 Where repairs are required, include repairs under warranty, cut asphalt to its full depth making straight neat cuts.
- .2 Compact granular base and subbase in accordance with requirements for new asphalt.
- .3 Coat exposed cut edges with a tack coat. Place hot asphalt mixture and compact to thickness required in accordance with requirements for new asphalt.

- 3.6 **Pavement Marking**
- .1 Provide all painted pavement markings shown on drawings including, but not limited to, parking stalls, barrier free symbol, games lines.
 - .2 Premark lines in an approved manner and as indicated on drawings.
 - .3 Apply paint with an approved pressure type distributor that will ensure uniform application and a positive means to shut-off.
 - .4 Evenly apply paint at the rate of 4.5L/10m².
 - .5 Barrier free symbol shall be painted in stalls as indicated on drawings
- 3.7 **Schedule**
- .1 Provide medium duty asphalt paving where indicated to be new.
 - .1 **Medium Duty Asphalt Pavement and Base Construction:**
 - .1 Granular Subbase: 300 mm Granular 'B'
 - .2 Granular Base: 150 mm Granular 'A'
 - .3 Asphalt Base Course: 60 mm of HL-8 base course asphalt.
 - .4 Asphalt Top Course: 35 mm of HL-3a top course asphalt.
 - .2 Provide medium duty asphalt paving where indicated for existing asphalt paving to be removed and replaced.
 - .1 **Medium Duty Asphalt Pavement and Base Construction:**
 - .1 Granular Sub-base: Existing Granular 'B' to remain.
 - .2 Granular Base: 150 mm Granular 'A'
 - .3 Asphalt Base Course: 60 mm of HL-8 base course asphalt.
 - .4 Asphalt Top Course: 35 mm of HL-3a top course asphalt.

End of Section

PART 1 - GENERAL

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|-----|--|----|---|---------------|
| 1.1 | <u>General Requirements</u> | .1 | Comply with requirements of Division 1. | |
| 1.2 | <u>Related Sections</u> | .1 | Excavating, Trenching and Backfilling | Section 02200 |
| | | .2 | Asphalt Paving | Section 02510 |
| | | .3 | Cast-In-Place Concrete | Section 03300 |
| 1.3 | <u>Reference Standards</u> | .1 | Do concrete work in accordance with requirements of Division 3 except where otherwise specified herein. | |
| 1.4 | <u>Inspection & Testing</u> | .1 | Comply with the requirements of Section 01400 Quality Control. | |

PART 2 - PRODUCTS

- | 2.1 | <u>Materials</u> | .1 | <u>Concrete Materials:</u> CAN3-A23-M77, 25MPa at 28 days with 6% ∇ 1% air entrainment and not less than 325 kg/m ³ of cement. Maximum slump to be 50mm. | | | | | | | | | | | | | | | | | |
|-------------------------|-------------------------|----|--|------------------------------------|-------------------------|------------------------|---------|-----|-------|----------|--------|---------|---------|---------|---------|---------|--------|--------|----------|-------|
| | | .2 | <u>Reinforcing Steel:</u> | | | | | | | | | | | | | | | | | |
| | | | 1) | Bars: CSA G30.12-M1977, Grade 400. | | | | | | | | | | | | | | | | |
| | | | 2) | Mesh: CSA G30.5-M1983, 150 x 150mm | | | | | | | | | | | | | | | | |
| | | .3 | <u>Forms:</u> Either steel or wood, capable of producing smooth flat surfaces. Use flexible spring-steel forms or laminated boards to form radius bends as required. | | | | | | | | | | | | | | | | | |
| | | .4 | <u>Expansion Joints:</u> 12mm thick asphalt impregnated fibre board, unless indicated otherwise. | | | | | | | | | | | | | | | | | |
| | | .5 | <u>Granular Base:</u> Granular 'A' material OPSS 1010 clean, angular crusher run natural stone, free from silt, clay, friable materials, roots and vegetable matter and graded within following limits. | | | | | | | | | | | | | | | | | |
| | | | <table border="0" style="width: 100%;"> <thead> <tr> <th style="text-align: left;"><u>Sieve Size (MTC)</u></th> <th style="text-align: left;"><u>Percent Passing</u></th> </tr> </thead> <tbody> <tr> <td>37.5 mm</td> <td>100</td> </tr> <tr> <td>16 mm</td> <td>62 - 100</td> </tr> <tr> <td>9.5 mm</td> <td>48 - 73</td> </tr> <tr> <td>4.75 mm</td> <td>33 - 55</td> </tr> <tr> <td>1.18 mm</td> <td>15 - 45</td> </tr> <tr> <td>0.3 mm</td> <td>5 - 22</td> </tr> <tr> <td>0.075 mm</td> <td>0 - 8</td> </tr> </tbody> </table> | | <u>Sieve Size (MTC)</u> | <u>Percent Passing</u> | 37.5 mm | 100 | 16 mm | 62 - 100 | 9.5 mm | 48 - 73 | 4.75 mm | 33 - 55 | 1.18 mm | 15 - 45 | 0.3 mm | 5 - 22 | 0.075 mm | 0 - 8 |
| <u>Sieve Size (MTC)</u> | <u>Percent Passing</u> | | | | | | | | | | | | | | | | | | | |
| 37.5 mm | 100 | | | | | | | | | | | | | | | | | | | |
| 16 mm | 62 - 100 | | | | | | | | | | | | | | | | | | | |
| 9.5 mm | 48 - 73 | | | | | | | | | | | | | | | | | | | |
| 4.75 mm | 33 - 55 | | | | | | | | | | | | | | | | | | | |
| 1.18 mm | 15 - 45 | | | | | | | | | | | | | | | | | | | |
| 0.3 mm | 5 - 22 | | | | | | | | | | | | | | | | | | | |
| 0.075 mm | 0 - 8 | | | | | | | | | | | | | | | | | | | |
| | | .6 | <u>Non Shrink Grout:</u> Pre-mixed non metallic 30 Mpa compressive strength. | | | | | | | | | | | | | | | | | |
| | | .7 | <u>Tactile Surface Plates:</u> | | | | | | | | | | | | | | | | | |
| | | .1 | Plate shall conform to OPSS 351 -Construction Specification for Concrete Sidewalks. | | | | | | | | | | | | | | | | | |

- .2 Gray cast iron tactile walking surface indicator plates shall be according to ASTM A 48M, Class 35B, and shall be bare and not coated with paint or other coatings or substances. Castings shall be sound, free from pouring faults, cracks, blowholes, and other defects.
- .3 The surface of each new cast iron plate on both the tops of the truncated domes and the field between truncated domes shall have a minimum wet and dry static coefficient of friction of 0.8 according to ASTM C 1028.
- .4 The initials or trademark of the manufacturer, year of manufacture, and country of manufacture shall be distinctly cast and legible in raised letters on the top side of each plate

PART 3 - EXECUTION

- 3.1 **Preparation Subgrade**
 - .1 Examine rough graded subgrade over which curbs and paving are to be installed to ensure it is suitable for installation. Start of work shall imply acceptance of conditions.
 - .2 Fine grade subgrade as required to bring it to required levels and slopes.
 - .3 Compact subgrade to the requirements of Section 02200.
 - .4 Stake out curb and paving areas and obtain Consultants review prior to proceeding.
- 3.2 **Granular Base**
 - .1 Over compacted subgrade place compacted granular base to underside of paving.
 - .2 Compact base courses to 100% Standard Proctor Density.
 - .3 Install granular base within a tolerance of 12mm within 3 metres.
- 3.3 **Installation Cast-In-Place Curbs**
 - .1 Obtain approval of granular base, by Consultant, prior to placement of paving.
 - .2 Erect formwork to obtain the required curb section.
 - .3 Install sufficient quantity of forms to allow continuous progress of work so forms can remain in place at least 24 hours after concrete placement.
 - .4 Obtain approval of forms from Consultant before pouring concrete.
 - .5 Install side forms free of warp. Provide proper support to maintain alignment and grade to the following tolerances.
 - 1) Top of Form
Not more than 3mm in 3.0 metres.
 - 2) Vertical Face
Longitudinal axis not more than 6mm in 3.0 metres.

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- .6 Treat all form lumber with a non-staining mineral oil prior to concrete placement.
 - .7 Unless otherwise detailed, place three continuous 10M reinforcing bars, one near the bottom, one near the top and one in the middle of the curb. Cut reinforcing at expansion joints.
 - .8 Install transverse expansion joints at returns and at 5.5 metres O.C. Install longitudinal expansion joint where curbs and paved areas abut each other, buildings, other concrete slabs or pads or vertical restraints, unless indicated otherwise.
 - .9 Fill joints with specified expansion joint filler cut to the full cross sectional shape of the curb.
 - .10 Moisten subgrade to reduce suction at the time concrete is placed. Do not place concrete around structures until they have been brought to the required grade and alignment.
 - .11 Deposit and spread concrete in a continuous operation between transverse joints. If interrupted for more than 1/2 hour, place a construction joint. Sections less than 5.5 metres in length between transverse joints will not be permitted.
 - .12 After screeding and compacting, finish uniformed surfaces with a wood float to produce a uniform texture and finish throughout.
 - .13 Do not place concrete on fill that is frozen or which contains frozen material. Concrete, when deposited in forms, shall have a temperature of not less than 10°C, nor more than 32°C. Provided means to maintain these limits for 72 hours after placing.
 - .14 Inspect formed surfaces immediately after stripping forms, grind down fins and repair sand runs and honeycombs with the same mix used for the curbs and gutters minus the coarse aggregates.
 - .15 After stripping the forms and finishing, treat curb surfaces with approved curing compound, or use other curing method acceptable to Consultant.
 - .16 Protect concrete from harmful effects of sunshine, drying winds, cold temperatures, and running surface water for a minimum period of five days.
- 3.4 **Installation of Concrete Paving**
- .1 Construct wood forms for all unsupported concrete edges to provide straight, clean lines, and smooth radius curved lines.
 - .2 Place wire reinforcing mesh on top of compacted base. Before pouring concrete raise mesh 25mm above base. Cut mesh at expansion joints.
 - .3 Obtain Consultants approval of granular base and reinforcing steel/mesh installation prior to placing concrete.
 - .4 Install expansion joints around manholes and catch basins and along length adjacent to concrete curbs, catch basins, buildings, or permanent structures

- or services. Install expansion joints at approximately 6m O.C. in both directions.
- .5 Divide paving sections between expansion joints into the pattern indicated on the Drawings. Unless otherwise indicated, provide tooled joints during finishing stage at maximum 1500mm O.C. in each direction or saw cut, if directed by Consultant after completion of finishing.
 - .6 Round edges, including edges of joints, with 10mm radius edging tool.
 - .7 Finish surfaces to within 3mm in 3.0 metres from line, level or grade as measured with a straight edge placed on surface.
 - .8 Finish concrete with wooden float to produce an even gritty surface and in accordance with Municipal requirements.
 - .9 Treat exposed surfaces with curing, compound in accordance with manufacturers instructions, or moist cure in accordance with CAN3 A23.1-M77.
 - .10 Immediately after stripping forms, treat expose edges with curing compound.
- 3.5 **Tactile Walking Surface Indicator Plate Installation**
- .1 Cast iron Tactile walking surface indicator plates shall be set into wet prepared concrete sidewalk ramp as specified in the Contract Documents and according to the plate manufacturer's installation instructions.
 - .2 Plates shall be cleaned after installation.
- 3.6 **Schedule**
- .1 Provide heavy duty granular base at driveways and parking lots.
 - 1. Granular Subbase: 400 mm Granular 'B'
 - 2. Granular Base: 200 mm Granular 'A'
 - .2 Provide medium duty granular base at pedestrian walkways.
 - 1. Granular Base: 200 mm Granular 'A'

End of Section

PART 1 - GENERAL

- 1.1 **Related Work**
- .1 Concrete Reinforcement: Section 03200
 - .2 Concrete Floor Finishing: Section 03345
- 1.2 **References**
- .1 ANSI/ACI 117-81, Tolerances for Concrete Construction and Materials.
 - .2 ASTM C 260-94, Specification for Air-Entraining Admixtures for Concrete.
 - .3 ASTM C 309-94, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .4 ASTM C 494-92, Specification for Chemical Admixtures for Concrete.
 - .5 ASTM D1751-83(1991), Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
 - .6 ASTM D 1752-84 (R1992), Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
 - .7 ASTM E1155M-87, Test Method for Determining Floor Flatness and Levelness Using the F-Number System.
 - .8 CAN/CSA-A5-03, Portland Cement.
 - .9 CSA-A23.1-00, Concrete Materials and Methods of Concrete Construction.
 - .10 CSA-A23.2-00, Methods of Test for Concrete.
 - .11 CAN/CSA-A23.5-03, Supplementary Cementing Materials.
 - .12 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- 1.3 **Certificates**
- .1 Submit certificates in accordance with Section 01300 - Submittals.
 - .2 Minimum 4 weeks prior to starting concrete work submit to Consultant manufacturer's test data and certification by qualified independent inspection and testing laboratory that following materials will meet specified requirements:
 - .1 Portland cement.
 - .2 Supplementary cementing materials.
 - .3 Grout.
 - .4 Admixtures.
 - .5 Aggregates.
 - .6 Water.
 - .7 Waterstops.
 - .8 Joint Filler.
 - .3 Provide certification that mix proportions selected will produce concrete of

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| | | | quality, yield and strength as specified in concrete mixes, and will comply with CAN/CSA-A23.1. |
| 1.3 | <u>Certificates (Cont'd)</u> | .4 | Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CAN/CSA-A23.1 and that mix design is adjusted to prevent alkali aggregate reactivity problems. |
| 1.4 | <u>Quality Assurance</u> | .1 | Minimum 4 weeks prior to starting concrete work, submit proposed quality control procedures in accordance with Section 01400 - Quality Control for Consultant's approval for following items: |
| | | .1 | Hot weather concrete |
| | | .2 | Cold weather concrete |
| | | .3 | Curing |
| | | .4 | Finishes |
| | | .5 | Formwork removal. |
| 1.5 | <u>Records</u> | .1 | Keep record at job site showing date, time, ambient air temperature, place of each pour of concrete, together with transit-mix delivery slip certifying contents of pour. |
| | | .2 | Make records available to Consultant for inspection upon request. |
| | | .3 | Submit mix design for each class of concrete. |
| 1.6 | <u>Cold Weather Curing and Protection Requirements</u> | .1 | Provide adequate protection for the concrete by means of heated enclosures, coverings, insulation, or suitable combination of these methods when the outside air temperature is at or below 5 Deg. C. Conform to Clause 21 of CSA-A23.1. |
| 1.7 | <u>Hot Weather Curing and Protection Requirements</u> | .1 | When the outside air temperature is at or above 27 deg. C., protect freshly deposited concrete from drying too rapidly, to prevent plastic shrinkage cracking. Conform to Clause 21 of CSA-A23.1. |

PART 2 - PRODUCTS

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|-----|-------------------------|----|---|
| 2.1 | <u>Materials</u> | .1 | Portland cement: to CAN/CSA-A5. |
| | | .2 | Supplementary cementing materials: to CAN/CSA-A23.5. |
| | | .3 | Water: to CSA-A23.1. |
| | | .4 | Aggregates: to CSA-A23.1. Coarse aggregates to be normal density. |
| | | .5 | Water reducing admixture: to CAN3-A266.2-M78 and ASTM C494, Type A, Prokrete N by Conchem Lafarge, WR75 by Euclid Chemical Canada Ltd. or Pozzolith 322N by Master Builders Technologies Limited. |
| | | .6 | Air entraining admixture: to ASTM C260 and CAN3-A266.1, Pro Air by Conchem Lafarge, Eucon Air by Euclid Chemical Canada Ltd. or MB-AE10 by Master Builders Technologies Limited. |

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|-----|--|-----|---|
| 2.1 | Materials
<u>(Cont'd)</u> | .7 | Chemical admixtures: to ASTM C 494. Consultant to approve accelerating or set retarding admixtures during cold and hot weather placing. Use of calcium chloride is not acceptable. |
| | | .8 | Non premixed dry pack grout: composition of non metallic aggregate Portland cement with sufficient water for the mixture to retain its shape when made into a ball by hand and capable of developing compression strength of 40 MPa at 7 days. M-Bed Standard by Sternson, V-3 Non-metallic Grout by W.R. Meadows of Canada Ltd., In-Pakt by C.C. Chemicals Canada Ltd. or Progrout by Conchem Lafarge. |
| | | .9 | Liquid Curing/Sealing Compound: to CAN/CSA-A23.1 and to ASTM C 309 Type 1-chlorinated rubber, Class B water based acrylic curing/sealing compound, Acryseal WB by Conchem Lafarge, Masterseal W by Master Builders Technologies Limited, Florseal W.B. by Sternson or Sealtight Intex by W.R. Meadows of Canada Ltd. |
| | | .10 | Waterstops: Volclay waterstop type RX, 25 mm x 19 mm by American Collorid. |
| | | .11 | Premoulded joint fillers: |
| | | .1 | Bituminous impregnated fiber board: to ASTM D1751, 12.7mm thick x depth of slab. |
| | | .2 | Sponge rubber: to ASTM D1752, Type I, flexible grade. |
| | | .12 | Dovetail anchor slots: minimum 0.6 mm thick galvanized steel with insulation filled slots. |
| | | .13 | Dampproof membrane: 0.25 mm polyethylene sheet conforming to CAN/CGSB-51.34. |
| | | .14 | Sealant for dampproof membrane: acoustical sealant to CAN/CGSB-19.21. |
| | | .15 | Shrinkage control fibres: Fibre Mesh fibrillated polypropylene fibres by Fibermesh Canada Ltd. or equal, 19 mm in length. |
| | | .16 | Sealant for control joints in concrete floors and where slab abuts foundation wall: polyurethane base, multi-component, to CGSB 19-GP-15A, Type 1, shore hardness of 20-35, Duraseal-U by W.R. Grace and Co. of Canada Ltd. |
| | | .17 | Wet curing: water conforming to CSA-A23.1, Clause 4, clear and entirely free from any elements which might cause staining of concrete, and min. 0.1 mm (4 mils) thick polyethylene film as specified herein. |
| | | .18 | Polyethylene film (for wet curing): minimum 0.1 mm (4 mils) thick, complying with maximum allowable moisture loss requirements of ASTM C156. |
| 2.2 | <u>Mixes</u> | .1 | Ready-mixed concrete and concrete proportions shall be in accordance with CSA-A23.1, Clause 14, and as follows. |

- 2.2 **Mixes (Cont'd)**
- .2 Concrete shall be proportioned by the water-cement ratio and to provide a plastic and workable mix without the formation of free water on the surface.
 - .3 Mix shall be designed for both strength and durability. Submit to Consultant the mix design for the different classes of concrete indicated in the General Construction Notes provided on the structural drawings and listed below.
 - .4 The amount of free moisture in the aggregate shall be deducted from the amount of mixing water being added.
 - .5 Specified slumps shall be maintained and checked periodically with slump tests.
 - .6 Mix shrinkage control fibres into slab mix at rate of 0.9 kg/cu.m of concrete, unless otherwise indicated on drawings. Add admixture as required.
 - .7 Class of exposure: refer to Clause 15 and Tables 7, 8 and 9 of CSA-A23.1, and Class of Concrete Table herein.
 - .8 Air content: to Table 10 of CSA-A23.1, according to category of exposure and Class of Concrete table provided on structural drawings.
 - .9 Concrete mix shall be designed and proportioned to yield the specified ultimate and compressive strength at 28 days as determined by laboratory testing standard 150 mm x 300 mm or 100 mm x 200 mm cylinders moist cured in the laboratory.

.10 Classes of concrete:

CLASS OF CONCRETE	LOCATION	EXPOSURE CLASS	STRENGTH (MPa)	SLUMP (mm)	AIR (percent)
A	Footings	-	20	80	up to 3
B	Foundation Walls	F-2	25	80	4 to 7
C	Slab on Grade Inside Building, Slab on Composite Floor Deck	-	25	80	up to 3
D	Slab on Grade Outside Building	C-1	35	80	5 to 8
E*	Topping for Concrete Slabs	-	25	50	up to 3
F	Concrete Fill	-	5	20-80	

*concrete must utilize plasticizer to facilitate placement.

PART 3 - EXECUTION

- | | | | |
|-----|------------------------------------|----|--|
| 3.1 | <u>Preparation</u> | .1 | Obtain Consultant's approval before placing concrete. Provide 24 hour notice prior to placing of concrete. |
| 3.1 | <u>Preparation (Cont'd)</u> | .2 | Pumping of concrete is permitted only after approval of equipment and mix. |
| | | .3 | Ensure reinforcement and inserts are not disturbed during concrete placement. |
| | | .4 | Prior to placing of concrete obtain Consultant's approval of proposed method for protection of concrete during placing and curing. |
| | | .5 | Maintain accurate records of poured concrete. Items to indicate date, location of pour, quality, air temperature and test samples taken. |
| | | .6 | In locations where new concrete is dowelled into existing work, drill holes in existing concrete. Place steel dowels and pack solidly with epoxy grout to anchor and hold dowels in positions as indicated. |
| 3.2 | <u>Construction</u> | .1 | Do cast-in-place concrete work in accordance with CSA-A23.1. |
| | | .2 | Place concrete to prevent layering and segregation, and vibrate sufficiently to ensure thorough compaction, maximum density, and according to CSA-A23.1 Clause 19. |
| | | .3 | Sleeves and inserts. |
| | | .1 | Set and build in inserts, anchors, frames, angles, sleeves, plates and similar items supplied by other trades. Advise trades well in advance of scheduled placement to allow adequate time for supply of items to be built in. Have respective trades verify location of items supplied by them. |
| | | .2 | No sleeves, ducts, pipes or other openings shall pass through structural members, except where indicated or approved by Consultant. |
| | | .3 | Where approved by Consultant set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere. Sleeves and openings greater than 100 x 100 mm not indicated, must be approved by Consultant. |
| | | .4 | Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Consultant before placing of concrete. |
| | | .5 | Check locations and sizes of sleeves and openings shown on structural and civil drawings with architectural, mechanical and electrical drawings. |
| | | .4 | Anchor bolts: |
| | | .1 | Set anchor bolts with templates under supervision of appropriate trade prior to placing concrete. |
| | | .2 | With approval of Consultant, grout anchor bolts in preformed holes or holes drilled after concrete has set. Formed holes to be minimum 100 mm diameter. Drilled holes to be minimum 25 mm larger in diameter than bolts used to manufacturer's recommendations. |
| | | .3 | Protect anchor bolt holes from water accumulations, snow and ice build-ups. |
| | | .4 | Set bolts and fill holes with shrinkage compensating grout or epoxy grout. |
| | | .5 | Locate anchor bolts used in connection with expansion shoes, rollers |

and rockers with due regard to ambient temperature at time of erection.

- 3.2 **Construction**
(Cont'd)
- .5 Grout under base plates using procedures in accordance with manufacturer's recommendations which result in 100% contact over grouted area.
 - .6 Dovetail anchor slots:
 - .1 Install continuous vertical anchor slot to forms where masonry abuts concrete wall or columns.
 - .2 Install continuous vertical anchor slots at 800 mm oc where concrete walls are masonry faced.
 - .7 Surface Finishing
 - .1 Finish concrete in accordance with CSA-A23.1.
 - .2 Use procedures acceptable to CAN/CSA-A23.1 to remove excess bleed water. Ensure surface is not damaged.
 - .3 Honeycomb: In locations where the repair of honeycomb is acceptable to Consultant, cut out defective areas and fill the space with a cement mortar of the same materials as the surrounding concrete. Incorporate a liquid latex bonding agent into the mix. Apply in layers not exceeding 25 mm in thickness.
 - .4 Patching: Patching of exposed concrete is not permitted without acceptance of Consultant. Patching prior to acceptance shall be grounds for rejection of the concrete. Where patching is accepted, the exposed patch shall be indistinguishable from the surrounding finish after both are dry. Determine patching mixes by trial batches. Perimeter of cut-out areas shall have edges which are perpendicular to the surface. Incorporate a liquid latex bonding agent into the mix. Just prior to application, coat the base surface with the bonding agent. Cure patches by keeping continuously moist for seven days.
 - .5 Unexposed Concrete Walls: Correct defects and remove fins.
 - .6 Exposed Concrete Walls: Produce finish on concrete no later than one day after forms removed. Wet surface and rub with carborundum brick until uniform colour and smooth texture are produced. Do not use a cement paste. Rub exposed sharp edges to produce a 3 mm radius unless otherwise indicated.
 - .8 Finishing and Curing Concrete Floors.
 - .1 Leave slabs level or uniformly sloped to drain where indicated, ready for finishing.
 - .2 Machine float, power steel trowel and hand trowel interior slabs to produce smooth, dense, satisfactory surface free from ridges, voids or machine marks, whether scheduled to be left exposed or covered. Broom finish exterior slabs.
 - .3 Use only competent mechanics to produce workmanship of highest quality.
 - .4 Liquid curing and sealing compound: treat concrete surfaces with specified compound where floor is to be left exposed with no other finishes. Apply in accordance with manufacturer's instructions. Do not apply membrane curing compound to floor surfaces subsequently to receive additional applied floor finish. Use curing compounds compatible with applied finish on concrete surfaces. Provide written declaration that compounds used are compatible.
 - .5 Water curing: water cure floors designated to receive applied floor

- finish, including paint. Do not use curing/sealing compound. Water down entire floor area and cover with polyethylene sheets for minimum 7 days. Sheet coverage includes exposed edges. Provide suitable weights to prevent blow-off or displacement of sheets. Remove cover after minimum 7 consecutive days. Allow to air dry until concrete has developed design strength.
- 3.2 **Construction (Cont'd)**
- .6 Provide swirl-trowelled finish where terrazzo is to be applied. Provide depressions to accommodate terrazzo.
- .9 Waterstops
- .1 Install waterstops to provide continuous water seal. Do not distort or pierce waterstop in such a way as to hamper performance. Do not displace reinforcement when installing waterstops. Use equipment to manufacturer's requirements to field splice waterstops. Tie waterstops rigidly in place.
- .2 Use only straight heat sealed butt joints in field. Use factory welded corners and intersections unless otherwise approved by Consultant.
- .10 Joint Fillers
- .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Consultant. When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
- .2 Locate and form isolation and construction joints as indicated. Install joint filler.
- .3 Use 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces, except where perimeter insulation is installed in its place. Extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.
- .11 Sawcut Joints
- .1 Sawcut control joints in slabs-on-grade where indicated on drawings, 5 mm wide x 38 mm deep unless indicated otherwise on drawings. Perform sawcutting 12 to 24 hours after concrete has been placed, as soon as concrete can be cleanly cut and before shrinkage cracks can form.
- .2 Fill sawcut control joints full depth with sealant in accordance with manufacturer's printed instructions, not less than 28 days after concrete placement. Joints shall be clean and dry when filled.
- .12 Patching
- .1 Make good temporary openings left in concrete work for pipes, conduits, ducts, shoring and other such work during construction using mix of same proportions as surrounding work. Reinforce as required and finish to match surrounding work. Carry out patching as specified in standards contained herein.
- 3.3 **Site Tolerance** .1 Concrete tolerance in accordance with CSA-A23.1.
- 3.4 **Field Quality Control** .1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by Owner in accordance with CAN/CSA-A23.1 and Section 01400 - Quality Control.
- .2 Costs of tests to be paid as specified in Section 01020 - Allowances.

- 3.4 **Field Quality Control (Cont'd)**
- .3 Each test shall consist of 3 cylinders plus one additional site cured cylinder during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
 - .4 Slump test and air entrainment test shall be made from same batch of concrete from which test cylinders are made.
 - .5 Tests shall include mix proportions and design.
 - .6 Non-destructive Methods for Testing Concrete shall be in accordance with CAN/CSA-A23.3.
 - .7 Inspection and testing company shall distribute inspection reports in accordance with Section 01300 - Submittal Procedures.
 - .8 Co-operate with and assist inspection and testing company's personnel during inspection and testing.
 - .9 Remove defective materials and completed work which fail tests and replace as directed by the Consultant.
 - .10 Where work or materials fail to meet strength requirements as indicated by test results, pay costs of additional inspection and testing required for new replacement work or materials.
 - .11 Inspection or testing by Consultant will not augment or replace Contractor quality control nor relieve him of his contractual responsibility.

End of Section

PART 1 - GENERAL

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| 1.1 | <u>General Requirements</u> | .1 | Comply with requirements of Division 1. |
| 1.2 | <u>Related Sections</u> | .1 | Cast-in-Place Concrete: Section 03300. |
| 1.3 | <u>Reference Standards</u> | .1 | Do concrete floor finish in accordance with CAN3-A23.1-M77 except where specified otherwise. |
| | | .2 | Conform to Concrete Floor Finish Specifications of Concrete Floor Contractor's Association of Toronto. |
| | | .3 | Surface tolerances 1:350 from plane, maximum 13 mm from floor level at any point, free from trowel marks and "Washboard" chatters. |
| 1.4 | <u>Qualifications</u> | .1 | The work of this section is to be done by a concrete floor finish contractor of recognized standing having personnel with experience in this type of work and who has the necessary equipment to carry out the work. |
| 1.5 | <u>Guarantee</u> | .1 | Provide the following guarantee in accordance with the General Conditions, notwithstanding the time provisions therein. |

Three year guarantee against defects in workmanship and materials.

PART 2 - PRODUCTS

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| 2.1 | <u>Materials</u> | .1 | <u>Concrete materials and reinforcement</u> : in accordance with Section 03300. |
| | | .2 | <u>Additive</u> : "Albitol" distributed by Albert Chemical Sales of Canada Limited. |
| | | .3 | <u>Curing compound</u> : Mats 3.5.1. |
| | | .4 | <u>Sheet</u> : polyethylene film, 0.1 mm thick, CGSB 51-GP-51M; or waterproof paper, Type 2, ASTM C171. |
| | | .5 | <u>Cement</u> : Mats 3.2.1, normal, false set final penetration minimum 50% when tested in accordance with ASTM C 359. |
| | | .6 | <u>Additives, admixtures and hardeners</u> : to be compatible. |
| | | .7 | <u>Chemical Hardener</u> : Sealhard 400 by Sternson Ltd. or Saniseal 100 by Master Builders. |

PART 3 - EXECUTION

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| 3.1 | <u>Inspection</u> | .1 | Check that drains and other insets and inserts are set at correct heights. |
| 3.2 | <u>Preliminary Finishing</u> | .1 | After concrete has been placed to screeds under Section 03300, strike off concrete level and flush with screeds with true, wooden, strike-off bar. |

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| 3.2 | Preliminary Finishing (Cont'd) | .2 | Immediately after striking off concrete, level it and consolidate it with wooden bull float, or in limited access areas, with wooden darby. Complete levelling and consolidation before free moisture rises to surface (bleeding). |
| | | .3 | Use suitable techniques to finish abutting pours at joints to eliminate "humping". If humping occurs, grind joint down level to surrounding surface. |
| 3.3 | <u>Float Finish</u> | .1 | After preliminary finishing wait until concrete stiffens sufficiently to sustain foot pressure with only about 6 mm indentation. |
| | | .2 | Float concrete with hand float or with disc type power float or power trowel with float shoes attached. |
| | | .3 | Do not bring water and fines to surface by over floating. Where longer floating is required, floating operation shall be repeated after sheen has disappeared and concrete has further hardened. |
| 3.4 | <u>Light Steel Trowel Finish</u> | .1 | After float finish, trowel surface with steel hand trowel or power trowel keeping blade relatively flat at first and raising blade angle a little more on subsequent passes. Do not bring water and fines to surface by over trowelling. |
| | | .2 | Slope surface to drains not less than 1:50, unless different slope is indicated or no slope to drain is required. Surface shall be level where no drainage requirements exist. |
| | | .3 | Trowel surface as required to leave surface even and straight, free of high or low spots, pits, ridges or other surface irregularities and blemishes. |
| | | .4 | Surface shall have firm and even textured finish. |
| 3.5 | <u>Steel Trowel Finish</u> | .1 | After float or shake finish, trowel surface with steel hand trowel or power trowel keeping blade relatively flat at first and raising blade angle a little more on subsequent passes. |
| | | .2 | Trowel surface at least twice and as many times as necessary to produce smooth, dense surface with close surface tolerances. Do not bring fines to the surface by over trowelling. |
| | | .3 | Surface shall have a smooth, level, extremely fine textured but not burnished finish. |
| 3.6 | <u>Chemical Hardened Finish</u> | .1 | Not sooner than 14 days after steel trowel apply chemical hardener. |
| | | .2 | Make sure surface is thoroughly cured, dry and free from dust. Remove dust with heavy duty, commercial vacuum cleaner. |
| | | .3 | Floors which are to receive chemical surface treatment must not be cured using membrane forming liquid curing compound. Use other means of curing. |

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| | | .4 | Remove oil, grease or other foreign substances on surface using suitable floor cleaner. Allow floor to dry thoroughly after cleaning. | | | | | | | | | | | |
| | | .5 | Apply chemical treatment as direct by manufacturer. | | | | | | | | | | | |
| 3.7 | <u>Curing</u> | .1 | Cure surfaces which are to receive chemical surface treatment. Begin curing immediately after trowelling. | | | | | | | | | | | |
| | | .2 | Other finishes may be cured by any method specified in CAN3-A23. Do not use curing compound without first determining whether subsequent finishes are to be applied. If subsequent finishes are to be applied do not use curing compounds, unless it can be warranted not to affect bond of applied finishes. | | | | | | | | | | | |
| 3.8 | <u>Finishes Schedule</u> | .1 | Finish top horizontal concrete surfaces in accordance with intended use and any intended applied finish. Conform to room finish schedule and following table of finishes. | | | | | | | | | | | |
| | | .2 | <table border="0"> <tr> <td><u>Intended Use of Surface or Intended Applied Finish</u></td> <td><u>Integral Finish</u></td> </tr> <tr> <td>- surface to receive cementitious beds for subsequent applied hard finishes, e.g. ceramic tile, quarry tile, portland cement bonded terrazzo.</td> <td>float finish</td> </tr> <tr> <td>- seamless, liquid applied flooring; liquid applied waterproof membranes.</td> <td>light steel trowel</td> </tr> <tr> <td>- resilient flooring, exposed surfaces not indicated to receive other or applied finishes, glued down carpet.</td> <td>steel trowel finish</td> </tr> <tr> <td>- exposed surfaces indicated to be chemically hardened, other surfaces.</td> <td>steel trowel finish, followed by chemical surface treatment</td> </tr> </table> | <u>Intended Use of Surface or Intended Applied Finish</u> | <u>Integral Finish</u> | - surface to receive cementitious beds for subsequent applied hard finishes, e.g. ceramic tile, quarry tile, portland cement bonded terrazzo. | float finish | - seamless, liquid applied flooring; liquid applied waterproof membranes. | light steel trowel | - resilient flooring, exposed surfaces not indicated to receive other or applied finishes, glued down carpet. | steel trowel finish | - exposed surfaces indicated to be chemically hardened, other surfaces. | steel trowel finish, followed by chemical surface treatment | |
| <u>Intended Use of Surface or Intended Applied Finish</u> | <u>Integral Finish</u> | | | | | | | | | | | | | |
| - surface to receive cementitious beds for subsequent applied hard finishes, e.g. ceramic tile, quarry tile, portland cement bonded terrazzo. | float finish | | | | | | | | | | | | | |
| - seamless, liquid applied flooring; liquid applied waterproof membranes. | light steel trowel | | | | | | | | | | | | | |
| - resilient flooring, exposed surfaces not indicated to receive other or applied finishes, glued down carpet. | steel trowel finish | | | | | | | | | | | | | |
| - exposed surfaces indicated to be chemically hardened, other surfaces. | steel trowel finish, followed by chemical surface treatment | | | | | | | | | | | | | |

End of Section

PART 1 - GENERAL

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| 1.1 | <u>General Requirements</u> | .1 | Comply with requirements of Division 1. | |
| 1.2 | <u>Related Sections</u> | .1 | Concrete fill for block lintels: | Section 03302 |
| | | .2 | Masonry, including mortar joint workmanship: | Section 04200 |
| 1.3 | <u>Reference Standards</u> | .1 | Quality Standards: meet requirements of CSA A179-94, Mortar and Grout for Unit Masonry. | |
| 1.4 | <u>Source</u> | .1 | Source of Materials: for mortar to remain exposed in finished project, brands | |
| | <u>Quality Control</u> | | of cementitious materials and source of supply of sand, shall remain the same for duration of work. | |
| 1.5 | <u>Delivery & Storage</u> | .1 | Store cementitious materials so as to prevent moisture absorption from any source. Do not use material affected by moisture. | |
| | | .2 | Store mortar and aggregate materials to prevent contamination. Do not use contaminated materials. | |

PART 2 - PRODUCTS

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| 2.1 | <u>Materials</u> | .1 | Water: potable and non-staining. |
| | | .2 | Aggregate - Sand: CSA A82.56M |
| | | .3 | Portland cement: CAN/CSA-A5-93, Type 10. |
| | | .4 | Masonry cement: CAN/CSA-A8-93, Type H. |
| | | .5 | Waterproofer: Master Builders "Omnicon" |
| | | .6 | Lime: Hydrated lime 'S' Type to ASTM C207. |

PART 3 - EXECUTION

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| 3.1 | <u>Proportioning & Mixing</u> | .1 | Mix mortar in accordance with table 2 of CSA A179-94 and the recommended procedures of the Brick Institute of America Manual MI except as specified herein. |
| | | .2 | Mix mortar to proportions indicated in Mortar Schedule. |
| | | .3 | An experienced competent tradesman must supervise mortar mixing. |
| | | .4 | Mix mortar in watertight mechanical mixers. Measure ingredients accurately by volume. Bring mortar to required elasticity. Continue mixing mortar until materials are blended to uniform colour, but not less than 3 minutes, or more than 5 minutes. Do not mix longer than 10 minutes. |

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| 3.1 | Proportioning
& Mixing
(Cont'd) | .5 | Do not use admixtures of any kind in mixes except where specified otherwise. |
| | | .6 | Prehydrate pointing mortar by mixing ingredients dry then mix again adding just enough water to provide a damp workable mix that will retain its form when pressed into a ball. Allow to stand for not less than two hours then remix with sufficient water to produce mortar of the proper consistency for pointing. |
| 3.2 | Time Limits &
Retempering | .1 | Use and place mortar in final position within the following time limits after mixing: |
| | | .1 | Air Temp. above 25 degrees C - 12 hours. |
| | | .2 | Air Temp. below 25 degrees C - 2.5 hours. |
| | | .2 | Standard mortar that has stiffened within above time limits because of evaporation of water may be retempered by adding water as frequently as needed to restore required consistency. Discard mortar not used within above time limits. |
| 3.3 | Mortar
Schedule | .1 | Bearing walls: Type S mortar. |
| | | .2 | Non bearing walls: Type N mortar consisting of 1 part Masonry Cement, 3 parts aggregate. |
| | | .3 | Where cement mortar is called for on Structural Drawings: Type S mortar. |
| | | .4 | At solid bearing courses and foundation walls: type S mortar. |
| | | .5 | Exterior brick and block veneer: Type N mortar. |

End of Section

PART 1 - GENERAL

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| 1.1 | <u>General Requirements</u> | .1 | Comply with requirements of Division 1. | |
| 1.2 | <u>Related Sections</u> | .1 | Supply of reinforcing steel and concrete for block lintels: | Section 03302 |
| | | .2 | Installation of dovetail anchor slots at concrete elements: | Section 03302 |
| | | .3 | Mortar | Section 04100 |
| | | .4 | Supply of loose steel lintels | Section 05123 |
| | | .5 | Caulking: | Section 07900 |
| | | .6 | Supply of steel door frames | Section 08100 |
| | | .7 | Supply of access doors for mechanical and electrical Work. | Division 15 & 16 |
| 1.3 | <u>Work Installed But Supplied By Others</u> | .1 | Build into masonry elements inserts, anchors, bolts, sleeves and other items supplied by other Sections and which are required for installation and performance of work of other Sections. | |
| | | .2 | Install loose steel lintels. | |
| | | .3 | Coordinate installation of lateral supports required for final support of masonry partitions with Section 05500. | |
| | | .4 | Install steel window and door frames and access doors occurring in masonry elements. | |
| | | .5 | Install reinforcing steel and concrete fill into block lintels. | |
| 1.4 | <u>Reference Standards</u> | .1 | Confirm to requirements of CSA A370.94, CSA A371.94 and CSA S304.1.94. | |
| 1.5 | <u>Qualifications</u> | .1 | The work of this section is to be done by a masonry contractor of recognized standing having personnel with experience in this type of work and who has the necessary equipment to carry out the work. | |
| | | .2 | Ensure that work is executed under the continuous supervision and direction of a competent foreman. | |
| 1.6 | <u>Submittals</u> | .1 | Before ordering any materials submit two samples of all materials for approval. | |
| | | .2 | Submit additional materials as required for testing to a Testing Company approved by the Consultant and provide results of standard tests on the actual production run of exterior brick including compression, absorption and saturation coefficient and 50 cycle freeze thaw resistance test. | |
| | | .3 | Submit shop drawings in accordance with the General Conditions of all special masonry units. | |
| 1.7 | <u>Inspection & Testing</u> | .1 | The Consultant may at his discretion call for tests of mortar or other masonry materials to be made by an independent inspection company. | |

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| | | .2 | A Cash Allowance for these tests will be carried by the General Contractor in accordance with the General Conditions. |
| 1.8 | <u>Source Quality Control</u> | .1 | Submit laboratory test reports certifying compliance of masonry units and mortar ingredients with Specification requirements. |
| | | .2 | For clay units, in addition to requirements set out in referenced Standards include data indicating initial rate of absorption for units proposed for use. |
| 1.9 | <u>Product Handling & Storage</u> | .1 | Handle masonry units so as to prevent soiling and chipping and deliver to the job site in dry condition. |
| | | .2 | Store masonry units above and off ground on level platforms which permit air circulation under stacks. |
| | | .3 | During storage, protect masonry units against moisture absorption, damage, staining and freezing. |
| | | .4 | Keep materials dry until use. |
| 1.10 | <u>Protection</u> | .1 | Keep masonry dry using waterproof non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain. Anchor securely in position. |
| | | .2 | In hot weather, protect freshly laid masonry from drying too rapidly by means of waterproof, non-staining coverings. |
| | | .3 | Protect sills, projections and exposed edges so that finished work will not be damaged or defaced. |
| | | .4 | Protect face work from splashing or marking. Protect interior block walls which are to be painted or left unfinished from staining and other damage. |
| | | .5 | Protect all work installed by other trades from splashing and marking and other damage. |
| | | .6 | Provide temporary bracing of masonry work during and after erection until permanent lateral support is in place. |

PART 2 - PRODUCTS

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| 2.1 | <u>Materials</u> | .1 | <u>Concrete Block:</u> Metric size and autoclaved. |
| | | .1 | Lightweight block: Ultra Lite to CSA Standard A-165.1M |
| | | .2 | Standard weight block: to CAN3-A165.1M85. |
| | | .3 | Units must be cured for at least 28 days before delivery and shall have a moisture content of not more than 30% of total absorption. |
| | | .4 | Size: unless indicated otherwise 190 x 390 mm x thickness as shown on drawings. |

2.1 **Materials**
(Cont'd)

- .5 Exposed block units shall be uniform in size, free of perceptible warp or twist, without chipped, ragged or broken edges; have a uniform surface texture, free of cracks, blemishes or defects detrimental to appearance or performance.
- .6 Where indicated on Drawings and/or Specifications, provide solid or semi-solid units.
- .7 Provide manufacturer's catalogued special units such as bullnose corner, lintel block and 45° corner blocks.

.2 **Metal Reinforcement and Anchors**

- .1 **Material:** high tensile strength steel wire meeting ASTM A82, by Blokklok or Durowall.
- .2 **Finish:** hot dip galvanized after fabrication to ASTM A153, Class B.
- .3 Provide prefabricated assemblies for corners and intersections.
- .4 **Horizontal Reinforcement:**
 - .1 Single wythe and solid walls: truss type with minimum 3.66 mm thick side and cross rods unless otherwise indicated; width 50 mm less than wall thickness: BLOK-TRUS BL30.
 - .2 Cavity walls at walls with concrete block back-up: Refer to Structural drawings. Ferro Slotted Block Tie (type i) consisting of 1.6 mm thick steel connector plate of length to suit insulation and concrete block thickness, steel wire V-tie, 4.8 mm diameter. Refer to structural drawings.
 - .3 Cavity walls at walls with structural steel backup: Ferro Rap Tie consisting of slotted connector plate of length to suit insulation thickness, anchored with predrilled anchors, and steel wire V-tie. Refer to structural drawings.
- .5 **Anchors and Ties:**
 - .1 Non-bearing walls and partitions to bearing walls: corrugated wall ties minimum 0.7 mm thick, 21 x 175 mm BLOK-LOK BLT7A.
 - .2 Masonry walls, partitions and veneer to concrete elements: Flexible wire tie, 4.76 mm thick, length to suit wall condition, and dovetail anchor slot: BLOK-LOK BLT8, or POS-1-TIE NWTC-TAPCON screw anchors by National Wire Products Industries Inc.
 - .3 Masonry to structural steel: flexible triangular 4.76 mm thick ties and weld on anchor straps: BLOK-LOK FLEX-O-

LOK BLT9 or POS-1-TIE NWDI-DRIL-IT screw anchors by National Wire Products Industries Inc.

- .4 Strap anchors: galvanized, 2 mm thick, crimped, 50 mm x 150 mm.
- .3 **Fire stop:** ULC labelled, firebarrier mineral wool by Double A/D Distributors Ltd., Fire-Bloc by M.W. McGill and Associates. Use Bakelite 910-10 Adhesive.
- .4 **Dovetail anchor slots:** 26 ga. galvanized steel, glass fibre filled. Supply to Section 03300 for installation.
- .5 **Preformed Control Joint Key:** Titewall BL.A Rubber Preformed Joint Key by BLOK-LOK.
- .6 **Bond Break:** 0.1 mm thick polyethylene.
- .7 **Compressible Filler:** Rockwool Insulation

PART 3 - EXECUTION

3.1 Erection General

- .1 Build masonry work true to line, plumb, square and level, with vertical joints in proper alignment.
- .2 Assume complete responsibility for dimensions, plumbness and levels of this work and constantly check same with graduated rod.
- .3 Masonry courses to be of uniform height, and both vertical and horizontal joints to be of equal and uniform thickness.
- .4 Extend all non-bearing partitions to within 25 mm of underside of floor or roof construction above and pack joint with a compressible filler of fire stop mineral wool, leave no voids.
- .5 Carry wall up in uniform manner, no one portion being raised more than 750 mm above another at any time. Build no more than 1500 mm of wall measured vertically in any one day.
- .6 Buttering corners of units, throwing mortar into joints, deep or excessive furrowing of bed joints not permitted. Do not shift or tap units after mortar has taken initial set. Where adjustments must be made after mortar has started to set, remove mortar and replace with fresh supply.
- .7 Isolate masonry from vertical structural framing in exterior walls using 12 mm thick asphalt impregnated rigid board cemented to columns.
- .8 Cut exposed masonry units with power driven masonry saw only. Ragged or chipped edges will not be permitted.
- .9 Consult with other sections to avoid cutting and patching. Co-operate in setting and aligning built-in items. Build in conduit and piping so that they are not exposed. Do not break masonry bond to accommodate concealed built-in items.

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- .10 Install access doors occurring in masonry elements, required by Division 15 and 16. Install access doors, level, plumb properly aligned and securely anchored, in locations directed by Division 15 and 16.
- .11 Grout solid with mortar all spaces around built-in items.
- .12 Build in metal nailing plugs, grounds, inserts, anchor bolts, bearing plates, loose and miscellaneous items of steel and iron, isolated beams, lintels and shelf angles, sleeves, blocking and items furnished by other Sections.
- 3.2 **Blockwork**
- .1 Lay all block in running bond, except where noted to be stack bond, with thicker end of face shell upward. Coursing to be modular 200 mm for one block and one joint.
- .2 Do not wet blocks before laying.
- .3 Lay units with webs aligning one over the other in full bed of mortar over entire laying surface including webs. Vertical joints shall be fully filled with mortar on both faces and squeezed tight.
- .4 Exposed faces shall be full units laid out to minimize cutting with not less than 100 mm at any vertical edge or corner.
- .5 Top course of block walls shall be laid with semi-solid blocks at door and window sills, at wall changes to brick and where shown on Drawings.
- .6 Use solid block for at least two courses under all point bearing loads.
- .7 Use special shaped units where indicated, specified or required. Use bull nosed units for exposed external corners, window jambs, door jambs and as detailed. Exposed open cells not permitted.
- .8 Use square cornered block for first course at floor at locations with exposed external bullnose corners. Grind square corner above top of base to match bullnose of blocks above as detailed.
- .9 Where resilient base is indicated, tool the joints to within 100 mm of the floor. Cut joints flush behind the base.
- .10 Provide minimum 400 mm solid or grouted block for jambs of openings and at ends of walls.
- .11 Cope or cut with power saw exposed units to accommodate flush mounted electrical outlets, grilles and other components. Leave maximum 5 mm clearance. Cover plates and flanges must cover cut edges.
- .12 Take special care to prevent mortar or other substances from staining exposed block faces. Replace stained blocks as directed by the Consultant at no extra cost to Contract.
- .13 Tie intersecting non-bearing walls together with masonry reinforcing every second course.

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| | .14 | Concrete block to receive thinset ceramic tile installation shall be laid plumb with maximum variation of 3 mm in 2 M with joints finished flush. |
| | .15 | Provide continuous 0.1 mm thick polyethylene bond breaker at base of partitions and walls which bear on concrete slabs. |
| | .16 | Use lightweight blocks for all interior block walls and partitions. |
| 3.3 | <u>Mortar & Pointing</u> | |
| | .1 | Make all joints uniform in thickness, straight, in line, with mortar compressed to form concave joints. |
| | .2 | After joints have been tooled rub walls with burlap. |
| | .3 | Strike joints flush where walls are to receive insulation, ceramic tile or similar finishes. |
| 3.4 | <u>Building-In</u> | |
| | .1 | Build in door and window frames, steel lintels, sleeves, anchor bolts, anchors, nailing strips and other items to be built into masonry. |
| | .2 | Do not distort metal frames. Bed anchors of frames in mortar and fill frame voids with mortar or grout as wall is erected. |
| 3.5 | <u>Bearings</u> | |
| | .1 | Fill concrete block solid with 20 mPa concrete for two courses below bearing points of structural members, and where indicated. |
| | .2 | Install building paper and wire mesh reinforcing in the bed below second block course from top. |
| | .3 | Use 100% solid concrete blocks where indicated. |
| | .4 | Build masonry neatly around beam and lintel bearings. |
| | .5 | Complete fill voids beneath steel bases bearing on masonry with an approved non-shrink grout having a compressive strength at 28 days of at least 35MPa. Where grout is exposed to view or weather, use no-ferrous expansion agents. |
| 3.6 | <u>Control Joints</u> | |
| | .1 | Provide continuous vertical control joints in concrete block partitions and walls at locations indicated and at heads of all doors and openings over 300 mm wide. Provide continuous vertical control joints maximum 10 M apart and at all corners and intersections. |
| | .2 | Form control joints as detailed. Stop masonry reinforcing each side of joints and provide continuous preformed rubber joint key. |
| 3.7 | <u>Construction Joints</u> | |
| | .1 | Where fresh masonry joins partially or totally set masonry, clean exposed surfaces of set masonry and remove loose mortar and foreign material prior to laying fresh masonry. |

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| | | .2 | If necessary to stop off a horizontal run of masonry, rack back one-half masonry length in each course. Tothing will not be permitted unless approved by the Consultant. |
| 3.8 | Chases, Openings & Holes | .1 | Chases and openings shall be built in during erection of masonry work, and purpose-made chased units shall be built into proper position. |
| | | .2 | Openings in masonry work exceeding 200 mm opening width shall be provided with lintels in accordance with lintel schedule. |
| | | .3 | No horizontal or diagonal chasing of completed walls or formation of holes shall only be carried out with Consultant's prior approval, and then only with a tool designed to cleanly cut masonry units. |
| | | .4 | Chases shall be plumb and shall be minimum of one unit length from jambs of openings. |
| 3.9 | Anchoring, Bonding & Reinforcement | .1 | Anchor or bond walls and partitions at points where they intersect. |
| | | .2 | Anchor masonry walls and partitions to concrete elements with anchors spaces at 400 mm vertically. |
| | | .3 | Unless otherwise indicated reinforce all walls and partitions with continuous horizontal metal reinforcement, installed at 400 mm o.c. vertically. |
| | | .4 | At all wall openings place continuous reinforcement in first and second mortar joints above and below openings. Additional reinforcement at openings shall extend 610 mm beyond both sides of openings. |
| | | .5 | Install prefabricated corner assemblies at outside corners. |
| | | .6 | Lap continuous reinforcement 150 mm at splices. Cut reinforcement at control joints. |
| 3.10 | Cutting Masonry | .1 | Cutting of masonry units exposed in finished work shall be done with approved type power saw. Where electrical conduit outlet or switch boxes occur, grind and cut units before services installed. |
| | | .2 | Obtain Consultant's approval before cutting any part or area which may impair appearance or strength of work. |
| | | .3 | Patching of masonry not permitted. |
| 3.11 | Reinforced Lintels | .1 | Install reinforced concrete block lintels at openings where steel lintels are not indicated. |
| | | .2 | Support masonry units of reinforced block lintels built in place. Provide a level platform, true to the proper elevation and of sufficient strength to support the load without visible deflection. Maintain supports in place for a minimum of 7 days and for a period sufficient to permit the concrete to cure and gain sufficient strength to safely support all loads. |
| | | .3 | Cast and cure lintels on a plank. Set special channel lintel blocks using specified mortar. Place wood stops at each end of lintel to prevent movement. |

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| | | .4 | Place 25 mm of 20 mPa concrete in voids, lay in reinforcing bars as indicated on drawings and place concrete to level of block sides. Rod and tamp concrete well without disturbing reinforcing. Allow lintels to cure 7 days before moving. |
| | | .5 | Minimum bearing shall be 200 mm each side. |
| | | .6 | Provide building paper in joint at bearings and at vertical joint at ends of block lintels to break bond. |
| 3.12 | <u>Reglets & Recesses</u> | .1 | Form continuous reglets and recesses in masonry elements as shown on Drawings and as required to accommodate work of other Sections. |
| | | .2 | Rake out mortar joints and make sawcuts in masonry elements as shown on Drawings and as required to accommodate work of other Sections. |
| | | .3 | Make reglets 25 mm deep, unless otherwise shown. |
| 3.13 | <u>Steel Door Frames</u> | .1 | Install steel frames in masonry walls. Build in frames rigid, true and plumb. Fill voids between frames and masonry with mortar grout. |
| | | .2 | Brace frames solidly in position while being built in. Provide temporary horizontal wood spreader at mid-height of frames to ensure maintenance of required frame width until masonry work is completed. For frames over 1200 mm width provide temporary vertical support at centre of head. |
| | | .3 | Comply with installation requirements specified under Section 08100. |
| 3.14 | <u>Patching & Cleaning</u> | .1 | At completion of work, holes and other defects in masonry joints shall be repaired, and masonry surfaces shall be thoroughly cleaned. |
| | | .2 | Holes in masonry joints shall be filled with mortar and suitably tooled. Cut out and repoint defective joints. |
| | | .3 | Dry brush masonry surfaces at end of each day's work and after all final pointing. |
| | | .4 | Remove mortar smears and droppings from concrete block masonry surfaces after such smears and droppings have dried. When mortar joints are dry and hard, clean masonry surfaces by rubbing down with abrasive blocks and stiff fibre brushes. |
| | | .5 | Remove efflorescence from masonry surfaces by wet cleaning in accordance with manufacturer's recommendations. |
| | | .7 | Upon completion of work, clean blockwork by brushing and washing. In extreme cases a 5% solution of muriatic acid may be used preceded and followed by a copious bath of clean water. Clean blockwork to be painted to suit requirements of Section 09900. |

End of Section

PART 1 - GENERAL

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| 1.1 | <u>General Requirements</u> | .1 | Comply with requirements of Division 1. | |
| 1.2 | <u>Related Sections</u> | .1 | Metal Doors and Frames | Section 08100 |
| | | .2 | Painting: | Section 09900 |
| 1.3 | <u>Reference Standards</u> | .1 | Do welding work to C.S.A. W59-1984 unless specified otherwise. | |
| | | .2 | Comply with the Ontario Building Code latest edition. | |
| 1.4 | <u>Submittals</u> | .1 | Submit shop drawings in accordance with the General Conditions. Clearly indicate such items as design calculations, materials, thickness, construction, connections, joints, anchorage, supports, reinforcements, and other relevant details. | |
| | | .2 | Shop drawings for ladders and pit covers shall bear stamp of a professional engineer registered in Ontario. | |
| 1.5 | <u>Work Supplied To Other Trades</u> | .1 | Supply the following items for installation under other Sections of work: Anchor bolts, bearing plates, sleeves and other inserts to be built into concrete and masonry elements and required for anchorage and support of work of this section. | |
| | | .2 | Supply other Sections with instructions, and if required, templates, necessary for accurate setting of inserts and components. | |
| 1.6 | <u>Product Delivery & Storage</u> | .1 | Deliver, handle and store fabricated components to prevent permanent distortion, corrosion and damage. | |

PART 2 - PRODUCTS

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| 2.1 | <u>Materials</u> | .1 | Material to be free from defects impairing strength durability or appearance and be of best commercial quality for purposes specified. |
| | | .2 | <u>Steel sections and plates:</u> To C.S.A. GRO.21-M1978. Type (300W). |
| | | .3 | <u>Steel Pipe:</u> To CSA B63-1966 (R1971) standard weight, extra strong, double extra strong, black, galvanized finish. |
| | | .4 | <u>Square steel tube:</u> CAN3-G40.21-M81, Grade 350W, Class H. |
| | | .5 | <u>Sheet steel:</u> Hot dip galvanized, cold rolled, with stretcher level degree of flatness to ASTM A526; zinc coating designation Z275. |
| | | .6 | <u>Stainless steel:</u> To C.S.A. G110.6-1968 Type 302, exposed surfaces to have No. 4 polished finish. |

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| 2.1 | <u>Materials</u>
<u>(Cont'd)</u> | <p>.7 <u>Welding materials:</u> To C.S.A. W59-1984.</p> <p>.8 <u>Bolts and anchor bolts:</u> To ASTM A307-76B.</p> <p>.9 <u>Galvanizing:</u> Hot dipped galvanizing with minimum zinc coating of 600 g/m² to CSA G164-1965 (1972).</p> <p>.10 <u>Chromium plating:</u> Chrome on steel with plating sequence of 9 micrometres thickness of copper, 10 micrometres thickness of nickel and 2.5 micrometres thickness of chromium.</p> <p>.11 <u>Galvanized primer:</u> Zinc rich, ready mix to CGSB 1-GP-181M.</p> <p>.12 <u>Cast Iron:</u> Soft grey iron.</p> <p>.13 <u>Wrought Iron:</u> Best quality, strong homogeneous, ductile forged iron to CSA standards latest edition for wrought iron.</p> <p>.14 <u>Shop primer:</u> CGSB 1-GP-40M.</p> <p>.15 <u>Zinc rich paint:</u> CGSB 1-GP-181M.</p> <p>.16 <u>Bituminous enamel:</u> Alkali resistant asphaltic coating.</p> <p>.17 <u>Non-shrink grout:</u> Por-Rok by Hallemite Products Ltd., or SET 15 Minute Anchoring Cement by SET Products Ltd.</p> |
| 2.2 | <u>Fabrication</u> | <p>.1 Fabricate components in the shop in largest size practicable to minimize field jointing.</p> <p>.2 Fabricate components square, straight, true, free from warpage and other defects. Accurately cut, machine file and fit joints, corners, copes and mitres.</p> <p>.3 Fabricate items from steel unless otherwise noted.</p> <p>.4 Reinforce fabricated components to safely withstand expected loads.</p> <p>.5 Make joints in built-up sections with hairline joints in least conspicuous locations and manner.</p> <p>.6 Make allowance for thermal expansion and contraction when fabricating exterior work.</p> <p>.7 Joints shall be welded unless otherwise indicated and unless details of construction do not permit welding. Exposed welds shall be continuous and shall be ground smooth.</p> <p>.8 Close exposed open ends of tubular members with welded on steel plugs.</p> <p>.9 Curved work to be made true radii.</p> <p>.10 Use self-tapping shake-proof countersunk flat headed screws on items required to be assembled by screws or as indicated.</p> |

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| 2.2 | <u>Fabrication (Cont'd)</u> | .11 | Where work of other Sections is to be attached to work of this Section, prepare work by drilling and tapping holes, as required to facilitate installation of such other work. |
| | | .12 | Work of this Section, supplied for installation under other Sections, shall be prepared as required ready for installation by drilling, countersinking and tapping holes, forming shapes and cutting to required sizes. |
| | | .13 | Grind off mill stampings and fill recessed markings on steel components left exposed to view. |
| 2.3 | <u>Connections</u> | .1 | All exposed fastenings to be of same material, colour and finish as the metal to which it is applied. |
| | | .2 | Connections and accessories must be adequate to sustain safely and withstand stresses and strains to which normally subjected. |
| | | .3 | Shop and field connections to be riveted or welded and where indicated or required, blind riveted. Rivets, screws and fastenings to be countersunk into exposed work and finished flush. |
| | | .4 | Connect all members to form a homogeneous structure. Connections to develop the full strength in the member connected before failure. |
| 2.4 | <u>Finishes</u> | .1 | Thoroughly clean steel of loose scale, rust, oil, dirt and other foreign matter. Suitably prepare steel surfaces by power tool cleaning to receive specified finishes. |
| | | .2 | Grind smooth sharp projections. |
| | | .3 | Remove oil and grease by solvent cleaning. |
| | | .4 | Apply coatings in the shop and before assembly. Where size permits, galvanize components after assembly. |
| | | .5 | Shop apply coat of primer to interior components after fabrication except where galvanized or zinc rich paint finish is required. |
| | | .6 | Do not paint surface to be field welded. |
| | | .7 | Dip bolts that are to remain permanently in the structure, in oxide paint before placing in position. |
| | | .8 | Hot dip galvanize all exterior components and, where so indicated, interior components, after fabrication. |
| | | .9 | Apply coat of bituminous enamel to surfaces of metal components in contact with cementitious materials and dissimilar metals. |

PART 3 - EXECUTION

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| 3.1 | <u>Installation</u> | .1 | Erect metal work square, plumb, straight and true, accurately fitted, with tight joints and intersections. Drill, cut and fit as necessary to attach this work to adjoining work. |
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- 3.1 **Installation**
(Cont'd)
- .2 Provide suitable and acceptable means of anchorage such as dowels anchor clips, bar anchors, expansion bolts and shields, toggles.
- .3 Make field connections with high tensile bolts, or weld to CSA S16-1969 and CSA S16S1-1975.
- .4 Provide temporary supports and bracing required to position components until they are permanently anchored in place.
- .5 Securely anchor components in place; unless otherwise indicated, anchor components as follows:
- .1 To concrete and solid masonry with expansion type anchor bolts.
- .2 To hollow construction with toggle bolts.
- .3 To thin metal with screws or bolts.
- .4 To thick metal with bolts or by welding.
- .5 To wood with bolts or lag screws.
- .6 Fill space between railing members and sleeves with non-shrink grout.
- .6 Hand items to be cast into concrete or built into masonry over to appropriate trades together with setting templates.
- .7 Touch-up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection.
- .8 Touch-up galvanized surfaces with zinc primer where burned by field welding.
- .9 Dissimilar metals and metals in contact with cementitious elements shall have contact surfaces coated with bituminous paint or be isolated by other means as approved by Consultant.
- 3.2 **Schedule of**
Components
- .1 **Hollow Metal Frame Supports**
- .1 Provide supplementary steel supports for hollow metal frames as detailed.
- .2 **Miscellaneous Steel Items**
- .1 Miscellaneous steel angles, plates and lintels indicated on Architectural Drawings, but not included on Structural Drawings.
- .2 Other metal fabrications shown on Drawings and not specifically covered in other Sections. All steel components indicated on Structural Drawings will be provided by Section 05123.

.3 **Bollards**

- .1 Fabricate from 150 mm diameter heavy walled steel pipe, concrete filled as detailed. Unless otherwise indicated extend bollard 914 mm above grade and 1220 mm below grade.
- .2 Finish: Hot dipped galvanized with 6mm HDPE dome top bollard cover – colour yellow with two reflective tape strips.

End of Section

PART 1 - GENERAL

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| 1.1 | <u>General Requirements</u> | .1 | Comply with requirements of Division 1. |
| 1.2 | <u>Work Supplied to Other Trades</u> | .1 | Supply following items for installation under other Sections of work: Anchor bolts, bearing plates, sleeves and other inserts to be built into concrete and masonry elements and required for anchorage and support the work of this section. |
| | | .2 | Supply other Sections with instructions, and if required, templates, necessary for accurate setting of inserts and components. |
| 1.3 | <u>Source Quality Control</u> | .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. |
| 1.4 | <u>Product Delivery & Storage</u> | .1 | Store material on site on skids off the ground and covered for protection from rain. |
| | | .2 | Take adequate measures to prevent moisture gain of kiln dried materials. |

PART 2 - PRODUCTS

- | 2.1 | <u>Lumber Material</u> | .1 | Lumber: unless specified otherwise, softwood, S4S, moisture content 19% or less in accordance with following standards: | | | | | | | | | | | | | | | | | | | | | |
|-------------|-------------------------------|--------------|--|------------|----------------|--------------|----------|--------|---|-------|--------|---|--------|--------|---|-------|--------|---|-------|-------------|---|-------------|-------------|---|
| | | .1 | CAN 3-086-M84 | | | | | | | | | | | | | | | | | | | | | |
| | | .2 | CSA 0141-1970 | | | | | | | | | | | | | | | | | | | | | |
| | | .3 | NLGA Standard Grading Rules for Canadian Lumber, 1980 edition revised according to Supplement No. 1, 1981. | | | | | | | | | | | | | | | | | | | | | |
| | | .2 | Furring, blocking, railing strips, grounds, rough bucks, curbs. | | | | | | | | | | | | | | | | | | | | | |
| | | | <table border="0"> <thead> <tr> <th><u>USE</u></th> <th><u>SPECIES</u></th> <th><u>GRADE</u></th> </tr> </thead> <tbody> <tr> <td>Blocking</td> <td>Spruce</td> <td>2</td> </tr> <tr> <td>Studs</td> <td>Spruce</td> <td>1</td> </tr> <tr> <td>Plates</td> <td>Spruce</td> <td>1</td> </tr> <tr> <td>Other</td> <td>Spruce</td> <td>1</td> </tr> <tr> <td>Cants</td> <td>Douglas Fir</td> <td>2</td> </tr> <tr> <td>Wood Fascia</td> <td>Douglas Fir</td> <td>1</td> </tr> </tbody> </table> | <u>USE</u> | <u>SPECIES</u> | <u>GRADE</u> | Blocking | Spruce | 2 | Studs | Spruce | 1 | Plates | Spruce | 1 | Other | Spruce | 1 | Cants | Douglas Fir | 2 | Wood Fascia | Douglas Fir | 1 |
| <u>USE</u> | <u>SPECIES</u> | <u>GRADE</u> | | | | | | | | | | | | | | | | | | | | | | |
| Blocking | Spruce | 2 | | | | | | | | | | | | | | | | | | | | | | |
| Studs | Spruce | 1 | | | | | | | | | | | | | | | | | | | | | | |
| Plates | Spruce | 1 | | | | | | | | | | | | | | | | | | | | | | |
| Other | Spruce | 1 | | | | | | | | | | | | | | | | | | | | | | |
| Cants | Douglas Fir | 2 | | | | | | | | | | | | | | | | | | | | | | |
| Wood Fascia | Douglas Fir | 1 | | | | | | | | | | | | | | | | | | | | | | |
| 2.2 | <u>Plywood</u> | .1 | Douglas Fir to CSA 0121-M1978 Unsanded Sheathing Grade. | | | | | | | | | | | | | | | | | | | | | |
| 2.3 | <u>Fasteners</u> | .1 | Nails: to CSA B111-1974, hot dip galvanized steel for exterior work including components located in exterior walls and roofs; bright finish steel in all other locations. Unless otherwise indicated use common spiral flathead nails. | | | | | | | | | | | | | | | | | | | | | |

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| | .2 | Bolts, nuts, washers: ASTM A307, hot dip galvanized steel. |
| | .3 | Connectors, anchors, brackets, spikes: hot dip galvanized structural quality steel. |
| | .4 | Plugs for masonry walls: 4.5 mm galvanized sheet steel wall plugs by Drummond & Reeves, approx. 75 mm deep and 57 mm wide. |
| | .5 | Screws: to CSA B35.4-1972 zinc, cadmium or chrome plated. |
| | .6 | Nailing discs: flat caps, minimum 1" diameter, maximum 16 ga thick sheet metal, formed to prevent dishing. Bell or cup shapes not acceptable. |
| 2.4 | <u>Wood Treatment</u> | |
| | .1 | Preservative pressure treated components: to CSA, using alkaline copper quaternary (ACQ). |
| | .2 | Surface, cut, bore and trim components to sizes required as much as possible prior to pressure treatment. |

PART 3 - EXECUTION

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| 3.1 | <u>General</u> | |
| | .1 | Erect work plumb, level, square and to required lines, Ensure that materials are rigidly and securely attached to each other and to adjacent building elements and will not be loosened by work of other trades. |
| | .2 | Where other materials and components are to be applied directly over wood members recess heads of fastening devices below wood surfaces. |
| | .3 | Where work remains exposed to view, fasteners shall be uniformly and evenly spaced and neatly installed. |
| 3.2 | <u>Nailers, Blocking Copings Grounds</u> | |
| | .1 | Provide wood nailers, blocking, copings, strapping, bucks, grounds and other rough carpentry components to sizes and in locations required for satisfactory supply of fabricated items and other work. |
| | .2 | Unless otherwise indicated, provide minimum 38 mm thick material. Grounds may be 21 mm thick material unless otherwise indicated. |
| | .3 | Install wood members plumb, level, straight, true to line and solidly anchored to adjacent building elements. |
| | .4 | Provide rough bucks where indicated or required for windows, doors lockers and other elements. |
| 3.3 | <u>Anchors & Fasteners</u> | |
| | .1 | Provide rough hardware including nails, screws, bolts, washers, brackets, hangers, and fastening devices of all types. |
| | .2 | Unless otherwise indicated, attach wood members at maximum 600 mm . o.c. as follows: |
| | .1 | To concrete and solid masonry with expansion type anchor bolts. |
| | .2 | To hollow masonry with toggle bolts. |

- .3 To heavy gauge metal with bolts.
- .4 To light gauge metal with screws or bolts.
- .5 To wood with nails, screws or bolts as required to ensure stability.
- .3 Bucks and plates shall be anchored to masonry walls with 13 mm galvanized steel bolts 450 mm long.
- .4 Fasten wood copings to supporting masonry elements with 13 mm galvanized steel bolts min. 450 mm long spaced max. 600 mm o.c. Where width of coping plate exceeds 100 mm, stagger bolts off centre.
- 3.4 **Pressure Treated Components**
 - .1 Use preservative pressure treated lumber and Treated plywood within exterior wall and roof systems and other locations indicated on drawings.
 - .2 Where it is necessary to cut, bore or otherwise alter pressure treated components in the field, treat cut surfaces with heavy coat of wood preservative.

End of Section

1.0 GENERAL

The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section. The work of this section shall comply with all requirements of Division 1 – General Requirements.

1.1 SECTION INCLUDES

- .1 Materials, preparation and application for caulking and sealant.
- .2 Text to complete other various Sections containing sealant or caulking specifications, including Section [07 52 00 – Modified Bituminous Membrane Roofing].

1.2 RELATED SECTIONS

- .1 Section 04 90 00 – Masonry.
- .2 Section 07 62 00 – Sheet Metal Flashing and Trim.
- .3 Section 08 11 13 – Hollow Metal Doors and Frames
- .4 Section 08 11 16 – Aluminum Doors and Frames.
- .5 Section 08 44 13 – Aluminum Curtain Walls.
- .6 Section 08 51 13 – Aluminum Windows and Operable Sashes.
- .7 Section 08 80 00 – Glass and Glazing

1.3 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM C 510-[16] Standard Test Method for Staining and Color Change of Single- or Multicomponent Joint Sealants.
 - .2 ASTM C 661-[15] Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer.
 - .3 ASTM C 719-[14(2019)] Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle).
 - .4 ASTM C 794-[18] Standard Test Method for Adhesion-in-Peel of Elastomeric Joint Sealants.
 - .5 ASTM C 834-[17] Standard Specification for Latex Sealants.
 - .6 ASTM C 919-[18], Standard Practice for Use of Sealants in Acoustical Applications.
 - .7 ASTM C 920-[18] Standard Specification for Elastomeric Joint Sealants.
 - .8 ASTM C 1087-[16] Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems.
 - .9 ASTM C 1135-[19] Standard Test Method for Determining Tensile Adhesion Properties of Structural Sealants.
 - .10 ASTM C 1184-[18e1] Standard Specification for Structural Silicone Sealants.
 - .11 ASTM C 1193-[16] Standard Guide for Use of Joint Sealants.
 - .12 ASTM C 1247-[20] Standard Test Method for Durability of Sealants Exposed to Continuous Immersion in Liquids.

- .13 ASTM C 1248-[18] Standard Test Method for Staining of Porous Substrate by Joint Sealants.
- .14 ASTM C 1311-[14] Standard Specification for Solvent Release Sealants.
- .15 ASTM C 1330-[18] Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.
- .16 ASTM C 1564-[15] Standard Guide for Use of Silicone Sealants for Protective Glazing Systems
- .17 ASTM D 412-[16] Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
- .18 ASTM D 2203-[01(2018)] Standard Test Method for Staining from Sealants.
- .19 ASTM D 2240-[15e1] Standard Test Method for Rubber Property—Durometer Hardness
- .20 ASTM D 3960-[05(2018)] Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings
- .21 ASTM E 119-[19] Standard Test Methods for Fire Tests of Building Construction and Materials
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS) GANA Glazing Manual - 2008.
 - .1 Safety Data Sheets (SDS),

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Installation Meeting:
 - .1 Convene pre-installation meeting 1 week prior to beginning work of this Section Consultant to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review mock-ups and procedures.
 - .5 Review manufacturer's written installation instructions and warranty requirements.
 - .2 Ensure subcontractor representatives, site supervisor and project manager attend.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for joint sealants and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Manufacturer's product to describe:
 - .1 Caulking compound.
 - .2 Primers.
 - .3 Joint backing.
 - .4 Sealing compound, each type, including compatibility when different sealants are in contact with each other.
 - .3 Submit 2 copies of WHMIS SDS.
- .2 Samples:

- .1 Submit 2 samples of each type of material and colour.
- .2 Cured samples of exposed sealants for each colour where required to match adjacent material.
- .3 Manufacturer's Instructions:
 - .1 Submit instructions to include installation instructions for each product used.

1.6 CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.
- .2 Warranty Documentation: Submit Warranty Documents Specified.

1.7 QUALITY ASSURANCE

- .1 Perform the work in accordance with the manufacturer's written project recommendations.
- .2 Obtain each type of joint sealant through one source from a single manufacturer.
- .3 Qualifications:
 - .1 The installation of the sealant work shall be performed by a recognized specialized applicator, having at least five (5) years of experience, with skilled mechanics, thoroughly trained and competent in all phases of the work.
- .4 Mock-up:
 - .1 Construct mock-ups two (2) weeks prior to commencement of the work to demonstrate all of the joints encountered in this project.
 - .2 The mock-ups shall be 1 m in length for each type of sealant and substrate.
 - .3 Locate mock-ups where directed by the Consultant.
 - .4 The mock-ups shall demonstrate the surface preparation prior to the sealant installation and the location, size, shape, colour, depth of joints, and adhesion and cohesion, complete with back-up material, primer, and new sealant.
 - .5 Allow 48 hours for inspection by the Consultant before proceeding with the sealant work.
 - .6 Upon receipt of written confirmation from the Consultant, the mock-up may remain as part of the finished work.
 - .7 The approved mock-up shall be the standard to which all work shall be performed.
 - .8 The mock-up shall be performed prior to the pre-installation conference

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 At time of delivery, the Contractor is to verify the sealant expiry dates. Any sealants that have expired or will expire prior to installation are to be returned to the supplier/manufacturer and should not be accepted on site.
- .4 Storage and Handling Requirements:
 - .1 Store materials off ground, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect joint sealants from nicks, scratches, and blemishes.

- .3 Replace defective or damaged materials with new.

1.9 SITE CONDITIONS

- .1 Ambient Requirements:
 - .1 Proceed with installation of joint sealants only when:
 - .1 Ambient and substrate temperature conditions are within limits permitted by joint sealant manufacturer or are above 4.4 degrees C.
 - .2 Joint substrates are dry.
 - .3 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.
 - .2 Joint-Substrate Conditions:
 - .1 Proceed with installation of joint sealants only after contaminants capable of interfering with adhesion are removed from joint substrates

1.10 ENVIRONMENTAL REQUIREMENTS

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials. Labelling and provision of Safety Data Sheets (SDS) shall be acceptable to Health Canada.
- .2 Ensure that all materials, containers, rags, etc. are disposed of in accordance with the local Waste Management Plan and hazardous material disposal regulations and requirements.
- .3 Ventilate area of work by use of approved portable supply and exhaust fans.
- .4 VOC limit 250 g/L maximum.

1.11 ALTERNATIVES

- .1 Alternatives to manufacturer's brands or supply sources of materials will not be accepted.

1.12 WARRANTY

- .1 Contractor shall provide a warranty by the sealant manufacturer covering a period of five (5) years for all labour and materials from the date of Substantial Performance of the contract agreeing to furnish sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within the specified warranty period.
- .2 Defective work shall include, but is not limited to, joint leakage, cracking, crumbling, melting, running, loss of adhesion or loss of cohesion, and substrate staining.

1.13 ANTICIPATED FIELD TESTING PROGRAM

- .1 Material and adhesion tests shall be conducted at the discretion of the Consultant on a random basis to show that properties are appropriate to the particular sealant and proper bond is achieved.
- .2 Extent of testing shall be as follows:
 - .1 Ten (10) tests for the first 1 000 feet (300 m) of joint length for each type of elastomeric sealant and joint substrate.
 - .2 One (1) test for each 1 000 feet (300 m) of joint length therefore or one test per each floor per elevation.
- .3 The Contractor shall repair all test areas as part of the work in accordance with this section.

- .4 All sealant installation failing material and adhesion tests shall be rectified in accordance with manufacturer and Consultant approved methods. Rectified areas will be retested until results confirm compliance with the manufacturer's written requirements

Part 2 Products

2.1 SEALANT

- .1 Porous Substrates (Clay Brick, Concrete, Stone, etc.)
 - .1 Dow Corning 790 Silicone Building Sealant manufactured by Dow Corning Corporation.
 - .2 Dow Corning 756 SMS; Silicone Building Sealant manufactured by Dow Corning Corporation.
 - .3 Dow Corning CCS (Contractors Concrete Sealant) manufactured by Dow Corning Corporation.
 - .4 Silpruf NB SCS 9000 manufactured by GE Silicones.
 - .5 Spectrem 1 manufactured by Tremco Ltd.
 - .6 Spectrem 2 manufactured by Tremco Ltd.
- .2 Non-porous Substrates (Glass, Metal, etc.)
 - .1 Dow Corning 756 SMS Silicone Building Sealant manufactured by Dow Corning Corporation.
 - .2 Dow Corning 791 manufactured by Dow Corning Corporation.
 - .3 Dow Corning 795 manufactured by Dow Corning Corporation.
 - .4 Dow Corning CWS (Contractor's Weather Sealant) manufactured by Dow Corning Corporation.
 - .5 Spectrem 1 manufactured by Tremco Ltd.
 - .6 Spectrem 2 manufactured by Tremco Ltd.
- .3 Porous Substrate/Metal Substrate
 - .1 Dow Corning 756 SMS Silicone Building Sealant manufactured by Dow Corning Corporation.
 - .2 Dow Corning 790 Silicone Building Sealant manufactured by Dow Corning Corporation.
 - .3 Dow Corning Contractors Weatherproofing Sealant (CWS)
 - .4 SilPruf NB SCS 9000 manufactured by GE Silicones.
 - .5 Spectrum 1 manufactured by Tremco Ltd.
 - .6 Spectrem 2 manufactured by Tremco Ltd.
- .4 Continuous Immersion – Applicable for Potable Water (Not for Chlorine/Bromine Exposure, i.e. pool water)
 - .1 Vulkem 116 manufactured by Tremco Ltd.
 - .2 Vulkem 45 SSL manufactured by Tremco Ltd.
- .5 Self-Levelling
 - .1 Vulkem 45 SSL manufactured by Tremco Ltd.
 - .2 Sikaflex 2C SL manufactured by Sika Canada.
 - .3 THC-901 manufactured by Tremco Ltd.

- .6 Interior – Applicable for Window Perimeter
 - .1 Tremflex 834 manufactured by Tremco Ltd
- .7 Acoustic Sealant
 - .1 Tremco Acoustical Sealant manufactured by Tremco Ltd.
- .8 Butyl Rubber
 - .1 Butyl Sealant manufactured by Tremco Ltd.
- .9 Self-Adhered Waterproof SBS Membrane Sealant
 - .1 Dow Corning 758 Silicone Weather Barrier Sealant manufactured by Dow Corning Corporation.
- .10 Silicone Sealant with Fungicides: for use in washrooms and Food Prep areas, (interior counter back splash and washroom fixtures):
 - .1 SCS1700 Sanitary Silicone Sealant by GE Silicones.
- .11 Sealant colour to later selection by Consultant and/or Owner from manufacturer's full range of colours.
- .12 The Contractor shall obtain written confirmation of the sealant suitability for this project. A copy of this confirmation shall be forwarded to the Consultant prior to commencing with the work of this section.

2.2 PRIMERS

- .1 Primer shall be as specified by the sealant manufacturer.

2.3 JOINT BACKING

- .1 Butt Joint and Bridge Joint Applications
 - .1 Cylindrical Sealant Backing, of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance. Material shall be of type that will not adhere to the specified sealant:
 - .1 Closed-cell material (i.e. polyethylene) with a surface skin. Do not puncture backer; rod may cause bubbling in sealant.
 - .2 Bi-cellular material with a surface skin.
 - .3 [Open-cell foam backer rod shall be used for the exterior (secondary) sealant bead in a two-stage sealant joint].
 - .4 [Open-cell material OR Open cell foam backer rod shall not be used on this project].
 - .2 Where the joint size cannot accommodate foam rod, polyethylene tape or other joint backing material recommended by sealant manufacturer shall be used.
- .2 Fillet Joint Applications
 - .1 Bond breaker tape, polyethylene tape or other plastic tape recommended by the sealant manufacturer shall be used to prevent adhesion to the specified sealant or to the back of joint.

2.4 CLEANING AGENT

- .1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant in accordance with sealant manufacturer's written recommendations.
- .2 Primer: in accordance with sealant manufacturer's written recommendations.

2.5 MASKING TAPE

- .1 Non-staining, non-absorbent material compatible with joint sealant and surface adjacent to joints.

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 joint sealants installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.
- .2 The Contractor shall arrange for the sealant Manufacturer's representative to visit the site and review the surface preparation and installation procedures at the start of the work.

3.2 PREPARATION

- .1 Consult and follow the sealant manufacturer's project recommendations.
- .2 Remove the existing sealant around the joints and penetrations without causing damage to the substrates.
- .3 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.
- .4 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work.
- .5 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.
- .6 Ensure joint surfaces are dry and frost free.
- .7 Do not apply sealant to masonry until mortar has cured. Refer to Section 04 90 00 – Masonry.
- .8 Butt and Bridge Joint Applications
 - .1 Examine the joint sizes and correct as required to allow for the anticipated movement and to achieve proper width / depth ratio in accordance with the manufacturer's recommendations for the specified sealant unless indicated differently on the drawings, or by the Consultant.
 - .2 Should joint width correction be required, ensure that the correction is distributed appropriately to each side of joint.
- .9 Fillet Joint Applications
 - .1 Remove oil, grease and other coatings from non-ferrous metals with an approved cleaning solvent or abrasive technique. Obtain approval from the Consultant prior to commencing.

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 Primers that require application by the wipe of a clean soft cloth, shall be poured onto the cloth. Do not dip the cloth into the primer container.
- .4 Prime only as much area as can be sealed in the same working day

3.4 BACKUP MATERIAL

- .1 Cylindrical Sealant Backing:
 - .1 Install the backer rod without stretching, twisting, braiding or puncturing the outer skin. Do not leave gaps between ends of sealant backings.
 - .2 Use an approved installation tool that is blunt surfaced and is designed accurately to place the backer rod.
 - .3 Using the approved tool, smoothly and uniformly place the backer rod to the recommended joint depth and rod compression.
 - .4 The minimum compression of the foam backer rod is twenty-five (25) percent. Vary backer rod size as required to achieve specified compression.
- .2 Bond Breaker Tape:
 - .1 Install bond breaker tape without stretching, twisting or puncturing the tape.
 - .2 Use an approved installation tool that is blunt surfaced and is designed accurately to place tape within the joint.
 - .3 Width of bond breaker tape shall fit exactly the width of the joint.
 - .4 Install tape at the back of the joint.
 - .5 Do not leave gaps between ends of bond breaker tape.
- .3 Three-sided adhesion is not permitted.
- .4 Foam backer rod shall only be installed in areas that can be sealed in the same working day.

3.5 MIXING

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

3.6 APPLICATION

- .1 Sealant:
 - .1 The Contractor shall have a trained representative on site at all times who is responsible for all sealant applications.
 - .2 Perform all work in strict accordance with the manufacturer's printed instructions. The Contractor shall provide the Consultant a copy of these instructions prior to commencing with the injection and sealing operations.
 - .3 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.
 - .4 Apply sealant in continuous beads.
 - .5 Apply sealant using gun with proper size nozzle.
 - .6 Use sufficient pressure to fill voids and joints solid.

- .7 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
- .8 Tool exposed surfaces before skinning begins to give slightly concave shape.
- .9 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

3.7 TWO-STAGE SEALANT JOINT

- .1 A two-stage sealant bead consists of two sealant beads separated by a drained air space with each sealant bead having its own appropriate joint backing material.
- .2 The interior sealant bead shall be allowed to fully cure prior to the installation of the exterior bead. Sealant cut tests to confirm adhesive properties must be completed by the Consultant and repaired by the Contractor prior to the installation of the exterior bead. Obtain written confirmation from the Consultant prior to proceeding with the installation of the exterior bead.
- .3 A minimum of 25 mm must be maintained between the exterior face of the interior sealant bead and the back of the joint backing material for the exterior bead.
- .4 The Contractor is to ensure that the installation of a primer or surface preparation procedures for the interior sealant bead do not inhibit the adhesion of the exterior sealant bead.
- .5 At the intersection of horizontal and vertical sealant joints, return the horizontal interior sealant bead to interface with the exterior sealant bead closing the air space between sealant beads.
- .6 Install gap in the exterior vertical sealant joint at all intersections of horizontal and vertical sealant joints as per the details

3.8 ROUT AND SEAL REPAIRS

- .1 Grind sides of crack to a minimum width of 6mm and depth of 6mm (1/4 inch).
- .2 Apply bond breaker tape inside the joint.
- .3 Fill the joint with sealant. Tool sealant following application

3.9 CLEANING

- .1 Progress Cleaning:
 - .1 Leave Work area clean at end of each day.
 - .2 Clean adjacent surfaces immediately.
 - .3 Remove excess and droppings, using recommended cleaners as work progresses.
 - .4 Remove masking tape after initial set of sealant
- .2 Final Cleaning:
 - .1 Upon completion remove surplus materials, rubbish, tools and equipment.
 - .2

3.10 PROTECTION

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

END OF SECTION

PART 1 - GENERAL

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|-----|---|----|--|------------------|
| 1.1 | <u>General Requirements</u> | .1 | Comply with requirements of Division 1. | |
| 1.2 | <u>Related Sections</u> | .1 | Caulking at frame perimeters: | Section 07900 |
| | | .2 | Finish Hardware: | Section 08710 |
| | | .3 | Glazing: | Section 08 88 00 |
| | | .4 | Painting: | Section 09 21 16 |
| 1.3 | <u>Qualifications</u> | .1 | Acceptable manufacturers: Member of The Canadian Steel Door & Frame Manufacturers' Association. | |
| | | .2 | Reference standards: Unless otherwise specified, meet requirements of "Canadian Manufacturing Specification for Steel Doors and Frames" published by the Canadian Steel Door & Frame Manufacturers' Association. | |
| | | .3 | Fire protection requirements: fire rated doors, frames and screens shall bear ULC labels. | |
| | | .4 | One manufacturer is to provide doors and frames unless specified otherwise. | |
| 1.4 | <u>Guarantee</u> | .1 | Provide the following guarantee in accordance with the General Conditions, not withstanding the time provision therein. | |
| | | .1 | Three years on materials and labour. | |
| 1.5 | <u>Submittals</u> | .1 | Submit shop drawings in accordance with Division 1. | |
| | | .2 | Clearly indicate each type of frame, door, material, core thickness reinforcements, glazing stops, location of anchors, exposed fastenings and finishes. | |
| 1.6 | <u>Work Supplied to Other Trades</u> | .1 | Supply frames and anchors to other Sections where it is necessary to build frames into work of other Sections. | |
| | | .2 | Supply instructions required for accurate positioning and proper installation of components supplied to other Sections. | |
| 1.7 | <u>Design Requirements of Doors & Frames</u> | .1 | Exclusion of water. | |
| | | .2 | Prevent air infiltration in excess of 0.5 cubic feet/minute/linear foot. | |
| | | .3 | U factor of 0.56 or less | |
| | | .4 | S.T.C. 20. | |

PART 2 - PRODUCTS

- 2.1 **Materials**
- .1 Sheet Steel: Cold rolled steel with stretcher level degree of flatness, meeting requirements of ASTM A366 Class 1.

Finish:
 - .1 W25 wipe coated zinc finish to ASTM A526.
 - .2 Hot dipped galvanized zinc to ASTM A526M for all doors and frames where indicated.
 - .2 Core Material:
 - .1 Fire rated doors: in accordance with fire test requirements.
 - .2 Exterior doors: semi-rigid glass fibre insulation minimum density of 24 kg/m².
 - .3 Interior doors, except fire rated doors: honeycomb core of rigid pre-expanded resin impregnated Kraft paper having maximum 20mm hexagonal shaped cells.
 - .3 Finishing Materials:
 - .1 Touch up paint: zinc rich paint CGSB 1-GP-181M.
 - .2 Metal filler: two component epoxy type.
 - .3 Shop primer: zinc or lead chromate type.
 - .4 Door Bumpers: Gray neoprene double stud.
- 2.2 **Reinforcement & Hardware Preparation**
- .1 Templated hardware: prepare work in accordance with templates supplied by Section 08710. ANSI Standards will not necessarily be used. Drill and tap doors for templated hardware. Provide door latch guide.
 - .2 Blank, reinforce, drill and tap doors and frames for concealed, mortised and surface mounted hardware and concealed magnetic contacts. Provide door closer reinforcement at all steel doors and frames whether closer is required by hardware list or not.
 - .3 Hardware reinforcements shall be minimum 3.4mm thick.
 - .4 Guard boxes: 0.9 mm (20 ga.) steel welded to back of frame at hardware cutouts where mortar or other materials could obstruct hardware operation.
 - .5 Provide steel angle high frequency top hinge reinforcing in doors and frames. Weld both legs of angle to adjoining surfaces.

- 2.3 **Doors**
- .1 Construct fire rated doors in accordance with fire test requirements.
 - .2 Provide all doors of seamless construction with no visible seams or joints on faces and vertical edges. Render joints invisible by grinding, filling and dressing smooth.
 - .3 Exterior doors: 1.6 mm (16 ga.) thick base sheet steel of urethane core construction. Fully weld vertical seams for full height of door and grind smooth. Mechanically interlock face sheets at vertical edges and continuously weld seams extending full height of door. Fill all seams and grind smooth.
 - .4 Interior doors: 1.2 mm (18 ga.) thick base sheet steel of honeycomb core construction. Mechanically interlock, with adhesive, face sheets at vertical edge to form a tight straight joint. Tack weld every 6" for full height of door. Fill all seams with epoxy and grind smooth
 - .5 Provide condensation weep holes at bottom edge of exterior doors.
 - .6 Provide flush end steel closures at top edge of all exterior doors and where required for attachment of hardware, weather stripping and concealed magnetic switches.
 - .7 Prepare doors as required for louvres, glazing and between glass blinds where indicated. Surround openings in flush doors with minimum 1.2mm thick steel edge channels, welded to both face sheets. Where prepared openings in doors exceed 35% of the total door area, face sheets at vertical edges must be continuously welded.
 - .8 Provide 0.9 mm thick removable glazing stops of zinc coated steel channels mitred at corners, accurately fitted into position and fastened with countersunk Phillips, flathead sheet metal screws.
 - .9 Glazing stops at outside of exterior doors shall be rendered non-removable.
 - .10 Doors to be square and true. Maximum twist 3mm measured on the diagonal of the door.
 - .11 Construct rail and stile doors in same manner as flush doors.
 - .12 Undercut doors where shown or required to suit floor finish.
- 2.4 **Frames**
- .1 Provide welded frames of 1.6 mm thick sheet steel to profiles shown on Drawings.
 - .2 Shop assemble components with accurately cut joints. Mitre outside corner joints of frames. Weld joints on inside of profile; grind welds, flush and sand to smooth uniform surface.
 - .3 Glazing stops shall be minimum 0.9 mm thick steel, drilled and secured with oval headed screws.

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|-----|----------------------------|-----|---|
| 2.4 | Frames
(Cont'd) | .4 | Drill interior door frames for double stud rubber bumpers. Drill strike jamb of each single frame for 3 bumpers. Drill head member of double door frames for 2 bumpers. |
| | | .5 | Provide full height 3.4 mm thick steel reinforcement at hinge side of all frames. |
| | | .6 | Provide steel channel head reinforcement for door frames wider than 915 mm. |
| | | .7 | Tack weld two removable 1.2 mm thick steel spreader channels to inside faces of door frames at base. |
| | | .8 | Provide adjustable base clips for anchorage to floor at bottom of each door jamb. |
| | | .9 | Provide 0.9 mm guard boxes at all strike and hinge reinforcements. |
| | | .10 | Provide welded on drip at head of exterior door frames. |
| | | .11 | For screens with between the glass blinds, prepare frame to accept tilt control knob assembly. |
| | | .12 | Prepare frames as required to accommodate wiring to electrical hardware devices. |
| | | .13 | Provide removable mullions where indicated. |
| | | .14 | Provide 1.2 mm thick continuous steel closer panels at all exposed backs of head and jamb frame conditions. |
| | | .15 | Prepare frames as required to accommodate supplementary steel supports provided by Section 05500. |
| | | .16 | Provide 1.6 mm thick anchors for frames. |
| 2.5 | Transom
Panels | .1 | Provide insulated metal transom panels at head of doors where shown on drawings. |
| | | .2 | Construct panels in manner specified for hollow metal doors. |
| | | .3 | Secure panels to frame with concealed fastenings. |

PART 3 - EXECUTION

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|-----|--|----|--|
| 3.1 | Frame &
Screen
Installation | .1 | Set frames plumb, square, level and at correct elevation. |
| | | .2 | Allowable limit of distortion shall be 1.5mm out of plumb at each jamb, measured on face of frame, resulting in maximum twist of frame of 3mm measured from upper corner to lower diagonal corner. |

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|-----|---|----|--|
| 3.1 | Frame & Screen Installation (Cont'd) | .3 | Generally anchorage of frames shall be by means of standard anchors. Where standard anchors cannot be used, provide special anchors to ensure proper installation. Method of anchorage shall not be visible when frames are installed. |
| | | .4 | Provide minimum 3 anchors at each jamb. At frames exceeding 2150 mm in height provide one additional anchor for each additional 610mm or part thereof. |
| | | .5 | Anchor intermediate vertical frame members to structure above as required to ensure stability. Where required, provide steel frame extensions. Provide flexible connection at structure to allow for deflection. |
| | | .6 | 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 950mm wide. Remove temporary spreaders after frames are built-in. |
| | | .7 | Remove spreader channels only after frames are securely anchored in place. |
| 3.2 | <u>Doors</u> | .1 | Install doors after wet finishes are completed. |
| | | .2 | Doors must be square and true within frame. Maintain approximately 3mm between perimeter outside edge of sides and head of door and inside edge of frame. |
| | | .3 | Exterior doors and fire doors must seal tight against weatherstrip and smoke gaskets. |
| | | .4 | Install transom panels where indicated on drawings. |
| | | .5 | Install hardware in accordance with hardware supplier's instructions. |
| | | .6 | Adjust operable parts to ensure proper operation. |
| 3.3 | <u>Touch-up</u> | .1 | Patch damaged shop primer. Remove rust, sand damaged and abraded surfaces and touch-up with prime paint matching original finish. |
| | | .2 | Touch-up damaged zinc coating with zinc rich paint prior to application of shop primer. |

End of Section

PART 1 - GENERAL

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|-----|--|----|--|---------------|
| 1.1 | <u>General Requirements</u> | .1 | Comply with requirements of Division 1. | |
| 1.2 | <u>Related Sections</u> | .1 | Installation of finish hardware | Section 08100 |
| 1.3 | <u>Scope of Work</u> | .1 | Supply only of | |
| | | .1 | Finishing Hardware | |
| 1.4 | <u>Quality Assurance</u> | .1 | The products listed in the finishing hardware schedule establish the minimum quality standards for this project. Deviations are not permitted. | |
| | | .2 | Companies tendering this project shall retain a qualified Architectural Hardware Consultant (A.H.C.) who will assume responsibility relative to their profession. | |
| | | .3 | Finishing Hardware companies tendering on this project shall BID only those products specified, or for the purpose of tendering products listed here in as equivalents. Alternates will be allowed only as outlined in Section 2.1. | |
| | | .4 | The Architect's Consultant will be provided with a copy of the approved hardware schedule and all approved change notices to complete a quality assurance inspection at completion of the project. It will be the hardware supplier's responsibility to correct any hardware found to be improperly supplied, including installation, painting and reworking of doors and/or frames. | |
| 1.5 | <u>Handling, Delivery and Storage</u> | .1 | Package finishing hardware for each opening, identified shall correspond with hardware schedule. | |
| | | .2 | Copy of finishing hardware schedule shall accompany hardware shipments. | |
| | | .3 | Deliver all hardware to job site and obtain signed receipt. | |
| | | .4 | The general contractor shall provide on site an adequate, enclosed, lockable, clean and dry storage area. Access to locked storage area will be the responsibility of the general contractor. | |
| | | .5 | All hardware shall be checked in jointly by representatives of the general contractor and hardware supplier to avoid discrepancies. | |
| | | .6 | The general contractor shall protect the finish and function of the installed hardware from the other trades (paint, plaster, cleaners, etc.) during the construction period. | |

- 1.6 **Warranty** .1 Submit a written warranty covering finish hardware against defects in materials and workmanship. The warranty period shall be two years generally and five years for closers. Warranty commences on date of Substantial Completion.
- .2 Hardware products found defective within warranty period shall be removed by the general contractor or owner and returned to the distributor for evaluation.
- 1.7 **Submittals** .1 Submit templates when requested to contractor for use by installers and fabricators as required for proper location and installation of hardware.
- .2 Submit 4 (four) copies of the hardware schedule complete with a list and legend of abbreviations used. It is the Suppliers responsibility to thoroughly check the Hardware Schedule and working drawings to ensure, all handlings are correct, product will function as listed and that there are no errors or omissions before submitting for approval.
- .3 Upon request submit physical samples of each type of hardware for the project. Samples which may be required shall be tagged for their intended use and shall be incorporated into the supply of finishing hardware.
- .4 Supply wiring schematics and product information for all electronic hardware supplied under this section.
- 1.8 **Codes and Regulations** .1 All hardware listed or furnished shall meet requirements of Federal, Provincial and Local Codes having jurisdiction over this installation.

PART 2 - PRODUCTS

- 2.1 **Manufacturers** .1 The following is a list of acceptable manufacturers for work under this contract. The listed acceptable alternative manufacturers must provide products which are of equal quality of better than the specified manufacturers products.

	Manufacturer As Specified	Acceptable Alternative Manufacturer
Hinges	Stanley	Hager
Locks	Schlage	No substitution
Exit Devices	Sargent	Von Duprin (Full stainless steel)
Closers	LCN4041 Cush	Sargent 351 PS
Kickplates	Gallery	Hager/CBH
Push/Pulls	Gallery	Hager/CBH
Overhead Stops	Sargent Glynn Johnson	
Weatherstrip	Hager	KN Crowder National Guard

PART 3 - EXECUTION

- 3.1 **Execution**
- .1 The contractor installing the hardware shall carefully follow manufacturer's instructions for installation of all finish hardware.
 - .2 The finish hardware installer shall be experienced in the installation of architectural hardware and have general knowledge of the functions of the various types of hardware.
 - .3 Thru bolts for door pulls are to be counter sunk and concealed by push plates where push plates are listed.
 - .4 Manufacturer's fasteners supplied are to be used. It is the installers responsibility to ensure fasteners are not over tightened or stripped by use of screw guns, etc.
 - .5 Provide finished hardware for all display cases. Refer to Architectural drawings for locations.
- 3.2 **Keying**
- .1 All locks shall be interchangeable core and to be keyed to a factory registered master key system.
 - .2 Furnish the following quantities of keys:
 - 2 Grand master keys
 - 3 Master keys per level
 - 2 Change keys per lock
 - 10 Construction keys
 - .3 All permanent Cores and Keys are to be delivered to the end user.
- 3.3 **Adjusting**
- .1 It is the hardware installer's responsibility to adjust the hardware as per the manufacturer's specifications. Final adjustments to closers shall be made at final completion of products.
- 3.4 **Documentation**
- .1 The finish hardware supplier shall include copies of the as-built finishing hardware schedule, and maintenance manuals to the owner on completion of this project.
- 3.5 **Finishes**
- | | | |
|-----------------------|--|--|
| .1
32D
EN
CH | Standard N.B.H.A. Code
32D
EN
CH | BHMA Base Material & Description Code
630 Stainless Steel, Satin
689 Silver Enamel
Charcoal Grey |
|-----------------------|--|--|
- 3.6 **Hardware Schedule**
- .1 Refer to the Finishing Hardware List, dated _____ prepared by Empire Hardware Ltd included within this section.

End of Section

1.0 GENERAL

1.1 GENERAL REQUIREMENTS

- .1 The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section. The work of this section shall comply with all requirements of Division 1 – General Requirements.

1.2 SECTION INCLUDES

- .1 Provision of all labour, materials, equipment and incidental services necessary to provide glass and glazing for:
 - .1 Interior doors and screens,
 - .2 Exterior doors, and screens,
 - .3 Exterior windows,
 - .4 Exterior curtain wall systems,
 - .5 Unframed mirror glazing.
- .2 Section includes but is not limited to the provision of:
 - .1 Glass
 - .2 Specialty glazing products
 - .3 Glazing sealants, gaskets, tapes, and backing materials
 - .4 Miscellaneous glazing materials necessary to complete the work of this section

1.3 ALTERNATE PRICE

- .1 Submit an Alternative Price to delete sprinkler protection, and substitute Fire Rated Glazing assembly, where indicated on the drawings.

1.4 REFERENCE STANDARDS

- .1 ANSI/ASTM E330; Test Method for Structural Performance of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
- .2 ASTM C509; Standard Specification for Elastomeric Cellular Gasket and Sealing Material.
- .3 ASTM C542; Specification for Lock-Strip Gaskets.
- .4 ASTM C864; Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
- .5 ASTM C920; Specification for Elastomeric Joint Sealants.
- .6 ASTM C1115; Specification for Dense Elastomeric Silicone Rubber Gaskets and Accessories.
- .7 ASTM D790; Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- .8 ASTM D2240; Test Method for Rubber Property - Durometer Hardness.
- .9 ASTM E84; Test Method for Surface Burning Characteristics of Building Materials.
- .10 ASTM F1233; Test Method for Security Glazing Materials and Systems.
- .11 CAN/CGSB-12.1; Tempered or Laminated Safety Glass.
- .12 CAN/CGSB-12.3; Flat, Clear Float Glass.
- .13 CAN/CGSB-12.5; Mirrors, Silvered.

- .14 CAN/CGSB-12.8; Insulating Glass Units.
- .15 CAN/CGSB-12.9; Spandrel Glass.
- .16 CAN/CGSB-12.11; Wired Safety Glass.
- .17 CAN/CGSB-12.20; Structural Design of Glass for Buildings.
- .18 Flat Glass Manufacturers Association (FGMA) Glazing Manual.
- .19 Laminators Safety Glass Association Standards Manual.

1.5 PERFORMANCE REQUIREMENT

- .1 Provide continuity of building enclosure vapour and air barrier using glass and glazing material as follows:
 - .1 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.
 - .2 Size glass to withstand wind loads, dead loads and positive and negative live loads acting normal to plane of glass to a design pressure measured in accordance with the Ontario Building Code and CAN/CGSB-12.20.
 - .3 Limit glass deflection to flexural limit of glass with full recovery of glazing materials.
 - .4 Provide thermal stress analysis for all single glazed lites and all sealed glass units. Make recommendations for additional heat treatment, thickness change, or other required modifications prior to ordering of materials or manufacture of sealed glass units.

1.6 SAMPLES

- .1 Submit 300mm x 300mm samples of all tinted, coated, and surface treated glass in accordance with Section 01 30 00.

1.7 QUALITY ASSURANCE

.1 Manufacturer/Fabricator

- .1 Manufacturers or fabricators providing Products under this Section shall have sufficient plant, equipment and competent personnel to provide the Products, in accordance with the Contract Documents. Firm(s) shall have past experience in the manufacture or fabrication of the Products specified herein, and shall have successfully completed Projects of similar scope and type.

.2 Installation/Application

- 1 Installers or applicators of the Products specified herein, shall be competent in the skills required to perform such tasks. Installation/ shall be performed in accordance with industry standards specified herein, warranty requirements, and in accordance with generally accepted, industry best practices.

.3 Documentation

- .1 If requested by the Consultant, submit documentation to support the competency of firms and personnel.

.4 Pre-application Meeting

- .1 Convene a pre-application meeting for the Products specified in this section. Attendees must include, as a minimum, representatives of the following:
 - .1 Contractor (Site Superintendent & Project Manager)
 - .2 Application Subcontractor (Site Foreman & Project Manager)
 - .3 Product Manufacturer and/or Distributor (Technical Representatives)
 - .4 Related Subcontractors whose work is affected by that of this Section.

1.8 ENVIRONMENTAL REQUIREMENTS

- .1 Install glazing when ambient temperature is 10°C minimum. Maintain ventilated

environment for 24 hours after application.

- .2 Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.9 MAINTENANCE DATA

- .1 Provide maintenance data including cleaning instructions for incorporation into Operations and Maintenance manual.

1.10 EXTENDED WARRANTY

- .1 Provide sealed glass unit manufacturer's warranty certificate stating that the factory sealed insulating glass units specified under this section are guaranteed against failure of seal of enclosed air space and deposits on inner faces of glass detrimental to vision, for a period of ten (10) years from the Date of Substantial Performance.

2.0 PRODUCTS

2.1 FLAT GLASS

.1 Safety Glass

- .1 **Tempered (TG):** to CAN/CGSB-12.1, tong-free, roller marks free, with visible after installation factory-applied permanent impression in one corner identifying each pane as tempered. Glass must have smooth ground edges where used in Draft Stop applications. Thickness as indicated in schedules and on drawings.

- .2 **Laminated (LG):** to UL 972, constructed of 2 layers of heat-strengthened glass, with 1.5mm Saflex® PVB interlayer, CPSC Category II.

- .2 **Low Emissivity (Low-E) Glass:** minimum 6mm thick, PPG "Solarban 70 Clear" by PPG Industries Inc.

- .1 Coating: soft-sputtered.
- .2 Visible Light Transmittance: 64%.
- .3 Shading co-efficient: 0.44.
- .4 Visible Light Reflectance: 11%.
- .5 Tempered Low-E Glass; to CAN/CGSB-12.1, 6mm thick, tong free, roller marks free, with visible after installation factory-applied permanent impression in one corner identifying each pane as tempered. Low-E coating one face.

- .3 **Spandrel Glass:** to CAN/CGSB-12.9, PPG Starfire Glass with Opacicoat coating on Surface #4, custom colours as selected by Consultant, minimum 6mm thick.

- .1 Type: 1 – Tempered safety glass.
- .2 Class: A - Float
- .3 Style: 3 - Organic coated.
- .4 Form: M - Monolithic.

- .4 **Fire Resistive Glass (FRG):** laminated fire-resistive glass with surface-applied film; **FireLite PLUS**, as manufactured by Nippon Electric Glass Company, Ltd., distributed by Technical Glass Products, Kirkland WA, or **PYRAN PLATINUM L** manufactured by Schott AG, and distributed by Glassopolis (Toronto).

- .1 Properties:

- .1 Thickness: 8mm overall.
 - .2 Weight: 2.4 lbs./sq. ft.
 - .3 Approximate Visible Transmission: 88 percent.
 - .4 Approximate Visible Reflection: 9 percent.
 - .5 Fire-rating: 20 minutes to 3 hours for doors; 20 minutes to 90 minutes for other applications.
 - .6 Impact Safety Resistance: ANSI Z97.1 and CPSC 16CFR1201 (Cat. I and II).
 - .7 STC Rating: Approximately 35 dB.
 - .8 Surface Finish: Premium (polished).
 - .9 Positive Pressure Test: UL 10C, UBC 7-2 and 7-4; passes.
 - .10 Labelling: Permanently label each piece of FR glass with the FR glass logo, UL logo and fire rating in sizes up to 3,325 sq. in., and with the appropriate label only for sizes that exceed the listing (as approved by the local authority having jurisdiction).
 - .11 Fire Rating: Fire rating listed and labelled by ULC for fire rating scheduled at opening locations on drawings, when tested in accordance with ULC Standards CAN4 S-104 and CAN4 S-106.
- .5 **Mirror Glass (MR-1 & MR-2):**
- .1 Unframed Mirrors: (1/4") 6mm thick, tempered safety glass, back finished with one coat silver, one coat copper, and two coats backing paint. Provide continuous trim on all perimeter edges of mirror installation (butt joints between mirror sheets, with edges ground and polished). Mirrors to be adhesive mounted to wall. Refer to drawings for sizes.
 - .1 Edge Trim:
 - .1 Schluter®-SCHIENE-AE, by Schluter Systems (Canada) Inc.
- .6 **Sealed Insulating Glass Units (IGU):**
- .1 **Double Glazed Units (IGU-2)**
To CAN2-12.8 and composed of two lites of minimum 6 mm thick glass separated by a 13mm wide "warm edge" spacer, double sealed and atmospheric pressure equalized to prevent bowing of the glass lites in the vertical position. All units shall be Argon Gas filled.
Edges of glass shall be straight cut, free of nicks and other imperfections conducive to breakage. 25mm overall thickness for double glazed units.
 - .1 **U-Value: 0.24,**
 - .2 **SHGC: 0.27.**
 - .1 **Vision Units (IGU-2):** Double-glazed, double sealed insulating glass units, clear tempered safety glass inner and outer lites, with specified low emissivity coating on No. 3 surface.
 - .2 **Spandrel Glass Units (SP-1):** Double-glazed, double-sealed insulating glass units, with tempered spandrel glass inner lite - coating on Surface #4 (Spandrel Colour 1), and specified low emissivity coating on Surface No. 3. Tempered clear safety glass outer lite.
 - .3 **Light Diffusing Units (LD-1)**
 - .1 Oakalux type 37/40 light diffusing unit, 24 mm thick composed of two lites of 6 mm tempered glass (TG) separated by 13mm air filled cavity with Okalux 12 mm capillary slab and fibre tissue.

The inner core constructed of acrylic fiber for STC class rating minimum 38db. Minimum Light diffusing Power (LDP) of 0.80

- .1 Direct VLT minimum : 33%
- .3 Diffuse VLT minimum : 27%
- .4 **SHGC : 0.33**
- .5 Shading Coefficient ratio minimum: TSET/0.86
- .6 **U-Value: 0.44**

.7 Glazing Films

- .1 Film Coatings for glass, 75 micron thick film, self-adhesive, as supplied by Convenience Group Inc., Toronto ON; 3M Fasara, white semi-transparent film. Custom hexagonal pattern as detailed on the drawings.

.8 Float Glass (GL)

- .1 Clear float glass to CAN2-12.3 Glazing Quality. Unless otherwise indicated provide 6 mm thick glass for panes up to 2.25 m², 6 mm thick glass for panes up to 4 m² and 8 mm thick glass for panes in excess of 4 m².

2.2 GLAZING MATERIALS

.1 Setting Blocks:

EPDM or Neoprene, 80 – 90 (Shore A) durometer hardness to ASTM D2240, to suit glazing method, glass weight, and area.

.2 Spacer Shims:

EPDM or Neoprene, 50 – 60 (Shore A) durometer hardness to ASTM D2240, 75mm long x one half height of glazing stop x thickness to suit application. Self adhesive on one face.

.3 Glazing Tapes:

- .1 Compression: 100% solids, preformed macro-polyisobutylene/butyl rubber with integral synthetic rubber spacing rod; coiled on release paper; size as required for frame stop heights; POLYSHIM II, by Tremco.
- .2 Non-compression: 100% solids, preformed butyl rubber to ASTM C1281, 66 (Shore 00) durometer hardness to ASTM D2240; coiled on release paper; size as required for frame stop heights; Tremco 440 tape.
- .3 Fire Rated Glass Tape: Closed cell polyvinyl chloride (PVC) foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2 percent.

.4 Glazing Gaskets:

- .1 Dense Gaskets for Compression Glazing
 - .1 Extruded from ozone-resistant compound, resistant to sunlight, weathering, oxidation and permanent deformation under load. Gasket Configuration shall provide for mechanical engagement with the metal. Gaskets shall meet either ASTM C-864 Option II, or ASTM C-1115 Type C (for silicone compounds).
 - .1 Dense Neoprene extrusions: Tremco Incorporated, 50, 60 and 70 durometer hardness.
 - .2 Dense EPDM extrusions: Tremco Incorporated, 40, 50, 60 and 70 durometer hardness.

- .3 Dense SCR-900 extrusions: Tremco Incorporated, 60 and 70 durometer hardness.
- .4 Dense Silicone extrusions: Tremco Incorporated, 40, 60 and 70 durometer hardness.
- .2 Cellular Gaskets for Compression Glazing:
 - .1 Extruded from ozone-resistant compound, resistant to sunlight, weathering, oxidation and permanent deformation under load. Gasket configuration shall provide for mechanical engagement with the metal. Gaskets shall meet ASTM C-509 Option II.
 - .1 Cellular extrusions: Tremco Incorporated, Closed Cell Neoprene extrusions.
 - .2 Cellular extrusions: Tremco Incorporated, Closed Cell EPDM extrusions.
- .5 **Glazing Sealants:**
 - .1 Cap Beads:
 - .1 Commercial Glazing: single or multi-component, non-acid curing silicone sealant to ASTM C920;
 - .1 One part neutral cure silicone; equivalent to Spectrem 2, by Tremco.
 - .2 Heel and Toe Beads
 - 1 Commercial Glazing: single or multi-component, non-acid curing silicone sealant to ASTM C920;
 - .1 One part medium modulus silicone sealant; equivalent to Tremsil 600, by Tremco.
 - .3 Perimeter Seals
 - .1 Single or multi-component, elastomeric sealant to ASTM C920;
 - .1 One part neutral cure silicone; equivalent to Spectrem 2, by Tremco.
 - .2 One part low modulus neutral cure silicone; equivalent to Spectrem 3, by Tremco.
 - .4 Metal Expansion Seals
 - .1 Single or multi-component, non-acid curing silicone sealant to ASTM C920;
 - .1 One part, neutral curing, silicone sealant; equivalent to Spectrem 2, by Tremco.
 - .5 Metal to Metal Joinery Seals
 - .1 Single or multi-component, non-acid curing silicone sealant to ASTM C920;
 - .1 One part medium modulus silicone sealant; equivalent to Tremsil 600, by Tremco.
 - .6 Concealed Splice Sleeve Conditions
 - .1 Single component, non-drying, non-skinning synthetic rubber sealant;
 - .1 One part synthetic rubber; equivalent to Tremco Curtain Wall Sealant, by Tremco.

- .7 Fire Rated Glass Sealant: One-part neutral curing silicone, medium modulus sealant, Type S; Grade NS; Class 25 with additional movement capability of 50 percent in both extension and compression (total 100 percent); Use (Exposure) NT; Uses (Substrates) G, A, and O as applicable. Acceptable Products:
 - .1 Dow Corning 795 - Dow Corning Corp.
 - .2 Silglaze-II 2800 - General Electric Co.
 - .3 Spectrem 2 - Tremco Inc.

2.3 GLAZING ACCESSORIES

- .1 **Glazing Clips:** manufacturer's standard type.
- .2 **Mirror Attachment:** mirror adhesive.

2.4 SEALED GLASS UNIT FABRICATION

- .1 Fabricate sealed glass units through the Insulating Glass Manufacturers Association of Canada Certification Program to CAN/CGSB 12.8. Sealed units shall bear IGMAC Certified Products List number and be properly identified.

3.0 EXECUTION

3.1 EXAMINATION

- .1 Verify that openings for glazing are correctly sized and within tolerance.
- .2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

3.2 PREPARATION

- .1 Clean contact surfaces with solvent recommended for use by the sealant manufacturer, and wipe dry thoroughly.
- .2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- .3 Prime surfaces scheduled to receive sealant.

3.3 EXTERIOR GLAZING

- .1 Aluminum Frames - Tape / Gaskets
 - .1 Cut glazing tape to length and set against permanent stops, level with sight line. Seal corners by butting tape and dabbing with sealant.
 - .2 Apply heel bead of sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete continuity of air and vapour seal.
 - .3 Place setting blocks at 1/4 points, with edge block maximum 150mm from corners.
 - .4 Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of light or glass unit.
 - .5 Install removable stops with gaskets inserted between glazing and applied stops.

3.4 INTERIOR GLAZING

.1 Wet Method - Sealant / Sealant

- .1 Install glazing resting on setting blocks. Install applied stop and centre light by use of spacer shims at 600mm centres, 6mm below sight line.
- .2 Locate and secure glazing light using spring wire clips or glazers' clips.
- .3 Fill gaps between glazing and stops with glazing sealant until flush with sight line. Tool surface to straight line.

.2 Steel Frames - Tape / Sealant

- .1 Cut glazing tape to length and set against permanent stops, 3mm below sight line. Seal corners by butting tape and dabbing with sealant.
- .2 Place setting blocks at 1/4 points, with edge block maximum 150mm from corners.
- .3 Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of light or glass unit.
- .4 Install removable stops with spacer strips inserted between glazing and applied stops below sight line. Place glazing tape on glazing light or unit with tape 6mm below sight line.
- .5 Fill gap between glazing and stop with sealant to depth equal to bite of frame on glazing, maximum 6mm below sight line.
- .6 Apply cap bead of sealant along void between stop and glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

.3 Glazing Film Installation

- .1 Clean glass to receive film, thoroughly and let dry.
- .2 Install plastic film in accordance with film manufacturer's instructions.
- .3 Remove all air bubbles, creases or visible distortion.
- .4 Fit tight to glass perimeter. Do not leave clear gaps.
- .5 Provide glazing film to interior mirrors, screens and windows where indicated on the drawings. Final extent and design by the Consultant.

3.5 MIRROR INSTALLATION

- .1 Set mirrors with adhesive, applied in accordance with adhesive manufacturer's instructions. Install Schluter trim at perimeter edges of mirror installation.
- .2 Place plumb and level, in locations indicated on the drawings.

3.6 CLEANING & PROTECTION

- .1 During installation, remove all corrosive or foreign materials or droppings resulting from work of this trade.
- .2 Perform initial cleaning operation of all glass and mirrors upon completion of installation. Do not remove labels or protective films until time of final cleaning.

- .3 After initial cleaning, mark large lites with an "X" by using removable plastic tape. Do not use masking tape. Do not mark heat absorbing or reflective glass units.
- .4 Provide instructions for the proper method and materials to be used in the cleaning and maintenance of finished surfaces. Remove all remaining labels and protective films at time of final cleaning.

3.7 GLAZING TYPES SCHEDULE

- .1 Refer to the Drawings for the locations and extent of all glazing types.
Provide the following glass types:
 - .1 **IGU-2:** Double glazed Insulating Glass Unit; Tempered
Clear Glass outer lite and Tempered Low-E Glass (3) inner lite.
All exterior glazing
 - .2 **LD1:** Double glazed light diffusing unit, tempered clear glass outer and inner
lites separated by 13mm air filled cavity with 12 mm capillary slab and fibre
tissue.
Exterior glazing where noted on drawings
 - .3 **IGU-3: Reserved**
 - .4 **SP1:** Insulating Glass Spandrel Units, with tempered spandrel glass inner lite -
coating on Surface #4 (Spandrel Colour 1), and specified low emissivity
coating on Surface No. 3. Tempered clear safety glass outer lite.
Exterior glazing where noted on drawings. Refer to Colour Schedule for
colour
 - .5 **TG:** Clear tempered safety glass. thickness as shown on the documents.
 - .1 Interior doors and screens:
 - .2 Display case glass shelves and doors.
 - .6 **FRG:** Fire Rated safety glass.
 - .1 Interior Fire Rated Doors and Screens where indicated on the
documents.
 - .7 **LG:** Laminated Glass (Interior Screens); 2 layers - 8mm heat strengthened
glass with 1.52mm Vanceva PVB interlayer.
 - .1 Interlayer Colour: Vanceva Clear.
 - .8 **MR1 & MR2:** Mirror glass:
thickness as indicated on the drawings.
 - .9 **GL:** 6 mm thick glass for panes up to 2.25 m², 6 mm thick glass for panes up
to 4 m² and 8 mm thick glass for panes in excess of 4 m².

END OF SECTION

1.0 GENERAL

1.1 GENERAL REQUIREMENTS

- .1 The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section. The work of this section shall comply with all requirements of Division 1 – General Requirements.

1.2 SECTION INCLUDES

- .1 Provision of all labour, materials, equipment and incidental services necessary to provide acoustic panel ceiling systems including the following:
 - .1 Non-load bearing steel stud systems
 - .2 Steel ceiling & soffit suspension systems
 - .3 Gypsum board
 - .4 Sheathing Board
 - .5 Taping & Jointing
 - .6 Accessories

1.3 REFERENCES

- .1 ASTM C473; Test Methods for Physical Testing of Gypsum Panel Products.
- .2 ASTM C475; Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- .3 ASTM C630/C630M; Specification for Water-Resistant Gypsum Backing Board.
- .4 ASTM C645; Specification for Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board.
- .5 ASTM C840; Specification for Application and Finishing of Gypsum Board.
- .6 ASTM C954; Specification for Steel Drill Screws for the Application of Gypsum Board.
- .7 ASTM C1002; Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases.
- .8 ASTM C1047; Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
- .9 ASTM C1178; Specification for Glass Mat Water-Resistant Gypsum Backing Board.
- .10 ASTM C1395/C1395M; Specification for Gypsum Ceiling Board.
- .11 ASTM C1396/C1396M; Specification for Gypsum Board.
- .12 ASTM D3273; Test Method for Resistance to Mold Growth on the Surface of Interior Coatings in an Environmental Chamber.
- .13 ASTM-E90; Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
- .14 ASTM-E119; Test Methods for Fire Tests of Building Construction and Materials.
- .15 CAN/CGSB-51.34; Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .16 CAN/CGSB-71.25; Adhesive, for Bonding Drywall to Wood Framing and Metal Studs.

- .17 CAN/ULC-S102; Building Materials and Assemblies, Standard Method of Test for Surface Burning Characteristics
- .18 CAN/ULC-S114; Determination of Non-combustibility of Building Materials.
- .19 CAN/CSA-S136; Cold Formed Steel Structural Members.

1.4 QUALITY ASSURANCE

.1 MANUFACTURER/FABRICATOR

- .1 Manufacturers or fabricators providing Products under this Section shall have sufficient plant, equipment and competent personnel to provide the Products, in accordance with the Contract Documents. Firm(s) shall have past experience in the manufacture or fabrication of the Products specified herein, and shall have successfully completed Projects of similar scope and type.

.2 INSTALLATION/APPLICATION

- 1. Installers or applicators of the Products specified herein, shall be competent in the skills required to perform such tasks. Installation/ shall be performed in accordance with industry standards specified herein, warranty requirements, and in accordance with generally accepted, industry best practices.

.3 DOCUMENTATION

- 1 If requested by the Consultant, submit documentation to support the competency of firms and personnel.

.4 PRE-APPLICATION MEETING

- .1 Convene a pre-application meeting for the Products specified in this section. Attendees must include, as a minimum, representatives of the following:
 - .1 Contractor (Site Superintendent & Project Manager)
 - .2 Application Subcontractor (Site Foreman & Project Manager)
 - .3 Product Manufacturer and/or Distributor (Technical Representatives)
 - .4 Related Subcontractors whose work is affected by that of this Section.

1.5 SUBMITTALS

- .1 Samples: Submit samples in accordance with Section 01 30 00.

- .2 Submit duplicate (4" x 4") 102mm x 102mm samples of each type of gypsum board panels in specified finishes.

1.6. **SYSTEM REQUIREMENTS**

- .1 Performance Requirements: Fabricate and install systems as indicated but not less than that required to comply with ASTM C754 under the following conditions:
 - .1 Standard systems: Maximum deflection of $l/240$ of partition height.
 - .2 Systems to receive water resistant gypsum board or backer board: Maximum deflection of $l/360$ of partition height.
 - .3 Interior suspended ceilings: Maximum deflection of $l/360$ of distance between supports.
 - .4 Exterior soffits and interior vestibule ceilings: Withstand minimum positive and negative pressure of 0.95kPa with maximum deflection of $l/360$ of distance between supports.
- .2 Partition Walls
 - .1 Partitions exceeding 9m in height are considered tall walls. Use double structural studs back-to-back 610mm on center. Attach studs back to back with screws approximately 1220mm on center. Alternately, use engineered steel stud assemblies. Refer to Section 05 41 00.
 - .2 All stud assemblies requiring wind load resistance design shall be Engineered Steel Stud assemblies as specified in Section 05 41 00.
 - .3 Fire Resistance Ratings: Where fire resistance classifications are indicated, provide materials and application procedures identical to those listed by UL/ULC or tested according to ASTM-E119 for type of construction shown.
 - .4 Acoustical Ratings: Where sound ratings are indicated, provide materials and application procedures identical to those tested by manufacturer to achieve Sound Transmission Class (STC) scheduled or indicated in accordance with ASTM-E90.

1.7. **DELIVERY, STORAGE & HANDLING**

- .1 Deliver material to site promptly without undue exposure to weather.
- .2 Deliver in manufacturer's unopened containers or bundles, fully identified with name, brand, type and grade.
- .3 Store above ground in dry, ventilated space.
- .4 Protect materials from soiling, rusting, or damage.

- .5 Store board to be directly applied to masonry walls at 21°C for 24 hours prior to installation.

1.8. ENVIRONMENTAL REQUIREMENTS

- .1 Maintain temperature minimum 10°C, maximum 21°C for 48 hours prior to and during application of gypsum boards and joint treatment, and for at least 48 hours after completion of joint treatment.
- .2 Apply board and joint treatment to dry, frost-free surfaces.

1.9. SEQUENCING

- .1 Co-ordinate installation of ceiling suspension systems with work of mechanical and electrical trades. Allow for completion of major items of work by mechanical and electrical trades prior to installation of ceiling grid systems.

2.0 PRODUCTS

2.1 STEEL MATERIALS

- 1 Sheet Steel: Cold-rolled, commercial grade structural quality sheet steel, to ASTMA924/a924M; Zinc-Coated (Hot Dip Galvanized) to ASTM A653/A653M; coating designation Z275.

2.2 PARTITION FRAMING

- .1 Partition Stud Framing: to ASTM C645, stud sizes as indicated, roll-formed from 0.53mm thick, hot-dip galvanized sheet steel. Knock-out service holes at 460mm centres.
- .2 Partition Floor & Ceiling Tracks: to ASTM C645, 0.91mm thickness hot-dip galvanized sheet steel, widths to suit stud sizes, 32mm flange height for standard applications; 50mm flange height for deflection applications.
- .3 Stiffener Channels: 38mm or 64mm width, 1.3mm thick hot-dip galvanized sheet steel, cold rolled channels.

2.3 FURRING SYSTEMS

- .1 Metal furring runners, hangers, tie wires, inserts, anchors: to ASTM C645.
- .2 Drywall Furring Channels: 0.53mm core thickness hot-dip galvanized, steel channels for screw attachment of gypsum board.
- .3 Sound Isolation Clips: RISC-1 Sound Isolation Clips, by PAC International Inc.

2.4 FLAT CEILING SUSPENSION SYSTEM

- .1 Suspension System: tested in accordance with ASTM C635, roll formed from hot dip galvanized, sheet steel; USG Drywall Suspension System by CGC Inc., or an approved alternative, and as follows:
 - .1 Main Tees: 38mm x 38mm, single web construction.
 - .2 Wall-to-Wall Main Tees: 38mm x 38mm, single web construction.
 - .3 Cross Tees: 38mm x 38mm, single web construction.
 - .4 Cross Channels: 73x22mm, with 37mm face width.
 - .5 Wall Channels: 40x25mm, "C" channel.
 - .6 Wall Molds: 38 x 25mm "L" profile.
 - .7 Splice and Transition clips: purpose-made, roll formed from hot-dip galvanized steel sheet by USG, or an approved alternative.

- .8 Suspension wire: 2.75mm galvanized wire.

2.5 BOARD MATERIAL

- .1 Standard Board: to ASTM C36, regular 16mm thick, 1220mm wide x maximum practical length, ends square cut, edges tapered.
 - .1 AirRenew Essential Gypsum Board, by CertainTeed Gypsum Canada Inc.
 - .2 Sheetrock® Gypsum Board, by CGC Inc.
 - .3 Gold Bond Gypsum Board, by National Gypsum.
 - .4 ToughRock®, by G-P Gypsum (Georgia-Pacific)
- .2 Fire Rated Board (Type C): to ASTM C36, (5/8") 16mm thick, (48") 1220mm wide x maximum practical length, ends square cut, edges tapered.
 - .1 AirRenew Essential Type C Gypsum Board, by CertainTeed Gypsum Canada Inc.
 - .2 Sheetrock® Firecode Type C, by CGC Inc.
 - .3 Gold Bond Fire-Shield C Gypsum Board, by National Gypsum.
 - .4 ToughRock™ Fireguard C Gypsum Board, by Georgia Pacific.
- .3 Fire Rated Board (Type X): to ASTM C36, Type X to ASTM E119, (5/8") 16mm thick, (48") 1220mm wide x maximum practical length, ends square cut, edges tapered.
 - .1 AirRenew Essential Type X Gypsum Board, by CertainTeed Gypsum Canada Inc.
 - .2 Sheetrock® Firecode Type X, by CGC Inc.
 - .3 Gold Bond Fire-Shield Gypsum Board, by National Gypsum.
 - .4 ToughRock™ Fireguard Gypsum Board, by Georgia Pacific.
- .4 Moisture Resistant Gypsum Board: to ASTM C36, with water resistant facing, Type X to ASTM E119, 16mm thick, 1220mm wide x maximum practical length;
 - .1 M2Tech® Moisture and Mold Resistant Type X Gypsum Board, by CertainTeed Gypsum Canada Inc.
 - .2 Sheetrock Mold-Tough Panels, by CGC Inc.
 - .3 Gold Bond XP Gypsum Board, by National Gypsum.
 - .4 ToughRock® Mold-Guard, by G-P Gypsum (Georgia-Pacific)
- .5 Abuse Resistant Gypsum Board: to ASTM C36, with water resistant facing, Type X to ASTM E119, 16mm thick, 1220mm wide x maximum practical length;
 - .1 M2Tech® Extreme Impact Type X HPD Gypsum Board, by CertainTeed Gypsum Canada Inc.
 - .2 Sheetrock Glass-Mat Mold-Tough VHI Fire code X Panels, by CGC Inc.
- .6 Interior Ceiling Panels: to ASTM C1395, Type X to ASTM E119, 16mm thick, 1220mm wide x 2440mm long;
 - .1 Sheetrock® Interior Ceiling Board, by CGC Inc.
 - .2 Easi-Lite Lightweight Interior Ceiling Board, by CertainTeed Gypsum Canada Inc.
 - .3 Gold Bond Interior High-Strength LITE, by National Gypsum.
 - .4 ToughRock™ Span 24, by G-P Gypsum (Georgia-Pacific)
- .7 Tile Backer Board: to ASTM C1178, standard Type X to ASTM E119, 16mm thick, 1220mm wide x 2440mm long;
 - .1 DensShield® Tile Backer, by G-P Gypsum (Georgia-Pacific).

- .2 Diamondback Tile Backer Type X, by CertainTeed Gypsum Canada Inc.
- .3 Gold Bond e²XP® Tile Backer, by National Gypsum.
- .8 Glass Mat Exterior Sheathing Board: to ASTM C931, C1177, and C1278; standard 16mm thick, 1220mm wide x maximum practical length;
 - .1 DensGlass Gold Exterior Guard, by G-P Gypsum (Georgia-Pacific).
 - .2 Securock® Glass-Mat Sheathing, by CGC Inc.
 - .3 GlasRoc™ Sheathing by CertainTeed Gypsum Canada Inc.
 - .4 Gold Bond e²XP® Extended Exposure Gypsum Sheathing, by National Gypsum.

2.6 ACCESSORIES

- .1 Hanger Wire: 4.8mm galvanized pencil rod.
- .2 Screws
 - .1 For interior board: #6 or #8 bugle head, to ASTM C954, hardened and phosphate plated, drywall screws. Use self-drilling type for heavier thickness framing material.
 - .2 For exterior sheathing board: self-tapping, corrosion-resistant, screws and plates, Deklite by DeckFast, or equivalent.
- .3 Laminating Compound: as recommended by gypsum board manufacturer for laminating multiple layers of gypsum board, or for laminating gypsum board to masonry or concrete.
- .4 Corner Beads: 0.53mm thick, commercial grade, hot-dip galvanized sheet steel, to ASTM C645, perforated flanges, one piece length per location, refer to drawings for details and locations;
 - .1 "D-100" series, by Bailey Metal Products.
- .5 Drywall Trims: 6063-T5 extruded aluminum trims and moldings, factory primed finish for site painting, one-piece length per location, by Fry Reglets. Refer to drawings for details and locations;
 - .1 Reveal Molding: Drywall Reveal Molding, non-vented, "DRM 50-50" Series (13mm wide x board thickness).
 - .2 Reveal Molding: Acoustic Ceiling Reveal Molding WDM 50-50.
 - .3 Reveal Molding: Ceiling Reveal Molding DRWT 50-50.
 - .4 F Reveal Molding: F Reveal Molding 13mm x 16mm.
 - .5 Control Joint: DRM 50-50 2PC, and DRM 50-50 3PC.
 - .6 Z Reveal Molding: DRMZ 50-50.
- .6 Polyethylene: to CAN/CGSB-51.34.
- .7 Acoustical Sealant: to Section 07 92 00.
- .8 Firestop and Smoke Sealants: to Section 07 84 00.
- .9 Insulating Strip: rubberized, moisture-resistant, 3mm thick, closed cell neoprene strip, 12mm wide, with self sticking permanent adhesive on one face; lengths as required.
- .10 Joint Tape: Paper tape, nominal 50mm wide.

- .11 Joint Compounds: to ASTM C475, dry powder for mixing with water, or ready-mix compounds;
 - .1 Standard Interior Use Joint Compound
 - .1 DensArmor™ Sandable Joint Compound, by Georgia-Pacific.
 - .2 ProFin Taping and Joint Compound, by CertainTeed Gypsum Canada Inc.
 - .3 Sheetrock Setting-Type Joint Compound, by CGC Canada Inc.
- .12 Water: potable

3.0 EXECUTION

3.1 GENERAL

- .1 Perform work in accordance with ASTM C840 except where specified otherwise.

3.2 PARTITION CONSTRUCTION

- .1 Align top and bottom partition tracks at floor and ceiling and secure at 610mm o.c. maximum.
- .2 Secure partitions under acoustic ceiling grids with partition clips at 1220mm o.c. maximum and additionally at ends of return walls, and above each door jamb.
- .3 Install polyethylene dampproof course under stud shoe tracks of partitions on slabs on grade.
- .4 Place studs vertically at 406mm or 610mm o.c. as scheduled, and not more than 50mm 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 1:1200.
- .6 Attach studs to bottom and ceiling track using screws.
- .7 Coordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.
- .8 Coordinate 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, 50mm apart using column clips or other approved means of fastening placed alongside frame anchor clips.
- .10 Erect track at head of door/window openings and sills of sidelight/window openings to accommodate intermediate studs. Secure track to studs at each end,

in accordance with manufacturer's instructions. Install intermediate studs above and below openings in same manner and spacing as wall studs.

- .11 Frame openings and around built-in equipment, cabinets, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.
- .12 Install steel studs or furring channels between studs as required for attaching electrical and other boxes.
- .13 Extend framing above suspended ceilings for fire and sound separations and to form plenum areas as indicated.
- .14 Extend partitions to underside of floor/roof deck above except where noted otherwise on drawings. Provide cross-bracing above ceilings, where recommended by manufacturer.
- .15 Where partitions are fire, smoke, or sound separations, and occur parallel to, and under structural members, offset and continue partitions to underside of floor/roof deck above to maintain continuity of partition.
- .16 Maintain clearance under beams, joists, and structural slabs to avoid transmission of structural loads to studs. Use 50mm leg ceiling tracks or double track slip joint as indicated.
- .17 Install continuous insulating strips to isolate studs from uninsulated surfaces, or dissimilar metals.
- .18 Install two continuous beads of acoustical sealant or insulating strip under studs and tracks around perimeter of sound control partitions.

3.3 FURRING INSTALLATION

- .1 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles.
- .2 Furr for gypsum board faced vertical bulkheads within or at termination of ceilings.
- .3 Install wall furring for gypsum board wall finishes where indicated.
- .4 Furr openings and around built-in equipment, cabinets, access panels, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.
- .5 Furr, beams, columns, pipes and exposed services where indicated.
- .6 Install sound isolation clips and channels to assemblies indicated where scheduled on the drawings.

3.4 CEILING SYSTEM INSTALLATION

- .1 Erect metal framing to tolerance of 1:1200.
- .2 Install perimeter wall molds or channels level and straight, above elevation equal to thickness of board ceiling finish.
- .3 Install main channels/tees in parallel rows 1220mm o.c., supported on hanger wire at maximum 1220mm o.c. Align cross channel slots from one main runner to the next. End splices must be fully interlocked.
- .4 Install cross channels perpendicular to hanger channels at 405mm o.c. for moisture resistant board, soffit panels, and cement board; 610mm o.c. for all other installations. Screw fasten ends of furring channels to wall angles.
- .5 Provide wind support posts at 1220mm o.c. each way at exterior soffit applications.
- .6 Install additional cross channels within 200mm of parallel running walls where wall moulds or angles are not present.
- .7 Install cross channels parallel to, and at exact locations of steel stud partition header track.
- .8 Install standard cross tees at long edges of all rectangular light fixtures.
- .9 Frame openings and around built-in equipment, cabinets, access panels, on four sides with cross tees. Extend framing into reveals. Check clearances with equipment suppliers.
- .10 Ceiling suspension system shall not be used as primary support for mechanical/electrical equipment, other than those items penetrating the ceiling membrane or, to be installed on the underside of the ceiling. Other equipment must have its own support system.
- .11 Fire Rated System
 - .1 Install additional cross channels 200mm each side of ceiling board butt joints for full length of joint.
 - .2 Install additional cross channels 200mm from long edges of light fixture openings for additional board support.
 - .3 Install additional wire hangers at all corners of light fixtures and at centre points of supporting cross tees.
 - .4 Install ceiling edge fascias where indicated on the drawings.

- .5 Construct ceiling suspension systems to the following minimum fire rated designs:
 - .1 Up to 1 1/2 hours: UL Design G-528.
 - .2 Up to 2 hours: ULC Design I-517.
 - .3 Up to 3 hours: UL Design G-529.

3.5 BOARD APPLICATION

- .1 Do not apply gypsum board until bucks, anchors, blocking, electrical and mechanical work are approved.
- .2 Apply single layer gypsum board to wood or metal furring or framing using screw
- .3 Apply double layer gypsum board to wood or metal furring or framing using screw fasteners for first layer, and laminating adhesive for second layer. Maximum spacing of screws 305mm o.c.
- .4 Apply single layer gypsum board to concrete or concrete block surfaces, where indicated, using laminating adhesive.
- .5 Apply moisture resistant gypsum board to walls and ceilings in Pool, Change Rooms, Washrooms, Janitor's rooms, and garbage rooms. Apply silicone sealant to edges, ends, cut-outs which expose gypsum core and to fastener heads.
- .6 Apply cement board panels to all exterior soffit surfaces and interior surfaces where noted and scheduled.
- .7 Apply tile backer board to all wall surfaces to receive ceramic tile finish. Apply using screw fasteners, at 305mm o.c maximum spacing.
- .8 Apply 13mm diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, ducts, in partitions where perimeter sealed with acoustical sealant.
- .9 Apply glass mat gypsum sheathing board in single layer, to exterior side of load bearing steel studs, using pan-head screw fasteners. Maximum spacing of screws 305mm o.c.
- .10 Install abuse resistant gypsum board on all interior wall locations to height of 2400 above finished floor and where noted or detailed. Install regular gypsum board from 2400 height to U/S of structure.

3.6 INSTALLATION OF ACCESSORIES

- .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 with screws at 152mm o.c., or using contact adhesive for full length.

- .2 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.
- .3 Install insulating strips continuously at edges of gypsum board and casing beads abutting metal window and exterior door frames, to provide thermal break.
- .4 Construct control joints of back-to-back casing beads, set in gypsum board facing and supported independently on both sides of joint.
- .5 Provide continuous polyethylene dust barrier behind and across control joints.
- .6 Locate control joints at changes in substrate construction, at approximately 10000mm spacing on long corridor runs, at approximately 15200mm on ceilings.
- .7 Construct expansion joints as detailed, at building expansion and construction joints. Provide continuous dust barrier.
- .8 Install access doors to electrical and mechanical equipment where specified in Section 08 31 13 and by Mechanical and Electrical subtrades. Rigidly secure frames to furring or framing systems.
- .9 Install continuous aluminum soffit vents as indicated on the drawings. Install vent strip straight and true to line.

3.7 TAPING AND JOINTING

- .1 Provide levels of gypsum board finish for locations as follows, in accordance with Gypsum Association GA 214, Recommended Specification: Levels of Gypsum Board Finish.
 - .1 Level 1: Ceiling plenum and concealed areas, except provide higher level of finish as required to comply with fire resistance ratings and acoustical ratings.
 - .2 Level 2: Gypsum board substrate at tile, except remove tool marks and ridges.
 - .3 Level 3: Gypsum substrate under textured or applied coatings such as plaster.
 - .4 Level 4: Gypsum board surfaces to receive paint finish.
- .2 Interior Gypsum Board
 - .1 Pre-fill

-
- .1 Use setting-type joint compound. Mix joint compound according to manufacturer's directions.
 - .2 Fill joints between boards flush to top of eased or beveled edge.
 - .3 Fill joints of gypsum board above suspended ceilings in fire-rated partitions.
 - .4 Wipe off excess compound and allow compound to harden.
 - .2 Taping (Level 1)
 - .1 Butter taping compound into inside corners and joints.
 - .2 Center tape over joints and press down into fresh compound.
 - .3 Remove excess compound.
 - .4 Tape joints of gypsum board above suspended ceilings.
 - .3 First coat (Level 2)
 - .1 Use taping or all-purpose drying-type compound.
 - .2 Immediately after bedding tape, apply skim coat of compound and allow to dry completely in accordance with manufacturer's instructions.
 - .3 Apply first coat of compound over flanges of trim and accessories, and over exposed fastener heads and finish level with board surface.
 - .4 Second coat (Level 3)
 - .1 After first coat treatment is dried, apply second coat of compound over tape and trim, feathering compound 2 inches beyond edge of first coat.
 - .5 Third coat (Level 4)
 - .1 After second coat has dried, sand surface lightly and apply thin finish coat to joints, fasteners and trim, feathering compound 2 inches beyond edge of second coat.
 - .2 Allow third coat to dry. Apply additional compound, and touch-up and sand, to provide surface free of visual defects, tool marks, and ridges, and ready for application of finish.
 - .3 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.
-

- .4 Sand lightly to remove burred edges and other imperfections.
Avoid sanding adjacent surface of board.
- .5 Completed installation to be smooth, level or plumb, free from
waves and other defects and ready for surface finish.

END OF SECTION

1.0 GENERAL

1.1 GENERAL REQUIREMENTS

- .1 The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section. The work of this section shall comply with all requirements of Division 1 – General Requirements.

1.2 SECTION INCLUDES

- .1 Provision of all labour, materials, equipment and incidental services necessary to provide acoustic panel ceiling systems including the following:
 - .1 Acoustic ceiling panels
 - .2 Suspension grid systems
 - .3 Hangers and inserts

1.3 REFERENCES

- .1 ASTM-C635; Specifications for the Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
- .2 ASTM-C636; Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
- .3 CAN/CGSB-51.34; Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.
- .4 CAN/CGSB-92.1 Sound Absorptive Prefabricated Acoustical Units.
- .5 CSA-B111; Wire Nails, Spikes and Staples.
- .6 CAN/ULC-S102; Surface Burning Characteristics of Building Materials.

1.4 REGULATORY REQUIREMENTS

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

1.5 DESIGN REQUIREMENTS

- .1 Maximum deflection: 1/360th of span to ASTM-C635 deflection test.

1.6 QUALITY ASSURANCE

.1 MANUFACTURER/FABRICATOR

- .1 Manufacturers or fabricators providing Products under this Section shall have sufficient plant, equipment and competent personnel to provide the Products, in accordance with the Contract Documents. Firm(s) shall have past experience in the manufacture or fabrication of the Products specified herein, and shall have successfully completed Projects of similar scope and type.

.2 INSTALLATION/APPLICATION

1. Installers or applicators of the Products specified herein, shall be competent in the skills required to perform such tasks. Installation/ shall be performed in accordance with industry standards specified herein, warranty requirements, and in accordance with generally accepted, industry best practices.

.3 DOCUMENTATION

- 1 If requested by the Consultant, submit documentation to support the competency of firms and personnel.

.4 PRE-APPLICATION MEETING

- .1 Convene a pre-application meeting for the Products specified in this section. Attendees must include, as a minimum, representatives of the following:
- .1 Contractor (Site Superintendent & Project Manager)
 - .2 Application Subcontractor (Site Foreman & Project Manager)
 - .3 Product Manufacturer and/or Distributor (Technical Representatives)
 - .4 Related Subcontractors whose work is affected by that of this Section.

1.7 SUBMITTALS

.1 SUBMITTALS:

- .1 Make submittals in accordance with Section 01 30 00.

.2 SAMPLES:

- .1 Submit duplicate (4" x 4") 102mm x 102mm samples of each type of acoustical panels in specified finishes.

.3 CLOSEOUT SUBMITTALS

.1 Maintenance Materials

- .1** Provide acoustical ceiling panels amounting to $\pm 2\%$ of gross ceiling area for each pattern and type required for project, in accordance with Section 01 78 00.
- .2** Extra materials shall be from same production run as installed materials, in unopened packages clearly identified as to its contents.
- .3** Store where directed.

1.8 MOCK-UPS

- .1** Construct mock-ups in accordance with Section 01 30 00.
- .2** Construct one 3mx 3m mock-up of each type of acoustic panel ceiling in place, complete with wall molds suspension system grid and panels.
- .3** Allow for review by Consultant. Correct deficiencies.
- .4** Approved mock-up may form part of the finished Work, and shall serve as the minimum standard for work of this type.

1.9 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.

2.0 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- .1** Suspension Grid
 - .1** CertainTeed
 - .2** Armstrong World Industries
 - .3** CGC
- .2** Acoustic Panels
 - .1** CGC

2.2 STEEL MATERIALS

- .1** Sheet Steel: Cold-rolled, commercial grade structural quality sheet steel, to ASTM A635/A635M; Zinc-Coated (Hot Dip Galvanized) to ASTM A653/A653M; coating designation Z275.

2.3 SUSPENSION GRID SYSTEMS

- .1** Intermediate duty suspension grid systems, all components to be sheet steel to ASTM A635, galvanized to ASTM A653/A653M. Die cut components; double web main tees with rectangular bulb and rolled cap on exposed face; shop painted baked enamel finish.
Cross tees with rectangular bulb and web extended to form positive interlock with main tee webs, lower flange extended and offset to provide flush intersection.

- .2 Standard Grid (**ACT-1**): (15/16") 23mm wide exposed T-grid;
 - .1 Colour: white.
 - .2 Acceptable Products:
 - .1 Prelude XL, by Armstrong.
 - .2 15/16" EZ Stab Classic System, by CertainTeed.
 - .3 Wall Molds: 23mm wide;
 - .1 Colour: to match grid.
 - .2 Prefabricated shadow mold profile for all ceilings.

2.4 ACOUSTIC CEILING PANELS

- .1 Lay-in Acoustic Panels (**ACT-1**): to ASTM E1264 Type IV Form 2 Pattern E, square-cut edges for standard grid;
 - .1 Panel Size: (24" x 48") 610mm x 1220mm & (12" X 48") 305MM x 1220mm
 - .2 Finish: factory-applied latex paint.
 - .3 Colour: White.
 - .4 Pattern: fine textured.
 - .5 Fire Resistance: Class A - Firecode.
 - .6 NRC: 0.55.
 - .7 CAC: >35.
 - .8 Acceptable Products
 - .1 2315 Firecode Radar by CGC

2.5 ACCESSORIES

- .1 Hanger Wire: galvanized soft annealed steel wire, 3.6mm diameter for access tile ceilings to ULC/UL tested design requirements for fire rated assemblies, 2.6mm diameter for other ceilings.
 - .1 Hanger Inserts: purpose-made for individual substrate.
- .2 Carrying Channels: 38mm or 64mm, hot-dip galvanized steel.

3.0 EXECUTION

3.1 EXAMINATION

- .1 Do not install ceiling suspension system or acoustical panels and tiles until the work above ceiling has been inspected by Consultant.

3.2 SUSPENSION SYSTEM INSTALLATION

- .1 Install suspension system in accordance with ASTM-C636, to manufacturer's instructions, ULC/UL requirements, and this specification.
- .2 Secure hangers to overhead structure using attachment methods acceptable to Consultant.
- .3 Install hangers spaced at maximum 1220mm centres and within 150mm from ends of main tees.
- .4 Where mechanical or electrical equipment prohibit installation of hangers, provide carrying channels as required to span under equipment.
- .5 Lay out system according to reflected ceiling plan.
- .6 Ensure suspension system is coordinated with location of related components.
- .7 Install wall mold level to provide correct ceiling height.

- .8 Completed suspension system to support superimposed loads, such as lighting fixtures, diffusers, grilles, and speakers.
- .9 Support light fixtures with additional ceiling suspension hangers at each corner and at maximum 600mm around perimeter of fixture.
- .10 Supplementary support hangers for all tile-mounted mechanical and electrical fixtures shall be provided by those trades.
- .11 Interlock cross members to main runner to provide rigid assembly.
- .12 Frame at openings for light fixtures, air diffusers, speakers and at changes in ceiling heights.
- .13 Finished ceiling system to be square with adjoining walls and level within 1:1000.

3.3 EXPANSION JOINTS

- .1 Supply and install "Z" shaped metal trim pieces at each side of expansion joint. Design to accommodate plus or minus 25mm movement and maintain visual closure. Finish metal components to match adjacent exposed metal trim. Provide backing plates behind butt joints.

3.4 ACOUSTIC PANEL INSTALLATION

- .1 Install lay-in panels in correct seated position in ceiling suspension system.
- .2 In fire rated ceiling/floor and ceiling/roof systems, secure lay-in panels with hold-down clips and protect over light fixtures, diffusers, air return grilles and other appurtenances according to ULC/UL design requirements.
Note: In accordance with ANSI / UL 263 Item III. Floor-Ceilings and Roof-Ceilings item 10. Acoustical Materials, hold down clips only required for ceiling panels weighing less than 1 lb. per SQ.FT.

3.5 COORDINATION

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

3.6 INSPECTION AND CLEANING

- .1 Thoroughly inspect all ceiling tiles and remove any chipped, marked, scratched, stained, discoloured or otherwise damaged units, and replace with new units. Do not take replacement units from maintenance materials.
- .2 Thoroughly inspect all ceiling grid and remove any marked, scratched, dented or otherwise, damaged pieces, and replace with new.

END OF SECTION

1.0 GENERAL

1.1 GENERAL REQUIREMENTS

- .1 The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section. The work of this section shall comply with all requirements of Division 1 – General Requirements.

1.2 SECTION INCLUDES

- .1 Provision of all labour, materials, equipment and incidental services necessary to cover with paint the interior surfaces of the building or structure, and the building services and accessories not otherwise protected or covered, to the full intent of the drawings and specifications.
- .2 Surface preparation of substrates to receive painting and finishing is included in this section of work.
- .3 This section of work shall include the painting and finishing of all exposed surfaces of the following substrates:
 - .1 Wood
 - .2 Steel (Prime-painted & galvanized)
 - .3 Concrete
 - .4 Masonry
 - .5 Gypsum board surfaces
 - .6 All exposed surfaces and materials not factory finished / prefinished

1.3 REFERENCE STANDARDS

- .1 CAN2-85.100, National Standards of Canada, Painting.
- .2 Master Painters Institute (MPI) Architectural Painting Specification Manual.

1.4 MATERIALS AND EQUIPMENT NOT TO BE PAINTED

- .1 Surfaces not to be painted shall be left completely free of droppings, over-spray, or accidentally applied materials resulting from the work of this Section.
- .2 Items not to be painted include concealed structural elements, and equipment furnished with complete factory-applied, coloured paints and finish systems.

1.5 COOPERATION WITH OTHER TRADES

- .1 Schedule and coordinate this work with other trades and do not proceed until other work and/or job conditions are as required to achieve satisfactory results.
- .2 Examine all specification sections for materials and products and become thoroughly familiar with all provisions regarding painting.

1.6 QUALITY ASSURANCE

- .1 Acceptable Manufacturers
 - .1 Paints Stains and varnish.
 - .1 Benjamin Moore
 - .2 Sherwin Williams
 - .3 ICI (Glidden) Paints
 - .4 Para Paints
 - .5 Pratt & Lambert
 - .6 Sico Coatings
 - .2 All paints and finish products to be best quality from manufacturers listed
- .2 Applicators
 - .1 The painting subcontractor shall have a minimum of five (5) years documented experience in commercial painting and finishing, and shall maintain a qualified crew of size necessary to fully satisfy the requirements of this section.
- .3 Pre-application Meeting
 - .1 Convene a pre-application meeting for the Products specified in this section. Attendees must include, as a minimum, representatives of the following:
 - .1 Contractor (Site Superintendent & Project Manager)
 - .2 Application Subcontractor (Site Foreman & Project Manager)
 - .3 Product Manufacturers and/or Distributors (Technical Representatives)
 - .4 Related Subcontractors (i.e.. Mechanical and/or Electrical)

1.7 MOCK-UP REQUIREMENTS

- .1 Finish one complete room of each colour scheme required, showing selected materials, colours and textures. Have Consultant review mock-up for acceptance of colour and finish, prior to ordering of materials for further work.
- .2 Consultant reserves the right to change colour and/or finish selection upon review of mock-up, if deemed unacceptable.
- .3 Refinish rejected areas until acceptance is achieved.
- .4 Once approved by the Consultant, mock-ups shall serve as the minimum acceptable standard for similar work throughout the Project.

1.8 COLOUR SCHEDULE

- .1 Refer to the Room Finish Schedule and the Colour Schedule for colours and surface textures of all finishes. The final selection shall rest solely with the Consultant.

1.9 COMPLETION SCHEDULE

- .1 Furnish the Consultant with a schedule showing expected completion of the respective coats of paint for the various areas and surfaces. Keep this schedule current as the job progresses.

1.10 SUBMITTALS

- .1 Product Codes
 - .1 Submit a complete list of product codes from the manufacturer(s) proposed for use on this project, for all products listed in finish systems specified herein, in accordance with Section 01 30 00.
- .2 Samples
 - .1 Submit samples of all paints and finishes specified herein, in accordance with Section 01 30 00.
 - .2 Submit triplicate (8" x 12") 200 x 300mm sample panels of each type of paint and finish application for approval by the Consultant.
 - .3 Where manufacturer of paint differs from that listed in the colour schedule, employ spectrograph technology to ensure accurate colour match. Selection of the "next nearest colour" by another manufacturer will not be acceptable.
 - .4 Use birch plywood for wood finishes, gypsum board for paint finishes over smooth surfaces. Refer to Mock-up Requirements for masonry finishes.
 - .5 Finished work to match approved samples.
 - .6 The Consultant reserves the right to alter colour selections following sample review.

1.11 DELIVERY, STORAGE AND HANDLING

- .1 Paint and finish materials shall be delivered to the site in sealed original labelled containers bearing manufacturer's name, type of paint, brand name, colour designation and instructions for mixing and/or reducing.
- .2 Store materials in a heated, dry, well-ventilated, indoor place having a minimum ambient temperature of (45°F) 7°C.
- .3 Keep waste rags in metal drums and remove all rags, waste and trash from the building at the end of each working shift.
- .4 Provide CO2 fire extinguisher of minimum (20 lb) 9kg capacity in storage area.
- .5 Ensure that health and fire regulations are complied with in storage area.

1.12 GENERAL COLOUR REQUIREMENTS

- .1 Refer to the Room Finish Schedule and the Colour Schedule for type and extent of finishes, and for individual colour and sheen selections.
- .2 Where manufacturer of paint differs from that listed in the colour schedule, employ spectrograph technology to ensure accurate colour match. Selection of the "next nearest colour" by another manufacturer will not be acceptable.

- .3 The following, generally, will be painted colour, and sheen to match adjacent surfaces
 - .1 Access doors and electrical panel covers in public spaces including resource rooms and classrooms
 - .2 Exposed piping, conduit, and ductwork.
 - .3 Unfinished exposed materials.
- .4 Access doors and electrical panel covers shall be powder coated with colour to match adjacent wall colour.

1.13 ENVIRONMENTAL CONDITIONS

- .1 Temperatures: No painting shall be performed when substrate or ambient air temperatures are below (41°F) 5°C. Minimum allowable temperature for application of Latex paints is (45°F) 7°C.
- .2 Relative humidity: shall not exceed 85%.
- .3 Moisture content of substrates: Masonry and concrete materials shall be allowed to cure for a minimum of 28 days before application of paints. Substrates shall be measured by electronic moisture meter, to the following maximums:
 - .1 Plaster and Gypsum board: 12%.
 - .2 Masonry, concrete/concrete block: 12% for solvent based paints.
 - .3 Wood: 15%.
- .4 Lighting: Painting shall not proceed unless a minimum of (15 cd/ft²) 1.3 lx lighting is provided on the surfaces to be painted.
- .5 Ventilation: All areas where painting is proceeding require adequate continuous ventilation and sufficient heating facilities to maintain temperatures above (45°F) 7°C for 24 hours before during and after paint application.

1.14 MAINTENANCE MATERIALS

- .1 Supply Owner with one clearly identified, new and unopened gallon of each colour and type of paint, stain and varnish used for this work, in accordance with Section 01 78 00.
- .2 All colour mixing codes must be clearly labeled, and colour numbers (P1, P2, etc.) must be marked on the container.

1.15 EXTENDED WARRANTY

- .1 Provide upon completion of the work, a Warranty Certificate, in the name of the Owner, stating that the work of this section was performed in accordance with these specifications and the MPI manual (latest edition), and is warranted against defects in material or installation, for a period of two (2) years from Date of Substantial Performance.

2.0 PRODUCTS

2.1 MATERIALS

- .1 Paint, varnish, stain, enamel, lacquer and fillers shall be of a type and brand herein specified and/or listed under Chapter 5 (Approved Products List) of the MPI manual.

- .2 Paint materials such as linseed oil, shellac, turpentine, and any materials not specified herein but required for first class work with the finish specified shall be the highest quality product of an approved manufacturer. All materials shall be compatible with finish paint or coating materials.

2.2 MIXING

- .1 Paints shall be ready-mixed unless otherwise specified, except that any coating in paste or powder form, or to field-catalyzed shall be field-mixed in accordance with the directions of its manufacturer. Pigments shall be fully ground and shall maintain a soft paste consistency in the vehicle during storage that can and shall be dispersed readily and uniformly by paddle to a complete homogeneous mixture.
- .2 The paint shall have good flow and brush properties and shall dry or cure free of sags or runs to yield the desired finish specified.

2.3 GLOSS LEVELS

- | | | | |
|----|-----------------------------|------------|------------|
| .1 | MPI Gloss and Sheen Levels; | Gloss @60° | Sheen @85° |
| | Level G1 – (Flat): | max. 5 | max. 10. |
| | Level G2 – (Velvet): | max. 10 | 10-35. |
| | Level G3 – (Eggshell): | 10-25 | 10-35. |
| | Level G4 – (Satin): | 20-35 | min.35. |
| | Level G5 – (Semi-Gloss): | 35-70. | |
| | Level G6 – (Gloss): | 70-85. | |
| | Level G7 – (High Gloss): | 85. | |
- .2 Provide Level G5 (Semi-Gloss) finish in corridors, stairwells, washrooms, service rooms, metal work and elsewhere where noted on the Room Finish Schedule.
- .3 Provide Level G3 (Egg Shell) finish in all classrooms and offices

3.0 EXECUTION

3.1 INSPECTION OF SURFACES

- .1 Examine surfaces to receive paint finishes for defects which cannot be corrected by procedures specified herein, and which may result in unsatisfactory paint finishes. Report items to the Consultant and the Contractor in writing, prior to commencement of work of this section, or after initial prime coat shows defects in substrate.
- .2 The application of subsequent prime and finish coats shall be construed as acceptance of the surfaces, and thereafter this subcontractor shall be fully responsible for satisfactory work as required herein.

3.2 PREPARATION OF SURFACES

- .1 Refer to the MPI manual Chapter 3 for surface preparations not specified in this section.
- .2 Perform mandatory surface cleaning and preparation prior to commencing work of this section

3.3 PROTECTION

- .1 Protect all adjacent surfaces from paint and damage resulting from the work of this section and make good any damage caused by failure to provide such protection.
- .2 Mask all adjacent finishes and surfaces with masking tape as required. Remove tape promptly after final finish coat has been applied and allowed to dry.
- .3 Furnish sufficient drop cloths, shields and protective equipment to prevent spray or dropping from fouling surfaces not being painted or where painting has been completed.
- .4 Cotton waste, cloths and material, which may constitute a fire hazard, shall be placed in closed metal containers and removed daily from the site.
- .5 Remove and protect, prior to painting operations, all hardware, accessories, device plates, lighting fixtures, factory finished work, and similar items, or provide ample in-place protection such as masking tape. If removed, these items shall be labelled, stored, cleaned if necessary and re-installed following successful completion of the work in each area. Solvents detrimental to lacquer finishes are not to be used for cleaning these items.

3.4 APPLICATION

- .1 Apply paints and coatings by currently accepted trade methods. Application of primers and finishes shall be by brush, roller, spray, or a combination of those methods.
- .2 Painting coats specified are intended to cover surfaces satisfactorily when applied in strict accordance with manufacturer's recommendations. Where proper coverage has not been attained, the Consultant may ask for additional coats as required, at no additional cost.
- .3 Apply each coat at the proper consistency. Sand lightly between coats.
- .4 Tint primers to same colour range as finish coats.
- .5 Do not apply finishes on surfaces that are not sufficiently dry. Each coat of finish should be dry and hard before a following coat is applied unless specified otherwise by the manufacturer.
- .6 Tint filler to match wood for clear finishes. Work filler well into wood grain and remove excess prior to setting.
- .7 Interior woodwork to receive paint or enamel finish shall be back-primed upon arrival on site with enamel undercoater.
- .8 All edges of wood doors shall be primed with undercoater, stain, or varnish, as required by specified finish.
- .9 Where spraying of paint is required by surface conditions, mask and seal off areas to be sprayed, and back-roll all coats. Provide ventilation for areas to be sprayed.
- .10 Where spray painting is specified, finish (100ft²) 10m² by spraying a sample of the finish upon the request of the Consultant, using materials specified.

- .11 Provide complete coverage and hide. When colour, stain, dirt or undercoats show through final coat of paint, provide additional coats until the paint film is of uniform finish, colour, appearance and coverage, at no additional cost to the Owner.
- .12 Allow all coats to dry to manufacturer's recommendations before applying succeeding coats.
- .13 Touch up all suction spots or "hot spots" in concrete after the application of the first coat, before applying the second coat.
- .14 Surfaces to be stained shall appear uniform in shading with colour variations caused only by the natural wood grain.
- .15 Barricade areas where finishing is in progress to prevent traffic or other activities, and otherwise protect work until dry. Post "Wet Paint" signs and remove when no longer required.
- .16 Replace at the expense of this section, materials soiled or damaged by finishing materials which cannot be removed.
- .17 **New block masonry:**
 - 1. Do not apply finish coats until block filler application has been inspected to identify visible pin holes. Should visible pin holes be identified, additional coats of block filler are to be applied until there are no visible pin holes.
 - 2. Where inspections identify pin holes on a finished surface, the area noted shall be repainted first with block filler then the entire wall plane is to be refinished.

3.5 PAINTING AND FINISHING OF EXISTING MATERIALS AND SURFACES

- .1 Remove, label and store, prior to painting of existing materials and surfaces the following items:
 - .1 Door hardware signage and accessories,
 - .2 Device plates,
 - .3 Lighting fixtures,
 - .4 Factory finished work,
 - .5 Signage where removable.
- .2 Where such items are not removable, provide proper masking and protection prior to commencement of painting.
- .3 Clean such items if deemed necessary by the Consultant, before being re-installed following successful completion of the work in each area. Solvents detrimental to lacquer finishes are not to be used for cleaning these items.
- .4 All surface contaminants such as wax, oils, grease, dirt, tire marks (horizontal surfaces), etc., must be removed from the surface. Oil and grease can be removed by detergent cleaning, followed by a rinse with clean water; solvent cleaning can be used as an alternative on areas with a concentration of oil or grease. All loose and flaking paint must be removed by hand cleaning, power tool cleaning, or pressure washing.
- .5 All blisters must be removed from the surface and the edges feathered. Areas showing mildew growth must be treated. Glossy finishes must be 'dulled' by sanding, by a TSP treatment, or by sweep blasting to create an anchor pattern to promote adhesion of the new coating.

- .6 Rust stains can be removed with an oxalic acid treatment. If large amounts of efflorescence is present, mechanical removal (e.g. abrasive sweep blasting or power tool grinding) may be required, after which acid etching shall be performed.
- .7 After any application of muriatic acid, the surface must be flushed with large amounts of clean water to remove any residue, and then allowed to dry thoroughly. The pH of the surface shall be tested, as specified in 1.2 pH Testing before the application of paint. All bare areas must be spot primed.

3.6 PAINTING APPLICATION SCHEDULE

- .1 Application of finishes on various material surfaces to be as follows:
 - .1 **Concrete Finishing Systems** (Low contact areas – Mechanical, Electrical and Service Rooms where noted on Room Finish Schedule)
 - .1 Concrete Horizontal Surfaces; Premium Grade Finish.
 - .1 Concrete Floor Sealer, Gloss/Sheen – G3.
 - .2 Epoxy Concrete Floor Sealer
 - .2 **Masonry Finishing Systems; Premium Grade Finish**
 - .1 **Concrete Masonry Units – Previously Painted.**
 - Latex super adherent primer – 1 coat
 - Latex pre-catalyzed water based epoxy (LEP) – 2 coats or latex G3 or G5 where noted on Room Finish Schedule.
 - .2 **Concrete Masonry Units – New.**
 - Latex block filler – 2 coats (for lightweight block -apply additional coat)
 - Latex pre-catalyzed water-based epoxy (LEP) – 2 coats or latex G3 or G5 where noted on Room Finish Schedule.
 - .3 **Metal Finishing Systems**
 - .1 **Structural Steel; Premium Grade Finish.**
(Low contact overhead structural steel ductwork and decking)
 - Dry Fall (over Q.D. shop primer), Gloss/Sheen G2.
 - .2 **Metal Fabrications; Premium Grade Finish.**
(High contact doors and frames, railings, balustrades, etc)
 - Latex super adherent metal primer.
 - Latex pre-catalyzed water-based epoxy (LEP) – 2 coats Gloss/Sheen – G5.
 - .4 **Wood Finishing Systems**
 - .1 **Painted Wood** (miscellaneous wood items); Premium Grade (3-coat) Finish.
 - Latex Gloss/Sheen -G4.
 - .2 **Clear Finish Wood** (miscellaneous wood items); Premium Grade (3-coat) Finish.
 - .1 Clear Polyurethane (single component) finish, Gloss/Sheen -G4.

- .5 **Plaster & Gypsum Board Finishing Systems**
 - .1 **Gypsum Board; (walls)** Premium Grade Finish.
 - Latex water based epoxy (LEP) (over latex primer sealer), Gloss/Sheen – G3.
 - .2 **Gypsum Board; (ceilings)** Premium Grade Finish.
 - Latex (over latex primer sealer), Gloss/Sheen – G1.

3.7 **CLEAN-UP**

- .1 Upon completion of the work, remove all paint and varnish spots from floors, glass and other surfaces. Remove from the premises all rubbish and accumulated materials of whatever nature, not caused by others, and leave this work in clean, orderly and acceptable conditions.

END OF SECTION

PART 1 - GENERAL

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|-----|------------------------------------|----|---|------------------|
| 1.1 | <u>General Requirements</u> | .1 | Comply with requirements of Division 1. | |
| 1.2 | <u>Related Sections</u> | .1 | Finishing of Concrete Slabs: | Section 03302 |
| | | .2 | Sealants | Section 07900 |
| 1.3 | <u>Reference Standards</u> | .1 | Do tile work in accordance with installation manual 200-1979 (Revised 1989), 'Ceramic Tile', by Terrazzo Tile and Marble Association of Canada and CSC Architectural Specification Study 09300 on Ceramic Tile. | |
| | | .2 | American National Standards Institute (ANSI) / Ceramic Tile Institute (CTI) | |
| | | .1 | ANSI A108.1, Specification for the Installation of Ceramic Tile (Includes ANSI A108.1A-C, 108.4-.13, A118.1-.10, ANSI A136.1) | |
| | | .3 | American Society for Testing and Materials (ASTM) | |
| | | .1 | ASTM C144, Specification for Aggregate for Masonry Mortar. | |
| | | .2 | ASTM C207, Specification for Hydrated Lime for Masonry Purposes. | |
| | | .4 | Canadian General Standards Board (CGSB) | |
| | | .1 | CGSB 71-GP-22M, Adhesive, Organic, for Installation of Ceramic Wall Tile | |
| | | .2 | CAN/CGSB-75.1, Tile Ceramic | |
| | | .5 | Canadian Standards Association (CSA) | |
| | | .1 | CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A5, A8, A23.5, A362, A363, A456.1, A456.2, A456.3) | |
| 1.4 | <u>Qualifications</u> | .1 | <u>Installer:</u> Work to be performed by a qualified Contractor and who has personnel with experience of successful work on similar projects, and who has the necessary equipment to complete the work. | |
| 1.5 | <u>Guarantee</u> | .1 | Provide the following guarantees in accordance with the General Conditions, notwithstanding the time provisions therein, including but not limited to such defects as cracks and delamination, except where proven the defect is a direct result of structural failure. | |
| | | .2 | Provide certificate of quality compliance from tile manufacturer. | |
| | | .3 | Provide certificate of quality compliance from tile installer upon satisfactory completion of installation. | |
| | | .1 | General Tile Work | - 2 years |

- 1.6 **Submittals** .1 **Samples:**
- .1 Prior to ordering materials submit, for Consultant's review, duplicate samples of each tile, trim, fitting and base, mounted on panels complete with grout and mortar joints. Also submit samples of mitre cut base (if indicated on Finishes Drawings and Colour Schedule) and field tiles.
- .2 **Maintenance Data:**
- .1 Submit manufacturer's maintenance data for inclusion into the maintenance manuals specified in Division 1. Also submit manufacturer's specification sheets for mortar and grout systems installed.
- .3 **Maintenance Materials:**
- .1 Supply a minimum 2%, but not less than 1 box, of each tile specified, for maintenance purposes. Store material where directed by Consultant.
- .2 Maintenance materials to be of same run as materials installed.
- 1.7 **Site Mock-Up** .1 Prior to commencing work, review all details and provide mock-up for Consultants review. Mock-up will remain in place throughout installation as a representation of finish work standard and may become part of the finished work if approved by Consultant.
- .2 Review tile patterns and layout with Consultant, on site, prior to commencing work.
- 1.8 **Product Delivery & Storage** .1 Deliver materials to site in original unopened containers. Store in safe dry protected area free of moisture. Take precautions so no foreign matter contaminates materials.
- 1.9 **Environmental Conditions** .1 Do not install tiles when ambient air temperature and substrate temperature is less than 12°C.
- .2 Maintain a temperature of between 12°C to 20°C in areas of work for 24 hours prior to and during installation and for duration of curing time.
- .3 Inspect areas to receive work and certify surfaces are acceptable for installation. Do not commence installation until improper conditions have been corrected.
- 1.10 **Protection** .1 Exclude construction traffic from areas to receive tile, during installation and for duration of curing time.

PART 2 - PRODUCTS

- 2.1 **Tile General** .1 Specifications for tile and supporting accessories is based on materials manufactured and/or distributed by Olympia Tile International Inc., at 1-800-268-1613.

		.2	<u>Tile</u> : CAN2-75T-M77, except that no blisters or chips will be allowed; colours and patterns selected by Consultant.
2.3	Ceramic & Porcelain Tile	.1	Colour to be selected by Consultant. Refer to Section 00865 Colour Schedule for material selections.
2.4	Mortar/ Adhesives & Grout	.1	All interior wall tile to use Ultra/Mastic 1.
		.2	All floor tiles to use Karalastic/Karabond.
		.3	Colour to be selected by Consultant. Refer to Section 00865 Colour Schedule for material selections.
		.4	Provide "Grout Boost" Stain resistant grout additive by Specialty Construction Brands Inc, to grout for all porcelain floor tile applications.
		.5	Unless otherwise indicated all grout lines on walls to line up with grout lines on floors in all directions.
		.6	Apply grout conditioner to all exposed grout.
		.7	Apply grout sealer to all exposed grout.
2.5	Transition Strips	.1	Provide Schluter Schiene transition strips in satin anodized aluminum at the top edge and exposed side edges of porcelain tiles (where indicated on the finishes drawings and interior elevations).
		.2	Transitions strips are required to clean up edge of tiles where different thicknesses of tiles are specified and vertical edges. Refer to interior elevations for notes regarding location of transition strips.
		.3	Provide Schluter Quadec in brushed stainless steel for at outside corners where tile meets tile unless otherwise specified. Refer to Section 00865 Colour Schedule.
		.4	Grind all sharp edges smooth. Careful attention to corner conditions to ensure smooth finish to touch.
		.5	Use full length strips where possible. All connecting transition strips to have a seamless appearance and smooth to the touch.
2.8	General Materials	.1	<u>Water</u> : Potable and non-staining
		.2	<u>Portland Cement</u> : CAN3-A5-M83.
		.3	<u>Sand</u> : CSA A82.56-M1976.
		.4	<u>Control Joint Sealant</u> : Urethane sealant equal to Vulkem 245 self leveling sealant manufactured by Mameco Canada Ltd. Colour to match grout. Architect to make final colour selection.

PART 3 - EXECUTION

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|-----|---------------------------------------|----|---|
| 3.1 | <u>Inspection</u> | .1 | Examine floors for defects that are detrimental to installation and bonding of tile. |
| | | .2 | Examine drywall surfaces for adequate fixing, plumb, joint filling and freedom from waves. |
| | | .3 | Examine masonry and concrete surfaces for soundness, excessive moisture, efflorescence and variation tolerance. |
| 3.2 | <u>Preparation</u> | .1 | Substrates to be clean and free of foreign matter and minimum 10° C. |
| | | .2 | Clean substrates as required to produce acceptable surface. |
| | | .3 | Where substrate conditions require it, apply leveling coat and allow to cure. |
| 3.3 | <u>Tile / Stone General</u> | .1 | Finished work shall be level, plumb, or sloped as shown, true, square and free of defective, chipped, broken, discoloured or blemished tiles. Maximum allowable finished surface variation is 3 mm in 3 m when measured, in any direction, with a 3 m straightedge. |
| | | .2 | Lay out tile patterns symmetrically within each area using full tiles where possible, and to patterns shown. Unless otherwise indicated provide stacked pattern. Review with architect/interior designer on site prior to installation of any and all tiles. |
| | | .3 | Joints shall be parallel, uniform, neat, straight, square and completely filled. |
| | | .4 | Fit tile or stone accurately against and around interruptions, penetrations and abutting dissimilar surfaces. Wherever possible, drill holes for penetrating elements to ensure neat fitting. |
| | | .5 | After setting, sound tiles and replace hollow backed tiles. |
| | | .6 | Provide tile manufacturer's standard trim pieces at changes in direction and at terminations. Unless otherwise indicated provide the following corner and edge conditions. |
| | | .1 | Internal horizontal corners: coved. |
| | | .2 | External vertical and horizontal corners and edges: bullnose. |
| | | .3 | Internal vertical corners and unexposed edges: square butt joint. |
| | | .4 | Top of base: curved surface cap. |
| 3.4 | <u>Floor Tile Installation</u> | .1 | At floors shown to be sloped install setting bed to slopes indicated screed and tamp firmly, minimum 20 mm thick, with reinforcing mesh embedded approximately in centre of setting bed. Lap mesh 50 mm at joints. |
| | | .2 | Over setting bed trowel or brush on bond coat approximately 1.5 mm thick, or apply evenly over back of tiles. Set tiles onto setting bed and beat firmly and evenly in place so as to achieve true, uniform and properly bonded |

installation but without causing damage to tiles.

- .3 Provide minimum 1% slope to floor drains.
- .4 Floor tiles at floors without slopes, and base tiles may be installed with the thin set method using dry set mortar.
- .5 Unless otherwise indicated provide 3 mm wide joints.
- .6 Provided caulked control joints at 6 m on centres.

3.5 **Wall Tile
Installation**

- .1 Install tile on dry wall surfaces with organic adhesive or thin set bond coat (TTMAC 200-5 & -5A). Install wall tile on masonry or concrete with organic adhesive or dryset mortar (TTMAC 200-3, -3A).
- .2 Use presanded dry set mortar or latex Portland Cement mortar for setting tile on glass fiber reinforced concrete backer board base as follows:
 - .1 Fill space between edge of board and tub or shower receptor with mortar.
 - .2 Fill backer board joints and joints between backer board and other materials solid with mortar. Apply skim coat of mortar and embed fiberglass tape over joints.
 - .3 Apply mortar setting bed in one coat to 2.4 mm minimum thickness after tiles are beat in. Initially apply mortar coat smoothly, then notch.
- .3 Set wall tile in adhesive with 2 mm joint maximum both vertically and horizontally. Carry tile to ceiling unless otherwise indicated.
- .4 At internal corners where tile abuts tile, tile and grout one plane before commencing work on intersecting plane to ensure proper filling of void at corners. Grout corner joint with sealant, same colour as mortar grout.
- .5 Do tile work before ceilings are begun. Provide level and straight termination 50 mm above ceiling heights.
- .6 On cast-in-place concrete wall, use bonding agent before applying adhesive.
- .7 Install joint filler and seal behind escutcheon plates at every pipe penetrating tile work.
- .8 Consult and review tile patterns with architect/interior designer on site prior to installation.

3.6 **Grouting**

- .1 Remove mortar and adhesive from tile face as work progresses with CLEAN water.
- .2 Commence grouting not earlier than 24 hours after setting tiles unless otherwise directed by grout manufacturer.

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|-----|------------------------------|----|---|
| | | .3 | Force maximum grout into joint so as to fill them flush, leaving no voids. |
| | | .4 | Promptly as work progresses remove excess grout from adjacent tile surfaces with CLEAN water before grout establishes tight permanent adhesion. |
| | | .5 | Cure grout in accordance with manufacturer's directions, minimum of 10 days. |
| | | .6 | Use MORE™ Surface Acidic Cleaner - to remove grout haze from the surface. Product supplied by Olympia Tile & Stone. |
| | | .7 | Seal all polished tiles and grout with manufacturer's recommended sealer prior to and after grouting. Review and consult architect prior to tile installation and grouting. |
| 3.7 | <u>Control Joints</u> | .1 | Provide control joints at substrate control joint locations, at abutting dissimilar materials. |
| | | .2 | Unless otherwise detailed provide control joints 10 mm wide and fill with control joint sealant. |
| 3.8 | <u>Cleaning</u> | .1 | Thoroughly clean tiles in accordance with manufacturers' instructions rinse with clean water and polish with clean dry cloths. |

End of Section

PART 1 - GENERAL

1.1	<u>Reference</u>	.1	Comply with requirements of Division 1.	
1.2	<u>Related Sections</u>	.1	Concrete Floor Finishing	Section 03302
1.3	<u>Qualifications</u>	.1	Flooring Contractor(s) shall be established firms, experienced in the field, and appointed as a distributor by the manufacturer of the flooring product specified.	
1.4	<u>Submittals</u>	.1	<u>Samples:</u>	
		.1	Submit duplicate tiles/planks/or sheet sample pieces of each colour specified for approval.	
		.2	Direction of veining or marbleization in the floor tile will be in accordance with instructions issued by the Consultant when colour selection is made. Refer to Finishes Drawings.	
		.2	<u>Maintenance Data:</u>	
		.1	Furnish the Owner with three copies of manufacturers printed maintenance instruction for inclusion in the maintenance manuals.	
		.3	<u>Maintenance Materials:</u>	
		.1	Deliver 25 tiles and/or planks and/or 1 box of sheet flooring of each colour pattern and type flooring material required for this project for maintenance use. Store where directed. Clearly identify each box.	
		.2	Furnish to the Owner additional materials containing a total of at least 1% of each different colour or design of the indoor resilient athletic surface used on the project.	
		.3	Delivery 10 m length rubber base. Store where directed.	
		.4	Maintenance materials to be same production run as installed materials.	
1.5	<u>Delivery and Storage</u>	.1	Deliver materials to the job in sealed, original, labeled containers.	
		.2	Store flooring materials in areas of application for at least 48 hours prior to installation.	
1.6	<u>Environmental Requirements</u>	.1	Maintain minimum 20°C air temperature at flooring installation area for 3 days before, during and for 48 hours after installation.	
1.7	<u>Warranty</u>	.1	Provide three (3) year material and labour warranty for all products specified in this section	

PART 2 - PRODUCTS

- 2.1 **Materials**
- .1 Mastic Fill (latex underlayment): Bakelite Co. latex underlayment power/liquid or other approved manufacturer.
 - .2 **RUB – Rubber Base**: to meet the performance requirements of ASTM F-1861, Type TP and TV, Group 1 (Solid), Standard Specification for Resilient Wall Base.
 - .1 TighLock Carpet wall base is a wedge shaped toeless base specifically designed to be installed prior to traditional, direct, or double glue down carpet installations.
 - .2 Tightlock Resilient Topset wall base is specifically designed for resilient installations where there is a transition from resilient flooring to carpet.
 - .3 6.35mm (1/4") thick – wedge design, ± 100mm (4") high, complete with inside/outside corners.
 - .4 Should not crack, break, or show any signs of fatigue when bent around a (6.4mm (1/4") diameter cylinder.
 - .5 Product Performance and Technical Data
 - ASTM F 1515 (Resistance to Light)..... ΔE<8
 - ASTM F 925 (Chemical Resistance)..... Pass
 - 5% acetic acid
 - 70% isopropyl alcohol, mineral oil
 - 5% sodium hydroxide solution
 - 5% hydrochloric acid solution
 - 5% sulfuric acid solution
 - 5% household ammonia solution
 - 5.25% household bleach solution
 - Vinyl Wall Base:
 - ASTM E 84/ NFPA 255 (Flame/Smoke)..... Class B,
 - <450
 - ASTM E 648/ NFPA 253 (Critical Radiant Flux)..... Class I
 - Rubber Wall Base:
 - ASTM E 84/ NFPA 255 (Flame/Smoke)..... Class A,
 - <450
 - ASTM E 648/ NFPA 253 (Critical Radiant Flux)..... Class I
 - Acceptable rubber base manufacturers: Johnsonite, Nora, Roppe, Armstrong, Mannington.
 - Refer to Section 00865 Colour Schedule for colour selection(s).
 - .3 Metal Edge Strips: aluminum extruded, smooth mill finish with lip to

- j. 100% Recyclable
- k. NSF-332 Platinum Certified
- l. Phthalate-free (except for recycled material)
- m. iQ Natural contains 16% rapidly renewable content (Castor Oil) and 75% Natural Materials
- n. SCS FloorScore® Certified and meets California Specifications Section 01350
- o. LEED contributions for Homogeneous Vinyl Sheet Flooring includes MR2; MR4; MR6 (iQ Natural) and EQ4.3
- p. Johnsonite facilities are ISO 9001 and ISO 14001 Certified

Refer to Section 00865 Colour Schedule for colour selection(s).
Weld rods to match colour of product selected as per Colour Schedule.

.5 Luxury Vinyl Tile (LVT): Tandus / Centiva, A Tarkett Company.

Classification: ASTM F1700 Class III Type B
Total Thickness: 3.0mm (0.120")
Wear Layer Thickness: 0.5mm (20 mil)
Adhesive: CENTI 2001 Wet Set, CENTI 6000 SP, CENTI 2000 EP or other Tandus Centiva LVT preferred adhesives.

ASTM F137 (Flexibility)..... Pass
ASTM F2199 (Dimensional Stability)..... Pass
ASTM F970 (Static Load)..... Pass
ASTM F1914 (Residual Indentation)..... Excellent
ASTM E648 (Flammability)..... CRF ≥0.45 watts/cm² NFPA Class 1
ASTM D2047 (Slip Resistance)..... Pass >0.5 ADA Compliant
ASTM E662 (Smoke Density)..... Pass <450 D^{MC}
ASTM F1515 (Resistance to Light)..... Excellent
ASTM F925 (Chemical Resistance)..... Excellent
ASTM F1514 (Resistance to Heat)..... Excellent

Refer to Section 00865 Colour Schedule for colour selection(s).

PART 3 - EXECUTION

- 3.1 Inspection .1** Ensure concrete floors are dry by using test methods recommended by tile resilient flooring manufacturers, and exhibit negative alkalinity, carbonization for dusting. Follow current ASTM F710 guidelines for the preparation of concrete slabs to receive resilient flooring.

3.2	<u>Subfloor Treatment</u>	.1	Remove subfloor rides and bumps. Fill low spots, cracks, joints, holes and other defects with subfloor filler.
		.2	Clean floor and apply filler; trowel and float to leave smooth, flat hard surface. Prohibit traffic until filler cured.
		.3	Apply filler as necessary where resilient flooring terminates at adjacent thicker flooring materials to insure top of finished flooring materials are flush Feather filler sufficiently to eliminate abrupt changes in elevation.
		.4	Prime concrete to floor manufacturer's recommendations.
3.3	<u>General Application</u>	.1	All flooring materials are to be installed wall to wall over entire floor areas prior to the installation of any cabinet work.
3.4	<u>Resilient Flooring Application</u>	.1	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.
		.2	Lay flooring with joints parallel to building lines to produce symmetrical tile pattern. Border tiles minimum half tile width.
		.3	Install flooring to square grid pattern with all joints aligned.
		.4	Cut tile and fit neatly around fixed objects.
		.5	Install flooring in pan type floor access covers. Maintain floor pattern.
		.6	Terminate flooring at centerline of door in openings where adjacent floor finish, material or colour is dissimilar.
		.7	Provide reducer strip fully bonded to floor where floor covering terminates exposing edge of floor.
3.5	<u>Resilient Base Application</u>	.1	Set base in adhesive tightly against wall and floor surfaces. Use lengths as long as practicable and not less than 600 mm long.
		.2	Install straight and level to variation of 1:1000.
		.3	Scribe and fit to door frames and other obstructions.
		.4	Wrap base around exterior corners as recommended by base manufacturer. Miter internal corners.
		.5	Apply base to all millwork surfaces in contract with the floor unless otherwise detailed.
3.6	<u>Resilient Sheet Installation</u>	.1	Install in accordance with manufacturer's recommendations.
		.2	Heat weld all seams to create a monolithic and impermeable surface.

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|-----|---------------------------------------|----|--|
| | | .3 | Install resilient sheet flooring minimizing cross seams. Provide seam diagram during submittal process for approval prior to installation. |
| | | .4 | Install the indoor resilient athletic surfacing in strict accordance with the indoor resilient athletic surfacing manufacturer's written instructions. |
| | | .5 | Install the indoor resilient athletic surfacing minimizing cross seams. Provide a seam diagram during the submittal process for approval prior to installation. |
| 3.7 | <u>Sheet LVT Installation</u> | .1 | Install in accordance with manufacturer's recommendations. |
| 3.8 | <u>Games Lines</u> | .1 | Provide painted games lines in Gym Paint to be 2 part polyurethane paint as approved by flooring manufacturer. |
| | | .2 | Submit shop drawing for review by consultant showing games lines layout, line thickness, line colours and floor socket locations. Final layout on floor shall be reviewed by Consultant prior to painting. |
| | | .3 | Using the highest quality masking tape, tape the floor. Thoroughly mix the two-component games line paint, and paint between the tape. Remove all tape prior to the paint curing. |
| 3.9 | <u>Protection and Cleaning</u> | .1 | Protect all adjacent surfaces from damage resulting from the work of this scope. Make good all damage. |
| | | .2 | Prior to final completion, inspect the work and do all necessary replacement or repair. Replace or repair floor covering which has not seated in a level plane with surrounding material. Replace all damaged rubber base. |
| | | .3 | Promptly as the work proceeds and on completion, clean-up and remove from the premises all rubbish and surplus material resulting from the work of this Section. |
| | | .4 | Promptly remove adhesive from surface of resilient materials as work progresses. |
| | | .5 | Leave resilient floors broom clean, free of building materials, rubbish, paint, adhesives, stains and spills. |

End of Section

1.0 GENERAL

1.1 GENERAL REQUIREMENTS

- .1 The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section. The work of this section shall comply with all requirements of Division 1 – General Requirements.

1.2 SECTION INCLUDES

- .1 Provision of all labour, materials, Products, equipment and incidental services necessary to Provide all washroom accessories specified herein.
- .2 Washroom accessories not specified herein, will be supplied and installed by the Owner.
- .3 The following washroom accessories will be supplied by the Owner and installed by the Contractor. The Contractor shall be responsible to provide any and all concealed blocking and supports necessary to properly support Owner-supplied washroom accessories.
 - .1 Toilet tissue dispensers **(TTD)**.
 - .2 Paper towel dispensers **(PTD)**
 - .3 Soap dispensers. **(SD)**
 - .4 Sanitary napkin disposal **(SND)**
 - .5 Sanitary napkin / tampon vender **(SNV)**
 - .6 Waste receptacle **(WR)**
- .4 The following washroom accessory will be provided by the Electrical Division:
 - .1 Electric Hand Dryer **(HD)**

1.3 REFERENCE STANDARDS

- .1 ASTM A167; Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
- .2 ASTM A525M; Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot Dip Process.
- .3 ASTM A526M; Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot Dip Process, Commercial Quality.
- .4 ASTM B456; Specification for Electro-deposited Coating of Copper + Nickel + Chromium and Nickel + Chromium.
- .5 ASTM C1503; Specification for Silvered Flat Glass Mirror.
- .6 CAN/CGSB-12.5; Mirrors, Silvered.
- .7 CAN/CSA-B651; Barrier-Free Design.
- .8 CAN/CSA-G164; Hot Dip Galvanizing of Irregularly Shaped Articles.

1.4 SHOP DRAWINGS

- .1 Make submittals in accordance with Section 01 30 00.
- .2 **Product Data**
 - .1 Submit manufacturer's Product data for all items specified herein.
 - .2 Indicate size and description of components, base material, surface finish inside and out, hardware and locks.

3 **Shop Drawings**

- .1 Submit shop drawings of all items specified herein.
- .2 Indicate attachment devices, description of rough-in frame, and building-in details of anchors for grab bars.

1.5 **MAINTENANCE MATERIALS AND DATA**

- .1 Provide operation and maintenance data for washroom accessories for incorporation into Maintenance Manual in accordance with Section 01 78 00.
- .2 Provide two (2) complete sets of special tools required for accessing, assembly/disassembly or removal of washroom accessories.

2.0 **PRODUCTS**

2.1 **ACCEPTABLE MANUFACTURERS**

- .1 ASI Group Canada
- .2 Bobrick Washroom Equipment of Canada
- .3 Bradley Washroom Equipment
- .4 Frost Washroom Equipment

2.2 **MATERIALS**

- .1 Sheet Steel: commercial quality, to ASTM A526 with ZF001 zinc coating.
- .2 Stainless Steel Sheet Metal: to ASTM A167, Type 304, minimum (22 gauge) 0.80mm thick.
- .3 Stainless Steel Tubing: Type 304, commercial grade, seamless welded, (18 gauge) 1.27mm wall thickness.
- .4 Fasteners: concealed screws and bolts shall be hot-dip galvanized or stainless steel; all exposed fasteners stainless steel to match face of unit. Use plastic or lead expansion shields as recommended by fixture manufacturer for component, and its intended use.

2.3 **FINISHES**

- .1 Chrome and Nickel Plating: to ASTM B456, polished finish.
- .2 Stainless Steel: AISI No. 4 finish, (satin).

2.4 **COMPONENTS**

The following is a complete list of accessories some of which may or may not apply to this project. Provide accessories according to the accessories schedule.

- .1 **Grab Bars (GB):** (1¼") 32mm diameter, Type 304, (18 gauge) 1.27mm satin finish stainless steel tubing grab bars, with peened grip. Concealed mounting flange (1/8") 3mm thick, Type 304 stainless steel plate, (2") 50mm W x (3 1/8") 80mm H, with screw holes for concealed anchors. Cover of (3¼") 85mm diameter (12 gauge) 2.78mm stainless steel wall flanges. Grab bars to withstand downward force of 2.2N;
 - .1 **GB.1:** (24") 610mm long, mounted horizontally behind WC;
 - .1 Acceptable Products:
 - .1 B-5806.99x24 by Bobrick.
 - .2 812 Series by Bradley.
 - .3 Model 1001-24 by Frost.
 - .4 Model 3101-24P by ASI.

- .2 **GB.2:** (30" x 30") 762 x 762mm L-shaped; mounted beside WC;
 - .1 Acceptable Products:
 - .1 B-716722.99-L30x30 by Bobrick.
 - .2 837-057 Series by Bradley.
 - .3 Model 1003-30x30 by Frost.
 - .4 Model 3104-M3030P by ASI.
- .3 **GB.3:** (30" x 36") 762mm x 914mm L-shaped, mounted in showers;
 - .1 Acceptable Products:
 - .1 B-68137.99 by Bobrick.
 - .2 837-057 Series by Bradley.
 - .3 Model 1016 by Frost.
 - .4 Type 56P by ASI.
- .4 **GB.4:** (30") 762mm long, mounted vertically in Showers;
 - .1 Acceptable Products:
 - .1 B-5806.99x24 by Bobrick.
 - .2 812 Series by Bradley.
 - .3 Model 1001-24 by Frost.
 - .4 Model 3101-24P by ASI.
- .5 **GB.5:** Swing up / swing down barrier free grab bar.
Swing-up grab bar shall be manually raised for approach or departure and lowered to horizontal position for support. Counterweighted design shall prevent grab bar from falling back down to the full horizontal position once grab bar is raised to the full upright (vertical) position.
 - .1 Acceptable Products:
 - .1 B-4998.99 by Bobrick
- .6 **GB.6:** (30") 762mm long, mounted vertically each side of BF urinals;
 - .1 Acceptable Products:
 - .1 B-6806 x 30 (762mm), 38mm OD by Bobrick
- .2 **Framed Mirrors (MIR):** Vandal resistant 6mm tempered glass with #304 stainless steel channel frame polished to #4 satin finish and heavy gauge galvanized steel back
 - .1 **(MIR 1):** (18" x 30") 460 x 740mm framed tilted barrier free mirror
 - .1 Acceptable Products:
 - .1 Model B293 by Bobrick
 - .2 **(MIR 2):** (18" x 30") 460 x 740mm framed tilted barrier free mirror
 - .1 Acceptable Products:
 - .1 Model B290 by Bobrick
- .3 **Coat Hooks (CH):** Satin finish stainless steel safety release coat for installation in Barrier Free stall and elsewhere where noted on drawings.
 - .1 Single Hook;
 - .1 Acceptable Products:
 - .1 Model 1150-S by Frost.

- .4 **Mop Hooks (MH):** Type 304 stainless steel, satin finish. Anti-slip mop holders have spring-loaded rubber cam that grips handles (7/8" to 1-1/4") 20–30mm diameter. Holds 1 mop (3-1/4") 85mm from wall.
 - .1 Acceptable Products:
 - .1 B-223 by Bobrick.
- .5 **Mop Racks/Shelves (MR):** (24") 610mm long. Type 304 stainless steel, satin finish. Antislip mop holders have spring-loaded rubber cam that grips handles (7/8" to 1-1/4") 20–30mm diameter. Holds 3 mops (3-1/4") 85mm from wall. Height (5") 125mm.
 - .1 Acceptable Products:
 - .1 B-224x36 by Bobrick.
 - .2 Model 9984 by Bradley.
 - .3 Model 1115 by Frost.
 - .4 Model 1315-4 by ASI.
- .6 **Storage Shelf (STS):** (18") 457mm long x (4") 100mm wide, surface mounted Type 304 stainless steel, AISI No. 4 brushed finish with (3/4") 19mm return edge;
 - .1 Acceptable Products:
 - .1 MS-18, by Gamco Commercial Restroom Accessories (Div. of Bobrick).
 - .2 Model 950-4-18 by Frost.
- .7 **Folding Shower Seat (FSS):** wall-mounted, folding seat; colour as selected by Consultant;
 - .1 Acceptable Products:
 - .1 Model C9014-3 by Dunleavy-Cordun.
 - .2 B-5181 by Bobrick.
 - .3 Model 9569 by Bradley.
 - .4 Model 975 by Frost.
 - .5 Model 8206-28 by ASI.
- .8 **Shower Rod & Curtain (SRC):** (1") 25mm diameter, Type 304 stainless steel shower rod, vinyl shower curtain, and steel hooks.
 - .1 Acceptable Products:
 - .1 B-6107 rod, B204-2 vinyl shower curtains, B204-1 hooks, by Bobrick.
 - .2 Model 9538 rod, 9533 vinyl shower curtains, 9536 hooks, by Bradley.
 - .3 Model 1145-S rod, 1144-502 vinyl shower curtains, 1144-501L hooks, by Frost.
 - .4 Model 1214 rod, 1200-V vinyl shower curtains, 1200-SHU hooks, by ASI.
- .9 **Infant Change Station (ICS):** wall mounted fold down change station with liner dispenser; Fill dispenser with Sanitary Bed Liners.
 - .1 Surface-mounted, polyethylene;
 - .1 Acceptable Products:
 - .1 Koala Care Products KB110-SSWM by Bobrick.
 - .2 Model 962-11 by Bradley.
 - .3 Model 1124-S by Frost.
 - .4 Model 9013-9, by ASI.

- .10 **Special Needs Change Station (SNCS):** wall mounted fold down change station with liner dispenser; Fill dispenser with Sanitary Bed Liners. Fully stainless steel Type 304 brushed, extended length, CW dual pneumatic gas valve springs, replaceable ABS tray and safety straps. Dimensions: 64.75" L x 23.5" W x 4" H
 - .1 Surface-mounted, stainless steel
 - .1 Acceptable Products:
 - .1 Foundations Worldwide Inc. by GSR Storage systems (Canada).

2.5 FABRICATION

- .1 Weld and grind joints of fabricated components flush and smooth. Use mechanical fasteners only where approved.
- .2 Wherever possible form exposed surfaces from one sheet of stock, free of joints.
- .3 Brake form sheet metal work with 1.5mm radius bends.
- .4 Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.
- .5 Back-paint components where contact is made with building finishes to prevent electrolysis.
- .6 Hot-dip galvanize concealed ferrous metal anchors and fastening devices to CSA G164.
- .7 Shop-assemble components and package complete with anchors and fittings.
- .8 Deliver inserts and rough-in frames to job site at appropriate time for building-in. Provide templates, details and instructions for building in anchors and inserts.
- .9 Provide steel anchor plates and components for installation on studding and building framing.

3.0 EXECUTION

3.1 INSTALLATION

- .1 Install and secure fixtures rigidly in place as follows:
 - .1 Stud walls: install steel back-plate or 2x10 solid wood blocking to stud prior to plaster or drywall finish. Provide plate with threaded studs or plugs.
 - .2 Hollow masonry units: use toggle bolts drilled into cell/wall cavity.
 - .3 Solid masonry: use bolt with lead expansion sleeve set into drilled hole.
 - .4 Toilet/shower compartments: use male/female through bolts.
- .2 Install grab bars on built-in anchors provided by bar manufacturer. Supply templates, details and instructions for building in anchors in toilet compartments. Provide through bolt fastening of grab bars in toilet compartments.
- .3 Use tamperproof screws/bolts for fasteners.
- .4 Install mirrors using concealed fasteners in locations indicated.

- .5 Locate accessories where indicated on the drawings and/or as directed by the Consultant.

3.2 ACCESSORIES SCHEDULE

- .1 Provide the following accessories in the rooms listed as follows:

.1 **Universal Washroom 111**

One(1)	.CH	Coat Hook
One(1)	.GB-1	Horizontal Grab Bar
One (1)	.GB-2	L-shaped Grab Bar
One(1)	.MIR1	Framed Tilted Mirror Barrier Free
One(1)	.SD	Soap Dispenser
One(1)	.SNS	Sanitary Napkin Disposal
One(1)	.STS	Stainless Steel Shelf
One(1)	.TTD	Toilet Tissue Dispenser
One(1)	.HD	Wall Mounted Hand Dryer
One(1)	SNCS	Special Needs Change Station (Wall Mounted)

End of Section

PART 1 - GENERAL

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|-----|------------------------------------|----|--|
| 1.1 | <u>General Requirements</u> | .1 | The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section. The work of this section shall comply with all requirements of Division 1 – General Requirements |
| 1.2 | <u>Submittals</u> | .1 | Submit shop drawings for all items specified in this section in accordance with the General Conditions. |
| | | .2 | Clearly indicate fabrication details, plans, elevations, hardware and installation details. |
| 1.3 | <u>Product Handling</u> | .1 | Protect all items from damage. |
| | | .2 | Store items in heated weatherproof area. |
| | | .3 | Do not remove protective coverings from items until immediately prior to final inspection by Owner. |

PART 2 - PRODUCTS

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|-----|-----------------------------|----|--|
| 2.1 | <u>Fabrication</u> | .1 | Fabricate items true to dimensions, square, plumb, and level. |
| | | .2 | Joints and intersecting members shall be accurately fitted with adequate fastenings. |
| | | .3 | Finished work shall be free from distortion and defects detrimental to appearance and performance. |
| | | .4 | Fit and assemble work in shop where possible. Execute according to details and approved shop drawings. Where shop fabrication is not practical, make trial assembly in shop. |
| | | .5 | Nonferrous metals shall not be primed nor painted unless otherwise shown. |
| 2.2 | <u>Traffic Signs</u> | .1 | Acceptable product: Effective type signs constructed of heavy gauge aluminum with heat applied Scotchlite sheeting by Revere-Seaton in Markham or equal. |
| | | .2 | Provide 2400 mm length galvanized steel tee standard for each sign or length as required for each type of sign. |
| | | .3 | Set steel tees in concrete filled Sonotube footing set to minimum depth of 915 mm below finished grade. Extend concrete 25 mm above grade and slope top to drain away from post. |
| | | .4 | Refer to drawings for type, location and quantities. |

PART 3 - EXECUTION

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|-----|------------------------------------|----|--|
| 3.1 | <u>Preparation</u> | .1 | Report to the Contractor, in writing, defects of work prepared by other trades and unsatisfactory site conditions. |
| | | .2 | Verify all dimensions on the site. |
| 3.2 | <u>Installation General</u> | .1 | Install items in accordance with Manufacturer's printed directions. |
| | | .2 | Give actual dimensions of item to the General Contractor so that sufficient space is allowed for installation. |
| | | .3 | Use sufficient fastenings and anchors to provide a rigid installation to withstand expected usage. |

End of Section

1.0 GENERAL

1.1 GENERAL REQUIREMENTS

- .1 The General Conditions of the Contract, Supplementary Conditions, and the General Requirements of Division 1, form part of this section, and must be read in conjunction with the requirements of this section. The work of this section shall comply with all requirements of Division 1 – General Requirements.

1.2 SECTION INCLUDES

- .1 Indoor inclined platform wheelchair lifts.

1.3 REFERENCES

- .1 ASME A17.5 - Elevator and Escalator Electrical Equipment.
- .2 ASME A18.1 - Safety Standard for Platform Lifts and Stairway Chairlifts.
- .3 CSA B44.1 - Elevator and Escalator Electrical Equipment.
- .4 CSA B355 - Lifts for Persons with Physical Disabilities.
- .5 ICC/ANSI A117.1 - Accessible and Usable Buildings and Facilities.
- .6 NFPA 70 - National Electric Code.
- .7 CSA - National Electric Code.

1.4 SUBMITTALS

- .1 Make submittals in accordance with Section 01 30 00.
- .2 Product Data: Manufacturer's data sheets on each product to be used, including:
 - .1 Submit manufacturer's installation instructions, including preparation, storage and handling requirements.
 - .2 Include complete description of performance and operating characteristics.
- .3 Shop Drawings:
 - .1 Show typical details of assembly, erection and anchorage.
 - .2 Include wiring diagrams for power, control, and signal systems.
 - .3 Show complete layout and location of equipment, including required clearances.
- .4 Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

1.5 QUALITY ASSURANCE

- .1 Manufacturer Qualifications: Firm with minimum 40 years documented experience in manufacturing of inclined wheelchair platform lifts of installations specified.
- .2 Installer Qualifications: Firm licensed to install equipment of this scope, with evidence of experience with specified equipment. Installer shall maintain an adequate stock of replacement parts and have qualified people available to ensure timely maintenance and callback service at the project site.

1.6 REGULATORY REQUIREMENTS

- .1 Provide platform lifts in compliance with:
- .2 CSA B355 - Lifts for Persons with Physical Disabilities.
- .3 CSA B44.1/ASME A17.5 - Elevator and Escalator Electrical Equipment.
- .4 CSA - National Electric Code.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Store products in manufacturer's unopened packaging until ready for installation.
- .2 Store components off the ground in a dry covered area, protected from adverse weather conditions.

1.8 PROJECT CONDITIONS

- .1 Do not use wheelchair lift for hoisting materials or personnel during construction period.

1.9 WARRANTY

- .1 Warranty: Manufacturer shall warrant the wheelchair lift materials and factory workmanship for two years following completion of installation.
- .2 Extended Warranty: Provide an extended manufacturer's warranty for the entire warranty period covering the wheelchair lift materials and factory workmanship for the following additional extended period beyond the initial warranty. Preventive Maintenance agreement required.
 - .1 Five additional years.

2.0 PRODUCTS

- .1 Acceptable Manufacturer: Garaventa Lift;

2.1 STAIR LIFT FOR STRAIGHT STAIRWAYS

- .1 Garaventa Inclined Platform Lift: Stair-Lift Model XPRESS II to serve one flight of straight stairs, with two landings and two stops. Lift consists of an extruded aluminum guide rail, a folding platform that is moved along the guide rail by an integrated rack and pinion drive system, overspeed safety system and call stations at each landing. Conform to the following design requirements:

- .1 Application:
 - .1 Indoor.

- .2 Platform Load Rating: 250 kg (550 lbs).
- .3 Travel Speed: 4m/min (13 fpm) traveling up; 5 m/min (16 fpm) traveling down.
- .4 Platform Deck: Surface shall be slip resistant with the following features:
 - .1 Platform Size A (ADA Compliant): 800 mm (31 1/2 in.) wide by 1250mm (49 1/4") long
- .5 Platform Operation:
 - .1 Automatic Fold: Folded and unfolded electrically from the call station.
 - .2 Emergency Manual Fold: When unit is left in the open position, the platform may be manually folded and retained in the closed position.
- .6 Under Platform Obstruction Sensing:
 - .1 Provide an under-platform sensing device to stop the platform from traveling in the downward direction when encountering 20N (4 lbf) of pressure.
 - .2 Platform is permitted to travel in the opposite direction of the obstruction to allow clearing.
- .7 Passenger Restraining Arms:
 - .1 Platform equipped with retractable passenger restraining arms in compliance with ASME A18.1a – 2001 or more recent edition.
 - .2 Arms stop moving when an obstruction causing 20 N (4 lbf) of pressure is encountered and will immediately retract when the signal is removed.
 - .3 Provide with means to manually unlock and open the restraining arms for passenger emergency evacuation.
 - .4 Arms are folded and unfolded electrically from the call stations or platform controls.
 - .5 Top of arms mounted 800 mm (32 in.) to 1000 mm (38 in.) above the platform deck. When in the guarding position the arms are located above the perimeter of the platform.
 - .6 The gaps between the ends of the arms shall not exceed 100 mm (4 in.).
- .8 Boarding Ramps:
 - 1 Provide boarding sides of platform with retractable ramps positioned for travel at a height of 150 mm (6 in.) measured vertically above the platform deck.
 - .2 Lock ramps in their guarding positions during travel. When the platform is at the landing, only the retractable ramp servicing the landing shall be operable.
 - .3 Ramps shall be folded and unfolded electrically.
 - .4 Retractable ramps, in the guarded position, shall withstand a force of 550 N (125 lbf) applied on any 100 mm (4 in.) by 100 mm (4 in.) area. This force shall not cause the height of the ramp, at any point in its length, to be less than 150 mm (6 in.) measured vertically above the platform deck.
 - .5 Provide a means to manually unlock the ramps for emergency evacuation when the platform is located at a landing.
 - .6 Provide with a bi-directional obstruction sensitive device on the travel direction end of the platform to stop the lift when 20 N (4 lbf) of pressure is encountered on either the outside or inside of

- the platform. Platform is permitted to travel in the opposite direction of obstruction to allow clearing.
- .9 Platform Kick Plate:
- .1 Provide on the non-boarding and non-guide rail side of the platform a kick plate of not less 150 mm (6 in.) in height, measured vertically from the platform deck.
- .2 When the platform is folded the kick plate shall cover the platform controls, providing protection from vandalism.
- .10 Hand Grips:
- .1 Equip platform with a 32 mm (1-1/4 in.) tubular steel hand grip or grab bar at the top of the platform. The hand grip is to cover the entire width of the platform.
- .11 Clearances Dimensions:
- .1 The platform shall not protrude more than 260 mm (10 1/4 in.) from the mounting surface when folded and stored.
- .2 The platform shall not protrude more than 1020 mm (40 1/4 in.) from the mounting surface when unfolded and in use.
- .12 Controls:
- .1 Controls: 24 VDC Low Voltage type.
- .2 Platform equipped with emergency stop switch located within reach of the passenger. When activated the emergency stop button shall cause electric power to be removed from the drive system stopping lift immediately.
- .3 Operating controls shall be two separate 36 mm (1 1/2) diameter round continuous pressure buttons with directional arrows, mounted on the front surface of the platform control panel.
- .4 When the platform arrives at landing and the user releases the directional control button, the passenger restraining arms and boarding ramp shall unfold automatically allowing passenger to disembark.
- .5 Platform control panel shall include a receptacle for an optional plug-in hand-held attendant pendant control.
- .6 Platform shall be equipped for:
- .1 Keyed Operation.
Provide control wiring to allow the platform to be folded into the storage position from the opposite call station.
- .13 Passenger Seat: Fold-down type with safety belt.
- .14 Platform Security Lock: Provide to prevent unauthorized unfolding of the platform.
- .15 Attendant Hand-Held Pendant Control: Provide lift with a plug-in pendant control for attendant operation.
- .16 Autofold Platform: Automatically fold platform into storage position when left unused in open position at any landing for:
- .1 3 minutes
- .17 Platform On-Board Emergency Alarm: Provide platform with an on-board alarm that sounds when emergency stop button is pushed. The alarm shall have a battery back-up so that it will continue to function if lift power is lost.

.2 Drive and Guide Rail System:

.1 Operation:

- .1 Motor: 0.6 kW (3/4 HP) electric motor with an integrated brake.
- .2 Required power: 208-240 VAC, single phase, 50/60 Hz. on a dedicated 20-amp circuit. Power Transmission: Worm gear reduction to a pinion moving on a fixed gear rack.
- .3 A frequency inverter shall be used to smoothly start and stop the platform motion.
- .4 Drive carriage and associated control devices to be located within the platform conveyance.
- .5 An upper final limit switch shall be provided to stop the lift in the event of a failure of the primary limit switch.
- .6 Drive system shall be equipped with an hour counter.

.2 Guide Rail System:

- .1 Two-part guide rail system consisting of:
 - .1 Main Upper Rail: Extruded aluminum weighing 11.9 kg/m (8 lb/ft) with integrally mounted zinc plated gear rack.
 - .2 Lower Rail: 38 mm (1 1/2 in.) by 64mm (2 1/2 in.)
- .2 Rail Mounting:
 - .1 Rails shall be directly mounted to the stairway wall.
 - .3 Provide a mechanical stop at the upper landing to prevent over-travel of the drive carriage in the event of a switch failure.
- .3 Provide overspeed governor and brake on upper carriage drive, containing mechanical overspeed sensor and lock, with electrical drive cut-out protection.
- .4 Provide with manual handwheel for emergency operation.
- .5 Emergency Battery Operation:
 - .1 Auxiliary Power: Provide an external battery back-up system for normal up/down lift operation during a power failure for a minimum period of one hour with rated load.
 - .2 Emergency battery lowering provide an on-board battery system to allow the user to lower the platform during a power failure.

.3 Pedestrian Handrail Integrated with Guide Rail:

- .1 Provide a pedestrian handrail to be mounted to the top of the upper rail.
- .2 The top of the handrail gripping surface shall be between 785 mm (31 in.) and 1270 mm (50 in.) above the stair nosing and have a smooth gripping surface 38 mm (1-1/2 in.) in diameter.
- .3 Handrail will be on the same plane as the upper rail of the lift.

.4 Call Stations:

- .1 Provide surface mounted call stations at both landings.
- .2 Call stations:
 - .1 operating voltage to be 24V (wired) or 9V DC (wireless)
- .3 Call stations shall be provided with continuous pressure directional control buttons for call and send.
- .4 A one-touch control system shall be used to automatically fold/unfold the platform, boarding ramps and passenger restraining arms.
- .5 Call stations shall be equipped for:

- .1 Keyed Operation.
- .6 Provide continuous pressure Attendant Call buttons on each call station.
- .7 Mounting:
 - .1 Lower landing call station:
 - .1 Surface mounted call station.
 - .2 Upper landing call station:
 - .1 Surface mounted call station.
- .5 **Additional Safety or Code Requirements:**
 - .1 Wall Mounted Audio-Visual Alert: Provide wall mounted audio-visual alter(s) with adjustable volume control that sound while the lift is in operation and are visible by pedestrian traffic from all flights and landings.
 - .2 Building Fire Alarm Integration:
Building Fire Alarm System to connect the lift control system with the building fire alarm system. If the lift is not in operation when the building fire alarm system is activated power will be cut to the lift preventing use during fire evacuation. If the lift is in use when the building fire alarm system is activated, the lift shall only allow the passenger to travel to the designated landing with the emergency exit.
- .6 **Finish Environment Requirement:**
Design and fabricate lift to manufacturer's standard design for indoor locations.
 - .1 Guide rails and ramps shall be extruded aluminum. Extruded aluminum and steel components shall be painted with
 - .1 Optional color as selected by Architect from an RAL color chart.
 - .2 Electrical printed circuit boards and control transformers to be treated with a conformal coating for resistance to ambient moisture.

3.0 EXECUTION

3.1 EXAMINATION

- .1 Do not begin installation until substrates have been properly prepared.
- .2 Verify electrical rough-in is at correct location.
- .3 If substrate preparation is the responsibility of another installer, notify Consultant of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- .1 Clean surfaces thoroughly prior to installation.
- .2 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- .1 Install platform lifts in accordance with and in compliance with regulatory requirements specified and the manufacturer's instructions.
- .2 Install system components and connect to building utilities.
- .3 Accommodate equipment in space indicated.
- .4 Startup equipment in accordance with manufacturer's instructions.
- .5 Adjust for smooth operation.

3.4 FIELD QUALITY CONTROL

- .1 Perform tests in compliance with regulatory requirements specified and as required by authorities having jurisdiction.
- .2 Schedule tests with agencies and Architect, Owner, and Contractor present.

3.5 PROTECTION

- .1 Protect installed products until completion of project.
- .2 Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

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<u>SECTION</u>	<u>TITLE</u>
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END OF SECTION

PART 1 – GENERAL

1.1 WORK INCLUDED IN THIS SECTION

- .1 Refer to drawings for detailed demolition scope of work.
- .2 All existing building services not affected by this work shall be maintained in operation during and after the demolition work is complete. Any accidental interruption of existing building services not required by this project will be promptly repaired at no additional cost to the Board.
- .3 Prior to removing any piping, ensure the system is completely isolated and is not live.
- .4 Complete all work impacting existing Building Operations after hours only.

1.2 QUALIFICATIONS

- .1 Work of this section shall be executed by trades personnel having a minimum of five years' experience in the demolition field and capable to deploy adequate equipment to complete the work in an efficient and orderly manner.

1.3 EXAMINATION

- .1 Examine existing property. Determine the nature of materials to be removed.

1.4 SALVAGE

- .1 The Board Representative will review the Site prior to commencement of demolition and instruct the Contractor, in writing, as to the items to be retained for re-use or be turned over to the Board. In the absence of such specific instructions, materials from demolition shall become property of Mechanical Contractor who shall promptly remove all salvageable material and debris from Site.
- .2 Remove and store indicated items for future use by the Board. Remove, handle and transport such items to storage area designated by the Board Representative. Perform such work carefully and with diligence to prevent any damage to the items during removal and in storage. Store material to be salvaged, neatly on wooden pallets, where directed by Board.

1.5 MAINTAINING TRAFFIC

- .1 Maintain and preserve Board's access requirements within, to and from existing building in areas where demolition and removal work is being carried out.
- .2 Do not close, obstruct, place or store material in Board's driveways and passageways. Conduct operations with minimum interference with roads, streets, driveways, user traffic and passageways.

1.6 HAULING OPERATIONS

- .1 Maintain roadways and paving in the hauling areas clean on a daily basis and as required by Municipal Authorities.

1.7 INTERRUPTIONS TO BOARD'S OPERATIONS

- .1 There will be absolutely no interruptions to the School schedule during demolition work. Therefore, it is imperative that operations and machine and equipment movements, deliveries and removals are executed at time or times that will permit uninterrupted Board's operations in and around the school, including parking, receiving areas, deliveries and site and access and egress.
- .2 Where interruptions of domestic cold and hot water are necessary, coordinate with the School Representatives the timing and duration of such interruptions.

1.8 SAFETY REQUIREMENTS

- .1 Coordinate posting of danger signs conspicuously around property. Close doorways and thoroughfares giving access to area of demolition with barricades.
- .2 Provide a competent, experienced supervisor in charge of the Work and on Site while work is in progress.
- .3 Should any suspect designated substance not already identified, be encountered, cease work in the immediate area and immediately report, to the Board. Board is responsible for removal of designated substances.

1.9 PROTECTION

- .1 Prevent movement, settlement or damage of adjacent structures, services, walks, paving, parts of existing building to remain. Make good any collateral damage caused by demolition.
- .2 Take precautions to support affected structures and, if safety of building being demolished or adjacent structures or services appears to be endangered, cease operations and notify Board.
- .3 Prevent debris from blocking drainage systems (floor drains) or other mechanical and electrical systems that must remain in operation.
- .4 Protect building floors against damage from demolition work. Use ½" plywood covers over floor where lifting, moving, rolling of removed equipment is anticipated. Be responsible for repairing any damage to flooring caused by the work defined in this section. Execute repairs to the satisfaction of the Board at no cost to the Board.

PART2 - PRODUCTS

Not applicable

PART3 – EXECUTION

3.1 DEMOLITION

- .1 At the end of each day's work, leave site in a safe condition and erect safety barriers and lights as required. Ensure that no parts of the existing building are in danger of collapsing.
- .2 Review the requirements of new equipment to be installed. Perform all demolition work required to allow for the new equipment to be installed, whether shown on the drawings or not.
- .3 Control dust and dirt produced during demolition.
- .4 Provide any additional labour, materials and services not specifically indicated on the drawings but required to complete the work.
- .5 Dispose of demolished materials in accordance with the requirements of Authorities Having Jurisdiction.
- .6 At the end of demolition work, leave site in broom-clean condition. Clean existing surfaces specified to receive new applied finishes to ensure proper adherence.
- .7 Do not disturb adjacent structures or equipment designated to remain in place.
- .8 Confine operations and workers to those parts of the building which are defined on the drawings and exercise great care not to damage existing construction beyond that necessary for the carrying out of new work. Make good any such damage in every respect, to the satisfaction of the Board.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL

- .1 This section of the specification is an integral part of the Contract Documents and shall be read accordingly.
- .2 Where applicable, all portions of the Mechanical Supplementary Tender Form shall be submitted by bidders.

1.2 DUTIES OF MECHANICAL CONTRACTOR

- .1 The mechanical contractor shall assume the responsibilities and duties including but not limited to the ones described below:
- .2 Superintendence
 - .1 Provide full time on-site superintendent personnel and supporting staff with proven experience in project of similar value and complexity.
 - .2 Site superintendent shall have over-all authority to speak for and represent the mechanical contractor.
- .3 Coordination
 - .1 Coordinate the work with all the sub-trades involved to ensure that the work will be carried out on schedule and in proper sequence.
 - .2 Take complete responsibility for all remedial work that results from failure to coordinate any aspect of the mechanical work prior to its fabrication and/or installation.
 - .3 Take responsibility for the delivery of equipment necessary to complete the work in accordance with the approved schedule.
- .4 Staffing and Scheduling
 - .1 Within seven days after the award of the contract, the Mechanical Contractor shall provide to the Owner's representative the following information:
 - 1 Appointment of official representatives in the project.
 - 2 Schedule of work.
 - 3 Delivery schedule for specified equipment.
 - 4 Requirements for temporary facilities, site signs, storage, etc.
- .5 Work Completion Meeting
 - .1 Prior to application for Substantial Performance of the Work, the mechanical contractor shall participate in the take-over meeting. Agenda to include the following:

- 1 Review of outstanding deficiencies.
- 2 Submission of maintenance manuals, warranties and as-built drawings.
- 3 Results of performance tests and described further in this section.
- 4 Scheduling of training to Owner's personnel.

1.3 INTENT

- .1 Bidders for this work shall include for all labor, material, equipment and all other related cost including all applicable taxes (except HST) and fees to provide the work as indicated on the drawings.
- .2 Misinterpretation of any requirement of the drawings and specifications will not relieve the Mechanical Contractor of responsibility. If in any doubt, the Mechanical Contractor shall contact the Consultant for written clarification prior to submitting a bid for the Work.
- .3 Supplementary to definitions established are:
 1. "Concealed" means hidden from normal sight in furred spaces, shafts, ceiling spaces, walls, or partitions.
 2. "Exposed" means work normally visible, including work in equipment rooms, tunnels, and similar spaces.
 3. "Provide" (and all tenses) means supply and install for a complete, operational, and code-compliant system, including all devices, equipment, materials, accessories and/or components as specified or as otherwise required for a complete, operational, and code-compliant installation.
 4. "Install" (and all tenses) means secure in position, connect as specified, test, and verify.
 5. "Supply" means to supply all devices, equipment, materials, accessories and/or components to the responsible trade.
 6. "Remove" means to isolate, disconnect, disassemble, remove, and dispose of all devices, equipment, materials, accessories and/or components. Patch and make good all surfaces affected by the removal. Remove and dispose of all redundant material off site.
- .4 Where used, wordings such as "approved, to approval, as directed, permitted, permission, accepted, acceptance", shall mean: approved, directed, permitted, accepted, by authorized representative of the Owner.

1.4 INTERFERENCES

The mechanical drawings do not show all the architectural and structural details, and any information involving accurate measuring of the building shall be taken from the building drawings or at the building. Make without additional change, any necessary changes or additions to the runs of drains, pipes, ducts, etc., to accommodate the above conditions. The

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- location of equipment may be altered without charge providing the change is made before installation and does not necessitate major additional material.
- .2 Wherever differences occur between specifications, riser diagrams or schematics and drawings, the maximum conditions shall govern and the bid shall be based on whichever information indicates the greater cost.
 - .3 Field verifications of dimensions on plans shall be made since actual locations, distances, and levels will be governed by actual field conditions.
 - .4 Discrepancies between different plans, or between plans and actual field conditions, or between plans and specifications shall promptly be brought to the attention of the Consultant for a decision.
 - .5 Install all mechanical services including but not exclusive to drains, pipes, and ducts, to conserve headroom and interfere as little as possible with the free use of the space through which they pass. Install as high as possible, unless otherwise directed by the Consultant. All drains, pipes, ducts, etc., particularly those which may interfere with the inside treatment of the building, or conflicting with other trades, shall be installed only after the locations have been approved by the Consultant. Special care shall be taken in the installation of all mechanical services including, but not exclusive to drains, pipes, and ducts, which are to be concealed, to see that they come within the finished lines of floors, walls, and ceilings. Where such drains, pipes, ducts, etc., have been installed in such a manner as to cause interference, they shall be removed and re-installed in suitable locations without extra cost to the Owner.
 - .6 Before commencing work, check and verify all grade and invert elevations, stacks, levels, and dimensions, to ensure proper and correct installation of the work.
 - .7 In every place where there is space indicated as reserved for future or other equipment, leave such space clear, install blank offs, shut off valves with blind flanges and other work so that the necessary connections can be made without any stoppages to the system. Consult with the consultant whenever necessary for this purpose.
 - .8 In addition to the work specifically mentioned in the Specifications and shown on the drawings, provide all other items that are obviously necessary to make a complete working installation, including those required by the Authorities Having Jurisdiction over the work.
 - .9 The mechanical plans show approximate locations for wall mounted devices. Obtain Consultant's approval of mounting heights and locations before commencement of work.
 - .10 Prepare and submit complete interference drawings (in PDF format) to avoid and/or resolve conflict of trades and to coordinate the work of the Mechanical Division with that of all other Trades. Submission of interference drawings shall be done no later than 10 business days after the Project has officially begun. The cost of producing the interference drawings shall be included for in the Base Tender Price.
 - .11 Include costs (in the Base Tender Price) for the services of a third-party to 3D scan the entire area of construction upon completion of demolition. System shall be Matterport or similar. The

intent to is capture and submit to the Consultant a full 3D perspective of the space. This model shall be used to identify any potential conflicts ahead of installation and ordering of equipment to allow for quick resolution of site conflicts. 3D Model shall capture all architectural, structural, mechanical and electrical conditions on site and all such conditions shall be part of the model. The model, along with site verifications, shall be used as the basis for interference drawings.

1.5 EXAMINE SITE

- .1 Examine the site and the local conditions affecting the work. Examine carefully all drawings and the complete specifications to ensure that the work can be satisfactorily carried out as shown. No allowance will be made later for any expenses incurred through the failure to make these examinations or to report any such discrepancies in writing to the Consultant.

1.6 SUBCONTRACTOR'S SHOP

- .1 Provide Job site office, work-shop, tools, scaffolds, material storage, etc., as required to complete the work.

1.7 CLEANING

- .1 During the performance of the work and on the completion, remove from the place of the work all debris, rubbish and waste materials caused by the performance of the work. Remove all tools and surplus materials after completion and acceptance of the work.
- .2 All equipment shall be thoroughly vacuumed out at the time of final acceptance of the work.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Protection of Equipment:
 - .1 Equipment and material placed on the job site shall remain in the custody of the Contractor until phased acceptance, whether or not the Owner has reimbursed the Contractor for the equipment and material. The Contractor is solely responsible for the protection of such equipment and material against any damage.
 - .2 Place damaged equipment in first class, new operating condition; or, replace same as determined and directed by the Consultant. Such repair or replacement shall be at no additional cost to the Owner.
 - .3 Protect interiors of new equipment and piping systems against entry of foreign matter. Clean both inside and outside before painting or placing equipment in operation.
 - .4 Existing equipment and piping being worked on by the Contractor shall be under the custody and responsibility of the Contractor and shall be protected as required for new work.
- .2 Cleanliness of Piping and Equipment Systems:

- .1 Exercise care in storage and handling of equipment and piping material to be incorporated in the work. Remove debris arising from cutting, threading and welding of piping.
- .2 Piping systems shall be flushed, blown or pigged as necessary to deliver clean systems.
- .3 Clean interior of all tanks prior to delivery for beneficial use by the Owner.
- .4 Contractor shall be fully responsible for all costs, damage, and delay arising from failure to provide clean systems.

1.9 INSTALLATION OF WORK

- .1 Be responsible for:
 - .1 The layout of the work shown on the drawings and specified herein, and for any damage caused to the Owner by improper location or carrying out of this work.
 - .2 The prompt installation of the work in advance of concrete pouring or similar work.
 - .3 The condition of all material and equipment supplied and for the protection and maintenance of work completed.
- .2 Coordinate with other trades and schedule all work to suit the date for the substantial performance established in the construction contract.
- .3 Furnish items to be "built-up" in ample time and give necessary information and assistance in connection with the building in of the same.
- .4 Proceed with the work as quickly as practical so that construction may be completed in as short a time as possible and in accordance with the building schedule.
- .5 Ensure that all equipment and material is ordered in time to meet the building schedule. Provide a schedule of equipment deliveries to the Owner within the time limit stipulated.
- .6 Furnish promptly information required for the construction schedule.
- .7 Manufactured products supplied with instructions for their installation shall be installed in strict accordance with those instructions.
- .8 All new ductwork and piping shall be supported from a secondary structure site supplied and installed by the Contractor consisting of unistruct (or alternate as necessary) structure fastened to the building OWSJ structure. No supporting of piping, conduits ductwork or equipment from the roof deck will be permitted.

1.10 CODES, PERMITS, FEES AND CONNECTIONS

- .1 Conform to Federal, Provincial and Municipal regulations and perform work in accordance

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- with requirements of By-Laws and Regulations in force in area where the building is to be erected.
- .2 Apply for, obtain, and pay for all permits, fees and service connections for the work and the inspections required by Authorities Having Jurisdiction in the area where the building is to be erected.
 - .3 In particular, coordinate with and pay for the local gas supply company to adjust/modify/replace the existing gas meter assembly and PRV as required to ensure that the available gas pressure is adequate for all gas fired equipment to operate simultaneously at maximum capacity. The minimum gas pressure at the boiler shall not be less than 8" w.g. under simultaneous maximum operating condition of all gas-fired equipment.
 - .4 For information, a specific code or standard might be mentioned. This information must not be taken as the only code or standard applicable.
 - .5 When part of equipment does not bear the required CSA label, the contractor shall obtain from CSA or Hydro Electric Power Commission, when that part of the equipment is an electric component, a special approval and pay the applicable fees.
 - .6 Furnish necessary certificates as evidence that the work installed conforms with laws and regulations of Authorities having jurisdiction. Changes in work requested by an Authority having jurisdiction shall be carried out without charge.

1.11 MATERIALS

- .1 Where materials, equipment, apparatus, or other products are specified by the manufacturer, brand name, type or catalogue number, such designation is to establish standards of desired quality style or dimensions and shall be the basis of the Bid. Materials so specified shall be furnished under this Contract, unless changed by mutual agreement. Where two or more designations are listed, the Contractor shall base the submitted Tender Price based on the base specified equipment; any approved alternate will only be entertained after Notification of Award.

1.12 BASE BID SPECIFIED EQUIPMENT & SUBSTITUTIONS WITH APPROVED ALTERNATES

- .1 Requests for substitutions will not be accepted prior to the Notification of Award. Substitutions will be considered:
 - 1) The proposed substitutions have been investigated and complete data are submitted which clearly includes highlighting all aspects that meet the specifications. Consultant will only review data submitted. Incomplete data will be grounds for non-acceptance.
 - 2) Data relating to changes in the Contract Schedule, if any, and relation to other Work have been submitted.
 - 3) Same warranty is given for the substitution as for the original Product specified.

- 4) All claims are waived for additional costs related to the substitution which may subsequently arise.
- 5) Installation of the accepted substitution is co-ordinated into the Work and that full responsibility is assumed when substitutions affect other work. Make any necessary changes required to complete the Work. Revisions to the drawings for incorporation of the substitutions shall be made by the Consultant and all costs associated with the revisions shall be borne by the Contractor.

1.13 MATERIAL SUBSTITUTIONS

- .1 After execution of the Contract, requests for substitution of materials of makes other than those specifically named in the Contract Documents may be approved by the Consultant, subject to owner's review and acceptance of the financial credits involved.
- .2 In the absence of such express approval by the Consultant, the Mechanical Contractor will be held to furnish specified items under the base bid.

1.14 SHOP DRAWINGS AND SAMPLES

- .1 Submit to the Consultant detailed dimension shop drawings and installation wiring diagrams for all mechanical equipment. Further details and special requirements called for in these specifications shall be shown on the shop drawings.
- .2 Ensure that copies of all reviewed shop drawings are available on the job site for reference.
- .3 Provide samples of mechanical equipment as requested in the specification at the same time as the shop drawing submission.
- .4 **The Mechanical Contractor is responsible for consolidating all Mechanical Shop Drawings and submitted them in no more than three (3) packages as per the following:**
 1. HVAC Equipment and Material.
 2. Plumbing Equipment, Fixtures and Material.
 3. Fire Protection Equipment, Fixtures and Material.

Individual shop drawings not consolidated will not be accepted.

1.15 AS-BUILT DRAWINGS

- .1 Maintain up to date "as built" drawings on site.
- .2 At the conclusion of the project, the Consultant will forward to the Contractor a set of electronic files of the project. The Contractor shall modify the files as required, to reflect the as-built conditions, mark them conspicuously in the title block as "as-built drawings" and submit the modified files to the Consultant for review. Completion of the As-Built Drawings in AutoCAD will be the responsibility of the Mechanical Contractor at no extra cost to the project. The

Mechanical Contractor is responsible for updating all Architectural Plans based on the Architectural As-Builts while producing the Mechanical As-Builts

- .3 Put a digital copy of the as-built files (in AutoCAD 2017 format) as part of the Operations and Maintenance manuals.
- .4 Any subsequent changes found by the Consultant shall remain the responsibility of the Contractor at no charge to the Owner.

1.16 TEMPORARY AND TRIAL USAGE

- .1 After any part of the work has been completed, the Consultant will make an inspection, and performance tests of such parts shall be carried out under the direction of the Consultant. If deficiencies are found, they shall be immediately rectified to the satisfaction of the Consultant. After such deficiencies have been rectified, the work shall be placed in service at such time and in such order as the Consultant may direct. If, in placing a portion of the equipment in service, it is necessary to make temporary connections in the wiring in order to obtain proper operation, such connections shall be provided to the extent and in the manner required by the Consultant.
- .2 Temporary or trial usage of any mechanical devices, machinery, apparatus, equipment or materials shall not be construed as evidence of the acceptance of same.
- .3 No claims for damage will be considered for injury to, or the breaking of any parts of such work which may be used.

1.17 CONSULTANT'S INSTRUCTIONS

- .1 During construction the Consultant will issue such instructions as may be necessary for verification and corrections of the work. These instructions shall be binding as part of the specification.

1.18 ADDITIONAL WORK AND CHANGES

- .1 Unless a written order, reviewed by the Consultant and countersigned or otherwise approved by the Owner Representative, no additional work shall be undertaken by the Contractor.

1.19 WARRANTY

- .1 The Mechanical Contractor shall guarantee all work and apparatus installed under his contract against all defects of workmanship and material for a period of one (1) year after the Substantial Performance of the Work, unless otherwise mentioned in the Specifications, and shall make good any and all defects developing during such time without expense to the Owner. Any materials shall be further guaranteed as may be called for in these specifications. Where warranties on equipment extend beyond one (1) year the Mechanical Contractor shall honor the extended warranty.

1.20 SCHEDULING OF WORK

- .1 For all work to be performed under this contract, adhere to Construction Schedule agreed upon with the Owner Representative.

1.21 ENERGY CONSUMPTION

- .1 The Consultant may reject equipment submitted for approval on basis of performance or energy consumed or demanded.
- .2 All equipment installed on the project shall conform to the requirements outlined in ASHRAE 90.1 latest edition.

1.22 ELECTRIC MOTORS

- .1 Provide motors for mechanical equipment as specified.
- .2 If delivery of specified motor will delay delivery or installation of any equipment, install an acceptable motor for temporary use. Final acceptance of equipment will not occur until specified motor is installed.
- .3 All motors shall be manufactured and installed in accordance with CSA requirements.
- .4 Motor speed shall be 1750 rpm unless otherwise specified.
- .5 All motors shall be "T" frame CEMA Standard Design "B" with Class "B" insulation, 40°C ambient, standard drip-proof with a 1.15 service factor, or as otherwise specified. Motors in air stream or exposed shall be TEFC type.
- .6 Motors shall be of adequate size to operate associated equipment and drive mechanisms under all conditions of load and service and to bring equipment up to operating speed within 13 seconds without overloading, and be not less than the nameplate HP specified or indicated on the Drawings.
- .7 Integral HP motor sizes ½ HP and above shall be squirrel cage induction motors rated 575 volt or 230volt, 3 phase, 60 hertz, unless noted otherwise.
- .8 Fractional HP motors up to but not including ½ HP shall be rated 120 volt, single phase, 60 hertz and will be capacitor start, induction motors, with adequate thrust capacity when used with direct mounted equipment, and shall be provided with integral overload and overheating protection. Shaded pole starting devices will not be accepted.
- .9 Multi-speed motors and associated switching devices shall be circuited to protect the motor at each speed.
- .10 All motors, 1 HP and up shall comply with the Ontario Hydro EnerMark Motor Efficiency Level as tested either CSA 390 M 1985, or IEEE 112B, and be approved under the Canadian Electrical Safety Code.
- .11 All starter panels shall be lockable and supplied with locks.

.12 Special Requirements:

- .1 Where motor power requirements of equipment furnished deviate from power shown on plans, provide electrical service designed under the requirements of NFPA 70 without additional time or cost to the Owner.
 - .2 Assemblies of motors, starters, controls and interlocks on factory assembled and wired devices shall be in accordance with the requirements of this specification.
- .13 Wire and cable materials specified in the electrical division of the specifications shall be modified as follows:
- .1 Wiring material located where temperatures can exceed 71 degrees C (160 degrees F) shall be stranded copper with Teflon FEP insulation with jacket. This includes wiring on the boilers.
 - .2 Other wiring at boilers and to control panels shall be NFPA 70 designation THWN.
 - .3 Provide shielded conductors or wiring in separate conduits for all instrumentation and control systems where recommended by manufacturer of equipment.
- .14 Select motor sizes so that the motors do not operate into the service factor at maximum required loads on the driven equipment. Motors on pumps shall be sized for non-overloading at all points on the pump performance curves.
- .15 Motors utilized with variable frequency drives shall be rated "inverter-ready" per NEMA Standard, MG1, Part 31.4.4.2. Provide motor shaft grounding apparatus that will protect bearings from damage from stray currents.
- .16 Insulation Resistance: Not less than one half meg-ohm between stator conductors and frame, to be determined at the time of final inspection.

1.23 EQUIPMENT REQUIREMENTS AND INSTALLATION

- .1 Permit equipment maintenance and disassembly by use of unions or flanges to minimize disturbance to connecting piping and duct systems and without interference from building structure or other equipment.
- .2 Provide accessible means for lubricating equipment including permanent lubricated bearings.
- .3 For all base mounted boilers, pumps, compressors, air handling units, fans and other rotating equipment, provide chamfered edge housekeeping pads a minimum of 4" high and 4" larger than equipment dimensions all around. Work shall be performed by the trades specializing in this work.
- .4 Pipe drain lines, overflows and safety relief vents to drains. If the horizontal drains present a tripping hazard, use aluminum checkered plate covers.

- .5 Line-up equipment, rectangular cleanouts and similar items with building walls wherever possible.

1.24 LIFTING ATTACHMENTS

- .1 Provide equipment with suitable lifting attachments to enable equipment to be lifted in its normal position. Lifting attachments shall withstand any handling conditions that might be encountered, without bending or distortion of shape, such as rapid lowering and braking of load.

1.25 THERMOMETERS AND PRESSURE GAUGES

- .1 General:

- .1 Locate direct reading thermometers and gauges for reading from floor or platform.
- .2 Provide remote reading thermometers and gauges where direct reading instruments cannot be satisfactorily located.
- .3 Locate engraved lamacoid nameplate as specified in Section Identification, identifying medium adjacent to thermometers and gauges.

- .2 Thermometers:

- .1 Industrial, 9" adjustable angle cast aluminum case, CGSB standard CAN/CGSB-14.4-M88 red reading mercury, lens front tube, white scale black embossed figures, clear glass or acrylic window, tapered aluminum stem.
- .2 Scale shall be suitable for 2 times the temperature range of service. Scale shall be combined Celsius and Fahrenheit.
- .3 Standard of Acceptance: Weiss, Ashcroft, Terrice.

- .3 Pressure Gauges:

- .1 5" dial, solid front blow out back, fibreglass reinforced polypropylene case, phosphor bronze bourdon tube and brass 1/4" N.P.T. socket, bottom connection, stainless steel rotary type movement, gauge to be registered with the Provincial Boiler and Pressure Vessel Safety Branch with a registration number and conform to ANSI B40.1. Accuracy to be grade "A".
- .2 On pumps liquid filled gauges shall be utilized.
- .3 Standard of Acceptance: Weiss, Ashcroft, Terrice.
- .4 Provide bronze stop cock, bronze bar stock 1/4" N.P.T. bronze porous core pressure snubber for pulsating operation and diaphragm for corrosive service.

- .5 Use materials compatible with system requirements.
- .6 Gauges shall have combined kilopascal and psi scales.

1.26 PIPE HANGERS AND SUPPORTS

- .1 General
 - .1 Pipe Supports: Comply with MSS SP 58. Type Numbers specified refer to this standard. For selection and application comply with MSS SP 69.
- .2 Attachment to Concrete Building Construction:
 - .1 Concrete insert: MSS SP-58, Type 18.
 - .2 Self drilling expansion shields and machine bolt expansion anchors: Permitted in concrete not less than 102 mm (four inches) thick when approved by the Consultant for each job condition.
 - .3 Power driven fasteners: Permitted in existing concrete or masonry not less than 102 mm (four inches) thick when approved by the Resident Engineer for each job condition.
- .3 Attachment to Steel Building Construction:
 - .1 Welded attachment: MSS SP 58, Type 22.
 - .2 Beam clamps: MSS SP-58, Types 20, 21, 28 or 29. Type 23 C clamp may be used for individual copper tubing up to 23mm (7/8 inch) outside diameter.
- .4 Attachment to Metal Pan or Deck:
 - .1 As required for materials specified Steel Decking section of the specification.
- .5 Attachment to Wood Construction:
 - .1 Wood screws or lag bolts.
- .6 Hanger Rods
 - .1 Hot rolled steel, ASTM A36 or A575 for allowable load listed in MSS SP 58. For piping, provide adjustment means for controlling level or slope. Types 13 or 15 turn buckles shall provide 38 mm (1 1/2 inches) minimum of adjustment and incorporate locknuts. All thread rods are acceptable.
- .7 Hangers Supporting Multiple Pipes (Trapeze Hangers):
 - .1 Galvanized, cold formed, lipped steel channel horizontal member, not less than 41 mm by 41 mm (1 5/8 inches by 1 5/8 inches), 2.7 mm (No. 12 gage), designed to accept special

spring held, hardened steel nuts. Not permitted for steam supply and condensate piping.

- .2 Allowable hanger load: Manufacturers rating less 91kg (200 pounds).
- .3 Guide individual pipes on the horizontal member of every other trapeze hanger with 6 mm (1/4 inch) U bolt fabricated from steel rod. Provide Type 40 insulation shield, secured by two 13mm (1/2 inch) galvanized steel bands, or preinsulated calcium silicate shield for insulated piping at each hanger.
- .8 Supports for Piping Systems:
 - .1 Select hangers sized to encircle insulation on insulated piping. To protect insulation, provide Type 39 saddles for roller type supports or preinsulated calcium silicate shields. Provide Type 40 insulation shield or preinsulated calcium silicate shield at all other types of supports and hangers including those for preinsulated piping.
- .9 Piping Systems (MSS SP 58):
 - .1 Standard clevis hanger: Type 1; provide locknut.
 - .2 Riser clamps: Type 8.
 - .3 Wall brackets: Types 31, 32 or 33.
 - .4 Roller supports: Type 41, 43, 44 and 46.
 - .5 Saddle support: Type 36, 37 or 38.
 - .6 Turnbuckle: Types 13 or 15. Preinsulate.
 - .7 U bolt clamp: Type 24.
 - .8 Copper Tube:
 - 1 Hangers, clamps and other support material in contact with tubing shall be painted with copper colored epoxy paint, plastic coated or taped with non adhesive isolation tape to prevent electrolysis.
 - 2 For vertical runs use epoxy painted or plastic coated riser clamps.
 - 3 For supporting tube to strut: Provide epoxy painted pipe straps for copper tube or plastic inserted vibration isolation clamps.
- .9 Insulated Lines:
 - 1 Provide pre-insulated calcium silicate shields sized for copper tube.
- .10 Supports for plastic or glass piping: As recommended by the pipe manufacturer with black rubber tape extending one inch beyond steel support or clamp.
- .10 Piping with Vertical Expansion and Contraction:
 - .1 Movement up to 20 mm (3/4 inch): Type 51 or 52 variable spring unit with integral turn buckle and load indicator.
 - .2 Movement more than 20 mm (3/4 inch): Type 54 or 55 constant support unit with integral

adjusting nut, turn buckle and travel position indicator. //

.11 Heat Exchanger and Expansion Tank Hangers:

- .1 May be Type 1 sized for the shell diameter. Insulation where required will cover the hangers.

1.27 PIPE PENETRATIONS

- .1 Install sleeves during construction for other than blocked out floor openings for risers in mechanical bays.
- .2 To prevent accidental liquid spills from passing to a lower level, provide the following:
 - .1 For sleeves: Extend sleeve 25 mm (one inch) above finished floor and provide sealant for watertight joint.
 - .2 For blocked out floor openings: Provide 40 mm (1 1/2 inch) angle set in silicone adhesive around opening.
 - .3 For drilled penetrations: Provide 40 mm (1 1/2 inch) angle ring or square set in silicone adhesive around penetration.
- .3 Penetrations are not allowed through beams or ribs, but may be installed in concrete beam flanges. Any deviation from these requirements must receive prior approval of Consultant.
- .4 Sheet Metal: Provide for pipe passing through floors, interior walls, and partitions, unless brass or steel pipe sleeves are specifically called for below.
- .5 Cast Iron or Zinc Coated Pipe Sleeves: Provide for pipe passing through exterior walls below grade. Make space between sleeve and pipe watertight with a modular or link rubber seal. Seal shall be applied at both ends of sleeve.
- .6 Galvanized Steel or an alternate Black Iron Pipe with asphalt coating Sleeves: Provide for pipe passing through concrete beam flanges, except where brass pipe sleeves are called for. Provide sleeve for pipe passing through floor of mechanical rooms. Except in mechanical rooms, connect sleeve with floor plate.
- .7 Brass Pipe Sleeves: Provide for pipe passing through quarry tile, terrazzo or ceramic tile floors. Connect sleeve with floor plate.
- .8 Sleeves are not required for wall hydrants for fire department connections or in drywall construction.
- .9 Sleeve Clearance: Sleeve through floors, walls, partitions, and beam flanges shall be one inch greater in diameter than external diameter of pipe. Sleeve for pipe with insulation shall be large enough to accommodate the insulation. Interior openings shall be caulked tight with fire stopping material and sealant to prevent the spread of fire, smoke, and gases.

1.28 SPECIAL TOOLS AND LUBRICANTS

- .1 Furnish, and turn over to the Owner, special tools not readily available commercially, that are required for disassembly or adjustment of equipment and machinery furnished.
- .2 Grease Guns with Attachments for Applicable Fittings: One for each type of grease required for each motor or other equipment.
- .3 Tool Containers: Hardwood or metal, permanently identified for intended service and mounted, or located, where directed by the Owner
- .4 Lubricants: A minimum of 0.95 L (one quart) of oil, and 0.45 kg (one pound) of grease, of equipment manufacturer's recommended grade and type, in unopened containers and properly identified as to use for each different application.

1.29 WALL, FLOOR AND CEILING PLATES

- .1 Material and Type: Chrome plated brass or chrome plated steel, one piece or split type with concealed hinge, with set screw for fastening to pipe, or sleeve. Use plates that fit tight around pipes, cover openings around pipes and cover the entire pipe sleeve projection.
- .2 Thickness: Not less than 2.4 mm (3/32 inch) for floor plates. For wall and ceiling plates, not less than 0.64 mm (0.025-inch) for up to 80 mm (3 inch pipe), 0.89 mm (0.035-inch) for larger pipe.
- .3 Locations: Use where pipe penetrates floors, walls and ceilings in exposed locations, in finished areas only. Use also where insulation ends on exposed water supply pipe drop from overhead. Provide a watertight joint in spaces where brass or steel pipe sleeves are specified.

1.30 EXCAVATION AND BACKFILL

- .1 Grade the bottom of the pipe trench excavation as required.
- .2 In firm, undisturbed soil, lay pipes directly on the soil, and shape soil to fit the lower one-third segment of all pipes and pipe bells. Ensure even bearing along the barrels. Backfill excess excavation with 25 mPa concrete.
- .3 Where rock or shale is encountered, arrange to have this excavated and removed. After excavation, backfill with a bedding of 10 mm crushed stone.
- .4 Prepare new bedding under the pipe in unstable soil, in fill, and in all cases where pipe bedding has been removed in earlier excavation, particularly near perimeter walls of buildings, at manholes and catch basins. Compact to maximum possible density and support the pipe by 200 mm (8 inches) thick firm supports. Install reinforcing steel in cradle or construct piers every eight feet or closer, down to solid load bearing strata. Provide a minimum of one pier per length of pipe. Use same method where pipes cross.
- .5 Where excavation is necessary in proximity to and below the level of any footing, backfill with 25 mPa concrete to the level of the highest adjacent footing. Proximity is determined by the

- angle of repose as established by the consultant.
- .6 Provide support over at least the bottom one third segment of the pipe in all bedding methods.
 - .7 Do not open trench ahead of pipe laying and backfilling more than weather will permit. Keep walls of trenches straight to at least 450 mm (18") above the top of the pipe to keep the diameter load within the pipe design limits. Have excavations inspected at least once a week by authorities. .
 - .8 Before backfilling, obtain approval. Remove all shoring during backfill.
 - .9 Backfill trenches within building, with clean sharp sand or gravel in individual layers of maximum 150 mm (6") thickness, compacted to a density of 100% Standard Proctor. Hand compact the first layers up to a compacted level of minimum 300 mm (12") above the top of pipe. Hand or machine compact the balance up to grade, using approved equipment.
 - .10 Backfill trenches outside buildings, not under roads, parking lots, or traffic areas, up to a compacted level of 450 mm (18") above the pipes with individual layers of material 150 mm (6") thick, hand compacted to a density of 95% Standard Proctor, using approved 10 mm (3/8") crushed stone. Backfill the balance with 150 mm (6") layers of approved excavated material, compacted to 95% Standard Proctor, using approved equipment.
 - .11 Backfill all other trenches outside buildings with 150 mm (3/8") crushed stone in layers not exceeding 6" thickness, compacted to 100% Standard Proctor density up to grade level. Manual compaction up to 450 mm (18") above the pipe with approved equipment for the balance.
 - .12 Fill all depressions to a correct grade level with appropriate material. After a period has passed adequate to reveal any settlement, use maximum possible compaction. Pay all costs required to make good all damages caused by settlement.
 - .13 Dispose of excavated materials in accordance with the requirements of the Authorities having Jurisdiction.

1.31 TESTS

- .1 Do not insulate or conceal work until tested and approved. Follow construction schedule and arrange for tests.
- .2 Conduct tests in presence of Consultant.
- .3 Bear costs including retesting and making good.
- .4 Pipe pressure:
 - .1 Hydraulically test piping systems at 1.5 times system operating pressure or minimum 125 psi, whichever is greater.
 - .2 Maintain test pressures without loss for 4 hours unless otherwise specified.
 - .3 Test natural gas systems to requirements of authorities having jurisdiction and as per Ontario Gas Utilization Code O.Reg. 452/89.

- .4 Test drainage, waste and vent piping to code.
- .5 Prior to tests, isolate all equipment or other parts which are not designed to withstand test pressures.

1.32 PAINTING

- .1 Apply at least one coat of corrosion resistant primer paint to supports, and equipment fabricated from ferrous metals.
- .2 Touch-up paint all damaged equipment with products matching original finish in quality and appearance.
- .3 Paint the entire gas line where with two coats of yellow paint.

1.33 SPECIAL TOOLS AND SPARE PARTS

- .1 Furnish spare parts as follows:
 - .1 One set of packing for each pump.
 - .2 One glass for each gauge glass installed.
 - .3 One set of v-belts/bolts for each piece of machinery.
 - .4 One spare set of filters for each filter bank installed.
- .2 Upon completion of project and immediately before hand-over, replace all filters.

1.34 DIELECTRIC COUPLINGS

- .1 Provide wherever pipes of dissimilar metals are joined.
- .2 Provide insulating unions for pipe sizes larger than 2" diam. and under; same for flanges of pipe sizes over 2" diam.
- .3 Cast brass adapters may be used on domestic water systems and where approved by the Consultant.
- .4 Provide rubber gaskets to prevent dissimilar metals contact.

1.35 INSTRUCTION OF OPERATING STAFF

- .1 Supply certified personnel to instruct Owner operating staff on operation of new mechanical equipment. Supply maintenance specialist personnel to instruct operating staff on maintenance and adjustment of mechanical equipment and any changes or modification in equipment made under terms of guarantee.
- .2 Provide min. 6 hrs of instruction time during regular work hours prior to acceptance and turn-over to operating staff for regular operation.

- .3 Use operation and maintenance data manual for instruction purposes. On completion of instruction, turn manuals over to the Consultant.
- .4 Scheduling of the timing for the training of the operating staff shall be arranged 10 days prior to the completion of the project.
- .5 For training on controls, refer to section 15900

1.39 MAINTENANCE MANUALS

- .1 Provide minimum of one (1) hard (hard cover binder) and three (3) soft (USB's) copies of Mechanical Maintenance Manuals, in accordance to the following:
 - .1 Mechanical Maintenance Manuals to be delivered to the Consultant's office 10 days prior to the substantial completion of the Contract.
 - .2 Manuals to be bound in a hard cover neatly labeled: "OPERATING AND MAINTENANCE INSTRUCTIONS".
 - .3 The Maintenance Manuals shall be divided into sections with neatly labeled and tabbed dividers between each section. The sections to be included in the manual are:
 - .1 Section I - General.
 - .2 Section II - Piping and Pump Systems, Plumbing Fixtures and Accessories.
 - .3 Section III - Boilers, Heat Exchangers, Pool Filters and Accessories
 - .4 Section IV - Automatic Controls
 - .5 Section V - Air and Water Balancing
 - .4 The following information shall be contained within the sections:
 - .1 SECTION I: A list giving name, address and telephone number of the Consultant, Engineers, General Contractor, Mechanical Trade and Controls Trade. Written guarantees for the Mechanical Systems. A copy of the Valve directory giving number, valve location, normal valve position, and purpose of valve (a framed copy of Valve Directory to be hung in Boiler Room). Equipment lists and certificates shall be provided - certificates shall be signed and sealed by the appropriate suppliers.
 - .2 SECTION II, III: A copy of all pressure tests and operational tests. A copy of Gas Operational Tests for gas fired equipment. A list giving name, address and telephone number of all suppliers. Details of chemical treatment equipment and substances. A copy of all reviewed Shop Drawings for all mechanical equipment and ancillary devices (valves, expansion tanks, pumps, strainers, plumbing, etc). Copies of warranties.
 - .3 SECTION IV: Complete Control Diagrams, Wiring Diagrams and description of Control system and the functioning sequence of the system. Also refer to section 15900.
 - .4 SECTION V: For balancing reports and formats, refer to section 15015 of these specifications.

1.40 CONCRETE

- .1 All concrete work required to complete this project, whether shown on the drawings or not, shall be the Contractor's responsibility.
- .2 Refer to this specification section for requirements for housekeeping pad.

1.41 METALS

- .1 All steel construction required for the completion of this project, whether shown on the drawings or not, shall be the Contractor's responsibility.

1.42 CUTTING, PATCHING, ROOFING AND X-RAY

- .1 All cutting, patching, roofing and X-Rays required for the completion of this project whether shown on the drawings or not, shall be the Contractor's responsibility. The cutting and patching work shall be performed in accordance with the following:
 - .1 All cutting and patching shall be done by the trades specializing in the materials to be cut.
 - .2 All flashing and equipment supports on the roof shall be done in strict accordance with the Owner standards by Owner-approved roofing contractors only.
- .2 Should any cutting, roofing and/or repairing of finished surfaces be required, the Sub-trade contractor for the Contractor shall employ the particular trades engaged on the site for this type of work to do such cutting and/or repairing. Obtain the approval of the Consultant before doing any cutting. In the event that tradesmen required for particular cutting and/or repairing are not already on the site, bring to the site tradesmen to do this work.
- .3 Supporting members of any floor, wall or the building structure shall be cut only in such a location and manner as approved by the Consultant.
- .4 Where slabs in the portions of the building which are existing must be saw-cut or core drilled, all locations shall be x-rayed prior to saw-cutting or core-drilling. All x-raying shall be done by personnel qualified in the use of the type of equipment required to x-ray the saw-cuts shall be permitted to perform this work on the site. No allowance will be made later for expenses incurred through the failure of performing these x-rays.

1.43 INTERFERENCE DRAWINGS

- .1 The Mechanical Contractor is responsible for preparing detailed interference drawings once demolition work has proceeded to the point where all existing conditions are visible. Provide 2D plan view and 3D isometric view layouts for all project areas depicting site measurements of all floor areas, height, width and depth of all existing structural elements, new architectural walls, ceilings and floor assemblies, new structural elements and new mechanical ductwork and piping plans. Prior to proceeding with new work, ensure that any concerns of interference are alleviated; consult with the Engineer as necessary. Provide written notice to the Engineer of any potential interferences of concerns with existing conditions based on the site findings after demolition.

1.44 MECHANICAL PROJECT COMPLETION

- .1 10 (ten) days prior to substantial performance of work obtain documentation and/or prepare certification of the following items and submit them to the Owner's representative.
 - .1 All inspection certificates including drainage, Plumbing, and refrigeration.
 - .2 Guarantee certificates as called for under "Warranty".
 - .3 Record drawings.
 - .4 Operating and Maintenance Manuals.
 - .5 Test certifications as called for under "Testing".
 - .6 Provide a signed statement to the effect that all tests for mechanical systems and equipment have been completely carried out in the Trade Sections of these Specifications and to the manufacturer's recommendations, and in accordance with the requirements of all authorities having jurisdiction.

1.45 PERFORMANCE TESTS AND EQUIPMENT START-UP

- .1 After all equipment has been installed, adjusted, balanced and started up, subject equipment to a series of performance tests, as soon as conditions permit.
- .2 The timing of the tests shall be arranged to suit the convenience of the Consultant, and the manner and duration shall be as the Consultant deems necessary. Record the daily start and stop times, operating hours and functions performed. Ensure that the performance tests are witnessed by the Consultant.
- .3 All major equipment including but not limited to boilers, pumps, sand filters are to be inspected by the manufacturer to ensure that the equipment has been installed in accordance with their recommendations.
- .4 Operate equipment under varying load conditions, demonstrate start-up sequence, normal shutdown, simulated emergency shutdown, operation of temperature, etc., and safety controls. Operate switches and electrical devices for correct wiring sequences. Adjust components to achieve a proper functional relationship among all the components of all the systems. Repeat these functions as many times as deemed necessary by the Consultant to achieve reliable operation.
- .5 Repair defects and repeat tests as necessary. During test maintain lubrication schedule, set, align and tension drives.
- .6 At the successful completion of Performance Tests and all testing and balancing, make the systems ready for final inspection and subsequent acceptance of the Owner. Replace and clean filters, flush out lines and equipment, remove and clean strainers, fill liquid systems and purge air. Provide water treatment to pipes and report in accordance to Section 15602. Disinfect all domestic water as required by current by-laws and Authorities Having Jurisdiction.

- .7 Conduct tests to demonstrate operation and ability to meet requirements of all equipment and freedom from undue noise and vibration at the time of final inspection, having ensured that it has previously been subjected to Performance Tests.

1.46 PROJECT SPECIFIC NOTES

1. Obtain all approvals from public authorities having jurisdiction prior to commencing any work. Include, in the tender price, for all permit and inspection fees required by Authorities having Jurisdiction. Arrange for and attend all inspections required as per requirements of the Building Department or an Authority having Jurisdiction.
2. Examine architectural drawings and specifications and all contract documents before proceeding with the work. Any discrepancies between the drawings and specifications of all disciplines must be referred to the architect before any affected work is commenced.
3. The Mechanical Contractor shall furnish all labour, material, tools, equipment, etc. required to complete all work shown on the drawings and as specified in the contract documents. The work shall be performed in accordance with rules and regulations of all authorities having legal jurisdiction over the work. This Contractor shall provide any small items of work not specifically called for but required to complete the intended installation and/or required to achieve the desired intent or functional utility.
4. Perform all work in full accordance with the Ontario Building Code, All Applicable Codes, TDSB standards and good practices and the requirements of all other Authorities Having Jurisdiction. All work performed by this division shall be done in accordance with all manufacturer's recommendations. Obtain all available manufacturer's recommendations and comply.
5. All cutting, patching, coring, scanning, xraying, making good and fire stopping required for the work of this division shall be carried out by this division. The Mechanical Contractor is responsible for and shall pay for any and all damage to the building and/or surrounding area incurred by work of this division.
6. Review the designated substances survey provided by the board in detail prior to commencing any work.
7. The Mechanical Contractor must review and submit shop drawings for all materials to be supplied as a part of the Contract in conjunction with the General Contractor to the Architect and Mechanical Consultant prior to ordering. Order only upon receipt of approval. Order, supply and install as per all comments. The Shop Drawings must be reviewed and ensured for compliance with the Contract Documents by the Mechanical Contractor and General Contractor prior to submission; confirmation of review and confirmation that the submittal is in compliance with the Contract Documents is the responsibility of the Mechanical Contractor and General Contractor to include in writing with each Shop Drawing Submittal. Any non-conformance of the Submittal with the Contract Documents identified by the Mechanical Consultant will require a resubmission of the Shop Drawing Submittal by the Mechanical Contractor prior to review. The Mechanical Contractor shall bear all costs of any review by the Mechanical Consultant

beyond the Original Shop Drawing Submission at a cost of \$250.00 CAD + HST per resubmission.

8. All access panel ratings shall match that of the surface in which it is being installed. All access panels requiring supply/install as a part of the project work shall be included for in the Base Tender Price.
9. Coordinate with all other trades present on site throughout the full course of construction. Lay out of all work so as not to conflict with the work of other trades. Carry out work promptly which may interfere with the work and/or schedule of any other trades.
10. Cleanup and garbage: the contractor is responsible for maintaining as clean of a work area as possible during construction. The contractor is responsible to clean-up and remove tools from the site at the end of every working day. Disposal of all redundant materials, devices, and equipment is the responsibility of the contractor on a daily basis.
11. All work shall be done with minimum possible interruption to the existing building systems and in the time schedule permitted by the school board. Consult with the project supervisor prior to pricing. Complete the project within the allocated schedule.
12. Unless otherwise explicitly stated in writing in the Contract Documents, all materials, labour, scope and descriptions of work described in the Contract Documents is the responsibility of the Mechanical Contractor to supply and install as a part of the Base Tender Price. No materials and/or labour is to be completed under the Project Allowances unless explicitly noted as such in the Contract Documents.
13. All demolition and new work shall be completed in strict accordance with the Contract Documents with no deviations unless instructed by the Mechanical Consultant in writing prior to execution of the work. The Mechanical Consultant is not responsible, nor required, to accept any work (regardless of its compliance with code) not completed in accordance with the Contract Documents. The Mechanical Contractor will be responsible, at his/her cost, of furnishing a Sealed Letter from a Professional Engineer licensed in the Province of Ontario to accept and assume responsibility for all work not completed in accordance with the Contract Documents. The cost of obtaining this letter and the retaining of the Engineer, including all associated inspection charges, is the sole responsibility of the Contractor.
14. Unless otherwise noted, all devices, equipment, material, supplies, etc. shown on the drawings or otherwise required for a fully operational system as described/illustrated on the Drawings shall be supplied and installed under this Project. It shall not be assumed that any of the devices, equipment, material, supplies, etc. shown on the Drawings are to be provided (in part or in whole) by any other Party.
15. The Mechanical Contractor is responsible for taking pictures of work completed at the end of each week for record purposes. Pictures shall be taken throughout the work space and shall demonstrate all work completed that past week. When requested, share the pictures with the Mechanical Consultant. Pictures may be used for review of the monthly draws, conflicts identified on site, etc.

1.47 CLOSEOUT DOCUMENTS

- .1 Coordinate with the General Contractor to submit a comprehensive Closeout Document Package incorporating documents from all trades in one consolidated package. Closeout Documents shall consist of one (1) 3-ring binder hard copy and 3 USBs/CDs. The Mechanical Section of the Closeout Documents shall consist of the following:
 - (a) Mechanical Contractor Warranty Letter, signed and dated. Warranty shall be for a period of twelve (12) months starting on the Date of Substantial Completion.
 - (b) Project Shop Drawings, in consecutive order of the Consultant's number scheme.
 - (c) O&M Manuals for all equipment supplied on the project.
 - (d) AHJ Inspection Certificates & All Test Certificates.
 - (e) Fire Damper installation letter from the Sheet Metal Contractor stating 'All fire dampers and fire flaps have been installed in strict accordance with the Manufacturer's recommendations and requirements as well as Code Requirements.'
 - (f) Start-Up Reports for all Equipment.
 - (g) Red-Line As-Builts and CAD As-Builts (both completed by the Mechanical Contractor).

1.48 PROJECT PROGRESS THROUGHOUT CONSTRUCTION

- .1 The Mechanical Contractor is responsible for taking photos of all existing conditions and mechanical systems on site being affected by the Project at the onset of construction. All photos shall be date stamped.
- .2 The Mechanical Contractor is responsible for taking photos of the project's progress throughout the construction site every two weeks. All progress photos shall be shared and sent electronically to the Mechanical Consultant on the 15th and 30th of every month. Photos are meant to illustrate the progress of the project and correction of any deficiencies identified in routine site reviews and review of progress photos.
- .3 The Mechanical Consultant will, from time-to-time, visit the Project Site and issue a Field Review Report. The Mechanical Contractor is obligated to rectify any deficiency identified within 7 working days of receipt of the Report. The Mechanical Contractor is responsible for signing the Field Review Report upon 72 hours of the report being sent to the General Contractor, acknowledging receipt of the report. The Mechanical Contractor must take photos of all remedial work within 7 working days of receipt of the Report and distribute to the Consultant.

1.49 FIRESTOPPING & SEALING

- .1 Make fire rated and/or watertight where applicable seals at sleeves and other opening through floors and walls where conduit/cable/piping/ductwork/services passing through. Sleeves to extend minimum 25mm (1 inch) from both ends of the opening.
- .2 Provide firestopping protection of **all existing and new openings** through the floor, through the ceiling assembly, through the wall assembly regardless of the presence of any existing firestopping for existing penetrations.

- .3 Caulk spaces between piping, ductwork, servicesconduit, cables, bus ducts, raceways, cabletrays with "Cerafibre" 2300 F packing to Building Department approval. Pack and seal both sides of openings with Electrovert "Flameseal" putty, minimum thickness 25 mm (1"). Install in accordance with Electrovert Instruction Bulletin #3601.
- .4 The Mechanical Contractor is responsible for retaining the services of a specialized third-party Inspection Agency to inspect all firestopping completed for this project by the Mechanical Division. Include all costs of the Inspection Agency in the Base Tender Price. The Inspection Agency is to provide a report certifying acceptance of all firestopping work completed as part of this project.

END OF SECTION

1 GENERAL

1.1 Conform to Sections of Division 1 as applicable.

1.1.1 Conform to Section 20 05 11 Mechanical General Requirements as applicable.

1.2 RELATED SECTIONS

1.2.1 Installation of inserts, sleeves and anchors supplied by this Section: Section 04200, Masonry.

1.3 REFERENCES

ANSI B31.1 to B31.9 inclusive: Piping

CAN/CGSB-1.40-97

CSA B51-03

CSA B52-99

CAN/CSA-G40.20/G40.21-98

CAN/CSA-S16-01

CSA W47.1-92(R2001)

CAN/CSA W48-01

CSA W59-M1989(R2001)

CAN/CSA W117.2-01

Primer, Structural Steel, Oil Alkyd Type

Boiler, Pressure Vessel, and Pressure Piping Code

Mechanical Refrigeration Code

General Requirements for Rolled or Welded Structural
Quality Steel/Structural Quality Steel

Limit States Design of Steel Structures

Certification of Companies for Fusion Welding of Steel
Structures

Filler Metals and Allied Materials For Metal Arc
Welding.

Welded Steel Construction (Metal Arc Welding)

Safety in Welding, Cutting and Allied Processes

1.4 SUBMITTALS

1.4.1 **Shop Drawings:** Prepare and submit shop drawings for equipment covered by this Section including upper, middle and pipe attachments, riser clamps, shields and saddles, and sway braces.

2 PRODUCTS

2.1 MATERIALS

2.1.1 Welding Studs

-Graham

-Omark

-Nelson

2.1.2 Concrete Inserts and Anchors

-Readhead by ITW

-SSS by Star

-Parabolt by USM

- Kwik-Bolt by Hilti

2.1.3 Beam Clamps

- Grinnell
- Myatt
- Hilti

2.1.4 Concrete Grout:

- Sikagrout 212 by Sika Canada Inc.
- Embeco 636 Grout by Master Builders
- Sealtight V-3 Grout by W.R. Meadows

2.1.5 Pipe Hangers:

- Grinnell
- Myatt
- Hilti

2.1.6 Zinc-Rich Paint: Galvafruid by W.R. Meadows.

2.1.7 Primer: CAN/CGSB-1.40-M.

3 EXECUTION

3.1 GENERAL CONSTRUCTION REQUIREMENTS

3.1.1 Attachment to Building Construction

- 3.1.1.1 Use welding studs of size not larger than 10 mm (3/8") for attaching miscellaneous materials and equipment to building steel. If weight of materials or equipment require bolts or studs larger than 10 mm (3/8") dia, use steel clips or brackets, secured to building steel by welding or bolting method of attachment as approved by Consultant.
- 3.1.1.2 Use self drilling expansion type concrete inserts for securing miscellaneous equipment and materials to masonry or concrete construction already in place, of sufficient number and size to prevent concrete from breaking away. Use of powder or power actuated fasteners will not be allowed unless prior written approval is obtained from Consultant.
- 3.1.1.3 Support rods for any suspended item must not be attached to or extended through steel pan type roofs or through concrete slab roofs.
- 3.1.1.4 Provide beam clamps of 2-bolt design and of such type that rod load is transmitted only concentrically to beam web centreline. Use of "C" and "I" beam side clamps and other similar items will not be allowed without written consent of Consultant.
- 3.1.1.5 Where roof or floor framing consists of open web or long span steel joists, ensure that hangers are located at or within 150 mm (6") of joist top or bottom chord panel points, otherwise

provide additional structural steel as required where hanger spacing does not coincide with joist spacing. Design suspension assembly such that hanger load is transmitted only concentrically to supporting joist. Do not use "C" and "I" beam side clamps, brackets and other similar, without written consent of Consultant.

- 3.1.1.6 Locate secondary structural steel members between joists at or within 150 mm (6") of top or bottom chord panel points. Where secondary structural steel member cannot be located at or near joist panel point, provide additional diagonal structural steel web member(s) designed for applicable load to nearest panel point in opposite chord member. This condition may be waived if load to be suspended between panel points is not in excess of 45 kg (100 lbs). Diagonal hangers which will induce lateral stresses in chord members of joist will not be permitted. Submit shop drawings of suspension assembly indicating location of suspension or support points, max load at each suspension point, location and size of hangers, brackets and intermediate framing members when required, and also details of connection to building structure.

3.2 PIPING CONSTRUCTION METHODS

3.2.1 General

- 3.2.1.1 Unless specified otherwise herein, construct and install piping in accordance with ANSI Sections B31.1 to B31.9 as applicable to service, except that soldered joints will not be permitted in compressed air piping.
- 3.2.1.2 To avoid unnecessary cutting of masonry, provide inserts, sleeves and anchors to other trades for building in as Work proceeds. Arrange with other trades to leave openings, slots and chases to accommodate later installation of mechanical work.

3.3 PIPE HANGERS AND SUPPORTS

3.3.1 General

- 3.3.1.1 Support or suspend piping with necessary hangers, structural supports and/or brackets as indicated on Drawings and/or as required, to prevent sagging, warping and vibration and to allow for movement due to expansion and contraction. Place hangers and supports close to fittings, valves and/or other heavy parts.
- 3.3.1.2 Do not allow loads of any nature to be transmitted through piping connections to equipment not specifically designed for such loads. Where flexible connections are not called for at connections to equipment, support pipe by stands attached to both pipe and supporting structure so that force in any direction is not transmitted to equipment.
- 3.3.1.3 Provide suitably dampened spring hangers for first 3 supports from equipment connection on piping subject to excessive movement or shock from any source, thermal expansion and contraction, selected in accordance with ANSI B31.1. Where it is evident that no undue loads will be transmitted to equipment by system concerned, i.e. small bore connections to comparatively large equipment, cold service piping not subject to shock, etc., then spring hangers may be omitted and standard hangers used.

3.3.1.4 Use trapeze type hangers where pipes are grouped together, unless specifically indicated otherwise on Drawings. Suspend horizontal member by adjustable rods with locking feature for maintaining level and slope. Space trapeze type hangers based on closest interval required by any pipe supported thereon. Provide any auxiliary steel required to support trapeze between building steel.

3.3.1.5 Do not hang any pipe from another pipe unless specifically indicated on Drawings.

3.3.2 Saddles and Roller Supports

3.3.2.1 Provide saddles at roller supports for piping carrying liquids at 10.5 deg C (51 deg F) or higher. Weld saddles to black or galvanized steel piping. Refinish galvanized surfaces destroyed by welding with zinc rich paint.

3.3.3 Hangers

3.3.3.1 For insulated piping up to NPS 4 carrying liquids at temperatures 10.5 deg C (51 deg F) and higher, use standard weight clevis hangers with level adjustment and locknut.

3.3.3.2 For insulated lines of NPS 4 dia and larger carrying liquids at temperatures 10.5 deg C (51 deg F) or higher, use adjustable roller type hangers with locknuts, and rollers of sufficient width to clear outside diameter of insulation on piping. Support rollers at both ends, either by yoke, swivel type hanger or by 2 adjustable rods with locknuts.

3.3.3.3 For insulated piping carrying liquids at temperature of 10 deg C (50 deg F) or less, use elongated clevis type hangers, with clevis of sufficient width to fit over insulation bearing plate.

3.3.3.4 Provide insulation protection bearing plates at hangers and supports for piping carrying liquids at temperature of 10 deg C (50 deg F) or less. Install temporary spacers between plate and pipe equal to thickness of insulation specified. (Refer to Section 15081, Piping Insulation).

3.3.3.5 Bearing plates may be either shop fabricated, or manufactured plates of size required to properly fit outside diameter of pipe insulation.

3.3.3.6 Fabricate bearing plates conforming to following table for various pipe sizes:

Pipe Size (NPS)	P	Length of Thickness of	
		plate mm (in)	Plate mm (ga)
1/2 thr. 1-1/2		130 (5)	1.2 (18)
2		150 (6)	.52 (16)
2-1/2		200 (8)	1.52 (16)
3		230 (9)	1.52 (16)
4 and up		250 (10)	1.52 (16)

3.3.3.7 Form bearing plates to outside diameter of adjoining pipe insulation and extend plate up to

horizontal centre line of pipe.

3.3.3.8 For non-insulated piping use clevis type of wrought steel construction with adjustable rod, level locking feature and backnuts.

3.3.3.9 For copper tubing provide copper coated hangers. Regulations of some municipalities require that copper tubing be taped with plastic tape at hanger location, or hanger be provided with plastic insert. Meet these requirements when required, in which case copper coating may be omitted on hanger.

3.3.3.10 Attach hanger rods to building structure by means of malleable iron beam clamps, concrete inserts, and/or approved anchors as hereinbefore specified.

3.3.4 **Hanger Spacing**

3.3.4.1 For horizontal runs of plumbing and drainage piping comply with hanger spacing requirements of OBC.

3.3.4.2 For horizontal runs of black or galvanized steel pipe, other than for plumbing service, do not exceed max distances between supports and with min dia rods as follows:

<u>Pipe Size (NPS)</u>	<u>Distance m (ft)</u>	<u>Dia. of Rod mm (in)</u>
Up thru 1-1/4	1.8 (6)	10 (3/8)
1-1/2	1.8 (6)	10 (3/8)
2	3.05 (10)	10 (3/8)
2-1/2 & 3	3.66 (12)	12 (1/2)
4	4.27 (14)	16 (5/8)
6	5.18 (17)	19 (3/4)
8	5.79 (19)	22 (7/8)
10 & 12	6.71 (22)	22 (7/8)

3.3.4.3 Provide additional hangers in locations where there are concentrated loads such as valves, specialties and other such items.

3.3.4.4 For horizontal runs of copper tubing for services other than plumbing, do not exceed 1.8 m (6 ft) between hangers for lines up to and including NPS 3/4 and 2.4 m (8 ft) for lines of NPS 1 and larger.

3.3.4.5 For horizontal runs of piping fabricated of PVC, use hanger spacing as recommended by manufacturer.

3.3.5 **Vertical Piping Supports**

3.3.5.1 Support vertical plumbing and drainage piping as required by OBC, unless more stringent requirements are specified herein.

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- 3.3.5.2 Support cast iron soil pipe at every floor and other piping at every other floor unless otherwise required by expansion conditions or otherwise specified.
- 3.3.5.3 Support bottom of riser with base fitting set on concrete pier or by hanger located at top of riser pipe as close to riser as possible.
- 3.3.5.4 For supports at intermediate floors, use Grinnell Fig. 261 or approved equal steel extension pipe clamp, bolted securely to pipe. Rest ends of clamp on pipe sleeve or on floor.
- 3.3.5.5 Provide lateral stability of vertical piping by fabricated brackets or malleable iron, extension type split hangers. Run vertical piping at columns in column webs, on either or both sides of column, unless otherwise directed.
- 3.3.6 **Anchors and Guides**
- 3.3.6.1 Supply and install anchors where indicated on Drawings and/or as required to maintain permanent location of pipe lines. Construct anchors for steel or galvanized pipe of approved steel straps and/or rods and for anchoring copper lines use copper plated anchors or provide insulation bands between tubing and clamps if steel straps or rods are used. Install anchors and guides in approved manner.
- 3.3.6.2 Acceptable Materials: Grinnell #256 or Myatt.
- 3.4 **MISCELLANEOUS STEEL**
- 3.4.1 **General**
- 3.4.1.1 Supply and install miscellaneous structural supports, platforms and braces as may be required to hang or support piping unless Drawings or other Sections of Specifications state otherwise.
- 3.4.1.2 Submit detailed shop drawings to structural engineer for review before commencing fabrication.
- 3.4.2 **Materials and Fabrication**
- 3.4.2.1 Conform to CAN/CSA-S16 for materials, design of details and execution of work.
- 3.4.2.2 Conform to CAN/CSA-G40.20/G40.21, grade 300W for structural shapes, plates, and other similar items.
- 3.4.2.3 Use welded construction wherever practicable, with bolted joints allowed for field assembly using high strength steel bolts. Chip welds to remove slag, and grind smooth.
- 3.4.2.4 Conform to latest issue of following CSA Specifications.
- CSA W47.1, for qualification of welders
CSA W48.1-M, for electrodes (only coated rods allowed)

CSA W59-M, for design of connections and workmanship
CSA W117.2, for safety

3.4.3 Painting and Cleaning

3.4.3.1 Touch up minor damage to finish on equipment with standard factory applied baked enamel finish. If, in Consultant's opinion, damage is too extensive to be remedied by touch up, replace damaged equipment.

3.4.3.2 Clean steel by scraping, wire brushing or other effective means to remove base scale, rust, oil, dirt or other foreign matter.

3.4.3.3 Apply 1 coat of zinc chromate iron oxide primer, conforming to CAN/CGSB-1.40-M to miscellaneous steel.

3.4.3.4 In field, touch up bolt heads and nuts, previously unpainted connections and surfaces damaged during erection with primer as herein before specified.

3.4.3.5 Give 2 coats of primer to surfaces which will be inaccessible after erection.

3.4.3.6 Remove foreign matter from steelwork on completion of installation.

3.4.4 With exception of prime painting of miscellaneous steel or any other specific requirements as specified above or under respective Sections of the Mechanical Contractor, or equipment otherwise factory painted, painting will be provided under Division 9, Finishes.

3.5 CONCRETE INSERTS

3.5.1 Install inserts required for attachment of hangers, either for suspension of piping or equipment.

3.5.2 For masonry or poured concrete construction use expansion type units. Insert into concrete after concrete has cured. Anchors or inserts installed by explosive means shall not be used.

3.6 SEALED (STAMPED) SHOP DRAWINGS FOR PIPE SUPPORT SYSTEM

3.6.1 The Mechanical Contractor, as part of the Base Tender Price, is responsible for retaining the services of a Professional Engineer licensed in the Province of Ontario to prepare detailed support drawings (sealed by the Professional Engineer), with the drawings outlining the following information:

- .1 Floor Plans depicting support types being proposed in each area of work for each type of piping system (plumbing, drainage, heating, etc.). The support types are to be reviewed and approved by the Engineer for use in this application.
- .2 Floor Plans depicting attachment method of attaching the supports to the Building Structures.
- .3 Floor Plans depicting the maximum span of the supports in each area of work.

The Professional Engineer is responsible for overseeing the construction and supply/installation of the supports and provide a Letter of Completion at the end of the

work confirming that all work has been completed in accordance with the Engineered Plans.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL

- 1.1.1 This section of the specification shall be read in conjunction with and be governed by the requirements of Section 20 05 11 Mechanical General Requirements.

1.2 SHOP DRAWINGS

- 1.2.1 Submit shop drawings in accordance with 20 05 11 Mechanical General Requirements.
- 1.2.2 Submit for approval, manufacturer's catalogue literature related to installation and fabrication.

PART 2 - PRODUCTS

2.1 GENERAL

- 2.1.1 Supply access doors to the relevant building trade to provide access in furred ceilings for the following:
- .1 Servicing equipment
 - .2 Access to plumbing cleanouts
 - .3 Access to shut off valves.
 - .4 Inspection of life safety equipment.
 - .5 Service of operating devices
 - .6 All locations where periodic maintenance is required.
- 2.1.2 Access door sizes shall be as follows:
- .1 Body Entry: 24" x 24" (600 x 600 mm)
 - .2 For Hand Entry: 18" x 18" (450 x 450 mm)
 - .3 For Viewing Only: 12" x 12" (300mm x 300mm)
- 2.1.3 All doors shall open 180 degrees and have rounded safety corners
- 2.1.4 For fire rated ceilings or wall provide a fire rated access door that will match the fire rating of the wall that the access door is installed in. The Mechanical Contractor shall be responsible for reviewing the drawings and providing fire rated access doors where they are required.
- 2.1.5 Where body access is possible the access doors shall be provided with a releasing mechanism on both sides of the door.

2.1.6 Provide access panels in all ductwork where fire dampers or combination fire/smoke dampers are shown on the Drawings to allow for inspection of the dampers.

2.1.7 Provide access panels at all balancing damper locations to allow access to the damper in the future.

2.2 RECESSED ACCESS DOOR FOR DRYWALL APPLICATIONS

2.2.1 Door shall be 16 gauge steel. Mounting frame shall be 14 gauge galvanized steel.

2.2.2 Door shall be provided with a 25 mm (1") recess or 14mm (5/8") to suit the thickness of the drywall ceiling.

2.2.3 The frame shall be provided with a galvanized steel drywall taping bead on all sides.

2.2.4 The hinge shall be a concealed pivoting rod.

2.2.5 The latch shall be a flush to the surface, screwdriver operated cam latch.

2.2.6 The steel finish shall be 5 stage iron phosphate preparation with prime coat of grey baked enamel.

2.2.7 Standard of Acceptance: Acudor DW-5015, Mifab, Zurn, Watrous, Williams Brothers

2.3 RECESSED ACCESS DOOR FOR PLASTER APPLICATIONS

2.3.1 Door shall be 16 gauge steel. Mounting frame shall be 14 gauge galvanized steel.

2.3.2 Door shall be provided with a 14mm (5/8") recess and shall be lined with self furring galvanized lath.

2.3.3 The frame shall be provided an expansion casing bead with 75 mm (3") wide galvanized lath, recessed 20mm (3/4") to receive plaster.

2.3.4 The hinge shall be a concealed pivoting rod.

2.3.5 The latch shall be a flush to the surface, screwdriver operated cam latch.

2.3.6 The steel finish shall be 5 stage iron phosphate preparation with prime coat of grey baked enamel.

2.3.7 Standard of Acceptance: Acudor AP-5010, Mifab, Zurn, Watrous, Williams Brothers

2.4 FLUSH ACCESS DOORS FOR TILED WALL APPLICATIONS

2.4.1 For doors 400mm x 400mm (16" x 16") and smaller the door shall be 16 gauge with 18 gauge mounting frame.

2.4.2 For doors over 400mm x 400mm (16" x 16") the door shall be 14 gauge with 16 gauge mounting frame.

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- 2.4.3 Door shall be flush to frame with rounded safety corners.
 - 2.4.4 The frame shall be one piece welded to the mounting frame.
 - 2.4.5 The hinge shall be a continuous concealed hinge.
 - 2.4.6 The latch shall be a stainless steel screwdriver cam latch.
 - 2.4.7 The finish shall be type 304 #4 satin polish stainless steel.
 - 2.4.8 Standard of Acceptance: Acudor UF-5000, Mifab, Zurn, Watrous, Williams Brothers

2.5 FIRE RATED ACCESS DOOR

- 2.5.1 Door shall be constructed of 20 gauge steel with a 16 gauge mounting frame.
- 2.5.2 Door shall be filled with 50mm (2”) thick fire rated insulation.
- 2.5.3 The door frame shall be provided with a 25mm (1”) wide flange and mounting frame to have anchor straps.
- 2.5.4 The hinge shall be concealed and shall be provided with a spring closer.
- 2.5.5 Door shall be UL/ULC rated for 1 ½ hour “B” label with 250 degree F temp rise in 30 minutes.
- 2.5.6 The latch shall be a universal self latching bolt, operated by either a knurled knob.
- 2.5.7 The steel finish shall be 5 stage iron phosphate prepared with a prime coat of grey baked enamel.
- 2.5.8 For drywall applications provide a galvanized steel drywall taping bead flange.
- 2.5.9 Standard of Acceptance: Acudor FB-5050, Mifab, Zurn, Watrous, Williams Brothers

2.6 FIRE RATED ACCESS DOOR WITH INSIDE LATCH RELEASE

- 2.6.1 Door shall be constructed of 16 gauge steel with a 16 gauge mounting frame.
- 2.6.2 Door shall be flush to frame with reinforced edges.
- 2.6.3 The door frame shall be provided with a 25 mm (1”) wide flange and shall be provided with anchor straps.
- 2.6.4 The hinge shall be concealed and shall be provided with a spring closer.
- 2.6.5 The door shall be UL/ULC rated for 1 ½ hour “B” label or 2 hour “B” label as required where temperature rise is not a factor.
- 2.6.6 The latch shall be a universal self latching bolt, operated by either a knurled knob.

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- 2.6.7 The steel finish shall be 5 stage iron phosphate prepared with a prime coat of grey baked enamel.
- 2.6.8 Door shall be provided with an interior latch release.
- 2.6.9 For drywall applications provide a galvanized steel drywall taping bead flange.
- 2.6.10 Standard of Acceptance: Acudor FB-5060, Mifab, Zurn, Watrous, Williams Brothers

2.7 VALVE BOX – SURFACE MOUNT

- 2.7.1 Door shall be stainless steel in public areas and steel in mechanical rooms and service areas.
- 2.7.2 Door and box shall be 16 gauge steel.
- 2.7.3 The door shall overlap the box, providing a tight and secure fit.
- 2.7.4 The box shall be fully enclosed, attached to the door.
- 2.7.5 The hinge shall be a continuous piano hinge.
- 2.7.6 The door shall be provided with a cylinder lock and key.
- 2.7.7 For steel doors the finish shall be 5 stage iron phosphate preparation with prime coat of grey baked enamel.
- 2.7.8 Stainless steel doors shall be #4 satin finish.
- 2.7.9 Standard of Acceptance: Acudor ASVB, Mifab, Zurn, Watrous, Williams Brothers

2.8 VALVE BOX – RECESSED

- 2.8.1 Door shall be stainless steel in public areas and steel in mechanical rooms and service areas.
- 2.8.2 Door and box shall be 16 gauge steel.
- 2.8.3 The door shall be flush to the frame with rounded safety corners.
- 2.8.4 The box shall be fully enclosed, completely attached to the frame.
- 2.8.5 The hinge shall be a continuous concealed hinge.
- 2.8.6 The door shall be provided with a cylinder lock and key.
- 2.8.7 For steel doors the finish shall be 5 stage iron phosphate preparation with prime coat of grey baked enamel.
- 2.8.8 Stainless steel doors shall be #4 satin finish.
- 2.8.9 Standard of Acceptance: Acudor ARVB, Mifab, Zurn, Watrous, Williams Brothers

PART 3 - EXECUTION

3.1 INSTALLATION

- 3.1.1 On some drawings, access door locations have been indicated for coordination. The drawings do not show all access doors required.
- 3.1.2 The Mechanical Contractor shall provide a set of drawings showing locations and types of all access doors located in public areas to the Consultant for approval, prior to commencing the installation of any piping or ductwork within these areas.
- 3.1.3 Access doors shall be turned over to the building trade that is responsible for finishing the wall or ceiling where the access door is required.
- 3.1.4 The Mechanical Contractor shall be responsible for providing the access doors required to be installed in ductwork. Refer to other sections for requirements.

END OF SECTION

1 GENERAL

1.1 GENERAL

- .1 Section Includes:
 - .1 Valve Tags.
 - .2 Pipe Markers/Arrow Tape Above Ground.
 - .3 Underground Piping Warning Tape.
 - .4 Mechanical Equipment and HVAC Controls Identification.
 - .5 Safety Signs.
 - .6 Isolation Valves Numbering.

1.2 DEFINITIONS

- .1 Exposed Areas
 - .1 Finished areas and other areas used by personnel in normal use of building, such as equipment rooms and storage rooms.
- .2 Concealed Areas
 - .1 Duct or pipe tunnels, duct or pipe chases, spaces above accessible ceilings, and crawl spaces.

2 PRODUCTS

2.1 STANDARD OF ACCEPTANCE

- .1 W. H. Brady Co. catalogue numbers are used as a basis of identification.
- .2 Stock catalogue numbers are listed in these specifications. Subcontractor is responsible to review schedules and provide required markers. In some instances, "non-stock" markers (special) may be required.

2.2 MANUFACTURER'S NAMEPLATES

- .1 Manufacturer's nameplates:
 - .1 Provide metal nameplate on each piece of equipment, mechanically fastened with raised or recessed letters.
 - .2 Provide Underwriters' Laboratories or CSA registration plates, as required by respective agency.
 - .3 Manufacturers nameplate to indicate size, equipment model, manufacturer's name, serial number, voltage, cycle, phase and power of motors.
 - .4 Locate nameplates so that they are easily read. Do not insulate or paint over plates.

2.3 VALVE TAGS

- .1 Metal Tags: Brass or aluminium with stamped or engraved letters; tag sizes minimum 2 inches (round, square, or rectangle) with smooth edges. Thickness 19 gauge (.040 inches) minimum.
- .2 Beaded Chain: Size 6, brass or aluminium, 4 1/2 inches long with locking link.

2.4 PIPE MARKERS/ARROW TAPE ABOVE GROUND

- .1 Colour: Conform to ANSI A13.1.
- .2 Self-Sticking Pipe Markers/Arrow Tape: Material B-946, flexible, vinyl film tape with pressure sensitive permanent adhesive backing and printed markings.
- .3 Suitable for indoor/outdoor application.
- .4 Temperature range: Minus 40 degrees to 180 degrees F.

2.5 UNDERGROUND PIPING WARNING TAPE

- .1 Tracer wire and test station(s) required when burying cast iron, ductile iron, or non-metallic piping.
- .2 Tracer Wire: #10AWG THHN/THWN, yellow, solid copper.
- .3 Tracer Wire Test Station: C.P. Test Services. Test Station: Plastic Pipe, cast iron cover, 2-point terminal box.

2.6 CONTROLS IDENTIFICATION

- .1 Refer to section 25 20 11.

2.7 EQUIPMENT IDENTIFICATION

- .1 Labelling shall be furnished and installed by the contractor
- .2 Engraved signs shall be dark letters on light background.
- .3 Identify mechanical equipment and HVAC controls, e.g., air handling units, pumps, heat transfer equipment, water treatment devices, controls instruments, stationary tanks/containers, and similar items, with nameplates or tags.
- .4 Provide engraved nameplates made of rigid plastic laminate in which colored top and bottom layers of the material are thermoset with a contrasting color core. Minimum thickness 0.062 inch.
- .5 Size: min. 1" x 3".
- .6 Material Colour: White background/ black lettering.

- .7 Manufacturer: Brady, No. B-1
- .8 Provide lettering as follows:
 - .1 Size: 10 point minimum
 - .2 Spacing: 1/4 inch from top, 1/8 inch from bottom, 1/16 inch between lines.
 - .3 Provide nameplate with component nomenclature as noted in the Equipment Schedules. Coordinate with the controls sub-contractor.
- .9 As a minimum, identify the system, e.g., HVAC (heating, ventilating, and air conditioning), the component, e.g., FGF (furnace, gas fired), and the sequence number.

2.8 SAFETY SIGNS

- .1 Colors associated with specific words such as "Danger," "Warning," "Caution," or "Notice" shall conform to ANSI Z35.1.

2.9 DUCTWORK IDENTIFICATION

- .1 Provide labels on the two sides and the bottom of all ductwork at intervals of every 5' to note the System Type ('Fresh Air Supply', 'Return', 'Exhaust') and directional arrows.

3 EXECUTION

3.1 PREPARATION

- .1 Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

- .1 Valve Tags:
 - .1 Install with brass beaded chain.
 - .2 Steel stamp or engrave valve tag in accordance with schedule herein.
 - .3 Letter style block, 1/4-inch height minimum.
 - .4 Tag all valves in concealed or exposed areas except isolation and by-pass valves installed adjacent to the equipment they serve.
 - .5 Provide typewritten letter size list of applied tags and location. Frame under glass and hang where directed.
- .2 Pipe Markers Above Ground:
 - .1 Install in accordance with manufacturer's instructions.
 - .2 Seal markers with clear lacquer.
 - .3 Identify piping in exposed or concealed areas in accordance with schedule herein.
 - .4 Pipe marker consists of pipe contents identification with flow direction arrow tape. Provide consistent color scheme, unless otherwise noted.
 - .5 Wrap arrow tape completely around pipe at both ends of pipe markers.

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- .6 Install in clear view and align with axis of piping.
 - .7 Label piping at intervals of not more than 20 feet on horizontal and vertical runs, at each branch connection, and where pipe penetrates walls, ceilings and floors (both sides).
 - .8 Size of label depends on outside diameter (OD) of pipe. Pipe OD includes insulation or protective coating.
 - .9 Minimum length of marker including arrows:

- (a) 2" diam. pipe or smaller: 8"
- (b) 2" to 8" 12"
- (c) 8" to 10" 24"
- (d) Over 10": 32"

.3 Safety Signs

- .1 Install in clear view.

END OF SECTION

1 GENERAL

1.1 GENERAL

- .1 This section of the specification shall be read in conjunction with and be governed by the requirements of Section 20 05 11 Mechanical General Requirements.

1.2 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 20 05 11.
- .2 Provide separate shop drawings for each isolated system complete with performance and product data.
- .3 Submit type of isolator, size, height when uncompressed and maximum allowable static deflection weight of all isolated equipment, loads on each isolator and static deflection of each isolator under the specific design load.
- .4 Submit marked up plans indicating all locations where pipes are to be isolated in mechanical rooms and as specified.

2 PRODUCTS

2.1 GENERAL

- .1 Vibration isolator sizes and layout shall be determined by the vibration isolator supplier.
- .2 Elastomeric elements that will be exposed to temperatures below freezing shall be fabricated from natural rubber instead of neoprene.
- .3 All isolators to be installed outdoors or exposed to weather shall be hot dipped galvanized and shall be furnished with neoprene mounting sleeves for hold-down bolts to prevent any metal to metal contact.
- .4 Standard of Acceptance: Kinetics Noise Control, Vibro-Acoustics.

2.2 FLEXIBLE PIPE CONNECTORS

- .1 Flexible pipe connectors shall be used on all piping connected to rotating equipment (Chiller, pumps, air handling equipment) to reduce the transmission of noise and Vibration, and to eliminate stresses in piping systems due to misalignment and thermal movement of the piping.
- .2 Flexible connectors shall be of the single- or double-sphere molded joint configuration and shall meet or exceed specifications of the Rubber Expansion Joint Division, Fluid Sealing Association.

- .3 Connectors shall be made of molded neoprene reinforced with nylon tire cord and shall have mild steel floating flanges or female union ends.
- .4 Control rods shall be used with unanchored systems or with spring-mounted equipment where the pressures and movements exceed those the connectors are designed to withstand.
- .5 Standard of acceptance: Kinetics model Kinflex

2.3 FLEXIBLE DUCT CONNECTORS

.1 Flexible Connections

- .1 Where duct connections are made to fans and air handling units (not internally isolated), install a non combustible flexible connection of 822 g (29 ounce) neoprene coated fiberglass fabric approximately 150 mm (6 inches) wide. For connections exposed to sun and weather provide hypalon coating in lieu of neoprene. Burning characteristics shall conform to NFPA 90A. Securely fasten flexible connections to round ducts with stainless steel or zinc coated iron draw bands with worm gear fastener. For rectangular connections, crimp fabric to sheet metal and fasten sheet metal to ducts by screws 50 mm (2 inches) on center. Fabric shall not be stressed other than by air pressure. Allow at least 25 mm (one inch) slack during operation to insure that no vibration is transmitted.
- .2 Length of connection: 6"
- .3 Minimum distance between metal parts when system in operation: 3"
- .4 Install in accordance with recommendations of SMACNA.

2.4 ELASTOMERIC PADS

- .1 Neoprene waffle or ribbed; 9mm minimum thick; 50 durometer; maximum loading 350kPa. Mason type W
- .1 Application: between all floor-mounted pumps supports and the house-keeping pads

2.5 ELASTOMERIC MOUNTS

- .1 Neoprene, moulded from oil-resistant compounds, with a cast-in-top steel load transfer plate for bolting to supported equipment and a bolt-down plate with holes provided for anchoring to the supporting structure. Isolator shall provide lateral load resistance for loads applied parallel to mounting surface. Neoprene vibration isolators shall be Model RQ, by Kinetics Noise Control, Inc.
- .1 Application: between boilers and domestic hot water heaters support frames and house-keeping pads.

2.6 PIPE HANGERS

- .1 Colour coded springs, rust resistant, painted box type hangers. Swivel arrangement to permit hanger box or rod to move through a 30 deg. arc without metal to metal contact. Unless specified otherwise, the static deflection shall be 9mm, with a strain not exceeding 15%, and spring hangers to have minimum static deflection of 2". A neoprene sleeve shall be provided where the lower hanger rod passes through the steel hanger box such that the hanger rod cannot contact the steel hanger. The diameter of the clear hole in the hanger box shall be at least 19mm larger than the diameter of the hanger rod.
- .2 Standard of acceptance: Kinetics model SRH

3 EXECUTION

3.1 INSTALLATION

- .1 Provide vibration isolation for new equipment as noted in the specification, listed in the schedule and shown on the drawings.
- .2 Install vibration isolation equipment in accordance with manufacturer's instructions and adjust mountings to level equipment.
- .3 Ensure piping and electrical connections to isolated equipment do not reduce system flexibility.
- .4 All suction and discharge from the pumps shall be provided with flexible pipe connections.
- .5 Unless indicated otherwise, support all piping connected to the pumps and boilers with spring equipped hangers as described in these specifications, as follows:
 - .1 First 3 points of support.
 - .2 First point of support shall have a static deflection of twice deflection of isolated equipment, but not more than 2".
- .6 Unless specified otherwise, all pump supports will be mounted on elastomeric pads.
- .7 Unless specified otherwise, the boilers, indoor air handlers, indoor chillers will be mounted on elastomeric mounts
- .8 All wiring connections to the pumps shall be made in a 360 degree loop; minimum conduit length: 3 ft. Cut any ties used to install this loop prior to adjusting the isolators.

- .9 Provide suitable supports for all equipment which does not have a frame with adequate rigidity.
- .10 There shall be a minimum of 4" clearance between isolated equipment and the walls, ceiling, floors, columns and any other equipment not installed on vibration isolators.
- .11 Piping, ductwork, conduit or mechanical equipment shall not be hung from or supported on other equipment, pipes or ductwork installed on vibration isolators. Such elements shall be supported on or suspended from building structure.

END OF SECTION

1 GENERAL

1.1 GENERAL

- .1 This section of the specification shall be read in conjunction with and be governed by the requirements of Section 20 05 11 Mechanical General Requirements.

1.2 QUALITY ASSURANCE

- .1 Comply with OBC and NFPA 90A requirements, particularly paragraphs pertaining to the maximum flame spread index (currently set at 25) and maximum smoke development index (currently set at 50).
- .2 All materials shall be compatible and suitable for service temperature, and shall not contribute to corrosion or otherwise attack surface to which applied in either the wet or dry state.
- .3 Every package or standard container of insulation or accessories delivered to the job site for use must have a manufacturer's stamp or label giving the name of the manufacturer and description of the material.

1.3 SUBMITTALS

- .1 Submit in accordance with Section 20 05 11 shop drawings and product data
- .2 Provide the following:
 - .1 Insulation materials: Specify each type used and state surface burning characteristics.
 - .2 Insulation facings and jackets: Each type used. Make it clear that white finish will be furnished for exposed ductwork, casings and equipment.
 - .3 Insulation accessory materials: Each type used.
 - .4 Manufacturer's installation and fitting fabrication instructions for flexible unicellular insulation.

1.4 STORAGE AND HANDLING OF MATERIAL

- .1 Store materials in clean and dry environment, pipe covering jackets shall be clean and unmarred. Place adhesives in original containers. Maintain ambient temperatures and conditions as required by printed instructions of manufacturers of adhesives, mastics and finishing cements.

1.5 STANDARDS OF ACCEPTANCE

- .1 Knauf Fiber Glass
- .2 Owens/Corning Fiberglass
- .3 Armstrong
- .4 Johns Manville
- .5 Rockwool Manufacturing

2 PRODUCTS

2.1 GENERAL

- .1 K-factors (thermal conductivity) shown are expressed in BTU•in/hr•ft²•F.

2.2 FIBERGLASS PIPE INSULATION

- .1 Insulation:

- .1 Rigid molded in compliance with ASTM C547, Class 1, minimum density 3.5 pounds/cubic foot, K-factor of approximately 0.24 at 75 degrees F, suitable for temperatures from minus 20 degrees F to 450 degrees F.

- .2 Vapor Barrier

- .1 Factory applied vapor barrier all-service type with self-sealing lap and butt strips.

- .3 Valves and Fitting Covers

- .1 Pre-molded PVC covers with fiber glass insert. Manufacturers: Proto Corp., Ceelco.

- .4 Provide insulation on all new piping installed as part of this project or removed as part of this project. Applications

- .1 All domestic cold water piping.
 - .2 All domestic hot water and recirculation piping.
 - .3 All hot water heating piping.
 - .4 All glycol heating piping
 - .5 All condensate piping.
 - .6 All horizontal and vertical sections of storm drainage.
 - .7 All horizontal and vertical sections of sanitary drainage.

2.3 INSULATION THICKNESS

- .1 Hot water heating, all piping sizes: 1"
- .2 Domestic hot water less than 2" 1"
- .3 Domestic hot water larger than 2" 1½"
- .4 Domestic cold water, all piping sizes: 1"
- .5 Condensate, all piping sizes: 1"
- .6 Storm & Sanitary Piping, all piping sizes: 1"

2.4 ADHESIVE, MASTIC, CEMENT

- .1 ASTM C449: Mineral fiber hydraulic setting thermal insulating and finishing cement.
- .2 Other: Insulation manufacturers' published recommendations.

2.5 MECHANICAL FASTENERS

- .1 Wire: 1.3 mm thick (18 gage) soft annealed galvanized or 1.9 mm (14 gage) copper clad steel or nickel copper alloy.
- .2 Bands: 20 mm (3/4 inch) nominal width, brass, galvanized steel, aluminum or stainless steel.

2.6 CANVAS JACKETING

- .1 Apply in concealed areas, compact, firm ULC listed heavy plain weave, cotton fabric at 220 g/m sq.

2.7 PVC JACKETING

- .1 Apply in exposed areas on piping with operating temperatures less than 180°F. (80°C.).
- .2 Piping: ULC listed PVC moulded type jacketing material, gloss white complying with 25 Flame Spread and 50 Smoke Developed ratings.
- .3 Fittings: ULC listed PVC, gloss white, 1-piece, pre-moulded fittings complying with 25 Flame Spread and 50 Smoke Developed ratings.
- .4 PVC Application: strictly in accordance with the requirements of Authorities having jurisdiction.
- .5 Ultraviolet resistant.
- .6 Fastenings: To manufacturer's standard(s).

2.8 METAL JACKETING

- .1 At all locations where the pipe is located outdoors or in heavy abuse areas, use metal jacketing to protect piping or ductwork insulation.
- .2 Jacketing: Aluminum, 0.016 inches thick, embossed surface, with factory bonded moisture barrier.
- .3 Valve and Fitting Insulation Covers: Fabricate from same material as jacketing or use prefabricated insulation covers made in two matching halves.
- .4 Metal Jacketing Bands: 1/2 inch wide, aluminum or stainless.

2.9 PROTECTION SADDLES AND SHIELDS

- .1 Provide factory engineered galvanized steel hanger shields on horizontal insulated pipe complying with MSS SP-58 and MSS SP-59 standards for gauge and length of saddle.

2.10 SADDLES (PIPING/TUBING UP TO 2 INCHES)

- .1 Use 180 degree saddle on systems utilizing teardrop type hangers.

- .2 Use 360 degree saddle on systems utilizing trapeze hangers or clamps.

2.11 INSERTS AND SHIELDS (PIPING/TUBING OVER 2 INCHES)

- .1 Use 360 degree calcium silicate insert with a 180 degree shield on systems utilizing clevis or teardrop type hangers.
- .2 Use 360 degree calcium silicate with a 360 degree shield on systems utilizing trapeze hangers or clamps.
- .3 The unit shall have an integral moisture barrier consisting of a tri-laminate All-Service Jacket equal and similar to the jacketing on the adjoining insulation.
- .4 Insert: Calcium silicate, minimum density 9 pounds/cubic foot.

3 EXECUTION

3.1 EXAMINATION

- .1 Verify that items to be insulated have been pressure tested and approved before applying insulation material.
- .2 Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION - GENERAL

- .1 Install materials in accordance with manufacturer's instructions.
- .2 Required pressure tests of piping joints and connections shall be completed and the work approved by the Consultant for application of insulation. Surface shall be clean and dry with all foreign materials, such as dirt, oil, loose scale and rust removed.
- .3 Except for specific exceptions, insulate entire specified equipment, piping (pipe, fittings, valves, accessories). Insulate each pipe and duct individually. Do not use scrap pieces of insulation where a full length section will fit.
- .4 Insulation materials shall be installed with smooth and even surfaces, with jackets and facings drawn tight and smoothly cemented down at all laps. Insulation shall be continuous through all sleeves and openings, except at fire dampers and duct heaters (NFPA 90A). Vapor retarders shall be continuous and uninterrupted throughout systems with operating temperature 16 degrees C (60 degrees F) and below. Lap and seal vapor barrier over ends and exposed edges of insulation. Anchors, supports and other metal projections through insulation on cold surfaces shall be insulated and vapor sealed for a minimum length of 150 mm (6 inches).
- .5 Install vapor stops at all insulation terminations on either side of valves, pumps and equipment and particularly in straight lengths of pipe insulation.
- .6 Insulation on hot piping and equipment shall be terminated square at items not to be insulated, such as access openings and nameplates. Cover all exposed raw insulation with white sealer or

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- jacket material.
- .7 Protect all insulations outside of buildings with aluminum jacket using lock joint or other approved system for a continuous weather tight system. Access doors and other items requiring maintenance or access shall be removable and sealable.
 - .8 Piping work not to be insulated:
 - .1 In hot piping: Unions, flexible connectors, control valves, PRVs, safety valves and discharge vent piping, vacuum breakers, thermostatic vent valves, exposed piping through floor for convectors and radiators. Insulate piping to within approximately 75 mm (3 inches) of uninsulated items.
 - .9 Plumbing work not to be insulated:
 - .1 Piping and valves of fire protection system.
 - .2 Chromium plated brass piping.
 - .3 Piping in pipe basement serving wall hydrants.
 - .4 Small horizontal cold water branch runs in partitions to individual fixtures may be without insulation for maximum distance of 900 mm (3 feet).
 - .10 Work shall be performed by qualified insulation journeymen.
 - .11 Apply insulation and coverings on hot piping while surface is between 50 to 60°C
 - .12 Vapor barriers and insulation to be complete over full length of pipe or surface, without penetration for hangers, and without interruption at sleeves, pipe and fittings.
 - .13 Do not insulate factory-insulated equipment.
 - .14 Do not insulate nameplates.
 - .15 Fit insulation tightly against surface to which it is applied.
 - .16 For non-fire rated barriers (e.g., wall, floor, ceiling, or roof) continue insulation and vapor barrier through penetrations. For fire rated barriers, provide ULC/FM approved through penetration stop systems.
 - .17 Weatherproof outdoor installations of piping or ductwork covered with aluminum jacket. Provide watershed lap joints and seal with mastic as required.
 - .18 Do not install metal jacketing with raw edges; provide a safety edge.

3.3 INSTALLATION - PIPING

- .1 On exposed piping located in finished areas, locate cover seams in least visible area.
- .2 Provide continuous insulation through pipe hangers or supports. Do not notch insulation. Provide shields or saddles to prevent crushing insulation.

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- .3 Where insulation terminates, taper to pipe and finish with insulating cement or acrylic mastic.
 - .4 Cover insulated pipes located outdoors or in utility tunnels with aluminum jacket. Secure with aluminum bands and screws as required.
 - .5 Tape circumferential joints of pipe insulation with 3 inch wide white vinyl tape.
 - .6 Insulate fitting and valves where required with same material thickness as specified for adjacent pipe.
 - .7 Insulate potable and non-potable cold water piping within walls, chases, or ceiling plenums where return air is present.
 - .8 Insulate potable and non-potable cold water piping in equipment rooms.
 - .9 Do not insulate unions, flanges and valves in potable or non-potable piping systems of 140 degrees F or less, except for chilled water.
 - .10 Vertical pipe over 3" diameter: use insulation supports welded or bolted to pipe directly above lowest pipe fitting. Thereafter locate on 12 ft centers and at each valve and flange.
 - .11 Expansion joints: Terminate single layer and each layer of multiple layers in straight cut. Leave space of 1" between terminations. Pack void tightly with glass wool. Protect joints with aluminum sleeves.
 - .12 Use factory fabricated, easily disassembled insulation, for valves, fittings and process equipment requiring periodic maintenance of parts and sub-assemblies listed or indicated.

END OF SECTION

1 GENERAL

1.1 DESCRIPTION

- .1 Testing, adjusting, and balancing (TAB) of heating, ventilating and air conditioning (HVAC) systems. TAB includes the following:
 - .1 Systems Inspection report.
 - .2 Duct Air Leakage test report.
 - .3 Balancing air and water distribution systems; adjustment of total system to provide design performance;
 - .4 Recording and reporting results.

1.2 DEFINITIONS

- .1 TAB: Testing, Adjusting and Balancing; the process of checking and adjusting HVAC systems to meet design objectives.
- .2 CAABC: Canadian Associated Air Balance Council.
- .3 Hydronic Systems: Includes heating hot water, domestic hot water recirculation, and glycol water systems, as applicable to the project.
- .4 Air Handling Systems: Includes all central and distributed air handling equipment that provide outside air, supply air, return air, exhaust air and relief air to and from the building, as applicable to the project.
- .5 Air distribution systems: Includes all grilles, diffusers, terminal units (by pass/VAV).
- .6 Flow rate tolerance: The allowable percentage variation, minus to plus, of actual flow rate from values (design) in the contract documents.

1.3 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 TAB Agency: The TAB agency shall be a Sub-Contractor of the Mechanical Contractor and shall report to and be paid by the Mechanical Contractor.
 - .2 The TAB agency shall be one of the following Vendors:
 - (i) Enviro Balance Inc.
 - (ii) National Air Balance Inc.
 - .3 TAB Specialist: The TAB specialist shall be either a member of AABC or an experienced technician of the Agency.
- .2 TAB Agency shall be identified by the Mechanical Contractor within 15 days after the award of the contract.

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- .3 The TAB specialist will be coordinating, scheduling and reporting all TAB work and related activities and will provide necessary information as required by the Consultant. The responsibilities would specifically include:
 - .1 Shall directly supervise all TAB work.
 - .2 Shall sign the TAB reports that bear the seal of the TAB Agency. The reports shall be accompanied by report forms and schematic drawings required by the TAB standard, AABC.
 - .3 Would follow all TAB work through its satisfactory completion.
 - .4 Shall provide final markings of settings of all HVAC adjustment devices.
 - .5 Permanently mark location of duct test ports.
 - .4 Test Equipment Criteria: The instrumentation shall meet the accuracy/calibration requirements established by AABC National Standards and or by the instrument manufacturer.
 - .5 Tab Criteria:
 - .1 Air Filter resistance during tests, artificially imposed if necessary, shall be at least 90 percent of final values for pre-filters and after-filters.
 - .2 Flow rate tolerance:
 - .1 Air handling unit and all other fans, cubic meters/min (cubic feet per minute): Minus 0% to plus 10%.
 - .2 Grilles, diffusers and air terminal units (maximum values): 0% to +10%.
 - .3 Exhaust hoods/cabinets: 0 % to + 10 %.
 - .4 Minimum outside air: 0 % to +10 %.
 - .5 Individual room air outlets and inlets, and air flow rates not mentioned above: 0% to +10 % except if the air to a space is 100 CFM or less the tolerance would be 0 to plus 5 %.
 - .6 Heating hot water pumps and hot water coils: 0 % to +5 %.
 - .7 Heating hot water convectors, forced flow heaters, unit heaters: 0 % to +5 %.
 - .8 Chilled water and condenser water pumps: 0% to +5 %.
 - .9 Chilled water coils: 0 % to +5 %.

1.4 SUBMITTALS

- .1 Submit Following for Review to the Consultant:
 - .1 Systems inspection report on equipment and installation for conformance with design.
 - .2 Duct Air Leakage Test Report, demonstrating compliance with all ASHRAE 90.1 ductwork sealing requirements.
 - .3 Final TAB reports covering flow balance and adjustments, performance tests.
 - .4 Include in final reports uncorrected installation deficiencies noted during TAB and applicable explanatory comments on test results that differ from design requirements.

1.5 APPLICABLE PUBLICATIONS

- .1 The following publications form a part of this specification to the extent indicated by the reference thereto. In text the publications are referenced to by the acronym of the organization.
- .2 American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc. (ASHRAE): HVAC Applications ASHRAE Handbook, Testing, Adjusting, and Balancing
- .3 Associated Air Balance Council (AABC): AABC National Standards for Total System Balance
- .4 Sheet Metal and Air Conditioning Contractors National Association (SMACNA): HVAC SYSTEMS Testing, Adjusting and Balancing

2 Products

2.1 PLUGS

- .1 Provide plastic plugs to seal holes drilled in ductwork for test purposes.

2.2 INSULATION REPAIR MATERIAL

- .1 Coordinate with the mechanical Contractor the TAB activity such that it does take place before the insulation is installed on ductwork and piping.
- .2 In the absence of such coordination, the mechanical contractor shall be responsible for the repair to the ductwork and or piping insulation removed for TAB purposes, including the integrity of the vapor barrier material and the insulation jacket.

3 Execution

3.1 GENERAL

- .1 Obtain applicable contract documents and copies of approved submittals for HVAC equipment and automatic control systems.

3.2 SYSTEMS INSPECTION REPORT

- .1 Inspect equipment and installation for conformance with design.
- .2 The inspection and report is to be done after air distribution equipment is on site and duct installation has begun, but well in advance of performance testing and balancing work. The purpose of the inspection is to identify and report deviations from design and ensure that systems will be ready for TAB at the appropriate time.
- .3 Verify that all items such as ductwork piping, ports, terminals, connectors, etc., that is required for TAB are installed. Provide a report to the Consultant.
- .4 Reports: Follow check list format developed by CAABC or SMACNA, supplemented by narrative comments, with emphasis on air handling units and fans. Check for conformance with submittals.

Verify that diffuser and register sizes are correct. Check air terminal unit installation including their duct sizes and routing.

3.3 TAB REPORT

- .1 Format to be in accordance with referenced standard listed above, but using design drawing units.
- .2 Produce "as-built" full system schematics. Use as-built drawings for reference.
- .3 Submit 1 copy of preliminary TAB reports, each in "D" ring binders, complete with index tabs for verification and approval of Consultant.
- .4 Submit copies of final TAB reports after approval by the Consultant, to be incorporated into the Maintenance and Operations Manual.

3.4 PROCEDURES

- .1 Tab shall be performed in accordance with the requirement of the Standard under which TAB agency is certified.
- .2 Start final TAB only when building is essentially completed, including:
 - .1 Installation of ceilings, doors, windows and other construction affecting TAB.
 - .2 Application of sealing, caulking and weather-stripping.
 - .3 Normal operation of mechanical systems affecting TAB.
- .3 General: During TAB all related system components shall be in full operation. Fan and pump rotation, motor loads and equipment vibration shall be checked and corrected as necessary before proceeding with TAB. Set controls and/or block off parts of distribution systems to simulate design operation of variable volume air or water systems for test and balance work.

3.5 AIR BALANCE AND EQUIPMENT TEST:

- .1 Include all air handling units, fans, terminal units, fan coil units, room diffusers/outlets/inlets, as applicable to this project.
- .2 Adjust fan speeds to provide design air flow.
- .3 Test and balance systems in all specified modes of operation, including variable volume, economizer, and fire emergency modes. Verify that dampers and other controls function properly.
- .4 Parameters to be Measured
 - .1 Air Flow
 - .2 Air velocity.
 - .3 Static pressure.
 - .4 Velocity pressure.
 - .5 Temperature:
 - .1 Wet bulb.

- .2 Dry bulb.
- .6 Cross sectional area.
- .7 Fans RPM
- .8 Electrical power:
 - .1 Voltage
 - .2 Current draw.

.7 Locations of Measurements

- .1 Inlet and outlet of each
 - .1 Fan.
 - .2 Coil.
 - .3 Filter.
 - .4 Balancing damper.
 - .5 Other auxiliary equipment.
- .2 Main ducts.
- .3 Main branch ducts.
- .4 Sub-branch ducts.
- .5 Each supply, exhaust and return air inlet and outlet.
- .6 Before and after the silencers.

3.6 WATER BALANCE AND EQUIPMENT TEST:

- .1 Include all circulating pumps, heat exchangers, boilers, coils, as applicable to this project.
- .2 Adjust flow rates for equipment to the values indicated on the drawings and schedules. Set balancing valves and circuit setters to the values on indicated on the equipment schedules
- .3 Record final measurements for hydronic equipment on performance data sheets. Include entering and leaving water temperatures for heating and cooling coils, and for heat exchangers. Include entering and leaving air temperatures (DB/WB for cooling coils) for air handling units and reheat coils. Make air and water temperature measurements at the same time.
- .4 Parameters to be Measured
 - .1 Water/Glycol Flow (as applicable to the project)
 - .2 Pressure.
 - .3 Temperature.
 - .4 Specific gravity.
 - .5 Pumps RPM
 - .6 Electrical power:
 - .1 Voltage
 - .2 Current draw.
- .5 Locations of Measurements
 - .1 Inlet and outlet of each
 - .1 Pump.
 - .2 Coil.

- .3 Boiler.
- .4 Balancing valve.
- .5 Automatic control valves
- .6 Chiller.

3.7 VERIFICATION

- .1 Reported measurements shall be subject to verification by Consultant. Provide instrumentation and manpower to verify results of up to 30 % of all reported measurements. Number and location of verified measurements to be at discretion of Consultant.
- .2 Bear costs to repeat TAB, as required, to satisfaction of Consultant.

3.8 MARKING OF SETTINGS

- .1 Following approval of TAB final Report, the setting of all HVAC adjustment devices including balancing valves, splitters and dampers shall be permanently marked by the TAB Specialist so that adjustment can be restored if disturbed at any time. Style and colors used for markings shall be coordinated with the Consultant.

3.9 CONDUCTING THE TESTING AND BALANCING PROCEDURE

- .1 Part 1 - The Mechanical Contractor is responsible for conducting testing and balancing of all new mechanical systems and equipment as specified on the Drawings, Specifications and/or other Contract Documents and providing the comprehensive report to the Engineer.
- .2 Part 2 - The Contractor shall include for a repeat of all testing procedures to be conducted in witness of the Consultant on site after the completion of Part 1 (see .1). This is intended to demonstrate the operating characteristics of all mechanical systems once balancing has been complete and once the Engineer has had a chance to review the comprehensive report. The TAB Agency shall include for additional balancing during this Part as advise by the Engineer on site.

3.10 IDENTIFICATION OF TEST PORTS

- .1 The TAB Specialist shall permanently and legibly identify the location points of duct test ports. If the ductwork has exterior insulation, the identification shall be made on the exterior side of the insulation. All penetrations through ductwork and ductwork insulation shall be sealed to prevent air leaks and maintain integrity of vapor barrier.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL

- 1.1.1 This section of the specification shall be read in conjunction with and shall be governed by the requirements outlined in Section 20 05 11 Mechanical General Requirements.
- 1.1.2 All valves must have a valid CRN Number. Statutory declaration must be provided on request.
- 1.1.3 NO USE OF VICTAULIC OR 'GROOVED END' PRODUCTS WILL BE ALLOWED.

1.2 REFERENCE STANDARDS

- 1.2.1 Do the work in accordance with the Ontario Building Code Plumbing Code and local authority having jurisdiction.
- 1.2.2 ASTM B62-09 Specifications for Composition Bronze or Ounce Metal Castings.
- 1.2.3 ANSI/ASME B16.5-2005 Pipe Flanges and Flanged Fittings.
- 1.2.4 ANSI/ASME B16.11-2009 Forged Fittings, Socket Welding.
- 1.2.5 ASTM B88-03 Specifications for Seamless Copper Water Tube.
- 1.2.6 CSA B242-M80 Groove and Shoulder Type Mechanical Pipe Couplings.
- 1.2.7 MSS SP 67-2002 Butterfly Valves
- 1.2.8 MSS SP 70-2006 Cast Iron Gate, Globe, Angle and Check Valves
- 1.2.9 MSS SP 71-2005 Cast Iron Swing Check Valves Flanged and Threaded Ends.
- 1.2.10 MSS SP 80-2003 Bronze Gate, Globe, Angle and Check Valves

1.3 SHOP DRAWINGS

- 1.3.1 Submit product data in accordance with Section 20 05 11.
- 1.3.2 Indicate following: valves.

PART 2 - PRODUCTS

2.1 PIPING

- 2.1.1 Domestic hot, cold and recirc tubing, within building.
- .1 Above ground: copper tube, hard drawn, type L: to ASTM B88M.
- .2 Buried: copper tube, soft annealed, type K: to ASTM B88M.

2.1.2 All piping shall have certification markings for compliance with ASTM B88.

2.2 FITTINGS

2.2.1 Brass or bronze flanges and flanged fittings: to ANSI B16.24.

2.2.2 Brass or bronze threaded fittings: to ANSI B16.15.

2.2.3 Cast bronze to ANSI B16.18- 1984 or wrought copper and bronze to ANSI B16.22.

2.3 JOINTS

2.3.1 Rubber gaskets, 0.063" (1.6 mm) thick: to AWWA C111 -95.

2.3.2 Bolts, nuts, hex head and washers: to ASTM A307-92a-07b, heavy series.

2.3.3 For installation of the potable water system only lead free solder shall be used in accordance with Ontario Building Code Standards.

2.3.4 Solder, tin antimony, 95:5: to ASTM B32.

2.4 GATE VALVES

2.4.1 Gate valves shall only be utilized where specifically noted on the drawings. For all other shut off valve applications utilize ball valves for 2" (50 mm) or smaller and butterfly valves for 2.6" (65 mm) and larger.

2.4.2 NPS 2 and under, soldered:

.1 Non-rising stem to MSS SP-80, Class 125, 860 kPa, bronze body, screw-in or bolted bonnet.

.2 Standard of Acceptance: Jenkins, Crane, Toyo 281, Kitz 41, Grinnell

2.4.3 NPS 2 and under, screwed:

.1 Rising stem: to MSS SP-80, class 125, 860 kPa, bronze body, solid wedge disc.

.2 Standard of Acceptance: Jenkins, Crane, Toyo 293, Kitz 24, Grinnell

2.4.4 NPS 2-1/2 and over, in mechanical rooms, flanged:

.1 Rising stem: to MSS SP-70, class 125, 860 kPa, FF flange, cast-iron body, OS&Y bronze trim.

.2 Standard of Acceptance: Jenkins, Crane, Toyo 421, Kitz 72, Grinnell

2.4.5 NPS 2-1/2 and over, other than mechanical rooms, flanged:

.1 Non-rising stem: to MSS SP-70, class 125, 860 kPa, FF flange, cast-iron body, bronze

trim, bolted bonnet.

- .2 Standard of Acceptance: Jenkins, Crane, Toyo 415, Kitz 75, Grinnell

2.5 GLOBE VALVES

2.5.1 NPS 2 and under, balancing, soldered:

- .1 To MSS SP-80, Class 125, 860 kPa, bronze body, renewable composition disc, screwed over bonnet.
- .2 Lockshield handles: as indicated.
- .3 Standard of Acceptance: Jenkins, Crane, Toyo 222, Kitz 10, Grinnell

2.5.2 NPS 2 and under, balancing, screwed:

- .1 To MSS SP-80, class 125, 860 kPa, bronze body, screwed over bonnet, renewable composition disc.
- .2 Lockshield handles: as indicated.
- .3 Standard of Acceptance: Jenkins, Crane, Toyo 220, Kitz 09, Grinnell

2.6 SWING CHECK VALVES

2.6.1 NPS 2 and under, soldered:

- .1 To MSS SP-80, class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat.
- .2 Standard of Acceptance: Jenkins, Crane, Toyo 237, Kitz 23, Grinnell

2.6.2 NPS 2 and under, screwed:

- .1 To MSS SP-80, class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat.
- .2 Standard of Acceptance: Jenkins, Crane, Toyo 236, Kitz 22, Grinnell

2.6.3 NPS 2-1/2 and over, flanged:

- .1 To MSS SP-70, class 125, 860 kPa, cast iron body, FF flange, regrind renewable seat, bronze disc, bolted cap.
- .2 Standard of Acceptance: Jenkins, Crane, Toyo 435, Kitz 78, Grinnell

2.7 BALL VALVES

2.7.1 NPS 2 and under, branch isolators, screwed:

- .1 600 WOG, bronze body, solid chrome plated bronze ball, with Teflon seal.
- .2 Ball valves shall have full port opening.
- .3 Standard of Acceptance: Jenkins, Crane, Toyo 5044A, Kitz 58, Grinnell, Apollo.

2.8 AUTOMATIC CIRCUIT BALANCING VALVES

2.8.1 Circuit balancing valves shall be of the automatic variety. Manual circuit balancing valves will not be accepted.

2.8.2 Circuit Balancing Valves are required on the domestic hot water recirculation system.

2.8.3 Provide the following sizes:

- .1 Provide 0.032 l/s (0.5 gpm) for 12 mm pipe size.
- .2 Provide 0.063 l/s (1.0 gpm) for 20 mm pipe size.

2.8.4 Product Warranty and Performance Guarantee

- .1 Valves shall be warranted by the manufacturer to be free of defects in material and workmanship for a period of five years.
- .2 Valves shall control flow to within plus/minus 5 percent of design over an operating differential range of at least 14 times the minimum required for control. Four operating pressure ranges shall be available with the minimum range requiring less than 3 psid to actuate the mechanism.
- .3 The valve flow curve shall be smooth over its entire nominal control range. Gaps, bumps and dips in flow curves shall not be acceptable.

2.8.5 Shop Drawing Submission

- .1 The Balancing Valve Manufacturer shall submit a complete list of balancing valves, their location and their performance.
- .2 The Balancing Valve Manufacturer shall mark up a set of full size plans showing the location of each balancing valve and assign an appropriate identification tag for the balancing valve.
- .3 The Balancing Valve Manufacturer shall submit these drawings for the Consultant to review, incorporate any comments from the Consultant and then submit copies of this drawing to the Mechanical Contractor, Mechanical Consultant, Architect and Construction Manager.
- .4 All balancing valves shall be shipped to site with this tag number firmly attached to the

valve and the full size drawings shall be utilized to identify the location where they are to be installed.

2.8.6 Valve Flow Control Cartridge (Typical for all valves)

- .1 The non adjustable flow control cartridge shall be 100% stainless steel. Parts made of soft metals such as brass with only a coating of hard metal such as nickel shall not be allowed. Rubber based materials whose properties change with temperature and pressure shall not be allowed.
- .2 The cartridges shall have segmented ports through which water can pass, rather than a continuous large port, to eliminate noise and full travel linear coil spring.
- .3 The cartridge movement shall result in a shearing action that will dislodge or shear any particle that may tend to get stuck in a port.
- .4 Cartridge shall be removable from the housing and shall be held in place in the housing without adhesive.
- .5 All flow control cartridges shall be warranted by the manufacturer for five years from the date of sale.

2.8.7 Sizes 40mm and smaller

- .1 Valves shall have forged brass bodies and stainless steel cartridge assembly rated for a minimum of 230 psi/250F.

2.8.8 Valve end connections shall be either female sweat or FPT.

2.8.9 Valves shall be provided with two pressure/temperature taps.

2.8.10 Valves shall be provided with a union tailpiece and built in isolation valve.

2.8.11 The body design shall allow for inspection or removal of the cartridge without disturbing piping connections.

2.8.12 The valve shall come fully assembled and shall be permanently marked to show direction of flow and shall have a body tag to indicated flow rate and model number.

2.8.13 Provide a shut off valve upstream of the valve to allow the system to be shut off and the balancing valve to be removed without shutting down the entire heating system.

2.8.14 Standard of Acceptance: Griswold Isolator R valve.

PART 3 - EXECUTION

3.1 INCOMING WATER MAIN

- 3.1.1 The products utilized to build the meter assembly shall be in accordance with the Local Authorities requirements.
- 3.1.2 Where the Local Authority requires that this assembly use gate valves with all soldered connections the Mechanical Contractor shall solder all of the joints and use gate valves as specified above.

3.2 INSTALLATION

- 3.2.1 Connect to fixtures and equipment in accordance with manufacturers instructions.
- 3.2.2 Install tubing close to building structure to minimize furring, conserve headroom and space. Group exposed piping and run parallel to walls.
- 3.2.3 Cut square, ream and clean tubing and tube ends, clean recesses of fittings and assemble without binding.
- 3.2.4 Lay buried tubing in accordance with AWWA Class "B" bedding.
- 3.2.5 Isolate equipment, fixtures and branches with ball valves.
- 3.2.6 New or repaired potable water systems shall be purged of deleterious matter and disinfected prior to utilization. The method to be followed shall be that prescribed by the health authority having jurisdiction or in the absence of a prescribed method as follows:
- .1 The pipe system shall be flushed with clean, potable water until dirty water does not appear at the points of outlet.
 - .2 The system or part thereof shall be filled with a water/chlorine solution containing at least 50 parts per million (50 mg/L) of chlorine, and the system or part thereof shall be valved off and allowed to stand for 24 hours; or the system or part thereof shall be filled with a water/chlorine solution containing at least 200 parts per million (200mg/l) of chlorine and allowed to stand for three (3) hours.
 - .3 Following the required standing time, the system shall be flushed with clean potable water until the chlorine is purged from the system.
 - .4 The procedure shall be repeated where shown by a bacteriological examination that contamination remains present in the system.
- 3.2.7 Compression fittings are not acceptable.
- 3.2.8 All valves packing shall be asbestos free.
- 3.2.9 Provide isolation valves on all main branch feeds to each washroom group.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL

1.1.1 This section of the specification shall be read in conjunction with and shall be governed by the requirements outlined in Section 20 05 11 Mechanical General Requirements of the specification.

1.2 REFERENCE STANDARDS

- 1.2.1 Do the work in accordance with the Ontario Building Code Plumbing Code and local authority having jurisdiction.
- 1.2.2 CSA B70 - 2006 Specifications for Cast Iron Soil Pipe Fittings and Means of Joining.
- 1.2.3 CSA B125 - 2005 Specifications for Plumbing Fittings
- 1.2.4 ASTM B32 - 2008 Specifications for Solder Metal
- 1.2.5 ASTM B306 - 2009 Specifications for Copper Drainage Tube (DWV)
- 1.2.6 ANSI B16.29
- 1.2.7 ASTM B88, ASTM B88M - 2003 Specifications for Seamless Copper Water Tube
- 1.2.8 ASTM A74 - 2009 Specification for Cast Iron Soil Pipe and Fittings
- 1.2.9 ASTM C564 -2009 Specification for Rubber Gasket for Cast Iron Soil Pipe and Fittings

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

- 2.1.1 For all above grade vent, sanitary and storm piping, Type DWV to:
- .1 ASTM B306 - Specification for copper drainage tube (DWV).
 - .2 CSA B158 for cast brass fittings.
 - .3 ANSI B16.29 for wrought copper fittings.
 - .4 Solder: tin-lead, 50:50, to ASTM B32, type 50A - Specification for solder metal.
 - .5 ASTM B88.
 - .6 ASTM C564

2.2 CAST IRON PIPING AND FITTINGS

2.2.1 For above grade storm, sanitary and vent piping, minimum NPS 3, to CSA B70, ASTM A74 with heavy bituminous coating.

2.2.2 For above grade storm, sanitary and vent piping 4" (100 mm) size and larger: Cast iron.

2.2.3 For storm, sanitary and vent piping joints.

.1 Mechanical joints.

.1 Neoprene or butyl rubber compression gaskets for all pipe connections.: to ASTM C564-2009.

.2 SS clamps.

2.2.4 Provide PVC piping for Urinals in accordance with OBC for above-grade drainage in lieu of Cast Iron.

2.3 PUMPED DRAINAGE

2.3.1 Pumped drains shall be galvanized steel.

2.4 DRAINAGE AND VENTS

2.4.1 Piping And Fittings

2.4.2 For buried sanitary, storm and vent piping:

.1 ASTM D2665, ASTM D2949, ASTM B251

.2 ASTM D3034, ASTM F891

.3 CAN/CSA- B181.2 for PVC DWV or

.4 CAN/CSA B182.1- for plastic DWV.

2.4.3 Joints

.1 Solvent weld for PVC: to ASTM D2564.

.2 Solvent weld for ABS: to ASTM D2235.

.3 For sizes above 4" (100mm).

Provide Ring-Tite joints Canon Ring-Tite joints PVC DR35 gravity sewer pipe, with locked in rubber ring sealing feature providing tight flexible seal.

Spigot ends to be supplied complete with bevel.

2.4.4 All PVC piping below grade shall be a minimum of SDR 35.

2.5 CONDENSATE DRAIN PIPING

2.5.1 All condensate piping shall be Copper water tube, ASTM B88, Type L for runouts and Type M for mains.

PART 3 - EXECUTION

3.1 INSTALLATION

3.1.1 Install piping parallel and close to walls to conserve space, and to grade indicated, and to suit installation of related work.

3.1.2 Apply two coats of asphalt paint to pipe laid in, or passing through concrete.

3.1.3 Where piping passes through floor or wall below grade pack and seal in concrete complete with Link Seal in accordance with Specification Section 20 05 11.

3.1.4 PVC piping shall not be utilized above grade. PVC piping is acceptable for below grade piping where permitted by Code. The PVC piping shall convert to cast iron prior to the point where it penetrates the floor slab.

3.1.5 Provide venting to plumbing fixtures and fixture groups in accordance with the Ontario Building Code Plumbing Code and local authorities having jurisdiction.

3.1.6 Install buried pipe on 6" (150 mm) bed of clean sand, shaped to accommodate hubs and fittings, to line and grade as indicated. Backfill with clean sand.

3.1.7 Install piping parallel and close to walls to conserve space and to grade indicated, and to suit the installation of related work.

3.1.8 Apply solvent to male end of joints only.

3.1.9 Pipe installation: Pipe shall be installed as specified and indicated on the drawings.

3.1.10 The piping system shall be installed in accordance with the manufacturers current published installation procedures.

3.1.11 PVC piping shall not be utilized above grade. PVC piping is acceptable for below grade piping where permitted by Code. The PVC piping shall convert to cast iron prior to the point where it penetrates the floor slab.

3.1.12 Where piping passes through floor or wall below grade pack and seal in concrete in accordance with Mechanical General Requirements.

3.1.13 Provide venting to all plumbing fixtures and fixture groups in accordance to the Ontario

Building Code - Plumbing Code and local authorities having jurisdiction.

3.1.14 If tests are required by an authority having jurisdiction, perform tests in presence of each governing authority and obtain certification. Repeat tests as often as necessary to obtain certification.

3.1.15 Test pressure shall not exceed 1-1/2 times the maximum rated pressure of the lowest related element in the system.

3.1.16 Remove all fittings which do not withstand test pressure, replace and retest.

3.1.17 Eliminate leaks, or remove and refit defective parts.

3.2 TESTING

3.2.1 The drainage and vent system shall be tested in accordance with the Ontario Building Code - Plumbing Code and tested in accordance with the requirements of the authority having jurisdiction, perform tests in the presence of each governing authority and obtain certification. Repeat tests as often as necessary to obtain certification.

3.2.2 Perform tests before piping is covered or concealed.

3.2.3 Remove all fittings which will not withstand test pressure, and replace after test.

3.2.4 Eliminate leaks, or remove and refit defective parts.

END OF SECTION

1 GENERAL

1.1 Conform to Sections of Division 1 as applicable.

1.1.1 Conform to General Mechanical Requirements, Section 20 05 11 Mechanical General Requirements as applicable.

1.1.2 All plumbing fixtures depicted on the Drawings with a “Fixture Tag” (‘WC-1’ or WC-1) is a new plumbing fixtures and to be supplied and installed by the Mechanical Contractor in full complete with all necessary cold/hot water supply, drainage and vent piping.

1.2 REFERENCES

ANSI/ARI	Drinking Fountains and Self-Contained, Mechanically Refrigerated Drinking Water Coolers.
ANSI/ARI 1020	Application and Installation of Drinking Fountains and Drinking Water Coolers.
CAN/CSA-B45 Series-02	CSA Standards on Plumbing Fixtures.
CAN/CSA-B125-01	Plumbing Fittings.

1.3 SUBMITTALS

1.3.1 Product Data

1.3.1.1 Submit product data in accordance with the Mechanical General Requirements.

1.3.1.2 Indicate dimensions, construction details and roughing-in dimensions for all fixtures and trim.

1.3.2 Maintenance Data

1.3.2.1 Provide maintenance data for incorporation into manual specified in the Mechanical General Requirements.

1.3.2.2 Data to include:

- Description of plumbing fixtures and trim giving manufacturers name, type, model, year capacity and flow.
- Details of operation, servicing and maintenance.
- Recommended spare parts list.

1.4 FIXTURES AND TRIM

1.4.1 Manufacture plumbing fixtures in accordance with CAN/CSA-B45 Series. Conform to latest code requirements for water saving features noted in the Ontario Building Code.

1.4.2 Manufacture plumbing fittings in accordance with CAN/CSA-B125.

1.4.3 Architectural drawings to govern in determination of number and location of fixtures.

- 1.4.4 Fixtures in any one washroom or location to be product of one manufacturer and of same type, unless otherwise noted.
- 1.4.5 Trim in any one washroom or location to be product of one manufacturer and of same type, unless otherwise noted.
- 1.4.6 Exposed plumbing brass to be chrome plated.
- 1.4.7 The type number and letter allocated to each style of fixture identifies that particular fixture on Mechanical Drawings.

2 PRODUCTS

2.1 WALL HUNG WATER CLOSET, “WC-1” [BARRIER FREE DESIGN]

- 2.1.1 Water Closet: Wall hung exposed flush valve (barrier free design)- American Standard “Afwall Elongated” low consumption toilet #3351.101 “Low Consumption”, wall hung for flush valve, vitreous china, elongated syphon jet flush action bowl, fully glazed 2-1/8” (54 mm) internal trap way, 10”x12” (254 mm x 305 mm) large water surface 1.6 gal (6 L) flush, 1-1/2” (38 mm) top spud.
- 2.1.2 Flush Valve: Flush Valve & Supplies: Sloan Regal #111-XL-CP, exposed manual Flushometer for Top Spud toilet, chrome plated, 6L (1.6 US Gal) factory set flow, quiet action diaphragm type, non-hold open feature, A. D. A oscillating handle, back-check angle stop (screwdriver operated), flush tube for 292mm (11-1/2”) rough-in, vacuum breaker.
- 2.1.3 Seat: Centoco #AM820STS toilet seat, elongated heavy duty plastic open front with cover, reinforced S.S. check hinge, post, washers and nuts. Power for device by electrical trade. Ensure that sensor clear seat cover.
- 2.1.4 Supply & Installation: To meet Code requirements for Barrier free access.
- 2.1.5 Coupling: Mission Heavy Weight #HW Coupling, couplings, constructed of four extra wide corrugated type 304 stainless steel bands, connect from 100mm (3-15/16”) MJ to 100mm (3-15/16”) MJ, from cast iron to cast iron, heavy duty worm drive clamps.
- 2.1.6 Floor Supported Carrier: Jay R. Smith #0208Y single, horizontal carrier, 3” (75 mm) drain, all duco coated cast iron fittings, rear anchor bolt, face plate, heavy duty legs, adjustable nipple, plated hardware, cap nuts, test plug and protection cap.

2.2 LAVATORY, “LV-1” [BARRIER FREE DESIGN]

- 2.2.1 Lavatory: American Standard “Murro” #0954.123EC - 22” x 21” x 5-7-1/2” deep, wall hung, vitreous china, rear overflow, for concealed arm carrier. American Standard #0059 020EC shroud/knee contact guard to cover exposed piping. Provide RH Hole for new Soap Dispenser (soap dispenser is to be supplied and installed by the Architectural Division).
- 2.2.2 Faucet: Chicago Faucets No. 420-E2805ABCP, Deck Mounted 4" Fixed Centers Single Lever

Hot and Cold Water Mixing Sink Faucet, Chrome Plated solid brass construction. 4 5/8" Center to Center Rigid Cast Brass Spout. 0.5 GPM (1.9 L/min) Pressure Compensating Econo-Flo Vandal Proof Non-Aerating Spray. 1/2" NPSM Supply Inlets for 3/8" or 1/2" Flexible Riser. ECAST® construction with less than 0.25% lead content by weighted average. CALGreen Compliant. Secondary Control Valve: 4 5/8" Center to Center Rigid Cast Brass Spout.

- 2.2.3 Balancing Valve: Supply to hot water side of faucet and cold water supply to cold water side of faucet. Mechanical mixing valve with thermostatic limit stop by Lawler model TMM-1070 with temperature adj. dial & with integral back checks. Set valve temperature at 115F, shut-off at 120F. ASSE1070 approved. Provide tee, adaptor and flex copper tubing to suit installation.
- 2.2.4 Supplies: McGuire #H170BVRB supplies, C.P., polished brass, rigid short horizontal integral copper sweat tube nipples 1/2"x5" long, all brass 1/4 turn ball valve angle stops with combination V.P. loose key, and handles, escutcheons and S.S. braided flexible risers. McGuire #8872C-17T 'P' trap, C.P. brass adjustable body, 17 gauge, 1-1/4" and escutcheon.
- 2.2.5 Carrier: Jay R. Smith #0700-Z-M basic carrier, with concealed arms and block base feet support with semi-pedestal supported plate.

2.3 HANDHELD SHOWER, 'HS-1'

- 2.3.1 American Standard #7866.115 with brass control valve complete with wheel handle, vacuum breaker, and 10" spray end with self-closing hand valve, 46" hose, wall bracket with hook.
- 2.3.2 Thermostatic Water Mixing Valve: Symmons 5-120CK-TB or approved equal complete with recessed stainless steel (SS) cabinet with hinged & lockable SS door. 1/2" inlet and outlet. Set temperature regulator to a maximum 37 degrees Celsius (98 degrees Fahrenheit).

3 EXECUTION

3.1 FIXTURE INSTALLATION

- 3.1.1 Install wall hung lavatory and urinal hanger brackets supplied with fixtures to wall by means of a manufactured chair carrier of MIFAB, Smith, Watts or Zurn.
- 3.1.2 Install wall-hung water closets with chair carriers of MIFAB, Smith, Watts or Zurn manufacture, and of type and model recommended by manufacturer for each particular installation with due regard to construction and piping details.
- 3.1.3 Prior to commencing any work, refer to Architectural Drawings for exact placement location and mounting height of all plumbing fixtures. Failure to do so resulting in an install not complying with the Architectural Drawings or code compliance shall require the Mechanical Contractor to rectify the installation at no extra cost.
- 3.1.4 Insulate indirect waste of handicapped usage lavatory with 25 mm (1") thick insulation as described in Piping Insulation Specification.
- 3.1.5 Adjust flush valves to limit the quantity of water per flush cycle allowed by code. Consult

manufacturer for adjustment procedures.

- 3.1.6 Provide institutional grade caulking (clear colour) of all plumbing fixtures at all surfaces where the plumbing fixture interfaces with the wall or floor. Review extent of caulking with the Architect prior to commencing work. Any damage, discolouration or build up of dust resulting in subsequent construction activities by any trade prior to handing over of the Spaces to the Owner shall require removal of the caulking and installation of new. Caulking shall be done in a neat manner.

3.2 ADJUSTMENT

- 3.2.1 Verify maximum settings of thermostatic mixing valves.
- 3.2.2 Adjust stream regulator of drinking fountains as necessary to ensure proper operation.
- 3.2.3 Clean out aerator screens and strainers after lines have been flushed.

END OF SECTION

PART 1 **GENERAL**

1.1 **GENERAL**

- .1 Conform to Sections of Division 1, as applicable.
- .2 Conform to Section 20 05 11 Mechanical General Requirements as applicable.

1.2 **RELATED SECTIONS**

- .1 Plumbing Fixtures and Trim: Section 22 44 13.

1.3 **REFERENCES**

CAN3-B79-94	Floor Drains and Trench Drains
PDI-G101	Testing and Rating Procedure for Grease Interceptors with Appendix of Sizing and Installation Data
PDI-WH201	Water Hammer Arrestors

1.4 **SUBMITTALS**

- .1 Submit product data in accordance with Section 20 05 11 - Mechanical General Requirements.
- .2 Indicate dimensions, construction details and materials for the following: floor drains, cleanouts, water hammer arrestors, strainers, traps, trap seal primers.

1.5 **MAINTENANCE DATA**

- .1 Provide maintenance data for incorporation into manual specified in the Mechanical General Requirements.
- .2 Data to include:
 - 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.

PART 2 PRODUCTS

2.1 GENERAL

- .1 Furnish plumbing and drainage specialties. Ancon catalogue numbers are specified to indicate quality and features required. Furnish sizes as shown on Drawings.
- .2 Acceptable Manufacturers: Ancron, Zurn, Empoco.

2.2 FLOOR DRAINS

- .1 General: all floor drains to be provided with trap primer tapping.
- .2 Floor Drains - (Mech. Rooms/Unfinished Areas)

Duco coated cast body and flashing collar, with 200 mm (8") round cast iron vandalproof top grate and sediment bucket. Complete with trap priming connection. Outlet size: as indicated on the drawings.

Standard of Acceptance: JR Smith 2220 series
- .3 Funneled Floor Drains - Mechanical and Service Rooms

Duco cast iron flanged receptor, bar grate and funnel, c/w vandal-proof secured grate and sediment bucket. Used to receive the drip, condensate or waste water from indirect waste lines. The funnel prevents splashing and directs the waste into the drain. The exposed portion of grate serves as drain for any other waste on the floor. The funnel is attached to the grate by means of concealed screws and it may be moved to any grate location desired. Outlet size: as indicated on the drawings.

Standard of Acceptance: J R Smith 3750 series.
- .4 Floor Drains (Finished Areas, Washrooms, Janitor)

Duco coated cast iron body with flashing collar and adjustable strainer head, 150 mm (6") round or square top strainer head. The round top strainer may be used in all poured finished floors. Square top strainer shall be used in all tiled areas - aligned with the tile pattern. Refer to architectural floor material schedules. Floor drains c/w trap primer connection, vandal proof screws, sediment bucket. Reversible flashing collar permits adjustment of the strainer to meet finished floor level.

Standard of Acceptance: JR Smith 2005 series.
- .5 Hub Drains (Condensate Drain)

Duco Cast Iron Body with 5" Adjustable Cast Iron Strainer Head and Grate, with Oval Funnel Assemble

Standard of Acceptance: JR Smith SQ-4-1753-A

2.3 FLOOR DRAIN TRAPS AND PRIMERS

- .1 Furnish each floor drain installation with a deep seal "P" trap unless otherwise shown.
- .2 Furnish trap seal primer valves Ancon No. M3-810 with cast brass body, vacuum breaker and NPS 1/2 sweat connections.
- .3 Where a floor drain trap is not within a reasonable distance from a plumbing fixture, furnish an automatic flush tank for priming of trap, Crane No. 7-170 1/2 L, or American Standard No. AF-4104L, complete with automatic syphon, tank liner, concealed top cover, bottom supply and screw driver stop.
- .4 As an alternative to automatic flush tanks for remote floor drains, furnish ZURN Model Z1022 trap primers and distribution units, as supplied by S-M-S Ltd.

2.4 DRAINAGE CLEANOUTS

- .1 Stack Cleanout - Exposed Drains
 1. In base of cast iron stacks with neoprene gasketed secured cover. Duco Cast Iron Cleanout Tee and Countersunk Plug
 2. Standard of Acceptance: JR Smith 4510 series
- .2 Stack Cleanout - Drains Behind Finished Walls.
 1. In base of cast iron stacks with neoprene gasketed secured cover. Duco cast iron cleanout tee and countersunk plug with chrome plated bronze square frame and secured cover. nickel bronze frame with stainless steel cover.
 2. Standard of Acceptance: J R smith 4550 series.
- .3 Floor Cleanouts
 1. In Ceramic Tiled Areas
 - .1 Duco cast iron cleanout with square 6"x6" adjustable scoriated secured nickel bronze top. Vandal proof top, flashing flange and clamp. Gasket seal, bronze plug
 - .2 Standard of Acceptance: J R Smith 4052 series.
 2. In Vinyl Tiled Areas
 - .1 Duco Cast Iron Cleanout with Square Adjustable Secured Nickel Bronze Top with 1/8" Tile Recess. Vandal proof top, flashing flange and clamp. Gasket seal, bronze plug
 - .2 Standard of Acceptance: J R Smith 4172 series
 3. In Terrazzo Areas
 - .1 Floor cleanout, above with square nickel bronze cover and frame recessed for terrazzo. Cover can be adjusted to suit floor lines when installing finished floor.
 - .2 Standard of Acceptance: JR Smith 4180.

4. Carpeted and Other Finished Areas
 - .1 Duco cast iron cleanout with round adjustable scoriated secured nickel bronze top. Vandal proof top, flashing flange and clamp. Gasket seal, bronze plug
 - .2 Standard of Acceptance: JR Smith 4032
5. In Unfinished Areas and Outside Area.
 - .1 Epoxy coated cast body with integral clamp device, and removable positive seal cleanout plug and heavy duty scoriated safety finish adjustable cover secured with stainless steel screws.
 - .2 Standard of Acceptance: JR Smith 4232
6. For Heavy Traffic Areas
 - .1 Floor cleanout, above with extra heavy nickel bronze cover and frame. Gasket seal, bronze plug
 - .2 Standard of Acceptance: JR Smith 4112

2.5 SHOCK ABSORBERS

- .1 Size shock absorbers in accordance with P.D.I.-WH201.

Ancon	“Shok-Gard”
Zurn	Z-1700
Enpoco	HT Series

- .2 Provide shock absorbers for all new plumbing piping.

2.6 NON-FREEZE WALL HYDRANT (HOSE BIBB):

- .1 Encased recessed non-freeze wall or ground hydrant with NPS 3/4" hose outlet with vacuum breaker. Bronze quarter turn non-freeze hydrant with hose connection, integral vacuum breaker, "T" handle key, and stainless steel box with full 180 deg. cover opening. Meets ANSI A112.21.3
- .2 Standard of Acceptance: JR Smith 5509 QTNB.

2.7 ROOF DRAINS

- .1 Roof Drains - Controlled Flow

Duco cast iron body with combined flashing clamp and gravel stop with adjustable "flow rate control" assembly and aluminium dome, trapezoidal weirs limit the flow to the leaders. Adjustable to provide various flow rates as required. Outlet diameter as indicated on the drawings.

Standard of Acceptance: J R Smith 1083 series.

.2 Roof Drains – Standard Un-Controlled Flow

FLOFORCE™ High efficient flow performing roof drain. Roof drain engineered to evacuate water off of roof structure by incorporating a smooth funnel shaped interior surface, providing a seamless transition to outlet connection, and eliminating internal obstructions. Complete with Dura-Coated cast iron body with combination membrane flashing clamp/gravel guard and low silhouette Poly-Dome. Flashing clamp/gravel guard provided to prevent debris from entering the drain while allowing water to immediately pass through at zero head level. Poly-dome designed to maximize effective open area and promote efficient flow.

Standard of Acceptance: Zurn Z100F complete with large sump, roof membrane waterproof flange, under-deck clamp, sump extension, roof sump receiver, cast iron dome strainer and vandal-proof secured top. Provide all accessories necessary to install the roof drain with the proposed roofing type (see Architectural Drawings).

2.8 ELECTRONIC TRAP SEAL PRIMER

- .1 Provide a 120V, manifold trap seal primer system to provide trap seal primer to all floor drains. Provide an Electronic Trap Seal Primer on each floor – for a total of 3. Coordinate with Electrical for receptacle location.
- .2 System shall be Zurn Z1020 or equivalent.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install in accordance with Canadian Plumbing Code, provincial codes and local authority having jurisdiction except where specified otherwise.
- .2 Install in accordance with manufacturer's instructions and as specified.

3.2 CLEANOUTS

- .1 In addition to those required by code, and as indicated, install at base of all soil and waste stacks and rainwater leaders and where 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.

3.3 WATER HAMMER ARRESTORS

- .1 Install on branch supplies to each fixture or group of fixtures and where indicated.

- .2 Hot and cold water fixture outlets provided with a vertical air chamber, a minimum of 450 mm long. Air chamber of the same pipe dimension as the branch pipe diameter leading to the fixture, and located as close to the fixture as possible.
- .3 Hot and cold water main branches 75 mm (3") diameter and under to 25 mm (1") diameter: Provided with vertical air chambers of sizes and dimensions specified above, located at points where the pipe line changes direction through 90 degrees in horizontal plane, and at the top of all hot and cold water risers.

3.4 TRAP SEAL PRIMERS

- .1 Install trap seal primer valve in cold water supply line to nearest plumbing fixture (preferably a water closet) and run NPS 1/2 Type K copper piping to primer connection on floor drain body. Obtain Minister's Designee's approval for location of primer valves prior to installation.
- .2 Install trap primer tank in truss space or other suitable location as directed by ORC Designee, or as shown on Drawings.
- .3 (Install in access pit as indicated).

3.5 COMMISSIONING

- .1 After start-up, test, adjust and prove operation as indicated, to suit conditions.
- .2 Clean out strainers periodically until clear.
- .3 Clean out and prime all floor drain traps using trap seal primers or other means acceptable to the Canadian Plumbing Code.
- .4 Prove freedom of movement of cleanouts.

END OF SECTION

1 GENERAL

1.1 GENERAL

- .1 This section of the specification shall be read in conjunction with and be governed by the requirements of Section 20 05 11 Mechanical General Requirements.

1.2 QUALITY ASSURANCE

- .1 Comply with OBC and NFPA 90A requirements, particularly paragraphs pertaining to the maximum flame spread index (currently set at 25) and maximum smoke development index (currently set at 50).
- .2 All materials shall be compatible and suitable for service temperature, and shall not contribute to corrosion or otherwise attack surface to which applied in either the wet or dry state.
- .3 Every package or standard container of insulation or accessories delivered to the job site for use must have a manufacturer's stamp or label giving the name of the manufacturer and description of the material.

1.3 SUBMITTALS

- .1 Submit in accordance with Section 20 05 11 shop drawings and product data
- .2 Provide the following:
 - .1 Insulation materials: Specify each type used and state surface burning characteristics.
 - .2 Insulation facings and jackets: Each type used. Make it clear that white finish will be furnished for exposed ductwork, casings and equipment.
 - .3 Insulation accessory materials: Each type used.
 - .4 Manufacturer's installation and fitting fabrication instructions for flexible unicellular insulation.

1.4 STORAGE AND HANDLING OF MATERIAL

- .1 Store materials in clean and dry environment, pipe covering jackets shall be clean and unmarred. Place adhesives in original containers. Maintain ambient temperatures and conditions as required by printed instructions of manufacturers of adhesives, mastics and finishing cements.

1.5 STANDARDS OF ACCEPTANCE

- .1 Knauf Fiber Glass
- .2 Owens/Corning Fiberglass
- .3 Armstrong
- .4 Johns Manville
- .5 Rockwool Manufacturing

.6 Armaflex.

2 PRODUCTS

2.1 GENERAL

.1 K-factors (thermal conductivity) shown are expressed in BTU•in/hr•ft²•F.

2.2 MINERAL FIBRE BLANKET WITH VAPOUR BARRIER

.1 Provide external insulation on all new supply and return ductwork.

.2 Provide external insulation on all new exhaust ductwork for its entire length.

.3 Material:

.1 Mineral-Fiber Blanket Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II, for use to 450 deg. F, with a factory-applied jacket manufactured from foil, reinforcing scrim, and kraft paper (FSK). Minimum density of 3/4 lb./cu.ft., maximum conductivity of 0.43 (BTU-in./hr.-sq.ft.-deg. F) at 200 deg. F.

.2 Acceptable Material: Fiberglas, Knauf, Manson.

.3 Thickness: 1".

2.3 FIBROUS GLASS RIGID WITH VAPOUR BARRIER

.1 Apply on all indoor supply rectangular ductwork larger than 30" wide and on all ductwork located outdoors, regardless of size.

.2 Material:

.1 Mineral-Fiber Board Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IB, for use to 450 deg. F, with a factory-applied jacket manufactured from foil, reinforcing scrim, and kraft paper (FSK). Minimum density of 3 lb./cu.ft., maximum conductivity of 0.40 (BTU-in./hr.-sq.ft.-deg. F) at 300 deg. F.

.2 Acceptable products: Fiberglas AF 530, Manson, Knauf.

.3 Thickness: 1"

2.4 CANVAS JACKETS

.1 Apply in mechanical rooms where rigid insulation is applied: compact, firm ULC listed heavy plain weave, cotton fabric at 220 g/m sq.

2.5 METAL JACKETING

- .1 At all locations where the ductwork is located outdoors or in heavy abuse areas, use metal jacketing to protect piping or ductwork insulation.
- .2 Jacketing: Aluminum, 0.016 inches thick, embossed surface, with factory bonded moisture barrier.
- .3 Metal Jacketing Bands: 1/2 inch wide, aluminum or stainless.

2.6 EXTERIOR INSULATION

- .1 Cover all joints of the rigid insulation and fastener penetration with 3" wide pressure sensitive All Service Jacket (ASJ) tape. Rub tape hard with a nylon sealing tool. Over the entire surface apply a weave glass reinforcing cloth embedded between two 1/8" thick wet coats of Breather mastic, i.e., B. Foster Seal Fast 6 PM 35-00-4500.

2.7 FASTENINGS

- .1 Tape: self adhesive, 100 mm wide rated under 25 for flame spread and under 50 for smoke development.
- .2 Contact adhesive: quick-setting, non-flammable fire resistive adhesive to adhere fibrous glass to ducts. Flame spread 15 smoke development 0.
 - .1 Acceptable Products Foster 85-20 Asbestos Free, Armstrong 520.
- .3 Lap Seal Adhesive: Quick-setting adhesive for joints and lap sealing of vapour barriers. Flame spread 10 smoke development 0.
 - .1 Acceptable Products Foster 85-75, Asbestos Free, Drion.
- .4 For Canvas:
 - .1 Washable adhesive for cementing canvas lagging cloth to duct insulation.
 - .2 Acceptable Products: Foster 30-36 Asbestos Free.
- .5 Pins:
 - .1 Weld pins 4 mm diameter, with 1 1/2" diameter head for installation through the insulation. Length to suit thickness of insulation.
 - .2 Weld pins: If duct is over 24" wide, use on bottom of duct as well.
 - .3 Acceptable Products: Duro Dyne, Clip-Pin.

3 Execution

3.1 **APPLICATION**

- .1 Apply insulation after required tests have been completed and approved by Consultant. Insulation and surfaces shall be clean and dry when installed and during application of any finish.
- .2 Work shall be preformed by insulation journeymen.
- .3 Apply insulation and coverings on hot equipment while surface is between 50 to 60°C.
- .4 Vapour barriers and insulation to be complete over full length of duct or surface, without penetration for hangers, standing duct seams and without interruption at sleeves.
- .5 Install insulation with smooth and even surfaces.
- .6 Apply insulation materials accessories and finishes to manufacturer's recommendations.
- .7 Apply 1.0mm thick metal corners to all ductwork in mechanical rooms to a height of 7 ft.
- .8 Use stand-offs for all duct mounted accessories.
- .9 The last 3.0 meters of all exhaust ductwork shall be insulated, whether shown on the Drawings or not.

3.2 **DUCT INSULATION**

.1 General:

- .1 Adhere and seal vapour barrier using vapour seal adhesives.
- .2 Stagger longitudinal and horizontal joints, on multi-layered insulation.

.2 Mechanical Fasteners:

- .1 On rectangular ducts, use 50% coverage of insulating cement and weld pins at not more than 14" centres, but not less than 2 rows per side.

3.3 **JACKETS**

- .1 Provide fire retardant coating on canvas jackets.
- .2 Fire retardant coating shall be approved by authority having jurisdiction prior to application. Consultant reserves right to remove sample of covering for testing.
- .3 Coat canvas covering exposed in finished spaces with diluted coat of lagging adhesive.

As recommended by insulation manufacturer for priming. Dilution: 2 parts of water to 3 parts of lagging adhesive.

- .4 For all ductwork externally insulated inside of the building, provide 3M VentureClad Insulation Jacketing.

END OF SECTION

1.1. REQUIREMENTS INCLUDED

- 1.2. Procedures for onsite demonstration and testing of equipment and systems, including temporary facilities.

1.3. INSTRUCTION OF CLIENT'S OPERATING PERSONNEL.

- 1.3.1. All demonstrations, instructions and testing must be completed prior to Client acceptance for beneficial use. All safety devices must pass 100 percent before the mechanical systems can be accepted for beneficial use.
- 1.3.2. Plumbing and emergency power systems are not included.

1.4. DEFINITIONS

- 1.4.1. Start Up: Initial inspection, cleaning, lubrication, adjustment, and operation of equipment and systems by the contractor with the assistance of the representatives of the equipment manufacturers.
- 1.4.2. Pre Tests: The final stage of the startup procedure. This occurs after all adjustments have been made except for minor fine-tuning that can be done during the pre test. Serves as verification that the systems are ready for the final test. Witnessing of pre test by the Consultant is not required.
- 1.4.3. Final Tests: Tests, witnessed by the Commissioning Agent or their representative, which demonstrate that all equipment and systems are in compliance with requirements.

1.5. QUALITY ASSURANCE

- 1.5.1. Experienced, trained technical service personnel who are representatives of the equipment manufacturers and system designers shall demonstrate, provide instructions, pre test and final test, as specified, the following equipment:
- 1.5.1.1. Boilers and economizers
 - 1.5.1.2. Burners
 - 1.5.1.3. Control systems.
 - 1.5.1.4. Instrumentation.
- 1.5.2. Experienced technicians shall demonstrate and provide instructions on the following equipment (as applicable to the project):
- 1.5.2.1. Boilers and Burners
 - 1.5.2.2. Chillers and Cooling Towers

- 1.5.2.3. Pumps and piping systems
 - 1.5.2.4. Air handling equipment
 - 1.5.2.5. Exhaust/Return Fans
 - 1.5.2.6. Control and safety valves
 - 1.5.2.7. BAS and VFDs
- 1.5.3. The person responsible for programming the BAS shall demonstrate and provide instructions on hardware, software and programming.
- 1.5.4. The Board will provide a list of personnel to receive instructions and will coordinate their attendance at agreed upon times.
- 1.5.5. All safety devices shall comply with the TSSA requirements.

1.6. SUBMITTALS

- 1.6.1. Names and qualifications of personnel performing demonstrations, instructions and tests.
- 1.6.2. Certification that pre testing is complete.
- 1.6.3. Preliminary schedule of all demonstrations, instructions and final tests two weeks prior to proposed dates.
- 1.6.4. Provide reports within three weeks after satisfactory completion of demonstrations, instructions, and tests. List date, type of work, persons participating, amount of time, test results, calculations of test results, test data.
- 1.6.5. Completed System Readiness Checklists provided by the Commissioning Agent and completed by the contractor, signed by a qualified technician and dated on the date of completion,

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1. PREPARATION FOR FINAL TESTS, DEMONSTRATIONS, AND INSTRUCTIONS

- 3.1.1. Verify that equipment and systems are fully operational. Complete all start up and pre test activities for all equipment and systems. Complete all construction and finish work.
- 3.1.2. Arrange for all test personnel for all equipment to be continuously present during one period of time so that all equipment and systems can be tested in their interrelated functions.

For instance, the burner in a heating system shall be tested during the boiler testing, and instrumentation performance will be evaluated in conjunction with boiler testing.

3.1.3. Deliver maintenance and operating manuals four weeks prior to instruction period.

3.1.4. Furnish all special tools.

3.2. FINAL TESTS

3.2.1. Demonstrate proper operation of each equipment and system.

3.2.2. Provide tests on equipment as specified in the individual specification sections.

3.3. STARTUP AND TESTING

3.3.1. The Commissioning Agent will observe startup and contractor testing of selected equipment. Coordinate the startup and contractor testing schedules with the Resident Engineer and Commissioning Agent. Provide a minimum of 7 days prior notice.

3.4. COMMISSIONING

3.4.1. Provide commissioning documentation in accordance with the requirements of the Commissioning Agency for all inspection, start up, and contractor testing required above and required by the Systems Readiness Checklist.

3.5. DEMONSTRATIONS AND TRAINING

3.5.1. Demonstrate operation and maintenance of equipment and systems to Board personnel no more than two weeks prior to scheduled Board operation of the plant.

3.5.2. Use operation and maintenance manuals as basis of instruction. Review contents of manuals with personnel in detail to explain all aspects of operation and maintenance.

3.5.3. Demonstrate start up, operation, control, adjustment, trouble shooting, servicing, maintenance, and shut down of each item of equipment. Allow Government personnel to practice operating the equipment under supervision of instructors.

3.5.4. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instructions.

3.5.5. Submit training plans and instructor qualifications

3.6. TIME ALLOCATED FOR DEMONSTRATIONS AND INSTRUCTIONS

- 3.6.1. At least 8 total instructor hours to include all new building services installed under this project.
- 3.6.2. At least 4 total instructor hours to include BAS and computer workstation and programs.
- 3.6.3. Do not exceed three trainees per session, one four hour session, per day, per trainee.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL

- 1.1.1 This section of the specification shall be read in conjunction with and be governed by the requirements of Section 20 05 11 Mechanical General Requirements.

1.2 DESCRIPTION

- 1.2.1 Ductwork and accessories for HVAC including the following:
1.2.1.1 Supply air, return air, outside air, exhaust, and relief systems.

1.3 DEFINITIONS

- 1.3.1 SMACNA Standards as used in this specification means the HVAC Duct Construction Standards, Metal and Flexible.
1.3.2 Seal or Sealing: Use of liquid or mastic sealant, with or without compatible tape overlay, or gasketing of flanged joints, to keep air leakage at duct joints, seams and connections to an acceptable minimum.
1.3.3 Duct Pressure Classification: SMACNA HVAC Duct Construction Standards, Metal and Flexible.
1.3.4 Exposed Duct: Exposed to view in a finished room, and/or exposed to weather.

1.4 QUALITY ASSURANCE

- 1.4.1 Fire Safety Code: Comply with NFPA 90A.
1.4.2 Duct System Construction and Installation: Referenced SMACNA Standards are the minimum acceptable quality.
1.4.3 Duct Sealing, Air Leakage Criteria, and Air Leakage Tests: Ducts shall be sealed as per duct sealing requirements of SMACNA HVAC Air Duct Leakage Test Manual for duct pressure classes shown on the drawings.
1.4.4 Duct accessories exposed to the air stream, such as dampers of all types (except smoke dampers) and access openings, shall be of the same material as the duct or provide at least the same level of corrosion resistance.

1.5 SUBMITTALS

- 1.5.1 Submit in accordance with the Mechanical General Requirements:
.1 Rectangular ducts:
.1 Schedules of duct systems, materials and selected SMACNA construction alternatives for joints, sealing, gage and reinforcement.
.2 Sealants and gaskets.
.3 Access doors.
1.5.2 Round and flat oval duct construction details:
.1 Manufacturer's details for duct fittings.
.2 Sealants and gaskets.
1.5.3 Access sections.
1.5.4 Volume dampers, back draft dampers.

- 1.5.5 Upper hanger attachments.
- 1.5.6 Fire dampers, fire doors, and smoke dampers with installation instructions.
- 1.5.7 Sound attenuators, including pressure drop and acoustic performance.
- 1.5.8 Flexible ducts and clamps, with manufacturer's installation instructions.
- 1.5.9 Flexible connections.
- 1.5.10 Instrument test fittings.
- 1.5.11 Details and design analysis of alternate or optional duct systems.

1.6 APPLICABLE PUBLICATIONS

- 1.6.1 The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- 1.6.2 Air Moving and Conditioning Association (AMCA):
 - .1 500D-98 Laboratory Method of Testing Dampers for Rating
 - .2 500L-99 Laboratory Method of Testing Louvers for Rating
- 1.6.3 American Society for Testing and Materials (ASTM):
 - .1 A653-01 Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy coated (Galvannealed) by the Hot-Dip process
 - .2 A1011-02 Standard Specification for Steel Sheet and Strip Hot rolled Carbon structural, High-Strength Low-Alloy and High Strength Low-Alloy with Improved Formability
 - .3 B209-01 Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate
 - .4 C1071-00 Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material)
 - .5 E84-01 Standard Test Method for Surface Burning Characteristics of Building Materials
- 1.6.4 National Fire Protection Association (NFPA):
 - .1 90A-99 Standard for the Installation of Air Conditioning and Ventilating Systems
 - .2 96-01 Ventilation Control and Fire Protection of Commercial Cooking Operations
- 1.6.5 Sheet Metal and Air Conditioning Contractors National Association (SMACNA):
 - .1 2nd Edition – 1995 HVAC Duct Construction Standards, Metal and Flexible
 - .2 1st Edition - 1985 HVAC Air Duct Leakage Test Manual
 - .3 6th Edition – 1992 Fibrous Glass Duct Construction Standards

PART 2 - PRODUCTS

2.1 DUCT MATERIALS

- 2.1.1 General: Except for systems specified otherwise on drawings, construct ducts, casings, and accessories of galvanized sheet steel, ASTM A527, coating G90.

2.2 GALVANIZED STEEL - RECTANGULAR DUCTWORK

- 2.2.1 G-90 coated galvanized of lock-forming grade conforming to ASTM A653 and A924 Standards. Minimum yield strength for steel sheet and reinforcements shall be 30,000 PSI (207 kPa).
- 2.2.2 Thickness: to ASHRAE and SMACNA.
- 2.2.3 Fabrication: to ASHRAE and SMACNA.
- 2.2.4 Joints: to ASHRAE and SMACNA or proprietary manufactured duct joint. Proprietary

- manufactured flanged duct joint shall be considered to be a class B seal.
- .1 Standard of Acceptance: Namasco Ductmate; Exanno Nexus.
- 2.2.5 Fittings
- .1 Fabrication: to SMACNA.
- .2 Radiused elbows: standard radius.
- .3 Square elbows: over 16" with double thickness vanes. Not to be used unless specifically shown on drawings.
- .4 Main supply duct branches with splitter damper. If splitter damper is not used, provide branch and main duct balancing damper.
- .5 Sub branch duct with 45° entry and balancing damper on branch.
- 2.2.6 Transitions:
- .1 Diverging: 20° maximum included angle.
- .2 Converging: 30° maximum included angle.
- 2.2.7 Offsets: radiussed elbows as indicated.
- 2.2.8 Obstruction deflectors: maintain full cross- sectional area. Maximum included angles as for transitions.

2.3 SEALING CLASSIFICATION

- .1 Sealing classification as follows:

Seal Class	Sealing Requirements	Applicable Static Pressure Construction Class	Allowable Leakage Rate
A	All traverse joints, longitudinal seams and duct wall penetrations	4" w.g. (1000 Pa) -4" w.g. (-1000 Pa)	1% of total system design at system operating pressure 4"(1000 Pa)
B	All transverse joints and longitudinal seams	Up to 3" w.g. (750 Pa) -3" w.g. (-750 Pa) and less	1% of total system design at 3" w.g. (750 Pa)
C	All transverse joints only	Up to 2" w.g. (500 Pa) -2" w.g. (500 Pa) and less	1.5% of total system design at 2" w.g. (500 Pa)
D	Not sealed	Up to 1" w.g. (250 Pa) -1" w.g. (-250 Pa) and less	5% of total system design at 1" w.g. (250 Pa)

2.4 PRESSURE CLASSIFICATIONS

- .1 Ductwork material shall be constructed in accordance with SMACNA ratings for the following pressure classifications. Seal classifications shall be in accordance with the following table:

Ductwork	Operating Pressure	Seal Classification	Remarks
All supply ductwork	Up to 2". w.g. (500 Pa)	B	

All return ductwork	Up to 1 " w.g. (250 Pa)	B	
All exhaust ductwork	Up to -1" w.g. (-250 Pa)	B	
All Other Ductwork	Up to 0.5" w.g. (125 Pa)	D	

2.5 SEALANT AND TAPE

- 2.5.1 Joint Sealing: Refer to SMACNA HVAC Duct Construction Standards, paragraph S1.9.
- 2.5.2 Sealant: Elastomeric compound, gun or brush grade, maximum 25 flame spread and 50 smoke developed (dry state) compounded specifically for sealing ductwork as recommended by the manufacturer. Generally provide liquid sealant, with or without compatible tape, for low clearance slip joints and heavy, permanently elastic, mastic type where clearances are larger. Oil base caulking and glazing compounds are not acceptable because they do not retain elasticity and bond.
- 2.5.3 Tape: Use only tape specifically designated by the sealant manufacturer and apply only over wet sealant. Pressure sensitive tape shall not be used on bare metal or on dry sealant.
- 2.5.4 Gaskets in Flanged Joints: Soft neoprene.
- 2.5.5 Approved factory made joints such as DUCTMATE SYSTEM may be used.

2.6 DUCT CONSTRUCTION AND INSTALLATION

- 2.6.1 Follow SMACNA HVAC Duct Construction Standards.
- 2.6.2 Where specified, all ductwork shall be made liquid tight with continuous external weld for all seams and joints. Provide neoprene gaskets at flanged connections. Where ducts are not self-draining back to the equipment, provide low point drain pocket with copper drainpipe to sanitary sewer. Provide access door in side of duct at drain pockets.
- 2.6.3 Casings and Plenums
- .1 Construct in accordance with SMACNA HVAC Duct Construction Standards Section 6, including curbs, access doors, pipe penetrations, eliminators and drain pans. Access doors shall be hollow metal, insulated, with latches and door pulls, 500 mm (20 inches) wide by 1200 - 1350 mm (48 54 inches) high. Provide view port in the doors where shown. Provide drain for outside air louver plenum. Outside air plenum shall have exterior insulation. Drain piping shall be routed to the nearest floor drain.
- 2.6.4 Volume Dampers
- .1 Opposed blade, multi louver type as detailed in SMACNA Standards. Refer to SMACNA Detail Figure 2-12 for Single Blade and Figure 2.13 for Multi-blade Volume Dampers.
- 2.6.5 At the onset of the project, the Sheet Metal Contractor shall submit a sketch demonstrating and confirming the ability to transition the ductwork from the unit to the size shown on the Drawing within the Roof Curb. Advise of any issues prior to fabrication.
- 2.6.6 For all down-discharge rooftop unit, any elbows or transitions within 60' of the unit shall be equipped with turning vanes.

2.7 HANGERS AND SUPPORTS

- 2.7.1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.
- 2.7.2 Hanger configuration: to ASHRAE and SMACNA. Maximum size duct supported by straphanger: 500mm.
- 2.7.3 Hangers: galvanized steel angle with black galvanized steel rods to ASHRAE and SMACNA following table:

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)
up to 750	25 x 25 x 3	6
751 to 1500	40 x 40 x 3	10
1501 to 2400	50 x 50 x 5	10
2401 and over	50 x 50 x 6	10

- 2.7.4 Upper hanger attachments:
- .1 For concrete: manufactured concrete inserts.
 - .1 Standard of Acceptance: Myatt fig 485.
 - .2 For concrete after concrete pour:
 - .1 Expanded concrete anchors shall be made of steel.
 - .2 Powder actuated fasteners shall only be utilized for slabs that are thicker than 100 mm (4") and shall not be utilized in lightweight aggregate concretes.
 - .3 Holes for expanding fasteners shall be drilled either by a carbide bit or by the teeth on the fastener itself. Expansion shield shall be "set" by driving it into the hole and expanding it with a conical plug.
- 2.7.3 For steel joist: manufactured joist clamp or steel plate washer.
- .1 Standard of Acceptance: Grinnell fig 61 or 86 for joist clamps.
- 2.7.4 For steel beams: manufactured beam clamps:
- .1 Standard of Acceptance: Grinnell fig. 60
- 2.7.5 For round ductwork the duct shall be supported as follows:
- .1 For duct dimensions 900 mm (36") single hangers are acceptable.
 - .2 For duct dimensions over 900 mm (36") hanger rods shall be provided on both sides of the duct.
 - .3 Minimum hanger sizes shall be in accordance with table 4-2 of SMACNA.
- 2.7.6 Loading on trapeze bars shall be in accordance with Table 4-3 of SMACNA.

2.8 DUCT ACCESS DOORS, PANELS AND SECTIONS

- 2.8.1 Provide access doors, sized and located for maintenance work, upstream and downstream of:
- .1 Each duct mounted coil.
 - .2 Each fire damper (for link service), smoke damper and automatic control damper.

- .3 Each duct mounted smoke detector.
- 2.8.2 Openings shall be as large as feasible in small ducts, 300 mm by 300 mm (12 inch by 12inch) minimum where possible. Access sections in insulated ducts shall be double wall, insulated. Transparent shatterproof covers are preferred for un insulated ducts.
- 2.8.3 For rectangular ducts: Refer to SMACNA HVAC Duct Construction Standards (Figure 2 12).
- 2.8.4 For round and flat oval duct: Refer to SMACNA HVAC duct Construction Standards (Figure2-11).

2.9 FIRE DAMPERS

- 2.9.1 Galvanized steel, interlocking blade type, UL listing and label, 1 1/2 hour rating, 70 degrees C (160 degrees F) fusible line, 100 percent free opening with no part of the blade stack or damper frame in the air stream.
- 2.9.2 Fire dampers in wet air exhaust shall be of stainless steel construction, all others may be galvanized steel.
- 2.9.3 Provide sleeves and mounting angles, minimum 1.9 mm (14 gage), required to provide installation equivalent to the damper manufacturer's UL test installation.
- 2.9.4 Submit manufacturer's installation instructions conforming to ULC rating test.
- 2.9.5 Combination fire and smoke dampers: Multi louver or curtain type units meeting all requirements of both dampers shall be used where shown and may be used at the Contractor's option where applicable.
- 2.9.6 Standard of Acceptance: Nailor, Ruskin

2.10 INSTALLATION

- 2.11.1 Fabricate and install ductwork and accessories in accordance with referenced SMACNA Standards:
- 2.11.2 Drawings show the general layout of ductwork and accessories but do not show all required fittings and offsets that may be necessary to connect ducts to equipment, boxes, diffusers, grilles, etc., and to coordinate with other trades. Fabricate ductwork based on field measurements. Provide all necessary fittings and offsets at no additional cost to the Owner. Coordinate with other trades for space available and relative location of HVAC equipment and accessories on ceiling grid. Duct sizes on the drawings are inside dimensions which shall be altered by Contractor to other dimensions with the same air handling characteristics where necessary to avoid interferences and clearance difficulties.
- 2.11.3 Provide duct transitions, offsets and connections to dampers, coils, and other equipment in accordance with SMACNA Standards, Section II. Provide streamliner, when an obstruction cannot be avoided and must be taken in by a duct. Repair galvanized areas with galvanizing repair compound.
- 2.11.4 Supply and install volume control dampers on all branch take-offs (applicable to supply, return and exhaust ductwork) whether shown on the drawing or not.
- 2.11.5 Provide bolted construction and tie rod reinforcement in accordance with SMACNA Standards.
- 2.11.6 Construct casings, eliminators, and pipe penetrations in accordance with SMACNA Standards, Chapter 6. Design casing access doors to swing against air pressure so that pressure helps to maintain a tight seal.
- 2.11.7 Install duct hangers and supports in accordance with SMACNA Standards, Chapter 4.

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- 2.11.8 Install fire dampers in accordance with the manufacturer's instructions to conform to the installation used for the rating test.
- 2.11.9 Seal openings around duct penetrations of floors and fire rated partitions with fire stop material as required by NFPA 90A.
- 2.11.10 Where diffusers, registers and grilles cannot be installed to avoid seeing inside the duct, paint the inside of the duct with flat black paint to reduce visibility.
- 2.11.11 Control Damper Installation:
- .1 Provide necessary blank off plates required to install dampers that are smaller than duct size. Provide necessary transitions required to install dampers larger than duct size.
 - .2 Assemble multiple sections dampers with required interconnecting linkage and extend required number of shafts through duct for external mounting of damper motors.
 - .3 Provide necessary sheet metal baffle plates to eliminate stratification and provide air volumes specified. Locate baffles by experimentation, and affix and seal permanently in place, only after stratification problem has been eliminated.
 - .4 Install all damper control/adjustment devices on stand-offs to allow complete coverage of insulation.
- 2.11.12 Air Flow Measuring Devices (AFMD): Install units with minimum straight run distances, upstream and downstream as recommended by the manufacturer.
- 2.11.13 Protection and Cleaning: Adequately protect equipment and materials against physical damage. Place equipment in first class operating condition, or return to source of supply for repair or replacement, as determined by the Consultant. Protect equipment and ducts during construction against entry of foreign matter to the inside and clean both inside and outside before operation and painting. When new ducts are connected to existing ductwork, clean both new and existing ductwork by mopping and vacuum cleaning inside and outside before operation.
- 2.11 DUCT LEAKAGE TESTS AND REPAIR**
- 2.12.1 Ductwork leak test shall be performed for the entire air distribution supply and return system including fans, coils and filter section designated as static pressure class 750 Pa (3 inch W.G.) and above.
- 2.12.2 All supply ductwork less than 500 Pa (2 inch W.G) shall also be tested to the air distribution equipment or terminal device (where applicable).
- 2.12.3 Test procedure, apparatus and report shall conform to SMACNA Leakage Test manual. The maximum leakage rate allowed is 4 percent of the design air flow rate.
- 2.12.4 All ductwork shall be leak tested first before enclosed in a shaft or covered in other inaccessible areas.
- 2.12.5 All tests shall be performed in the presence of the Consultant and the TAB agency. The Test and Balance agency shall measure and record duct leakage and report to the Consultant and identify leakage source with excessive leakage.
- 2.12.6 If any portion of the duct system tested fails to meet the permissible leakage level, the Contractor shall rectify sealing of ductwork to bring it into compliance and shall retest it until acceptable leakage is demonstrated to the Consultant.
- 2.12.7 All tests and necessary repairs shall be completed prior to insulation or concealment of ductwork.
- 2.12.8 Make sure all openings used for testing flow and temperatures by TAB Contractor are sealed properly.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

- .1 This section of the specification shall be read in conjunction with and be governed by the requirements of Section 20 05 11 Mechanical General Requirements.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with Section 20 05 11 Mechanical General Requirements.

PART 2 PRODUCTS

2.1 SPLITTER DAMPER

- .1 Of same material as duct but one sheet metal thickness heavier.
- .2 Single thickness construction.
- .3 Size and configuration to recommendations of SMACNA.
- .4 Control rod with locking device.
- .5 Bend end of rod to prevent end from entering duct.
- .6 Pivot: piano hinge.

2.2 SINGLE BLADE DAMPER

- .1 Of same material as duct. V-groove stiffened.
- .2 Size and configuration to recommendations of SMACNA, except maximum height 10"
- .3 Locking quadrant.
- .4 Inside and outside end bearings.

2.3 MULTI-BLADE DAMPER

- .1 Factory manufactured of material compatible with duct.
- .2 Opposed blade: configuration to recommendations of SMACNA.
- .3 Maximum blade height: 4"
- .4 Bearings: pin in bronze bushings.
- .5 Linkage: shaft extension with locking quadrant.
- .6 Channel frame complete with angle stop.

2.4 DIVERTING DAMPER

- .1 Adjustable, curved vanes, mounted in supporting frame.
- .2 All aluminum construction.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install where indicated on the drawings and identified herein. For ducts concealed behind plaster or drywall ceilings, provide dampers where specifically shown on the drawings.
- .2 Provide splitter damper at every main branch take-off from main duct.
- .3 Provide balancing damper on all sub-branch ducts.
- .4 Install in accordance with recommendations of SMACNA.
- .5 Provide balancing dampers on all return air ducts connected to air handling units.

END OF SECTION

PART 1 **GENERAL**

1.1 **GENERAL**

- .1 This section of the Specification shall be read in conjunction with and shall be governed by the requirements outlined in Section 20 05 11 Mechanical General Requirements.

1.2 **REFERENCE STANDARDS**

- .1 Comply with requirements of:
 - 1. ULC S110M - Fire Tests for Air Ducts
 - 2. UL 181-2008 - Standards for Safety, Factory Made Air Ducts and Air Connectors
 - 3. NFPA 90A-2009 - Standard for the Installation of Air Conditioning and Ventilating Systems
 - 4. NFPA 90B-2009 - Standard for the Installation of Warm Air Heating and Air Conditioning Systems
 - 5. SMACNA – 2005 - HVAC Duct Construction Standards - Second Edition

1.3 **SUBMITTALS**

- .1 Submit shop drawings in accordance with Section 20 05 11 Mechanical General Requirements.

1.4 **CERTIFICATION OF RATINGS**

- .1 Catalogue or published ratings shall be those obtained from tests carried out by the manufacturer or Independent Testing Agency signifying adherence to Codes and Standards.
- .2 Product Requirements.

PART 2 **PRODUCTS**

2.1 **GENERAL**

- .1 Factory fabricated.
- .2 Pressure drop coefficients listed below are based on sheet metal duct pressure drop coefficient of 1.00.
- .3 Fire retardant type insulation materials, coverings and adhesives with maximum flame spread rating of 25 and maximum smoke developed rating of 50 when tested in accordance with CAN/ULC-S102 and NFPA 255-2006. Materials tested in accordance with ASTM C411-05 shall not flame, smoulder, glow or smoke at temperature to which exposed in

service. Flexible duct system shall meet OBC requirements for smoke and flame spread for return air plenums.

2.2 METALLIC-INSULATED

.1 Spiral wound flexible aluminum with 1" (25 mm) external insulation.

.2 Performance:

- Temperature range: -40°F to 250°F (-40°C to 120°C)
- Minimum bend radius: 1.5 x diameter
- Vinyl sleeve outer covering
- Maximum working pressure: 12" (3000 Pa)
- Class 1 duct material

PART 3 EXECUTION

3.1 DUCT INSTALLATION

.1 Install where indicated and in accordance with preferred method of SMACNA and the following:

1. Connections:

a. Duct Sizes 300 mm (12") and Under:

- i. Provide a minimum of three (3) #8 sheet metal screws equally spaced to hold the flexible duct.

b. Duct sizes above 300 mm (12"):

- i. Provide a minimum of five (5) #8 sheet metal screws equally spaced to hold the flexible duct.

c. Screws shall be located at least 1/2" (12 mm) from the end of the duct.

d. The collar to which the flexible duct is attached shall be a minimum 2" (50 mm) in length.

e. Cover entire joint with tape and seal as specified in Section 15801.

2. Supports:

a. Support shall be in accordance with SMACNA.

b. The maximum amount of sag for flexible duct shall not exceed 1/2" (12 mm) per foot. Provide additional supports as required.

3. Length:

- a. Maximum length of flexible duct: 1500 mm (5 ft.).
- b. Minimum length of flexible duct connecting to light fixture troffers or ceiling diffusers shall be 72" (1800 mm).

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

- .1 This section of the specification shall be read in conjunction with and be governed by the requirements of Section 20 05 11 Mechanical General Requirements.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 20 05 11 Mechanical General Requirements.
- .2 Product data to include fan curves and sound rating data.

1.3 OPERATION AND MAINTENANCE DATA

- .1 Provide operation and maintenance data for incorporation into maintenance manual specified in Section 20 05 11.

1.4 MANUFACTURED ITEMS

- .1 Catalogued or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards in force.

PART 2 PRODUCTS

2.1 FANS GENERAL

- .1 Capacity, static pressure, revolutions per minute, power, model, size and sound power levels: as indicated on the schedules.
- .2 Sound ratings: comply with AMCA (Air Moving and Conditioning Association) 301-76 tested to AMCA 300-67. Sound power levels shall not exceed those of the fan selected on the Schedule.
- .3 The fans shall bear the AMCA Certified Ratings Seal for air performance.
- .4 Fans: statically and dynamically balanced, constructed in conformity with AMCA 99-76.
- .5 Ratings: based on tests performed in accordance with AMCA 210-74, and ASHRAE 51-75.
- .6 Accessories and hardware: gravity back-draft dampers, wall sleeves and grilles (where applicable), insect screens.
- .7 Factory primed before assembly in colour standard to manufacturer.

- .8 Scroll drains: where indicated.

2.2 BELT DRIVE CENTRIFUGAL ROOF EXHAUST FANS

- .1 Roof exhaust fans shall be centrifugal belt drive type. The fan wheel shall be centrifugal backward inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced. The fan housing shall consist of the motor cover, shroud, curb cap and lower windband, and shall be constructed of heavy-gauge aluminum. The housing shall have a rigid internal support structure and leakproof design. The fan shroud shall be one piece with a rolled bead for extra strength which directs exhaust air downward. The lower windband shall be one piece with formed edges for added strength and the curb cap shall include prepunched mounting holes to ensure correct attachment.
- .2 The fan shall have sleeve bearing motors, carefully matched to the fan load, and furnished at specified voltage, phase and enclosure. Motors shall be mounted on true vibration isolators, out of the airstream. Fresh air for motor cooling shall be drawn into the motor compartment from an area free of discharge contaminants. Motors shall be readily accessible for maintenance. True vibration isolators shall be double-studded with no metal-to-metal contact. Each vibration isolator shall be sized to match the weight of each fan.
- .3 A disconnect switch shall be factory installed and wired from the fan motor to a junction box installed within the motor compartment.
- .4 A fan conduit chase shall be provided through the curb cap to the motor compartment for ease of installation.
- .5 All fans shall bear the AMCA Certified Ratings Seal for sound and air performance.
- .6 Each fan shall bear a permanently affixed manufacturer's nameplate containing the model number and individual serial number for future identification.
- .7 Standard of acceptance: Greenheck Model G, Penn, Carnes

2.3 CEILING MOUNTED WASHROOM/UTILITY EXHAUST FANS

- .1 Ceiling mounted exhaust fans shall be of the centrifugal direct drive type. The fan housing shall be constructed of steel. The plastic duct collar shall be a tapered sleeve for ease of connection to 3 in. and 4 in. round ductwork and shall include a backdraft damper.
- .2 The grille shall be constructed of non-yellowing high strength polymer and attached to the housing with torsion springs. The wheels shall be constructed of high strength polymer. The access for wiring shall be external. The motor disconnect shall be internal and of the plug in type.

- .3 All fans shall bear the AMCA Certified Ratings Seals for sound and air performance and shall be U.L. Listed.
- .4 Standard of Acceptance: Greenheck model SP, Penn, Jenn.

2.4 CEILING MOUNTED IN-LINE EXHAUST FANS

- .1 Duct-mounted exhaust or return air fans shall be of the centrifugal direct drive type. The fan housing shall be constructed of heavy-gauge galvanized steel. The housing interior shall be lined with ½" (13mm) acoustical insulation. The outlet duct collar shall include an aluminum backdraft damper and shall be adaptable for horizontal or vertical discharge. The access for wiring shall be external. The motor disconnect shall be internal and of the plug-in type.
- .2 The motor shall be mounted on vibration isolators. The fan wheel shall be of the forward-curved centrifugal type and dynamically balanced.
- .3 All fans shall bear the AMCA Certified Ratings Seals for sound and air performance and shall be U.L. Listed.
- .4 Standard of Acceptance: Greenheck model SQ, Carnes, Penn, Twin City, Loren Cook

2.5 DRYER BOOSTER FAN

- .1 Dryer booster fan shall be capable of maintaining an air velocity of 6 meters per second (1200 fpm) with an equivalent duct length of 40 meters (130 feet) of 100mm (4 inch) rigid steel duct. The dryer booster fan shall be capable of exhausting air up to 75°C. Unit shall have a five year warranty. Motor shall be a permanently lubricated, enclosed, external rotor design. The blower wheel shall be a self cleaning backward curved impeller design. The dryer booster fan shall have a galvanized steel housing with powder coat finish. A 15 meter (50 foot) cable shall be provided to connect the remote mount indicator panel to the dryer booster fan. Unit shall be provided with a 1.7 meters (5-1/2 foot) long 120 Vac power cord. Dryer booster fan is to be provided with inlet and outlet flanges for connection to 100mm (4") duct. Quick disconnect duct clamp to be provided. Galvanized mounting bracket and hardware are to be provided. Unit shall be provided with 450mm (18") of pressure sensing tubing with mounting grommet.
- .2 Standard of acceptance: Reversomatic, Fantech Model DBF4XLT, Greenheck, Carnes, Penn

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install fans as indicated, complete with resilient mountings. For all roof-mounted fans, manufacturer shall provide the matching curb.

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- .2 Provide a flexible connection on fans connections to ductwork. Each flexible connection shall be installed with at least 3" of slack across a clear metal to metal gap of 4" Each flexible connection shall consist of a minimum of 6" of fabric. Ensure metal bands of connectors are parallel with minimum 3" flex between ductwork and fan during running.
 - .3 Install fan restraining snubbers as indicated. Flexible connections shall not be in tension during running. Provide all sheaves and belts required for final air balance.
 - .4 The exact location of each fan is to be site approved by the Engineer prior to installation; seek the Consultant's approval and site review prior to commencing install. Any install completed without the Consultant's approval will require the Contractor to move the exhaust fan as directed at no extra cost to the Contract.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

- .1 This section of the specification shall be read in conjunction with and be governed by the requirements of Section 20 05 11 Mechanical General Requirements.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 20 05 11 Mechanical General Requirements.

1.3 SAMPLES

- .1 Submit samples in accordance with Section 20 05 11 Mechanical General Requirements.
- .2 Submit samples for the following:
 - a. None

1.4 MANUFACTURED ITEMS

- .1 Grilles, registers and diffusers shall be product of one manufacturer for generic type (i.e. grilles and registers by one, diffusers by one, or same).

1.5 CERTIFICATION OF RATINGS

- .1 Catalogued or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards.

PART 2 PRODUCTS

2.1 GENERAL

- .1 Provide standard product to meet capacity, throw, noise level, throat and outlet velocity.
- .2 Where grilles, registers and diffusers penetrate fire walls and fire partitions, provide approved steel sleeve secured to structure in accordance with NFPA 90A-1993 and required fire damper.
- .3 Frames:
 - a. Steel: primed cold rolled steel with exposed welded joints and mitred corners.
 - b. Aluminum: extruded satin finish with mechanical fasteners and mitred corners.
 - c. Provide full perimeter gaskets.
 - d. Provide plaster frames as plaster stops where set into plaster or gypsum board.
 - e. Provide concealed fasteners and balancing operators in all finished areas.

- f. Final finish to be selected by Architect from standard manufacturer finishes at shop drawing stage.
 - g. Style, frame, and installation details as indicated.
- .4 Sizes and capacities: as indicated in the schedule.
- .5 Standard of Acceptance: E.H. Price, Titus, Tittley Baily, Krugger

2.2 SQUARE PLAQUE DIFFUSERS

- .1 Square type 600 x 600 (24" x 24"), having fixed pattern, plaque-type, and volume control dampers with flow straightening devices and blank-off quadrants. Diffuser to be finished in off-white baked enamel and to be suitable for the ceiling in which it is installed.
- .2 Square type 300 x 300 (12" x 12"), having fixed pattern, and volume control dampers with flow straightening devices and blank-off quadrants. Diffuser to be finished in off-white baked enamel and to be suitable for the ceiling in which it is installed.
- .3 Standard of Acceptance: E. H. Price Model SPD, Titus., Tittley Baily, Krugger

2.3 LOUVERED RETURN GRILLES

- .1 Supply and install return grilles of the sizes and mounting types indicated on the plans and outlet schedule. Grilles shall be 0 degree deflection fixed louver type with blades spaced 1/2" (13) on center. The outlet shall have heavy extruded aluminum border and blades held in place with aluminum mandrel tubes not to exceed 12" (305) on center. Blades shall run parallel to the long dimension of the grille. The grille shall be finished as per the architectural requirements.
- .2 Standard of Acceptance: E H price 635DAL series, Tittley Baily, Krugger.

2.4 EGG-GRATE EXHAUST GRILLES

- .1 Furnish and install exhaust registers of the sizes and mounting types indicated on the plans and outlet schedule. Registers shall be of aluminum construction, consisting of aluminum 1/2" x 1/2" x 1/2" (13 x 13 x 13) grid (egg crate core) and an extruded aluminum border. The integral volume control damper (where required) shall be of the opposed blade type and shall be constructed of heavy gauge cold rolled steel. The damper shall be operable from the register face. The damper shall be coated steel. The grille shall be finished as per the architectural requirements.
- .2 Standard of Acceptance: E H Price model 80, Titus, Tittley Baily, Krugger

2.5 DOUBLE DEFLECTION SUPPLY GRILLES - ADJUSTABLE BLADES

- .1 Furnish and install aluminum supply registers of the sizes and mounting types indicated on the drawings. Registers shall be double deflection type with two sets of fully

adjustable deflection blades spaced 3/4" (19) on center. The front set of blades shall run parallel to the long dimension of the register. The integral volume control damper shall be of the opposed blade type and shall be constructed of cold rolled steel. The damper shall be operable from the register face. The grille shall be finished in a color selected by the Architect at shop drawings stage.

- .2 Standard of acceptance: E.H.Price model 610DAL, Titus, Tittley Baily, Krugger

2.6 TRANSFER GRILLE TYPES

- .1 Aluminum construction, 32 mm flat border, sightproof appearance, off-white baked enamel finish.
- .2 Standard of Acceptance: E.H.Price Model ATG1, Titus.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install in accordance with manufacturers instructions.
- .2 All diffusers and grilles in finished areas to have concealed mounting. In unfinished areas and where grilles or diffusers are to be installed in ductwork, install with bulkheads tight to either side. Site measure for exact fit.
- .3 Final locations of diffusers and grilles to be in accordance with details of Architect's reflected ceiling plan. Coordinate with lighting fixtures installation by Div. 16.
- .4 Install and adjust air registers to provide noiseless and draftless distribution. Primary air balance to be done at duct dampers with final adjustment only at diffusers and grilles.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

- .1 This section of the specification shall be read in conjunction with and be governed by the requirements of Section 20 05 11 Mechanical General Requirements.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with Section 20 05 11 Mechanical General Requirements.
- .2 Indicate the following: Louvers, Style and Performance.

1.3 CERTIFICATE OF RATINGS

- .1 Catalogued or published ratings shall be those obtained from tests carried out by the Manufacturer or those ordered by him from an independent testing agency signifying adherence to codes and standards.

PART 2 PRODUCTS

2.1 STATIONARY LOUVERS

- .1 Louvers shall be by Mechanical Contractor.
- .2 Frame: 102 mm deep, 6063T5 extruded aluminum. 3.2 mm nominal wall thickness. Downspouts and caulking surfaces included.
- .3 Blades: 6063T5 extruded aluminum. 3.2 mm nominal wall thickness. Drainable blades are positioned at 45 degree angle and spaced approximately 102 mm center to center.
- .4 Screen: 19 mm X 1.3 mm expanded, flattened aluminum bird screen in removable frame. Screen adds approximately 13 mm to louver depth. Also provide insect screen.
- .5 Finish: Factory-applied Kynar 500 or equivalent, colour, selected at shop drawing stage.
- .6 Features:
 - a. Published performance ratings based on testing in accordance with AMCA Publication 511.
 - b. High performance frame system with drainable head collects and removes water to provide excellent water penetration performance.
 - c. Drain gutter in each blade minimizes water cascade between blades.
 - d. All aluminum construction for low maintenance and high resistance to corrosion.
 - e. All welded construction.

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- .7 Performance:
 - a. .1 52% minimum free area.
 - b. .2 Beginning point of water penetration at 0.01 oz./sq. ft. is 1075 fpm
 - c. .3 Pressure drop: 0.15" w.g. at 870 fpm (Intake) and 900 fpm (exhaust).
 - .8 Size of louvers shall be coordinated with the brickwork pattern. Minimum louver size shall be 305mm x 305 mm.
 - .9 Standard of Acceptance: E.H.Price, Ruskin.

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install in accordance with manufacturers recommendations and in accordance with recommendations of SMACNA.
- .2 Reinforce and brace air vents, intakes and gooseneck hoods for wind speed in accordance with NBC for location.
- .3 Blank off and insulate with sheet metal, 2" of insulation and sheet metal, all unused portions of louvres.

END OF SECTION

CONTENTS

<u>SECTION</u>	<u>TITLE</u>
26 05 00	Common Work Results for Electrical
26 05 01	Basic Materials & Methods
26 05 20	Electrical Panelboards
26 05 73	Short Circuit, Coordination & Arc Flash Study
26 50 00	Lighting Systems
26 52 13	Emergency Lighting Systems
26 52 15	Lighting Controls

END OF SECTION

1.1 REFERENCES

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

1.2 APPLICATION

- .1 This Section applies to and is a part of all Sections of the Electrical Contractor.

1.3 WORK INCLUDED

- .1 Sections of these Electrical Specifications are not intended to delegate functions nor to delegate work and supply to any specific trade and the work shall include all labour, materials, equipment and tools required for a complete and working installation as described.

1.4 INTENT

- .1 Mention herein or indication on drawings of articles, materials, operations or methods requires: supply of each item mentioned or indicated, of quality, or subject to qualifications noted; installation according to conditions stated and; performance of each operation prescribed with furnishing of necessary labour, equipment and incidentals for Electrical Trade, The Electrical Contractor.
- .2 Supplementary to definitions established are:
 - 1. “Concealed” means hidden from normal sign in furred spaces, shafts, ceiling spaces, walls, or partitions. Wiring, raceways, and electrical boxes for all new or relocated devices shall be concealed.
 - 2. “Exposed” means work normally visible, including work in equipment rooms, tunnels, and similar spaces.
 - 3. “Provide” (and all tenses) means supply and install for a complete, operational, and code-compliant system, including all devices/equipment as specified complete with wiring, raceways, electrical boxes, and all other accessories or components required for a complete, operational, and code-compliant installation.
 - 4. “Install” (and all tenses) means secure in position, connect as specified, test, and verify.
 - 5. “Supply” means to supply all devices/equipment to the responsible trade.
 - 6. “Remove” means to isolate, disconnect, disassemble, remove, and dispose of all devices, equipment, wiring, raceways, and connections to other equipment. Patch and make good all surfaces affected by the removal. Remove and dispose of all redundant material off site

- .3 Where used, wordings such as "approved, to approval, as directed, permitted, permission, accepted, acceptance", shall mean: approved, directed, permitted, accepted, by authorized representative of the Owner.

- .4 Equipment and installation provided under this Division shall conform to applicable standards and regulations of the following organizations:

Canadian Standards Association (CSA)
Underwriter's Laboratories of Canada (ULC)
Ontario Electrical Safety Code (OESC)
Electrical Safety Authority (ESA)
Ontario Building Code (OBC)

1.5 WORKMANSHIP

- .1 Workmanship and method of installation shall conform to best standards and practice. Where required by local or other By-Laws and Regulations, tradesmen shall be licensed in their trade.

1.6 TEMPORARY & TRIAL USAGE

- .1 Temporary or trial usage of any equipment or materials shall not be construed as evidence of acceptance of same and no claim for damage shall be made for injury to or breaking of any part of such work which may be so used..

1.7 BY-LAWS & REGULATIONS

- .1 Work shall conform with latest rules, regulations and definitions of Canadian Electrical Code and applicable Municipal and Provincial Codes and Regulations, and with requirements of other authorities having jurisdiction in the area where work is to be performed. Minor changes required by an authority having jurisdiction shall be carried out without change to the Contract amount. Standards established by drawings and specifications shall not be reduced by applicable codes or regulations.

1.8 PERMITS & FEES

- .1 File Contract Drawings with proper authorities and obtain their approval of installation and permits for same before proceeding with work. Prepare and submit necessary detailed shop drawings as required by Authorities.
- .2 Pay all fees in connection with examination of drawings, permits, inspections and final certificate of approval.
- .3 All ESA Costs shall be included in the Electrical Contractor's Base Tender Price.

1.9 CERTIFICATES

- .1 Furnish necessary certificates as evidence that work installed conforms with laws and

regulations of authorities having jurisdiction.

1.10 GUARANTEE - WARRANTY

- .1 All material and labour provided as a part of the project shall be warrantied for a period of twelve (12) months starting from the Date of Substantial Completion for the Project, except for Fire Alarm Work which shall be warrantied for eighteen (18) months starting from the Date of Substantial Completion for the Project

1.11 SPECIFICATIONS, DRAWINGS & JOB CONDITIONS

- .1 Electrical Drawings do not show structural and related details. Take information involving accurate measurement of building from building drawings, or at building. Make, without additional charge, any necessary changes or additions to electrical work or equipment locations to accommodate structural conditions. Equipment locations may be altered by Engineer without extra charge provided change is made before installation and does not necessitate major additional material.
- .2 Examine site and local conditions. Examine carefully all drawings and complete specifications to ensure that work can be satisfactorily carried out as shown. Before commencing work, examine the work of other Sections and report at once any defect or interference affecting the work, its completion or warranty. No allowance will be made later for any expense incurred through failure to make these examinations or to report any such discrepancies in writing.
- .3 Relocate equipment and/or material installed but not coordinated with work of other Sections as directed, without extra charge.
- .4 Furnish "built-in" items in ample time and give necessary information and assistance in connection with building-in of same. Notify Section concerned in writing of size and location of recesses, openings and chases at least 48 hours before walls are erected, floors poured and similar work.

1.12 TENDER & SUBSTITUTIONS

- .1 The Base Tender Price shall be submitted based on the Base Specified Manufacturer as listed on the Drawings and/or Specifications. Any manufacturers listed as "equal" or "equivalent" may be proposed as an alternate to the Base Specified Manufacturer prior to Contract Execution with written approval only by the Consultant and Owner. Any changes to the Manufacturer of any materials/labour after execution of the Project Contract is not permitted.

1.13 INTERFERENCE DRAWINGS

- .1 Prepare and submit complete interference drawings (in PDF format) to avoid and/or resolve conflict of trades and to coordinate the work of the Electrical Division with that of all other Trades. Submission of interference drawings shall be done no later than 20 business days after the Project has officially begun. The cost of producing the

interference drawings shall be included for in the Base Tender Price.

- .2 Interference drawings shall indicate exact arrangements, of all areas and equipment to scale with dimensions.
- .3 Cooperate with work of the Mechanical Contractor and provide data requested and as required in the preparation of interference drawings for the work of The Mechanical Contractor.
- .4 Make interference drawings in conjunction with all parties and trades concerned showing sleeves and openings and passage of electrical work through building structure. Drawings shall also show inserts, special hangers and other features to indicate routing through confined spaces, installation of equipment in such areas.
- .5 Provide detail drawings, fully dimensioned, of equipment in Boiler and Mechanical Equipment Rooms, Electrical Rooms, Fan Rooms, etc. Base equipment drawings on approved Shop Drawings and include, but do not necessarily limit to, details pertaining to access, clearances, sleeves, connections, etc.
- .6 Provide detail drawings of pulling pits, equipment bases, anchors, floor and roof curbs, etc., pertaining to Electrical work.

1.14 SHOP DRAWING MATERIAL & LISTS

- .1 Prepare and submit shop drawings and lists of materials for review in accordance with Architectural Sections. Make submittals of more than two pages in booklet form. Individual and loose drawings will not be accepted for review.
- .2 Prior to equipment fabrication, delivery or installation, submit complete lists of materials proposed, indicating manufacturer, catalogue numbers and complete performance data.
- .3 Review of Shop Drawings by Consultant is for sole purpose of ascertaining conformance with general design concept. This review shall not mean that Architect and/or Engineer approves detail design inherent in Shop Drawings, responsibility for which shall remain with Contractor and such review shall not relieve Contractor of his responsibility for meeting all requirements of Contract Documents. Contractor is responsible for dimensions to be confirmed and correlated at site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of work with all trades.
- .4 Shop drawings transmitted via facsimile (fax) machines, or copies of same, will not be accepted for review.

1.15 RECORD DOCUMENTS

- .1 Conform to General Requirements. Maintain at least two (2) sets of documents and clearly mark in RED on same as job progresses, changes and deviations from work shown so that on completion Owner will have records of exact location of ducts and

equipment and record of material and equipment changes.

- .2 Record all homerun conduits, junction boxes for complete lighting, power and systems on As-Built Drawings.
- .3 Contractor shall obtain clean set of prints from Consultant at start of Contract Work and shall keep these prints up-to-date at jobsite, accurately recording all changes made on project and locating all services, equipment, etc. which may have been shown only diagrammatically on Contract Documents.
- .4 Contractor shall ensure that as-built information is accurately recorded and shall check same. As-Built drawings shall be reviewed with Consultant at each jobsite meeting.
- .5 Upon completion of Contract Work, prior to Substantial Performance inspection and after final review with Consultants, Contractor shall neatly transfer recorded information and make final As-Built submission to Consultant in the following form:
 - One (1) set of clean, legible prints.
 - Updated AutoCad 2004 drawings. The cost of transferring all redline markups from the PDFs to the CAD files is the responsibility and cost of the Contractor.
- .6 Consultants shall be responsible for reviewing As-Built information provided by Contractor. Revise drawings to suit any comments until acceptable for submission to the Owner.
- .7 The Contractor is responsible for incorporating all information from Project Addenda, Contemplated Changes Notices, Site Instructions, Change Directives and as-found existing conditions into CAD format at no extra cost to the Contract.

1.16 JOB SITE WORK SHOP AND STORAGE

- .1 Supply job site office, workshop, tools, scaffolds and material storage as required to complete the work of this Division. Location of temporary buildings, use of space on site or within building shall be to later direction.

1.17 PROTECTION

- .1 Securely plug or cap open ends of electrical raceways or equipment to prevent entry of dirt, dust, debris, water, snow or ice. Clean all equipment inside and outside before testing.
- .2 Equipment stored on site shall be protected from weather and kept dry and clean at all times. Take care to avoid corrosion of metal parts.
- .3 Protect work installed from damage. Secure all unfinished or loose work to prevent movement.

1.18 INSTRUCTIONS TO OPERATOR

- .1 Instruct Building Operators in repair, maintenance and operation of Electrical Systems and associated equipment.
- .2 Supply three (3) full Operation and Maintenance Instructions each in stiff cover, three-ring binder suitably indexed, separated and labeled. Operate each item of equipment in presence of Operators to ensure understanding of working parts and function of each item of equipment. Supply one complete set of "Reviewed" Shop Drawings in separate hard cover binder suitably separated and labelled for Owner's use.
- .3 Operation and maintenance manuals shall be carefully prepared in co-operation with equipment manufacturers and include miscellaneous parts necessary for proper, efficient operation of all equipment.
- .4 Manuals shall also include spare parts list for each type of equipment, component, control and device installed together with manufacturer's name and address so such items can be suitably identified and purchased. Include list of recommended spares.

1.19 CLEANING, LUBRICATION AND ADJUSTMENT

- .1 Immediately prior to completion of work:
 1. Remove all dust, dirt and other foreign matter from internal surfaces of enclosed electrical apparatus and equipment.
 2. Remove all temporary protective coverings and coatings, temporary labels.
 3. Clean, repair, lubricate and adjust all mechanism and moveable parts of apparatus and equipment leaving it in new condition and operating properly.
 4. Balance demand loads for service and distribution feeders within 5 percent upon completion of work and after the building is in full operation.

1.20 INSPECTION AND TESTING

- .1 Systems, equipment, and all major items of material shall be tested to the satisfaction of the Architect, and as required to establish compliance with plans and specifications, and with the requirements for the Supply and Inspection Authorities.
- .2 Faulty and defective equipment shall be replaced with new materials. Conductors which are found to be shorted or grounded, or to have less than proper insulation resistance, shall be replaced with new conductors.
- .3 Tests shall include but are not limited to the following:
 1. Test of secondary voltage cables shall include megger tests to establish proper insulation resistance, and phase-to-ground resistance of cables.

2. Proper functioning of all systems.
3. Polarity tests - to establish proper polarity connections to all sockets and receptacles.
4. Test of system neutral to establish proper insulation resistance and isolation of neutral from ground except for required ground connection at Service.

1.21 CERTIFICATE OF TESTS

- .1 When work is complete submit three copies of test results and a signed statement listing all tests that have been performed as required by specifications and manufacturer's instructions.

1.22 COMPLETION

- .1 Provide receipts from designated representative of Owner for portable and loose materials (e.g. spare fuses, fixture re-lamping equipment and the like).
- .2 Provide copy of final inspection certificate from Electrical Inspection Authority and fire alarm verification report.
- .3 Provide manufacturers corrected "as built" shop drawings for all major electrical items and systems, including all shop drawings returned for modifications.

1.23 ALTERATIONS TO EXISTING BUILDING

- .1 Note that certain alterations and structural changes are to be made to existing building. Architectural drawings and site are to be examined to determine extent of alterations affecting existing electrical systems. Where existing conduits and wires run through areas to be altered, to feed other parts of existing building, they shall be re-routed and reconnected to maintain their original function. Drawings do not necessarily indicate outlets, switches, receptacles, and the like, and other electrical equipment which are required to be relocated or abandoned. Provide decorative blank cover plates for obsolete outlet boxes remaining.
- .2 Electrical services and auxiliary services (fire alarm, P.A. intercom, and the like) shall be maintained continuously without interruption. Interruptions to services shall be confined to periods of time to be designated by Architect, and/or Owner's designated representative. Include in tender for temporary connections, overtime labour charges, and such related allowances in order to conform with these conditions.
- .3 The Electrical Contractor is responsible for removal, reinstallation, cutting and patching of ceiling and walls as required in the existing building.
- .4 Cutting directly related to electrical work, regardless of whether such work occurs in new or existing construction, shall be coordinated and paid for by Electrical Subcontractor involved, under supervision of Contractor.

- .5 Where existing electrical items or systems are demolished and removed from existing construction assemblies, Electrical Subcontractor involved shall be responsible for infilling entire hole left after removal of item or system with new construction assembly to match existing. Where new electrical items or systems are installed through existing construction assemblies, Electrical Subcontractor involved shall be responsible for properly sized and accurate cutting of existing construction assembly to allow installation of new work.
- .6 Include all efforts for the tracing and verifying of all branch circuits and panels as required to complete the scope of work proposed on the drawings.

1.24 PROJECT SPECIFIC NOTES

1. Obtain all approvals from public Authorities Having Jurisdiction prior to commencing any work. Include, in the tender price, for all ESA permit and inspection fees. Arrange for and attend all inspections required as per requirements of the Electrical Safety Authority, the Building Department and any other Authorities Having Jurisdiction; attendance for all Inspections shall extend to all Sub-Trades of the Electrical Contractor and Supplier/Manufacturers.
2. Examine Architectural Drawings and Specifications and all Contract Documents before proceeding with the work. Any discrepancies between the drawings and specifications of all disciplines must be referred to the architect before any affected work is commenced.
3. The Electrical Contractor shall furnish all labour, material, tools, equipment, etc. required to complete all work shown on the drawings and/or complete all work specified in the contract documents. The work shall be performed in accordance with rules and regulations of all Authorities Having Jurisdiction over the work. This Contractor shall provide any small items of work not specifically called for but required to complete the intended installation and/or required to achieve the desired intent or functional utility.
4. Perform all work in full accordance with the Ontario Building Code, Ontario Electrical Safety Code, TDSB standards and good practices and the requirements of all other Authorities Having Jurisdiction. All work performed by this division shall be done in accordance with all Manufacturers' recommendations. Obtain all available manufacturer's recommendations and comply.
5. All cutting, patching, coring, scanning, x-raying, making good and fire stopping required for the work of this division shall be carried out by this division. The Electrical Contractor is responsible for and shall pay for any and all damage to the building and/or surrounding area incurred by work of this division.
6. Review the Designated Substances Survey provided by the Owner in detail prior to commencing any work. All abatement work necessary for this project shall be included for in the Base Tender Price.
7. The Electrical Contractor must review and submit shop drawings for all materials to be supplied as a part of the Contract in conjunction with the General Contractor to the

Architect and Electrical Consultant prior to ordering. Order only upon receipt of approval. Order, supply and install as per all comments. The Shop Drawings must be reviewed and ensured for compliance with the Contract Documents by the Electrical Contractor and General Contractor prior to submission; confirmation of review and confirmation that the submittal is in compliance with the Contract Documents is the responsibility of the Electrical Contractor and General Contractor to include in writing with each Shop Drawing Submittal. Any non-conformance of the Submittal with the Contract Documents identified by the Electrical Consultant will require a resubmission of the Shop Drawing Submittal by the Electrical Contractor prior to review. The Electrical Contractor shall bear all costs of any review by the Electrical Consultant beyond the Original Shop Drawing Submission at a cost of \$250.00 CAD + HST per resubmission.

8. All materials used throughout shall be new, of best quality, C.S.A. approved, and of one manufacturer. Wherever trade names are not used to describe materials, these materials shall be of the best available quality. Obtain and pay for special ESA inspections of specified non-C.S.A. electrical equipment.
9. Provide all wiring, raceways, electrical boxes, and such components as required for a complete and operational installation.
10. All conduit shall be rigid steel or EMT with gland watertight connectors and compression type couplings, unless otherwise noted. Exposed raceways in finished areas shall be wiremold channels installed neatly in appearance, run parallel to building lines, and concentric right angle bends only shall be used. Exterior exposed conduit shall be rigid galvanized steel. Supply and install access doors as necessary due to the proposed work. All access panel ratings shall match that of the surface in which it is being installed.
11. All access panels ratings shall match that of the surface in which it is being installed. All access panels requiring supply/install as a part of the project work shall be included for in the Base Tender Price.
12. All wiring shall be of minimum #12 gauge copper, except as otherwise noted or as required based on the intended use of the device/equipment. All wiring shall be 600 Volt Type RW90. All wiring shall be run in conduit from the source to the load. BX cable may be used where permitted by code in ceiling space for final connections only and for a maximum length of 5'. Maximum voltage drop shall not exceed 2 percent.
13. Coordinate with all other trades present on site throughout the full course of construction. Lay out of all work so as not to conflict with the work of other trades. Carry out work promptly which may interfere with the work and/or schedule of any other trades.
14. After completion of the work, provide the consultant with a set of 'as-built' record drawings in pdf format prior to submission to the owner. Incorporate all changes in the pdf drawings.
15. Alterations and additions: contractors shall note that this contract is an alteration to an existing building and as such the contractor shall thoroughly investigate the existing electrical installation and electrical, mechanical, structural, and architectural conditions

prior to pricing and construction.

16. Demolition: remove all exposed conduits, branch wiring, outlets, etc. from surfaces being demolished.
17. Cleanup and garbage: the Contractor is responsible for maintaining as clean of a work area as possible during construction. The contractor is responsible to clean-up and remove tools from the site at the end of every working day. Disposal of all redundant materials, devices, and equipment is the responsibility of the contractor on a daily basis.
18. All work shall be done with minimum possible interruption to the existing Building systems and in the time schedule permitted by the Owner. Any work involving shut down of power or fire alarm coverage to parts of the Building or the entire Building shall be completed during weekend hours only. Provide labour accordingly and include for all premium costs associated with Weekend Labour in the Tender Price. Any shutdown exceeding two (2) hours shall require the Electrical Contractor to provide a backup diesel-fired generator and backing up select Life Safety and Essential Loads of the building for the duration of the shutdown. Include all costs of the temporary generator in the Base Tender Price. Coordinate timing of the shutdown with the Project Manager a minimum of five (5) business days in advance of the scheduled shutdown.
19. Paint all exposed conduit and backboxes, inside and outside of the building, to match the surrounding wall/ceiling colour. Minimize exterior conduit run where feasible.
20. All backboxes installed indoors shall be Wiremold. All backboxes installed outside shall be of cast aluminum finish.
21. For all panels where new circuits are added, provide a new typed panel directory based on the new loads. Incorporate all existing circuit information from the existing panel directory on site in the new panel directory.
22. Unless otherwise explicitly stated in writing in the Contract Documents, all materials, labour, scope and descriptions of work described in the Contract Documents is the responsibility of the Electrical Contractor to supply and install as a part of the Base Tender Price. No materials and/or labour is to be completed under the Project Allowances unless explicitly noted as such in the Contract Documents.
23. All new raceways and wiring installed shall be:
 - a. Concealed in new partitions.
 - b. Concealed above existing drop ceilings where present.
 - c. Concealed above new drop ceilings where present.
 - d. No exposed run of raceway/wiring will be permitted whatsoever in the new construction area.
 - e. Where the existing walls are block, all exposed raceways shall be Wiremold unless approved in writing by the Owner.
 - f. Where the existing walls are drywall, cut/patch/make good wall and conceal all raceways and backboxes.
 - g. In the new Universal Washroom, all raceways shall be concealed in the wall,

regardless of whether the wall is existing or not. Cut/patch/make good the block wall to conceal the conduit in the block wall.

24. All demolition and new work shall be completed in strict accordance with the Contract Documents with no deviations unless instructed by the Electrical Consultant in writing prior to execution of the work. The Electrical Consultant is not responsible, nor required, to accept any work (regardless of its compliance with code) not completed in accordance with the Contract Documents. The Electrical Contractor will be responsible, at his/her cost, of furnishing a Sealed Letter from a Professional Engineer licensed in the Province of Ontario to accept and assume responsibility for all work not completed in accordance with the Contract Documents. The cost of obtaining this letter and the retaining of the Engineer, including all associated inspection charges, is the sole responsibility of the Contractor.
25. Unless otherwise noted, all devices, equipment, material, supplies, etc. shown on the drawings or otherwise required for a fully operational system as described/illustrated on the Drawings shall be supplied and installed under this Project. It shall not be assumed that any of the devices, equipment, material, supplies, etc. shown on the Drawings are to be provided (in part or in whole) by any other Party.
26. Leave two (2) full sets of As-Built Drawings in full size (36"x48") on site at the conclusion of the project; handover to the Caretaker.
27. Panel directories shall include room numbers and names to identify the location of the device/equipment; obtain the finalized room numbering from the Architect at the time of preparation.
28. Run all raceways/wiring concealed above drop ceilings. Where there is an accessible drop ceiling, raceways shall be run in the accessible drop ceiling.
29. For all new circuits proposed on the Drawings, provide new breakers suitable for the respective power source. The Contractor is responsible for running new conduit into the panelboard as the existing conduits may not have space to accommodate new wiring. Allow for the necessary cutting, patching and making good of the existing wall to achieve this.

1.25 CLOSEOUT DOCUMENTS

- .1 Coordinate with the General Contractor to submit a comprehensive Closeout Document Package incorporating documents from all trades in one consolidated package. Closeout Documents shall consist of one (1) 3-ring binder hard copy and 3 USBs/CDs. The Electrical Section of the Closeout Documents shall consist of the following:
 - (a) Electrical Contractor Warranty Letter, signed and dated. Warranty shall be for a period of twelve (12) months starting on the Date of Substantial Completion, except for the Fire Alarm System Work which shall be for a period of eighteen (18) months starting on the Date of Substantial Completion.
 - (b) Project Shop Drawings, in consecutive order of the Consultant's number scheme.
 - (c) O&M Manuals for all equipment supplied on the project.

- (d) ESA Inspection & 'Final' Certificates.
- (e) Red-Line As-Builts (by the Electrical Contractor) and CAD As-Builts (completed by the Electrical Contractor in 2004 Format).
- (f) Emergency Lighting Letter, signed and dated, stating "The emergency lighting for the project has been supplied and installed in strict accordance with the Drawings, Specifications, Contract Documents, Code Requirements, Manufacturer's Recommendations and the requirement of all Authorities having Jurisdiction. The emergency lighting system as a whole has been tested and confirmed to be in continuous operation for a consecutive period of thirty minutes or more. All emergency lighting has been tested on site and confirmed to provide illumination as per OBC requirements with no deficiencies."
- (g) Fire Alarm Installation Letter, signed and dated, stating "The fire alarm system for the project has been supplied and installed in strict accordance with the Drawings, Specifications, Contract Documents, Code Requirements, Manufacturer's Recommendations and the requirement of all Authorities having Jurisdiction. All new devices and equipment have been supplied and installed in accordance with CAN/ULC-S524 and verified as per CAN/ULC-S537."
- (h) Emergency Lighting Illumination Testing results.
- (i) Emergency Lighting Voltage Drop Test.
- (j) Fire Alarm Verification Report.
- (k) Lighting Control Commissioning Report, by the Lighting Controls Manufacturer.
- (l) Short Circuit Calculation, Coordination and Arc Flash Study Report.
- (m) Integrated Systems Testing Certification, Plan and Final Report.
- (n) Data Cabling Testing Report.
- (o) ULC Monitoring Certificate.
- (p) Firestopping Inspection Report.

1.26 TRAINING & DEMONSTRATION

- .1 At the completion of the project, provide a complete training and walkthrough of all new and/or replaced electrical systems provided as part of the project. Participants of the training and walkthrough will be established by the Owner. Responsibilities including the following:
 - (a) Demonstrate to the appointed Staff the intent of all new devices, equipment and system and how to operate them and maintain them in accordance with the Manufacturer's Requirements.
 - (b) Provide end-to-end training on how to use the new devices, equipment and systems installed for the School's day-to-day operations.

1.27 PROJECT PROGRESS THROUGHOUT CONSTRUCTION

- .1 The Electrical Contractor is responsible for taking photos of all existing conditions and mechanical systems on site being affected by the Project at the onset of construction. All photos shall be date stamped.
- .2 The Electrical Contractor is responsible for taking photos of the project's progress throughout the construction site every two weeks. All progress photos shall be shared and sent electronically to the Electrical Consultant on the 15th and 30th of every month. Photos

are meant to illustrate the progress of the project and correction of any deficiencies identified in routine site reviews and review of progress photos.

- .3 The Electrical Consultant will, from time-to-time, visit the Project Site and issue a Field Review Report. The Electrical Contractor is obligated to rectify any deficiency identified within 7 working days of receipt of the Report. The Electrical Contractor is responsible for signing the Field Review Report upon 72 hours of the report being sent to the General Contractor, acknowledging receipt of the report. The Electrical Contractor must take photos of all remedial work within 7 working days of receipt of the Report and distribute to the Consultant.

1.28 FIRE ALARM WORK

- .1 All Fire Alarm Work shall be performed by Certified Fire Alarm Technicians only. Supply the name and registration number of all workers proposed to be on site at the onset of the project.

1.29 CAN/ULC-S1001 INTEGRATED SYSTEMS TESTING

1. The Contractor shall retain a ULC-Certified Integrated Testing Provider to provide Integrated Systems Testing for the new Fire Alarm System. The Integrated Testing Provider, in addition to being ULC-Certified, shall be a Professional Engineer Licensed in the Province of Ontario to be permitted to do Integrated Testing for this project. All costs of the Integrated Testing Provider shall be included for in the Base Tender Price.
2. The Electrical Contractor, Fire Alarm Technicians utilized for the new fire alarm install and the System Manufacturer shall include for all materials and labour, in the base tender price, necessary to conduct the Integrated Systems Testing in accordance with the Integrated Testing Provider's protocol. Demonstrate and test all systems as required. Re-demonstrate and test all systems until all systems pass the requirements of the Integrated Testing Provider and Building Department.
3. The Systems to be included in the Integrated Systems Testing include, but are not limited to the following:
 - a. Air Handling Unit and Fan Shut-Downs.
 - b. Sprinkler Flow and Supervisory Devices.
 - c. Elevator Recall.
 - d. Hold-Open Devices.
 - e. Door Operator Fire Alarm disabling.
 - f. Combination Fire/Smoke Dampers
4. In addition to the Integrated Testing Provider's Site Visit to complete the Integrated Testing, allow for the following:
 - a. A Second Visit (after the original Integrated Testing is completed) demonstrating successful Integrated Testing with the Electrical Contractor, Integrated Testing Provider and Project Engineer to demonstrate acceptable results at the time of the Engineer's Sign-Off.

- b. A Third Visit (after the original Integrated Testing is completed) demonstrating successful Integrated Testing with the Electrical Contractor, Integrated Testing Provider and the Building Inspector during the City's Inspection.
- c. Completion of a Second Integrated Test at the 1-Year Post Installation mark. Date and time will be coordinated with the School Board.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 Conform to Section 26 05 00 Common Work Results for Electrical.

1.2 MATERIALS

- .1 Materials shall be new, of Canadian manufacture where available, first quality and uniform throughout. Submit tender based on the use of materials and equipment specified, or on the listed acceptable alternate equipment as further detailed.
- .2 Electrical materials shall be C.S.A. approved and be so labeled. Material not C.S.A. approved shall receive acceptance for installation by Electrical Safety Authority (ESA) Special Inspections Branch before delivery, and modifications and charges required for such acceptance shall be included in work of this Section. Material shall not be installed or connected to the source of electrical power until approval is obtained.
- .3 Confirm capacity, ratings and characteristics of equipment items being provided to supply power to equipment provided under other Sections of the work. Resolve discrepancies before such items are purchased.

1.3 MATERIAL ACCEPTANCE

- .1 Acceptance of materials installed presumes that materials have not been damaged or exposed to conditions that would adversely affect performance and life expectancy.
- .2 If in the opinion of the Consultant, materials have sustained damage, or have been exposed to abnormal conditions it shall be the responsibility of the Contractor to have such tests performed as deemed necessary by the Consultant to establish condition and therefore, acceptability of installed materials.

PART 2 - PRODUCTS

2.1 RACEWAYS

- .1 Rigid galvanized steel conduit shall comply with CSA Specification C22.2 No. 45.
- .2 Electrical metallic tubing (EMT) may be used in place of rigid conduit in dry locations subject to governing regulations, embedded in masonry walls, and concealed above suspended ceilings. Connectors shall be of gland watertight EMT type with factory-installed insulated throats and provide compression type EMT couplings (cast fittings/set-screws are not acceptable) to be forged steel.
- .3 Rigid PVC conduit shall comply with CSA Specification C22.2 No. 136.
- .4 Watertight flexible conduit: "Sealtite" PVC jacketed flexible steel with Hubbell-Kellum strain relief grips; shall comply with CSA Standard C22.2 No. 56.

- .5 Surface wall-mounted raceways shall be Wiremold No. 4000 metallic type complete with two channels and all necessary fittings, closers, device modules, etc. Wiremold or approved equal only.

2.2 WIRE & CABLE

- .1 Branch wire and cable shall comprise copper conductors, sized as noted, rated 75 deg. C., 600 volt minimum flame retardant insulation, and CSA approved for application.
- .2 Wire and cable installed in conduit shall be PVC insulated Type TWH - Flame retardant and comply with CSA Specification C22.2 No. 75.
- .3 Use Electrovert "Z-Type" code markers for control & communication conductors.
- 4. All branch wiring shall be RW90.
- 5 All feeder cables shall be XLPE RW90.
- 6. All underground feeders and branch circuits run from and to outdoor environment shall be XLPE RWU90.

2.3 DEVICES

- .1 Wiring devices unless otherwise specified herein, or noted, shall be as manufactured by Hubbell, Leviton or Pass & Seymour.
- .2 Light Switches for shall be of low-voltage type as scheduled on the Drawings.
- .3 Occupancy sensors shall be of low-voltage type as scheduled on the Drawings.
- .4 Key-operated switches shall be of low-voltage type as scheduled on the Drawings.
- .5 Standard 15 Ampere, 120 volt duplex receptacles generally shall be specification grade Hubbell, White, CSA #5-15R and tamperproof type throughout the Area of Work.
- .6 Special purpose receptacles as noted on the drawings shall be Hubbell Conforming to CSA configurations (Table 46 and Table 47 of Canadian Electrical Code) for non-locking and locking receptacles. Provide attachment cap for each special purpose receptacle.
- .7 "Range" receptacles shall be CSA Type 14-50R, 50 amp. 3 pole, 4 wire, grounding 125/250V flush receptacle. Provide the above with 5 foot rubber cord set, 50 amp. and connect equipment.
- .8 Receptacles with integral ground fault interrupter shall be Hubbell No. GF-5252 or approved equal.
- .9 Service receptacle shall be Hubbell No. 5262-RD.

- .10 Clock receptacle shall have recessed fitting, Leviton No. 5261/CH. Mount as per the Modular Control Panel detail.

2.4 DEVICES - SPECIALIZED

- .1 Flush floor boxes shall be Hubbell Cat. No. 3SFB-SSC 3-service box complete with devices shown on drawings.
- .2 Provide low-voltage lighting control, as detailed.

2.5 DEVICE COVER PLATES

- .1 Switch and receptacle and other device faceplates for flush mounted devices, generally shall be single or multi-gang as required, type 301, stainless steel, #4 brushed finish with removable protective covering.
- .2 Weatherproof enclosures for outdoor receptacles shall be P&S 4600 with 4600-26 Mounting Plate, duplex ground fault receptacles and two #4609 Keys.
- .3 Cover plates for other devices such as flush fan controls, telephone, etc., shall be stainless steel to match above.

2.6 PANELBOARDS

- .1 See Section 26 05 20 for details.

2.7 SWITCHES

- .1 Provide fusible and non-fusible switches, NEMA Type 'HD' with quick-make, quick-break contacts, horsepower-rated where required, to match the motor protected. Provide holders to accept specified fuses. Switches to include mechanical cover interlocks and line side barriers.
- .2 Where applicable and available, switches shall be CSA "Approved For High Service Factor".
- .3 Provide safety disconnect switches adjacent to motors and other equipment when required by regulations.

2.8 FUSES

- .1 Provide fuse holders in fusible equipment with a complete set of proper size Form 1, HRC Nema J or L current limiting fuses. Fusible equipment so provided shall be adapted to reject CSA Standard C22.2 No. 59 fuses. Fuses shall be Federal Pioneer - "Econolim".
- .2 Provide one complete set of spare fuses for each rating and type used, unless otherwise scheduled.

- .3 Apply Thomas & Betts "Kopr/Shield" conductive anti-seize compound to all fuse ferrules and holders.

2.9 PUBLIC ADDRESS SPEAKERS

- .1 Procure all Public Address Speakers from Baldwin Sound Systems (Toronto). No alternate supplier for Public Address components will be permitted.
- .2 Site verify the existing public address speaker operating voltage and order new speakers to match.
- .3 Speakers shall be McBride 8229/25/7025 – Pre-assembled ceiling speaker (includes 8” dual cone speaker with 6 oz. magnet, 12-1/2” square steel baffle and 70/25 dual voltage 5 watt transformer). Speaker shall be supplied with SMC20E finished surface-mounted backbox.

PART 3 - EXECUTION

3.1 EQUIPMENT LOCATIONS

- .1 Approximate locations of electrical equipment, fixtures switches, outlets, and the like, are given on the drawings. Refer to the architectural drawings and room elevations for application. In absence of definite detail exact location of outlets shall be determined on site as work progresses.
- .2 Device plates shall cover opening left for outlet box, and plates shall be attached to boxes in an approved manner. Outlets and fixtures are to be located symmetrically, (i.e. centered in wall panels, ceiling panels or tiles, columns, between and above doors and the like).
- .3 The right is reserved to alter the location of equipment and outlets a distance of up to 3 metres without involving a change to the Contract amount, providing notice is given prior to installation.

3.2 MOUNTING HEIGHTS

- .1 Mounting heights of outlets, center of outlet to finished floor, except for exposed masonry construction, shall generally be as follows:
 - Light Switches - 1100 mm
 - Receptacles - 450 mm
 - Television Outlets - 400 mm
 - Data/Telephone Outlets - 400 mm
 - Manual Fire Alarm Stations – 1,150 mm
 - Panelboards – 2,000 mm to top of trim for standard panels.
 - Clocks - 2000 mm or 300 mm below ceiling (except where mounted in a Control Panel).
 - Thermostats – 1,200 mm
 - Fire Alarm Audible Temporal Pattern Horn/Strobes – As per CAN/ULC-S524.

3.3 HOLES & DRILLING

- .1 Pneumatic hammers and percussion drills are prohibited.
- .2 Where not sleeved, make holes through concrete walls and floors by core-drill only. Obtain Architect's approval before drilling.
- .3 Seal holes and sleeves through floors to serve as water dam.

3.4 CUTTING & PATCHING

- .1 Layout and install work in advance of other Sections for all new work. Bear all costs resulting from failing to comply with this requirement.
- .2 Pay for cutting and patching and making good as required for work of this Division by reason of faulty or late work. Employ appropriate trades already engaged on the site to perform such cutting, patching and making good existing walls, floor, ceiling, etc. Before commencing, obtain Architect's approval for extent and nature of cutting. Make good, disturbed surfaces to the Architect's approval.

3.5 EXCAVATION & BACKFILL

- .1 Provide necessary excavating and backfilling inside and outside building required for work of this Division, performed as specified under another Division of the work, except as modified below.
- .2 Keep excavations free from water, pump as necessary.
- .3 Excavation for underground services shall be to required depths and dimension and shall be prepared as required, so that no portion of any conduit, bears directly against any rock or other hard surface.
- .4 Remove and dispose of all surplus excavated material.
- .5 Backfill promptly after approval of work. Prevent damage to or displacement of walls, piping, conduits, waterproofing and other work.
- .6 For direct buried conduit and cable in all soil conditions excavate to 150 mm (6") below and a minimum of 200 mm (8") to either side of the cable run. Fill back with a bedding of sand.
- .7 Backfill trenches within building, with clean sharp sand in individual layers of maximum 150 mm (6") thickness, compacted to a density of 100% Standard Proctor. Hand compact the first layers up to a compacted level of minimum one foot. Hand or machine compact the balance up to grade, using approved equipment.

- .8 Backfill trenches outside buildings with granular 'A' gravel in layers not exceeding 150 mm (6") thickness, compacted to 100% Standard Proctor density up to grade level; manual compaction up to 450 mm (18") and mechanical compaction, using approved equipment, for the balance.
- .9 Make good work where damaged by excavation and filling work of this Division. Repair any subsequent settlement of fill placed under this Division and pay all costs in replacement of other work damaged by such settlement and restoration.

3.6 CONCRETE WORK

- .1 Provide concrete work where required for work of this Division in accordance with applicable requirements specified in Concrete Division 3.
- .2 Provide concrete Lighting Standard Bases, required for the work of this Division. Refer to detail on drawings.
- .3 Provide concrete Duct Banks required for the work of this Division. Refer to detail on drawing for typical construction details.
- .4 Reinforced concrete duct banks shall be keyed into sides of foundation walls. Extend and connect reinforcing steel of duct banks to reinforcing steel of foundation wall construction to prevent failure at the junction of the pipe support and wall.
- .5 Provide 100 mm (4") high housekeeping pads for all floor mounted electrical equipment, such as switchboard, distribution panels and transformer, etc.

3.7 HANGERS & INSERTS

- .1 Provide necessary hangers and inserts for work of this Division.
- .2 Fasten to cast-in place concrete by suitable drilled or cast-in inserts.
- .3 Fasten to structural steel using bolts or welded fasteners.
- .4 Do not use wood, chain, wire lashings, strap or grappler bar hangers except where noted or detailed.
- .5 Support fixtures independently of ceiling suspension systems. Provide additional supports as required, which shall be fastened to building structure steel members, joists, beams, etc., but not metal pan or roof decking. Material for additional supports and their installation shall comply with requirements of U.L.C. Refer to "List of Equipment and Materials" Vol. 2, and "Supplement" for application to rated assemblies.
- .6 Support outlet and junction boxes independently of the conduits running to them where required by electrical code and where deemed necessary by the Architect, use steel angle brackets or steel rods to support outlets and fixtures, to the building structure.

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- .7 Drilled fastenings to concrete shall be self-drilling concrete anchors, Phillips 'Red-Head' or approved equal. The maximum weight per fastening shall not exceed 25% of manufacturer's 'pull-out' load data.
 - .8 Surface mounted or stem suspended fixtures fastened to non-removable ceilings, 2 hr. fire rated ceiling assemblies, or mounted between metal suspension of exposed T-grid ceilings, shall be provided with minimum of two points of attachment for each 300 mm x 1200 mm (1' x 4') luminaire, using metal 'channel-bar' fastened to building structure. Attach luminaires to 'channel-bar' by means of threaded steel rods. Channel-bar shall be adequately supported and of a construction to prevent deflection under load, as selected from manufacturer's published data, and to Architect's approval. 'Channel-bar' shall be Unistrut, Burndy, Flexibar, Cantrough or Canadian Strut Products or approved equal.
 - .9 Use support clips (e.g. Caddy Type IDS) for suspension of fixtures attached to exposed T-grid ceilings. Clips shall be supported directly from building structure and not from suspended ceiling system.
 - .10 Provide recessed fluorescent fixtures with support frames, and plastering frames where applicable.
 - .11 Chain where permitted and specified for the installation of fluorescent lighting fixtures shall be No. 4, 2 mm (.080") Tenso Pattern coil steel chain, plated with a strength of 82 kg (180 lbs.) as manufactured by Dominion Chain Co. Ltd. or approved equal. Where 'S' hooks are used with chain, they shall be No. 6 type with open strength of 82 kg (180 lbs.) minimum. Attachment of chain at both ends of support shall develop full strength of chain.
 - .12 Support outlet boxes, junction boxes, conduit and the like, mounted on exposed steel deck roofing by means of self-tapping minimum #10 gauge screws, secured through bottom member of deck corrugation. Do not pierce top of steel deck.

3.8 PAINTING

- .1 Hangers, support framing and all equipment fabricated from ferrous metals which are not protected with zinc or other suitable corrosion-resistant finish shall have at least one coat of a corrosion-resistant paint applied before shipment or immediately on arrival at the site.
- .2 After installation, touch up all scratches, chips, other damage and defects in paint, using zinc chromate primer or paint or special enamels as necessary to match the original.
- .3 Finish and colour of all equipment shall be coordinated to provide uniform appearance.
- .4 Painting of conduits and supports and other exposed surface work will be done under Painting Section except as noted. Install materials in time to be painted together with mounting surfaces.
- .5 Do not paint over nameplates.

- .6 Refer to other Sections for special paint finishes of equipment.

3.9 NAMEPLATES & SCHEDULES

- .1 Identify electrical equipment supplied under this Division with 3 mm thick black laminated plastic nameplate to indicate equipment controlled to provide instruction or warning. Fasten each plate with two chrome plated screws. Lettering shall be 6 mm high for small devices such as control stations and at least 13 mm high for all other equipment. Submit a list of proposed nameplates for approval before manufacture.
- .2 Provide panelboards with typewritten schedules identifying outlets and equipment controlled by each branch circuit including existing panels being changed. Protect schedules with non-flammable clear plastic.
- .3 Identify junction boxes, pull boxes, cover plates, conduits and the like, provided for future extension, indicating their function (e.g. power, fire alarm, communication).
- .4 Verify room names and numbers prior to listing on nameplates and schedules.

3.10 BRANCH CIRCUIT WIRING & FEEDER CABLES

- .1 Provide branch circuit wiring, conduits and feeders as required for Lighting, Power and Auxiliary Systems. Separate conduit systems shall be provided for feeder, lighting and power systems, for exit light system and auxiliary communication systems.

3.11 CONDUIT, RACEWAYS AND WIREWAYS

- .1 Wire and cable shall be installed in conduit as follows:
 - Rigid galvanized steel conduit shall be used:
 - .1 Where noted and required by regulations.
 - .2 Where subject to mechanical damage.
 - .3 For all exposed conduit work.
 - .2 Electrical metallic tubing (EMT) may be used in place of rigid conduit in dry locations subject to governing regulations, embedded in masonry walls, and concealed above suspended ceilings. Connectors shall be of gland watertight EMT type with factory-installed insulated throats and provide compression type EMT couplings (cast fittings/set-screws are not acceptable) to be forged steel.
 - .3 Use flexible metallic conduit for connections to chain suspended and recessed fixture drops, motors and similar equipment to prevent transmission of vibration. A code-gauge green grounding conductor shall be provided for all such connections. Use "Sealtite" conduit with Hubbell-Kellum Sealtite conduit strain relief grips for all such connections at motors.
 - .4 Fasten every conduit and cable to structure by means of approved conduit clamps or clips. Wire lashing is not acceptable.

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- .5 Conceal conduits and wiring except where noted. Run exposed conduits parallel to building lines and to other conduits. Provide every empty conduit with a pull rope (3 mm polypropylene rope) and identify to designate its function (Power, Telephone, Fire Alarm and the like).
 - .6 Where conduit is installed in concrete slabs, obtain general approval, prior to commencing the work, on both maximum dimension and cross-overs which may be used therein.
 - .7 Install conduits in such a manner as to conserve head room and interfere as little as possible with free use of space through which they pass. Obtain approval for routing of same. Keep conduits at least 150 mm clear high temperature work.
 - .8 Conduit installed at the roof level of exposed structures, shall be run tight to roof deck, above purlins and beams.
 - .9 Conduit and cables for electrical work in demountable type and drywall type partitions shall enter from above, from a junction box concealed in the ceiling above and shall comprise a flexible conduit connection.
 - .10 All branch wiring shall be provided with a separate code gauge supplementary grounding conductor run in each conduit or duct, terminating at ground block at panelboards.
 - .11 Run conduit exposed in mechanical equipment rooms, electrical rooms, fan rooms, and the like, and installed after mechanical and other equipment is completed. Install fixtures, outlets, starters, etc., to clear and to suit application.
 - .12 Wiring, boxes, conduit fittings, etc., in hazardous areas shall conform with Ontario Electrical Code, covering explosion-proof areas. Provide conduit seals where required by these regulations.
 - .13 Provide housekeeping curbs around exposed conduits feeding panels, disconnect switches, starters, etc. penetrating floors in front of walls.

3.12 WIRE & CABLE

- .1 Wire and cable shall not be installed at temperatures below 20°C unless "minus 40" type is used. Wiring to heating equipment shall be rated 90°C minimum, the ampacity of which shall be limited to 75°C value.
- .2 Conductors used for all auxiliary systems (e.g. Fire Alarm) shall be tagged and/or colour-coded, and where applicable shall agree with manufacturer's wiring diagrams.
- .3 Minimum wire size for power wiring shall be No. 12 AWG gauge unless specified otherwise. Minimum wire size for "Common" neutral conductors shall be No. 10 AWG. Control wiring shall be #14 AWG red insulation. Maximum voltage drop between furthest outlet of any circuit, when fully energized, and panel to which it is connected shall not exceed two percent except for electric heating circuits which shall not exceed

one percent.

- .4 Cables shall be terminated with moisture-proof connectors, clamped to sheet metal enclosure by a single non-ferrous locknut and grounding bushing.
- .5 Sheaths of multi-conductor cables shall be grounded at both cable ends.
- .6 Sheaths of single conductor cables shall be grounded at supply end only. Provide a Code Gauge Grounding Conductor with each feeder cable run.
- .7 Number of wires indicated for lighting and power, motor and motor control, alarm, signal, communications, and auxiliary systems is intended to show general scheme only. The required number and types of wires shall be installed in accordance with equipment manufacturer's diagrams and requirements, and with requirements of the installation, except that specification standards shall not be reduced.
- .8 Solderless connectors with nylon-jacketted "Vibration-proof" screw-on wire connectors ideal "Wing Nuts", rated 600 volts shall be used for joints in Branch Wiring.
- .9 Use compression joints and terminals for all control wiring; and all conductors #4 AWG and larger. Mechanical connections are acceptable at panelboards and circuit breakers where these are part of factory-assembly.
- .10 Wire or cables in feeders, sub-feeders and branch circuits shall be colour-coded in accordance with Ontario Electrical Safety Code. Each end of feeder terminations (e.g. in Switchboard, Panelboards, switches, splitters and the like) Code Phase A - Red, Phase B - Black, Phase C - Blue, Neutral - White.
- .11 Use C.G.E. Vulkan X-Link insulated cables for circuits protected by ground fault circuit interrupters.
- .12 Include in each conduit, tubing and raceway, a code gauge green supplementary grounding conductor which shall be connected to suitable ground bus in equipment.
- .13 Armoured or sheathed cables may be used only for wiring within demountable and dry wall type partitions and if additionally specified or detailed; however it shall not be directly buried in or below concrete slabs.

3.13 OUTLET, JUNCTION & PULL BOXES

- .1 Use suitable electrical boxes for terminations and junctions on conduit work. Install pull boxes where necessary to permit installation of conductors. Support pull boxes, outlet boxes, panels and other cabinets independently of conduit.
- .2 Provide each light switch, wall receptacle and other device with an outlet box of suitable dimensions and a faceplate. Outlet boxes shall be adapted to their respective locations.
- .3 "Thruwall" and "Utility" type boxes shall not be used.

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- .4 Electrical boxes and panels shall be CSA approved, code-gauge sheet metal, galvanized or with suitable protective treatment. Secure covers with screws or bolts.
- .5 Outlet boxes shall not be installed "Back-to-Back" in walls; separate by a minimum of 150 mm.
- .6 Use "Masonry Type" outlet boxes for flush installation in masonry walls as detailed on standard Detail Drawings attached hereto.) Standard sectional boxes, 1004, 1104 and the like, shall not be used).
- .7 Install surface mounted devices, in cast conduit fittings, with threaded hubs and suitable stainless steel faceplates.
- .8 Paint the full length of conduits (installed above accessible and inaccessible ceilings) and main pull and junction boxes (excluding obvious outlet boxes) as per the following colour scheme:
- | | |
|--|--------|
| - Lighting | Yellow |
| - Lighting Controls | Orange |
| - Power | Blue |
| - Fire Alarm | Red |
| - Telephone/Data | Green |
| - Public Address, Sound and Clock System | Purple |

All conduits shall be painted with minimum three (3) coats of paint along the full circumference of the conduit for a clean and consistent finish. Conduits shall be painted prior to installation.

- .9 In addition, each box shall be identified with a system and service designator of logic reference to the service.

3.14 ACCESS DOORS & ACCESS MARKERS

- .1 Supply access doors for installation under the work of other Division where electrical equipment requiring maintenance or adjustment or inspection is located above ceilings, within walls or behind furring; except ceilings of lay-in removable panel type.
- .2 Access doors shall be 12 gauge hinged metal Stelpro Ltd. or equal #722 flush type, minimum size 300 mm x 300 mm (12" x 12") "Reach-in" 300 mm x 600 mm (12" x 24") "Crawl-in", with prime coat finish, concealed hinges, screwdriver lock and plaster key. Access doors in finished masonry or drywall construction shall be #722 less plaster key. Access doors shall be #726 in acoustic tile ceilings; #704 in drywall ceiling and #726E in plaster ceilings.
- .3 Access doors in fire rated ceiling assemblies, all fire rated walls, duct shaft or in corridor walls shall be UL, ULC or WHI listed 1-1/2 hour fire rated access doors equal to LeHage #L1010 or Acudor #150B with screwdriver lock.

- .4 Where lay-in removable panel ceilings requiring hold-down clips are used, access doors are not required but panels shall be secured with accessible hold-down clips and marked with Buildemup #6 RH brass paper fasteners inserted through acoustic panel and bent over. paint heads with blue enamel before installation.
- .5 Obtain approval for sizes and locations.

3.15 PANELBOARDS

- .1 Provide handle locking devices on circuit breakers feeding Plumbing, Heating, Ventilating equipment and controls and all auxiliary systems, time switches, and other devices as noted. Paint handles white, to permanently identify location and function. Provide 30 spare handle locking devices for future use.
- .2 Circuit numbers on drawings do not necessarily correspond to the numbers on the lighting panels. Circuits sharing a common neutral shall not be connected to the same main. Panel circuit breakers which are used directly for the switching of lighting fixtures shall be grouped in consecutive numbers commencing at breaker number one.
- .3 Use "Panduit" lok-strap cable ties for panelboard branch wiring.
- .4 Provide empty conduits from flush panelboards, and others as noted, terminating in accessible ceiling spaces, sized to accommodate spare and space breaker provisions. One 25 mm (1") conduit for each three spare breakers or spaces.
- .5 Provide two (2) 1" empty conduits c/w pull strings to the floor below ceiling space.

3.16 ELECTRIC WORK FOR OTHER DIVISIONS

- .1 Examine Architectural and Mechanical (Plumbing, Heating, Ventilating and Air Conditioning) plans and specifications to determine extent of electrical work in connection with these Divisions which is to be done under the work of the Electrical Division.
- .2 In general, all loose motor starters and associated controls for mechanical equipment will be supplied under Division 26 for installation and connection to both source and load side of the equipment.
- .3 Co-ordinate the exact location and verify characteristics of electrical provisions for the work of the Mechanical Division.
- .4 Coordinate locations of starters, motors and associated equipment with the work of the Mechanical Contractor's Sections to ensure proper location of equipment. The exact locations of conduit terminations at Mechanical units shall be determined from equipment manufactures' approved shop drawings. Conduits must be installed to enter only in the locations designated by equipment manufactures.
- .5 Provide safety switches required for disconnection of remotely controlled motors, and

where required at motors by C.E.C. regulations whether shown on the drawings or not. Where required at fan motors, they shall be concealed in the fan housing if possible.

- .6 Provide for the 120 volt mechanical equipment where noted, all necessary wiring and connections including wiring and installation of starters, thermostats, aquastats, speed controllers and time switches controlling equipment.
- .7 Where motor starters, switches and the like, are grouped together, a suitable 19 mm (3/4") thick plywood panelboard shall be provided to which all such equipment shall be secured. Provide all necessary angle iron supports for support of panelboard and paint entire assembly with two coats of fire retardant type enamel acceptable to Building Inspection Department.
- .8 Provide weatherproof unfused safety disconnect switches, fastened to exterior of roof mounted units, to approval.
- .9 Connect high temperature thermostats "Firestats" provided in ductwork by the Mechanical Contractor, to exhaust fan systems, to provide fan shutdown on activation.

3.17 GROUNDING & BONDING - GENERAL

- .1 Ground and bond all electrical systems in accordance with provisions of the Ontario Electrical Code.
- .2 Provide a grounding electrode in accordance with Section 10 of the Canadian Electrical Code.
- .3 Install grounding conductors to permit the shortest and most direct path from equipment to ground. Install grounding conductors in rigid galvanized conduit with both conductor and conduit bonded at both ends. Provide bonding jumpers with approved clamps to maintain ground continuity of metallic raceway systems at all expansion joints.
- .4 Ground connections to grounding conductors shall be accessible for inspection and made with approved solderless connectors bolted to the equipment of structure to be grounded. Clean contact surface prior to making connections to ensure proper metal to metal contact. Connections shall be of the type that grounds both conduit and conductor, and cap screws, bolts, nuts and washers shall be silicon bronze.

3.18 FIRESTOPPING & SEALING

- .1 Make fire rated and/or watertight where applicable seals at sleeves and other opening through floors and walls where conduit/cable passing through. Sleeves to extend minimum 25mm (1 inch) from both ends of the opening.
- .2 Provide firestopping protection of **all existing and new openings** through the floor, through the ceiling assembly, through the wall assembly regardless of the presence of any existing firestopping for existing penetrations.

- .3 Caulk spaces between conduit, cables, bus ducts, raceways, cabletrays with "Cerafibre" 2300 F packing to Building Department approval. Pack and seal both sides of openings with Electrovert "Flameseal" putty, minimum thickness 25 mm (1"). Install in accordance with Electrovert Instruction Bulletin #3601.
- .4 The Electrical Contractor is responsible for retaining the services of a specialized third-party Inspection Agency to inspect all firestopping completed for this project by the Electrical Division. Include all costs of the Inspection Agency in the Base Tender Price. The Inspection Agency is to provide a report certifying acceptance of all firestopping work completed as part of this project.

END OF SECTION

PART 1 GENERAL

1.1 RELATED INSTRUCTIONS

1.1.1 Refer to Section 26 05 00, Common Work Results for Electrical.

1.2 SCOPE

1.2.1 Work includes, but not limited to:

1.2.1.1 Providing new Electrical Panels throughout the Project Site as per the Drawings.

1.2.1.2 Obtaining approvals from and cooperation with Authorities having Jurisdiction, before and commencing Work.

1.2.1.3 Preparation of all necessary Working Drawings for submission to Inspection Authorities.

1.3 INSPECTION & TESTING

1.3.1 Systems, equipment and all major items of material shall be tested to the satisfaction of the Consultant, and as required to establish compliance with plans and specifications, and with the requirements for the Authorities having jurisdiction.

1.3.2 Faulty and defective equipment shall be replaced with new materials. Conductors which are found to be shorted or grounded, or to have less than proper insulation resistance, shall be replaced with new conductors.

1.3.3 Tests shall include but are not limited to the following:

1.3.3.1 Test of power cables shall include megger tests to establish proper insulation resistance, and phase-to-ground resistance of cables.

1.3.3.2 Test of all adjustable electrical protective devices of switchgear to establish calibration and operation in accordance with Specifications and approved co-ordination curves.

1.3.3.3 Visual examination of switchgear to determine adherence to allowable manufacturing tolerance and compliance with manufacturer's recommended installation requirements.

1.3.3.4 Proper functioning of all systems.

1.3.3.5 Polarity tests - to establish proper polarity connections to all sockets and receptacles.

1.3.3.6 Calibration setting, and test-tripping, of all protective relays and devices, using "Primary-injection" equipment, in accordance with approved co-ordination schedule.

1.3.3.7 Test of all alarm devices and contacts.

1.3.3.8 Inspection after system is energized shall include infrared thermo graphic examination of

current carrying parts in switchgear, transformers, and at ducts. The Contractor shall cooperate with Inspection personnel, open all equipment enclosures to permit inspection, and make good defective conditions.

1.3.4 Testing Company

- 1.3.4.1 Retain the services of an independent testing company, to Consultant's approval to perform the above tests.
- 1.3.4.2 The testing company shall submit test results directly to the Consultant.
- 1.3.4.3 Include copies of tests in Maintenance and Operating Manual.

1.3.5 Certification of Tests

- 1.3.5.1 When work is complete, submit three (3) copies of test results and a signed statement listing all tests that have been performed as required by Specifications and manufacturer's instructions.

PART 2 PRODUCTS

2.1 ELECTRICAL PANELS:

- 2.1.1 Panelboards as scheduled, shall comprise "Branch" panelboards, with fixed bolted connection thermal-magnetic, quick-make, quick-break, 40oC, calibrated ULC rated 'SWD' switching duty, molded-case circuit breaker branches. "Plug-in" breakers are not acceptable. Multipole breakers shall be common trip type.
- 2.1.2 Panelboards shall include the following features:
 - .1 Flush or surface trim as noted.
 - .2 Concealed hinges and lockable door.
 - .3 Combination catch and lock semi flush tumbler type - all keyed alike.
 - .4 Adjustable self-positioning trims.
 - .5 Plain trims not displaying any names or Symbols.
"Vault" type handles shall not be used except in unfinished areas.
 - .6 Typed schedules of circuits indicating equipment and area controlled on the backs of panel doors, in a steel trim pocket, covered with transparent non-inflammable plastic.
 - .7 Insulated neutral block.
 - .8 Supplementary ground block.
 - .9 Copper Bus.
 - .10 Isolated ground bar, as noted.
 - .11 Surge-suppression system, as noted.
 - .12 Sprinkler-proof
- 2.1.3 Power and Distribution type panelboards shall be breaker type, as scheduled on the drawings.
- 2.1.4 Unless noted otherwise, panelboards with main breakers or remote controlled switches shall be

provided with an indicating pilot lamp flush mounted in top of face trim which shall be connected to a 15 amp. circuit in the panelboard which shall be locked on and shall serve to indicate when the main breaker is in the closed position. Pilot lamp units shall be LED type or other approved types designed to provide maximum lamp life. Provide lamacoid nameplate to identify main breaker.

- 2.1.5 Panelboard shall be of circuit breaker type 120/208 Volt, 3 Phase, 4 Wire mains, minimum interrupting rating of 22,000A, RMS symmetrical at 208 Volt.
- 2.1.6 All panels shall be of code gauge steel with prime coat finish for painting. All locks on all panels shall be common to one key and shall also be common to the locks on the distribution panel. The Subcontractor shall be deliver three duplicate keys to the Owners. All panel hardware shall be chrome plated. All tubs shall be a minimum of 6" deep. Where panels are surface mounted they shall be sprinkler-proofed.
- 2.1.7 All panels shall be equipped with breaker-level metering capable of metering each load at each circuit/breaker level.
- 2.1.8 Acceptable Manufacturers are:
 - .1 Eaton (Cutler-Hammer)
 - or equivalent from:
 - .2 Schneider (Square `D')
 - .3 Siemens

PART 3 EXECUTION

3.1 ELECTRICAL PANELBOARDS

- 3.1.1 Provide complete electrical service as shown on the drawings and as further described here.
- 3.1.2 Grounding service, equipment, feeders, and the like shall be performed in accordance with Electrical Safety Regulations.
- 3.1.3 Submit shop drawings of all panelboards prior to ordering.
- 3.1.4 Any work involving shut down of power to parts of the Building or the entire Building shall be completed during weekend hours only. Provide labour accordingly and include for all premium costs associated with Weekend Labour in the Tender Price. Any shutdown exceeding two (2) hours shall require the Electrical Contractor to provide a backup diesel-fired generator and backing up select Life Safety and Essential Loads of the building for the duration of the shutdown. Include all costs of the temporary generator in the Base Tender Price. Coordinate timing of the shutdown with the Project Manager a minimum of five (5) business days in advance of the scheduled shutdown.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

1.2 STANDARDS

- 1.2.1 ANSI/IEEE Standard 242 Recommended practice for protection and coordination of commercial power system most current edition.
- 1.2.2 ANSI/IEEE Standard 399 Recommended practice for power system analysis most current Edition.
- 1.2.3 NETA STANDARD ATS 2005: Electrical Acceptance Testing Specification for electrical power equipment and distribution system most current Edition.
- 1.2.4 NFPA 70-E Standard for Electrical Safety in the Work Place most current Edition.
- 1.2.5 IEEE STD- 1584 Guide for performing Shock and Arc Flash Hazard Calculations most current Edition.
- 1.2.6 Canadian Electrical Code most current Edition.
- 1.2.7 Ontario Electrical Safety Code most current Edition.
- 1.2.8 CSA Z462 Electrical Safety in the Work Place (Draft).

1.3 SCOPE OF WORK

- 1.3.1 The Short Circuit; Protection and Coordination and Shock & Arc Flash Studies shall be completed for all distribution system modes of operation;
- 1.3.2 Normal power distribution operating mode;
- 1.3.3 The studies need to take into account how the about power distribution system modes of operation interrelate to each other in completion of the studies and recommendations provided with the studies.
- 1.3.4 The following minimum Utility Design Fault Levels shall be used in completion of the studies:
- 1.3.5 13,800 volts the minimum Design Fault Level to be used is 500 MVA.
- 1.3.6 27,600 volts the minimum Design Fault Level to be used is 835 MVA.
- 1.3.7 The Professional Engineer, licensed to practice in the Province of Ontario, completing the studies shall confirm the noted Design Fault Levels with the Local Power Utility. The above is the minimum that shall be used in the completion of the studies.
- 1.3.8 The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA 70E – 2004 annex D

- 1.3.9 The power system(s) short circuit; protection and coordination; shock and arc flash studies shall be completed by a Professional Engineer, licensed to practice in the Province of Ontario, specializing in this field. All information required to complete these studies shall be obtained through formal requests to related Trade(s) such as the Local Power Utility and manufacturers supplying the equipment.
- 1.3.10 Once the required Short Circuit; Protection and Coordination and Shock & Arc Flash Studies have been completed and submitted for review by the Consultant and all clarification have been provided and the reviewed studies have been acknowledged by the Consultant. The recommendations shall be implemented by the Contractor and a letter confirming that the implementations of the recommendations have been completed shall be submitted by the Contractor to the Consultant.
- 1.3.11 Arc Flash Study shall be focused on achieving incident energy level “Category 2” in the main electrical room; sub electrical rooms; and other associated electrical spaces.
- 1.3.12 No exceptions shall be permitted with respect to these required studies.
- 1.3.13 The Study shall be completed by Qualus Corporation or Brosz Technical Services.

1.4 DESCRIPTION OF WORK

- 1.4.1 The Contractor shall provide all studies as required by code and as outlined within this Specification section. The studies shall cover all electrical distribution systems and all of the various modes of operation of the electrical distribution systems.
- 1.4.2 The Study shall be a fully comprehensive study including the following:
- .1 All Utility Equipment upstream of the Main Service.
 - .2 The Main Service Equipment (including the main switchboard/main distribution panel and switch).
 - .3 All new panelboards, transformers, motor loads, PV Equipment and mechanical equipment throughout the Renovated Areas.
 - .4 All existing panelboards, transformers, motor loads, PV Equipment and mechanical equipment throughout the Existing School.
 - .5 No use of ‘lump sum’ motor inputs into the calculations will be permitted.
- 1.4.3 No electrical distribution equipment Shop Drawings for any of the electrical distribution systems shall be reviewed by the Consultant prior to the required studies being submitted and the review process with respect to the studies being completed. Should the Contractor order any or all of the electrical distribution equipment they do so at their own risk. Should changes be required to be made to any or all of the distribution equipment the Contractor will cover all costs.
- 1.4.4 It is important that all requests to related trades such as mechanical, equipment supplier is completed and information obtained in less than ten (10) working days of commencing of contract.
- 1.4.5 No assumption shall be made where it is possible to obtain the information from the manufacturer and equipment suppliers regarding impedances, protective device time current curves and cable lengths, type and size from the Contractor.

1.4.6 The Contractor will need to provide following information to the Consultant completing the studies:

- 1.4.6.1 Preliminary types and cable lengths.
- 1.4.6.2 All of the required equipment data from the electrical equipment vendor(s);
- 1.4.6.3 All of the required equipment data from the generator vendor(s);
- 1.4.6.4 All of the required equipment data from the UPS vendor(s);
- 1.4.6.5 All of the required equipment data from the transformer (power and distribution transformers) vendor(s);
- 1.4.6.6 All protective device co-ordination curves;
- 1.4.6.7 All protective device ground fault curves;
- 1.4.6.8 All damage curves for equipment and cables;
- 1.4.6.9 All required electrical data for elevators;
- 1.4.6.10 All required electrical data for mechanical equipment; and
- 1.4.6.11 Other data as required and requested by the Professional Engineer completing the studies.

1.4.7 The “ input data revised or modified “ for performing studies will be required to be updated and resubmitted to the Consultant once the Contractor has finalized all of his actual electrical types and feeder lengths.

1.4.8 These studies of high important and shall be completed and submitted within 20 - 25 working days after the letter of intent has been issued to the Contractor.

1.5 SYSTEM PROTECTION AND CO-ORDINATION

1.5.1 Retain one of the designated testing companies who specialize in this type of Work to prepare an equipment coordination study and schedule for all protective devices in the system in cooperation with suppliers of all pertinent switchgears; testing covered under cash allowance.

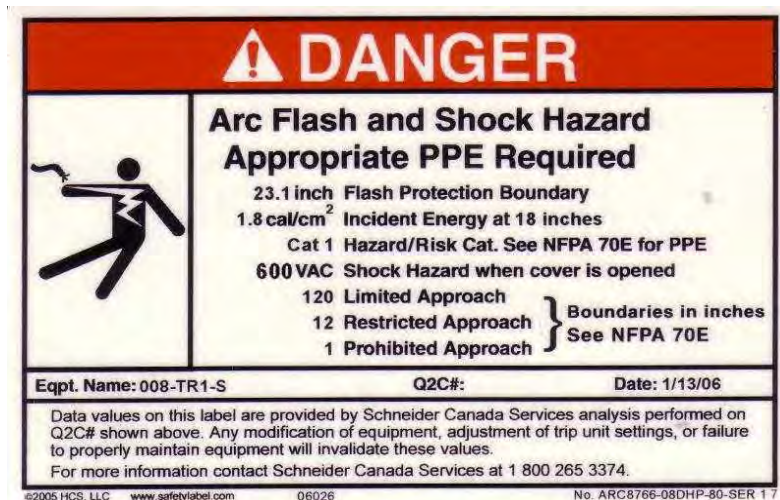
1.5.2 The firm of testing specialists shall be responsible for calculating short circuit kA rating, checking, adjusting, calibration and setting up of all protective devices in accordance with the values shown in the reviewed coordination study under this Contract.

1.5.3 Coordinate the relays, breakers and fuses to provide selective tripping or blowing. Coordinate the breakers, fuses, protective relaying and ground fault protection so that the breaker or fuse immediately ahead of a fault will trip or blow clearing the fault and leaving the system ahead of the tripped or blown protective device in the normal operating mode the study must also address the other distribution system modes of operation.

- 1.5.4 The curves shall be accompanied by the individual time current curves of each device to enable the verification of the ratings and settings used. These coordination curves shall be submitted for review and the various ratings and settings shall be made by the manufacturer's before the equipment is shipped. Review of these coordination curves will not eliminate the responsibility of the Contractor to provide correct protection and coordination.
- 1.5.5 Co-ordination curves shall be plotted showing the following:
 - 1.5.5.1 Plot utility relays or fuses protecting the incoming service. This information shall be obtained directly from the Local Utility;
 - 1.5.5.2 Main and feeder protection devices at every voltage level;
 - 1.5.5.3 Main and feeder protection devices ground fault curves at every voltage levels;
 - 1.5.5.4 Protection devices associated with the largest motor or refrigeration compressor; and
 - 1.5.5.5 Protection devices associated with the emergency power distribution system; UPS power distribution system and the Co-Generation power distribution system and showing all fault levels.
- 1.5.6 Each co-ordination time-current curve shall include:
 - 1.5.6.1 A single line diagram for the portion of the system involved;
 - 1.5.6.2 Transformer and cable damage curves where applicable;
 - 1.5.6.3 Available fault current level on the portion of the system involved;
 - 1.5.6.4 Ground fault curves; and
 - 1.5.6.5 Generator fault and damage curves where applicable.
- 1.5.7 Protection and Coordination curves shall be submitted as part of a report outlining the protection and coordination procedures, final breaker and relay settings and fuse ratings for the entire power distribution system(s) and modes of operation. The report shall clearly list all the breakers with their tag and final settings even if there are identical systems on the Project. I.e. information about the same settings can be duplicated if applicable with breaker in different locations. This list will be checked and signed off by the Professional Engineer who prepared and completed the studies.
- 1.5.8 Co-ordinate with the electrical equipment vendors; mechanical equipment vendors and obtain the recommended settings on protection devices (re: breaker and overloads). Incorporate this information on the associated studies.
- 1.5.9 The goal of this portion of the study is to achieve selective protection and coordination of protective devices including ground fault and to reduce the incident energy levels to within "Category 2" where applicable.

1.6 SHOCK AND ARC FLASH HAZARDS

- 1.6.1 This portion of the study shall be prepared and completed by a Professional Engineer, licensed to practice in the Province of Ontario. The study shall be based on power distribution systems diagrams and the various power distribution operating modes.
- 1.6.2 The Contractor shall obtain and provide all required information as required for the study to be completed.
- 1.6.3 The study and the report shall provide a full summary of the shock and arc flash hazard. The completion of the study shall with compliance with NFPA 70E and related standards and methods established in the industry.
- 1.6.4 The IEEE-1584 must be used for the calculation of the incident energy.
- 1.6.5 The study will ensure that worst case hazards are identified. This means that arc flash energy is calculated at the maximum fault and to include overloads conditions where applicable.
- 1.6.6 The study shall cover all electrical distributed equipment and distribution systems operating modes and voltage levels within the facility and site as well as the main incoming service to the building(s) and site.
- 1.6.7 The study will identify the arc flash boundaries, and incident energy at suggested distance of working. Determination of system operating modes and conditions that can impact short circuit currents and arc flash hazard energy levels shall be identified well in advance and shall be conveyed to the Owner and Consultant for confirmation.
- 1.6.8 The study will clearly state any assumptions made for arc-fault currents. L-G ground fault and L-L. The worst case scenario(s) shall be reflected in the reported as minimum requirement.
- 1.6.9 Arc-flash labels shall be created and installed on each piece of electrical distribution equipment for all electrical distribution systems.
- 1.6.10 The labels shall be per ANSI Z535. The labels shall identify the hazard level and protective clothing required.
- 1.6.11 Safe working distances shall be based upon the calculated arc flash boundary considering incident energy of 1.2 Cal / cm².
- 1.6.12 The label reflected below is an example of the required detail of what is to be on the label. A separate label shall be provided for each piece of the electrical distribution systems.



1.6.13 The shock and arc flash warning label shall have as a minimum the following information reflected on it:

- 1.6.13.1 Boundaries as per NFPA and CSA Z462 (Draft);
- 1.6.13.2 Flash Protection boundary;
- 1.6.13.3 Limited shock approach boundary;
- 1.6.13.4 Restricted shock approach boundary;
- 1.6.13.5 Prohibited shock approach boundary;
- 1.6.13.6 Personal protective equipment required to be employed and used with respect to each piece of electrical distribution equipment;
- 1.6.13.7 Incident Energy per IEEE 1584 recommended distance; and
- 1.6.13.8 Voltage value for Shock Hazard.

1.6.14 At least 24-hour training shall be provided to the staff employed at the facility to explain meaning of labels and protective equipment, and work permits for energized work. This is to ensure the implementation of the safety program that addresses the following as a minimum:

- 1.6.14.1 Ministry of Labour requirements;
- 1.6.14.2 Personal protective equipment;
- 1.6.14.3 Understanding of the shock and arc flash categories;
- 1.6.14.4 Electrical equipment labeling requirements;
- 1.6.14.5 Development of local Standard Operating Procedures (SOPs);

1.6.14.6 Lock out and tag out; and

1.6.14.7 Remote switching of equipment.

1.7 INSTALLATION

1.7.1 On completion of the calibration and testing, a full report shall be prepared by the testing specialists and submitted to the Consultant for review, comments and approval.

1.7.2 The report shall confirm that all protective devices have been adjusted and set in accordance with the protection and coordination study and that the protective systems provide the necessary degree of selective protection as well as selective ground fault protection.

1.7.3 The report shall include tabulation of settings and/or rating of all protective devices.

1.7.4 Each protective device shall be labelled with the proper setting for the device. Labels shall be installed or marked on the protective device behind glass windows. Fusible devices shall be labelled showing the size, type and current rating of the fuse element.

1.7.5 The firm conducting the protection and coordination study shall conduct on-site verification testing to ensure that all relays, breaker settings and fuse sizing has been set in accordance with the coordination study recommendations.

1.7.6 All shock and arc flash labels have been installed.

1.7.7 The Owner reserves the right to retain the services of an independent testing company to monitor, review and verify the results of the test report submitted by the Contractor.

1.7.8 Provide the services of electricians to assist in equipment tests performed by the independent testing companies appointed by the Owner, including thermo graphic (infrared) testing of bus bar joints and contacts of circuit breakers, etc. Remove cover plates, etc. to enable testing company to gain access to the equipment.

1.7.9 The Contractor shall be responsible to co-ordinate with equipment manufacturers to ensure that the equipment is furnished with protection as recommended in the co-ordination study.

1.7.10 Upon completion of the Project, after the commissioning stage has been completed and all commissioning deficiencies have been corrected and the Owner has acknowledged the commissioning is now complete. The Contractor shall conduct a complete thermo infrared scan of the entire electrical distribution systems. The timing of this scan shall be coordinated with the Owner.

1.7.11 The Short Circuit; protection and coordination; shock and arc flash studies shall be completed and the Consultants review process finalized in advance of any electrical equipment being manufactured, ordered and delivered to the Project.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED INSTRUCTIONS

- .1 Refer to Section 26 05 00 Common Work Results for Electrical.

1.2 WORK INCLUDED

- .1 Provide electrical lighting fixtures and systems scheduled, complete with drivers, mounting kits and necessary accessories required for their installation and performance.
- .2 Obtain and review all information with regards to the proper installation of all lighting systems from the Manufacturer. No installation shall be completed without a thorough review of the Manufacturer's recommendations and guidelines for installation. All installations shall comply with these recommendations and guidelines as well as any other requirements mandated by Authorities having Jurisdiction and local governing codes.

1.3 DRIVER CONDITIONING

- .1 All LED fixtures shall remain energized for a stabilizing period as recommended by the Manufacturer.

1.4 SHOP DRAWINGS

- .1 Conform to requirements of Section 26 05 00 Common Work Results for Electrical.
- .2 Submit for review an electronic submission of shop drawings containing illustrations of each fixture. Illustrations to be complete showing dimensions light distribution and mounting requirements. Illustrations to be noted to indicate special features and finishes. A copy is to be retained by the Contractor on the site, to ensure co-ordination of installation requirements.
- .3 LED fixture shop drawings must indicate Driver Manufacturer and Model No. for each fixture.
- .4 No light fixtures shall be ordered without the review and written approval of the Electrical Engineer. Shop drawings should indicate proposed mounting method and hardware required to facilitate a complete and safe installation.

PART 2 - PRODUCTS

2.1 REFERENCE NUMBERS

- .1 Catalogue reference numbers given for individual fixture types are intended as a guide when read with the description and the fixture as finally applied. Verify catalogue references with description and coordinated with installation conditions, with particular regard to ceiling construction details, type and finish before ordering fixtures.

2.2 LENSES

- .1 Plastic lenses in lighting fixtures shall be acrylic with minimum thickness of 3 mm (0.125 inches) and, providing flame spread and smoke density ratings, complying with applicable Federal and Provincial Codes; Ontario Fire Marshal's Fire Safety Design Standard; and the Ontario Building Code. Paragraph 3.1.13.1 (1).
- .2 Removable components of fixtures (louvres, lenses, wire guards, and the like) to be limited to maximum 1220 mm (48") in length.

2.3 FIXTURE SCHEDULE

Refer to Drawings for Specifications.

2.4 LIGHTING HARDWARE

- .1 The Contractor must supply and install all light fixtures as per the Manufacturer's recommendations as well as to the satisfaction of all Authorities having Jurisdiction, Code requirements, the Architect, and the Electrical Engineer.
- .2 Include, in the tender price, for all lighting hardware required for a complete and safe installation.
- .3 Lighting hardware includes, but isn't limited to, the mounting hardware required for each fixture. The Contractor is responsible for reviewing architectural finishes in all areas and providing lighting and mounting hardware to suit.
- .4 All parts used as a part of the installation must be of the same manufacturer as the respective light fixture. Wherever available, all parts must be unique to the respective fixture and purchased with the light fixture from the same supplier and manufacturer.

2.5 PHOTOMETRIC

- .1 The Electrical Contractor is responsible for obtaining a complete photometric of the entire area of lighting installation, both interior and exterior, prepared by a professional, third-party specializing in such work. All fixtures of all types shall be depicted on one layout. Refer to Architectural drawings for ceiling heights. Submit a copy of the interior and exterior photometric with the shop drawing submittal for the light fixtures. The Electrical Contractor in conjunction with the Manufacturer remains responsible for the accuracy of the photometric results and acceptance of fixtures based on this.
- .2 Photometric statistics shall be prepared for each zone/room. Statistics such as max/min and average footcandle readings shall be included in the photometric submittal.
- .3 Photometric shall take into account site condition impacts such as partitions, washroom stall partitions, suspended ceilings, reflectances, etc.

2.6 APPROVED EQUAL PRODCUTS

- .1 The Contractor is permitted to provide alternate products to the base product specified as long as the alternate fixture is equal or superior to the base bid product in all specifications. The Contractor remains responsible for ensuring compliance of the alternate product to the base specifications outlined above.
- .2 All alternate fixtures must be reviewed and approved in writing by the Electrical Engineer or Owner **during pricing**. No substitutions will be permitted to the base product upon award of the Contract.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Provide two new safety chains per new light fixture. Mount from the building structure. Provide unistrut supports throughout as necessary to support the safety chains where obstructions (ductwork, etc.) might prohibit installation without Unistrut.

3.2 RECESSED FIXTURES

- .1 Provide plaster and/or framing rings for recessed fixtures (except for 'Lay-in Tee-Bar' types) the installation of which shall be the responsibility of this Section.

3.3 SUSPENSION STEEL

- .1 Provide supports for light fixtures from new unistrut members attached and/or secured to building structure. No supports shall be attached to metal deck.

3.4 SITE AIMING

- .1 Position and aim adjustable lighting equipment as directed on the site. Position outdoor units after daylight hours as directed. Provide labour and materials necessary to accomplish this.

3.5 COMPLETION

- .1 Fixtures shall be clean at the time of final acceptance.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 Refer to Section 26 05 00 Common Work Results for Electrical.
- .2 All specifications must be read in conjunction with the Electrical Drawings.
- .3 The drawings and specifications must be read in conjunction with all front-end and tender documents (RFQ, etc.) issued by the Board and/or its representative along with the Drawing and Specification package.

1.2 WORK INCLUDED

- .1 Provide emergency lighting fixtures and systems scheduled, complete with lamps, and all necessary accessories required for their complete installation, performance, and on-going operation.
- .2 Additional details of 'Work Included' may be found throughout the specifications and/or drawing package.

1.3 SHOP DRAWINGS

- .1 Conform to requirements of Section 26 05 00.
- .2 The Contractor must submit electronic copies of all shop drawings for the Engineer's review and approval prior to ordering anything. The shop drawing package must include shop drawings for the following (as applicable):
 - .1 Exit Signs
 - .2 Remote Heads
 - .3 Battery Units

Each package must contain illustrations of each fixture. Illustrations are to be complete showing dimensions light distribution and mounting requirements. Illustrations to be noted to indicate special features and finishes. A copy is to be retained by the Contractor on the site at all times, to ensure co-ordination of installation requirements. The Contractor must work with the Manufacturer to provide a photometric study based on the proposed design and the selected devices/equipment. CAD will be made available by the Engineer for the Contractor to use.

PART 2 - PRODUCTS

2.1 REFERENCE NUMBERS

- .1 Catalogue reference numbers given for individual fixture types are intended as a guide when read with the description and the fixture as finally applied. Verify catalogue references with description and coordinated with installation conditions, with particular regard to wall or ceiling construction details, type and finish before ordering fixtures.

2.3 EMERGENCY LIGHTING SYSTEM

.1 Emergency Lighting Battery Units:

- .1 Provide Emergency Lighting Units and Wiring Systems as noted.
- .2 Supply and install the Emergi-Lite® Distinction™ Series battery units. The battery unit will supply the rated load for a minimum of **one hour** to 87.5% of the rated battery/voltage. The unit shall be rated 120 or 347V, 60 Hz and be CSA No.141 listed. The charger shall be fully computer tested and its charge voltage factory set to + or – 1% tolerance. A pulse type charger shall be employed to promote long battery life and reduce the potential for grid corrosion. The charger shall provide continuous high charge to recharge the battery. When the battery is at full capacity the charger will shut off. The pulse charge shall be current limited and precisely regulated by an electronic circuit which samples the battery in relation to its temperature, state of charge and input voltage fluctuations. The charger shall be current limited, temperature compensated, short-circuit proof and reverse polarity protected. The unit shall be furnished with an electronic lockout circuit, which will connect the battery when the AC circuit is activated, and an electronic brownout circuit, which will activate the emergency lights when utility power dips below 75% of nominal voltage. A low voltage battery protection circuit will disconnect the battery at end of the discharge. The unit will come complete with the Distinction™ Series diagnostics micro-controller board option. The unit shall self-test for 1 minute every 30 days, 10 minutes on the 6th month and 30 minutes every 12 months. The unit shall be furnished with a sealed dust tight relay, a selectable test switch 1 minute, 5 minutes, 10 minutes or 20 minutes and diagnostics LED indicator lights to continuously monitor the status of the unit: battery failed, battery disconnect, charger failure, lamp failure, service alarm, AC “ON” and charger “ON”.
- .3 Wall mounted unit shall be provided with recessed back box and mounting template to allow pre-installation feeds of A.C. input and D.C. output. Both A.C. input and D.C. output shall enter unit through back face without any visible cable or conduit feeds. Provide wall mounted shelf for each battery unit.
- .4 Provide a 120 volt input circuit for each unit wired to un-switched circuit indicated. Wire to exit signs from battery units. Size conductors to all remote lamps to provide maximum voltage drop of three percent.
- .5 Battery Capacities shall be as per the Drawings.

.2 Emergency Single Remote Heads:

- .1 Remote heads EF26/EF26DS/EF26D Series shall be comprised of one (single) or two (double or twin) 6W adjustable heads with LED lamps. Each lamp shall be housed in an impact-resistant polycarbonate cube. The cube lens shall be frosted to diffuse the light. Heads shall provide mounting holes for installation on a standard octagonal box.

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- .2 Single remote unit shall be Emergi-Lite Model: EF26MLM or approved equal.
Specifications:
- Single Cube.
 - One (1) 6W, 24V MR16, LED lamps.
 - White Finish
- .3 Wireguard shall be Emergi-Lite Model: 460.0035-E or approved equal.
- .3 Emergency Dual Remote Heads:
- .1 Remote heads EF26/EF26DS/EF26D Series shall be comprised of one (single) or two (double or twin) 6W adjustable heads with LED lamps. Each lamp shall be housed in an impact-resistant polycarbonate cube. The cube lens shall be frosted to diffuse the light. Heads shall provide mounting holes for installation on a standard octagonal box.
- .2 Dual/Double head remote unit shall be Emergi-Lite Model: EF26DSMLM or approved equal.
Specifications:
- Double Cube.
 - Two (2) 6W, 24V MR16, LED lamps.
 - White Finish
- .3 Wireguard shall be Emergi-Lite Model: 460.0032-E or approved equal.
- .4 Exit Sign (without built-in battery unit & remote heads):
- .1 Supply and install the Emergi-Lite® EAE Series slim-profile pictogram edge-lit sign. The unit shall operate with universal 2-wire AC input voltage of 120 to 347VAC at less than 3W and universal 2-wire DC input voltage from 6 to 24VDC at less than 2.5W. The housing assembly shall be constructed of extruded aluminum with textured finish and colour. The canopy shall be of die-cast aluminum and allow for wall, end, or ceiling mount. The legend shall be printed on a pure-acrylic panel. The panel shall come standard with double-face legend, for single-face and double-face applications. The light source shall be longlife white light-emitting diodes (LED) and shall provide even illumination in normal and emergency operation.
- .2 Exit sign shall be Emergi-Lite Model: EAE-UNIVERSAL-TA-U or approved equal.
Specifications:
- Universal faces.
 - Universal mounting kit
 - 120 to 347VAC input; 6 to 24VDC output.
- .3 Wireguard shall be Emergi-Lite Model: 460.0079-E (wall-mount), 460.0027-E (end-mount) or 460.0028-E (ceiling-mount) or approved equal.

.5 Acceptable Alternate Manufacturers

1. Lumacell
2. Beghelli
3. Stanpro

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Do not install or energize lamps until directed by Consultant which generally shall be just prior to occupancy of the building by the Owner.
- .2 Provide wiring in conduit and install devices in accordance to all Manufacturer recommendations and instructions. Advise the Consultant of any discrepancies or conflicts between the instructions set out in these drawings and specifications and the Manufacturer's recommendations and instructions prior to commencing work.
- .3 Connect remote heads to the respective battery unit as indicated on the drawing. Read all notes on the drawings prior to commencing work.
- .4 Provide remote heads as specified and as required for compliance with the Ontario Building Code. Install remote heads in the locations as shown on the drawings. Note that in most cases, the proposed location of new heads do not match the location of existing devices. The Contractor must locate remote heads in the new positions as proposed. The Contractor must make allowance for minor revisions to the system, including relocations and re-aiming, as required upon review of the testing results. Generally, all wiring shall be provided in accordance with the Manufacturer's requirements and be minimum No. 10 AWG. The wire size might need to be increased to satisfy voltage drop requirements. Verify voltage drops requirements with the Manufacturer prior to installation.
- .5 Prior to installation of any devices, verify the existing conditions around the proposed location and ensure there are no conditions that restrict visibility of exit signs, may affect coverage of emergency lighting, or atmospheric or climate conditions that may affect the operation of new devices (unheated areas, moist/damp air, etc.). Advise the Consultant in writing of all such conditions prior to installation and seek instruction prior to proceeding.

3.2 SITE AIMING

- .1 Position and aim adjustable lighting equipment as directed on site and to obtain light levels as required by code. Position outdoor units after daylight hours as directed. Provide labour and materials necessary to accomplish this.
- .2 Locate and aim emergency lighting remote heads to optimally illuminate egress route to meet or exceed all code requirements.

3.3 COMPLETION

- .1 Fixtures shall be clean and 100% operational at the time of final acceptance.
- .2 Upon a complete installation of the systems as proposed on the drawings, as per all code requirements, and to the satisfaction of all Authorities having Jurisdiction, commission and test the new system in entirety with the Manufacturer's Representative. Make allowance for adjustments as required by the Manufacturer or Authorities having Jurisdiction. Provide a letter to the Consultant that the system is complete, has been tested, adjusted (as required), and is in proper operating condition. Testing shall be performed during non-daylight hours.
- .3 Upon completion of installation, engage a professional third-party Professional Engineer (licensed by the Professional Engineers of Ontario) to complete an illumination level test throughout all areas of the building where the installation has taken place. The Contractor must work with the third-party agency to properly aim remote light heads, recording light level readings on a record set of floor plans, calculating light level readings, and issuing to the Consultant a letter stating that the emergency lighting levels meet the requirements of the Ontario Building Code. Notify the Owner and Consultant at least ten (10) days prior to the proposed testing and verification data and schedule a time and date that is acceptable to all.
- .4 The Contractor is responsible for engaging a professional third-party Professional Engineer (licensed by the Professional Engineers of Ontario) to complete a voltage drop test testing the voltage at each panel as well as the voltage at the most remote fixture.
- .5 Include (in the tender price) for the hiring of all third-party agencies (including, but not limited to, the Manufacturer's representative) as required by the drawing and specifications.

END OF SECTION

PART 1: GENERAL

- 1.0 Section Includes
 - A. Lighting Control Components and Systems:
 - 1. Line Voltage Wall Switches Low Voltage Wall Switches and Sensors
 - 2. Occupancy / Vacancy Sensors Detection
 - 3. Power Interfaces
 - 4. Line Voltage Wall Switches and Sensors
 - 5. Wireless Devices and Systems
- 1.1 Related Requirements
 - B. Section 26 50 00 – Lighting Systems
- 1.2 References
 - A. Underwriters Laboratories (UL):
 - 1. UL 916- Energy Management Equipment
 - 2. UL 924 - Emergency Lighting and Power Equipment
 - 3. UL 1472 – Standard for Safety Solid-State Dimming Controls
 - B. National Fire Protection Association (NFPA):
 - 1. NFPA 70 - National Electric Code
 - C. IEC 61000-4-2 Electromagnetic Compatibility (EMC) – Part 4-2: Testing and Measurement Techniques-Electrostatic Discharge Immunity Test; 2008
 - D. NEMA WD 7-2011: Occupancy Motion Sensors
 - E. NEMA SSL 7A: Phase Cut Dimming
 - F. FCC Part 15 and equivalent ISED / NOM
- 1.3 Administrative Requirements
 - A. Coordination
 - 1. Coordinate placement of daylight and occupancy sensors to achieve optimum performance. Proper sensor placement should be coordinated with others to avoid obstructions that would interfere with maintaining prescribed light levels
 - 2. Coordinate the work to provide luminaires and lamps that are compatible with the lighting controls to be installed
 - 3. Notify architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work
- 1.4 Submittals
 - A. Submit under provisions of the Electrical General Requirements.
 - B. Specification Conformance Document. Clearly define where the equipment submitted for review:
 - 1. Meets specification exactly as specified
 - 2. Meets specification as an alternate with clear definition of compliance
 - C. Shop Drawings include
 - 1. CAD renderings of the device with precise dimensions
 - 2. System schematic/typical riser diagrams
 - D. Product Data Sheets

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- 1.5 Project Closeout Documentation
- A. Provide a factory published manual
 - 1. Warranty
 - 2. Technical support contact
 - 3. Electronic manual on manufacturer's website for free download
- 1.6 Quality Assurance
- A. Manufacturer Qualifications:
 - 1. 20+ years of experience designing and assembling lighting controls.
 - 2. Phone Support: Toll-free technical support available from manufacturer through an online tool to schedule a technical support appointment and provide 24/7 emergency support.
 - 3. Remote Support: Manufacturer capable of providing remote support and ability to virtually connect with customers to address issues.
 - 4. On-Site Support: Manufacturer capable of providing on-site response time within the continental United States
 - 5. Service Contracts: Manufacturer capable of providing service contracts for continued on-site and remote support of the lighting control system post-installation for terms up to 10 years from substantial completion.
 - B. All devices are 100% factory function tested prior to delivery
 - C. Compliant with the requirements of NFPA 70
 - D. All power components UL listed for required loads
- 1.7 Project Conditions
- A. Only install equipment after the following site conditions are maintained:
 - 1. Ambient Temperature 14 to 105 degrees F (-10 to 40 degrees C); unless specified extended temperature operation within the product specification sheet.
 - 2. Relative Humidity less than 90% non-condensing
 - B. Standard electrical enclosures are permanently installed
 - C. Equipment is protected from dust, debris and moisture
- 1.8 Warranty
- A. Warranty: Manufacturer and Installer warrant that installed lighting control devices perform in accordance with specified requirements and agree to repair or replace (same device or equivalent), materials, and devices that fail to perform as specified within extended warranty period.
 - B. Five (5) years from the date of shipment

PART 2: PRODUCT INFORMATION

2.1 Manufacturers

- A. Acceptable: Acuity Brands Lighting, Inc. – System: SensorSwitch Brand
- B. Basis of controls design Manufacturer: Acuity Brands, One Lithonia Way, Conyers GA 30012 Steven Downs Manager of Senior Product Markets or Dennis Hoskins, Director of Product Market.

One of the following may be acceptable with approval if compliant with this specification:

- 1. Sensorswitch
- 2. Cooper

3. Hubbell
- C. Substitutions: Not Permitted
 4. All substitutions must be submitted in writing for approval at least 14 days prior to bid date.
 5. Proposed substitute products must be documented with a line by line compliance review

2.2 General:

- A. Provide system hardware that is designed, tested, manufactured, warranted by a single manufacturer
- B. Operational Life: At least 10 years expected life while operating within the specified ambient temperature and humidity range
- C. Power Failure Memory: automatically store system settings and recover from a power failure without requiring user input.

Occupancy Detection Technology Requirements:

- D. The occupancy sensor system shall sense the presence of human activity within the desired space and fully control the on/off function of the lights.
- E. Sensors shall utilize passive infrared (PIR) technology, which detects occupant motion, to initially turn lights on from an off state; thus preventing false on conditions. Ultrasonic or based sensing technologies shall not be accepted.
- F. For applications where a second method of sensing is necessary to adequately detect maintained occupancy (such as in rooms with obstructions), a sensor with an additional “dual” technology shall be used.
- G. Dual technology sensors shall have one of its two technologies do not require motion to detect occupancy. Acceptable dual technology includes PIR / Microphonics (also known as Passive Dual Technology or PDT) which both looks for occupant motion and listens for sounds indicating occupants. Sensors where both technologies detect nothing (PIR/Ultrasonic) shall not be acceptable.
- H. All sensing technologies shall be acoustically passive meaning they do not transmit sound waves of any frequency (for example in the Ultrasonic range), as these technologies have the potential for interference with other electronic devices within the space (such as electronic white board readers). Acceptable detection technologies include Passive Infrared (PIR), and/or Microphonics technology. Ultrasonic based sensing technologies shall not be accepted.
- I. Sensors shall offer a settable minimum on timer of at least 15 minutes, to prevent all cycling of lamps before they have burned for the lamp manufacturers minimum recommended time. This timer shall be in addition to the regular occupancy time delay that keeps lights on after last detected occupancy. User shall be able to disable/enable and change the value of this timer.
- J. Sensors shall utilize an occupancy time delay that keeps lights on after last detected occupancy. Factory default setting of the occupancy time delay shall be 10 minutes.
- K. Allow adjustments to the occupancy time delay based on owner preference, fixture life extension or increase energy savings. Should be done in consultation with the building owner and specifying engineer.
- L. Installer, in accordance with manufacturer’s recommendation, shall determine final sensor location. All sensors shall be factory calibrated for optimum performance for its installed PIR lens, and shall not require initial or subsequent field adjustment of detection sensitivity.

- M. All sensor setting adjustments shall be digital; comprising of a one or more user interfaces: Push-button, Visual Light Infrared, RFID or Bluetooth Programming methods
- N. The installing contractor shall be responsible for a complete and functional system in accordance with all applicable local and national codes.

2.3 Low Voltage Wall Switches

- A. Shall be capable of the following:
 - 1. Accept 12-24VAC/VDC
 - 2. Suitable for installation in a single-gang switch box
 - 3. Support On / Off / Dimming and 3-way Connection
 - 4. single and dual pole options
 - 5. Programmable via push button programming with visual LED visual feedback
- B. Product Series
 - 1. SPODM(A)
 - 2. SWS
 - 3. WSD LV

2.4 Line Voltage Wall Switches

- A. Shall be capable of the following:
 - 1. Shall accept Class 1 wiring directly.
 - 2. Devices will operate as On / Off and Dimming (pending model variant)
 - 3. Dimming devices shall be 0-10V sink devices
 - 4. Multi-way switches allow for 3-way, 4-way and up to 9 connections.
 - 5. All Multi-Way devices On / Off loads will operate and respond in unison.
 - 6. Multi-way devices with dimming loads will operate in unison when initiated by a dimming device
 - 7. Multi-way device is a class 1 low voltage data bus and must not be used with a standard toggle switch.
 - 8. Count down timer capabilities
 - 9. Single and dual pole options
- B. Phase Dimming Wall Switches;
Shall be capable of the following:
 - 1. Shall accept Class 1 wiring directly.
 - 2. Devices will operate on / off and dimming various load types: LED, Incandescent, CFL, ELV and MLV per the designated load rating based on support technology
 - 3. Compatible with NEMA SSL 7A
- C. Product Series
 - 1. PTS(A)
 - 2. SPODMR(A)
 - 2. SPODMRA MWO
 - 3. SPODMR(A) WR
 - 3. SPODMRA SSA (wireless)
 - 4. WPD
 - 5. ASD

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- 2.5 Line Voltage Wall Switch with Occupancy Sensor
- A. Sensor shall provide wall-to-wall PIR occupant movement supporting small (hand motions) and large (walking motion) detection .
 - B. In areas with periodic or permanent obstruction to a sensor's field of view, sensors that utilize dual technology (PIR/Microphonics) detection shall be used (as specified in above section 1.1, Occupancy Sensor Technology Requirements).
 - C. For applications requiring independent control of two loads, a sensor with two dual relays and dual override switches shall be required. Each relay shall have independent programmable occupancy time delays.
 - D. Sensors shall be capable of switching both 120 VAC and 277 VAC (models allowing 120-277 VAC input) and run off of 50/60 Hz power. A version capable of switching 347 VAC shall also be available. Load ratings shall be 800 W @ 120 VAC, 1200 W @ 277 VAC, 1500 W @ 347 VAC, and ¼ HP motor load.
 - E. Light Commercial devices will be designated as 120 VAC and lower load rating compared to commercial based products.
 - F. Sensor shall recess into single gang switch box and fit a standard GFI opening.
 - G. Sensor shall meet NEC grounding requirements by providing a dedicated ground connection internally and intrinsically through its mounting strap.
 - H. Line and load wire connections shall be interchangeable, such that installer cannot make an improper connection to a line/load in a manner that will cause malfunction or damage to the sensor.
 - I. Sensor shall not require a neutral connection regardless of number of poles and/or detection technology (only exception is versions with lighted push-buttons).
 - J. Sensor shall not allow any leakage of current to pass to the load when sensor is in the unoccupied (off) condition. Sensor shall not require a minimum load to be connected to function.
 - K. Sensor shall have optional features for photocell/daylight override, vandal resistant lens, low temperature/high humidity operation.
 - L. All sensor settings, including time delay and photocell settings shall be digital and accessible for adjustment via one or more user interfaces push-button, visual light, Bluetooth programming without requiring removal of cover plate or tools of any kind.
 - M. Wall Switch sensors shall have field programmable adjustments for selecting operational modes, occupancy time delays, minimum on time, and photocell set-point as applicable.
 - N. All models shall be capable of both Auto-On, Manual On, and Partial-On operation.
 - O. All models shall be capable of a "Reduced Turn On" operation where the initial PIR turn on level is higher in order to eliminate PIR from reflective surfaces from being detected. PIR shall be returned to normal levels upon initial PIR detection.
 - P. All models shall have a "Predictive Off" mode where user can manually turn the lights off when leaving the room and still have them come on automatically when they return to space.
 - Q. All models shall be capable of disabling override switch.
 - R. Multiple switches controlling the same load (3-way or 4-way applications) shall use multi-way based devices.
 - S. The following SensorSwitch models numbers color and optional features like dimming and out-of-box default behaviors are specified within the product datasheets. The list below is subject to change.
 - T. Product Series
 - 1. WSRA (PIR)
 - 2. WSRA 2P FAN (PIR, Dual Relay)
 - 3. WSX(A) (PIR)

4. WSX(A) MWO (PIR)
5. WSX(A) 2P (PIR, Dual Relays, Auto On Pole 1/Manual On Pole 2)
6. WSX(A) PDT (PIR/Microphonics)
7. WSX(A) MWO PDT (PIR/Microphonics)
8. WSX(A) PDT 2P (PIR/Microphonics, Dual Relays, On Pole 1/Manual On Pole 2)
9. WSX(A) SA (PIR, Manual On by default; programmable)
10. WSX(A) MWO SA (PIR, Manual On by default; programmable)
11. WSX(A) PDT SA (PIR/Microphonics, Manual On by default; programmable)
12. WSX(A) MWO PDT SA (PIR, Manual On by default; programmable)
13. WSX(A) VA (PIR, Manual On by default)
14. WSX(A) MWO VA (PIR, Manual On by default)
15. WSX(A) PDT VA (PIR/Microphonics Manual On by default)
16. WSX(A) MWO PDT VA (PIR/Microphonics Manual On by default)
17. WSX NL (PIR, lighted push-button, neutral required)
18. WSX PDT NL (PIR/Microphonics, lighted push-button, neutral required)
19. WSD LV (PIR, low voltage, power pack required)
20. WSD PDT LV (PIR/Microphonics, low voltage, power pack required)

2.6 Wall Switch Occupancy Sensors – Large Areas

- A. Sensor shall provide wall-to-wall PIR detection such that small hand motions are detected out to 40 ft (12.19 m).
- B. In areas with periodic or permanent obstruction to a sensor's field of view, sensors that utilize dual technology (PIR/Microphonics) detection shall be used (as specified in above section 1.1, Occupancy Sensor Technology Requirements).
- C. For applications requiring independent control of two loads, a sensor with two dual relays and dual override switches shall be required. Each relay shall have independent programmable occupancy time delays.
- D. Sensors shall be capable of switching both 120 VAC and 277 VAC and run off of 50/60 Hz. A version capable of switching 347 VAC shall also be available. Load ratings shall be 13A each pole, ¼ HP motor load.
- E. Sensor shall meet NEC grounding requirements by providing a dedicated ground connection and intrinsically grounding through its mounting strap.
- F. Line and load wire connections shall be interchangeable, such that installer cannot make an improper connection to a line/load in a manner that will cause malfunction or damage to the sensor.
- G. Sensor shall not require a neutral connection regardless of number of poles and/or detection technology.
- H. Sensor shall not allow any leakage of current to pass to the load when sensor is in the unoccupied (Off) condition. Sensor shall not require a minimum load to be connected in order to function.
- I. Sensor shall be the following SensorSwitch model numbers. Device color and optional features as specified.
- J. Product Series
 1. LWS(H) (PIR)
 2. LWS(H) 2P (PIR, Dual Relays)
 3. LWS(H) PDT (PIR/Microphonics)
 4. LWS(H) PDT 2P (PIR/Microphonics, Dual Relays)

2.6. Low Voltage Occupancy Sensors

- A. The installing contractor shall install one or more sensors with PIR coverage areas that cover the entire space and all entrance points. Exact placement and quantity required shall be per manufacturer's best practice recommendations.
- B. In areas with periodic or permanent obstruction to a sensor's field of view, sensors that utilize dual technology (PIR/Microphonics) detection shall be used (as specified in above section 2.2, Occupancy Sensor Technology Requirements).
- C. Sensors shall utilize a digital PIR detector (dual element pyro-electric detector) component, to provide a high degree of RF immunity.
- D. Sensors shall interconnect with other sensors and power/relay packs with class 2, three-conductor wire.
- E. Sensors shall operate on 12 to 24 VAC or VDC and consume no more than 5 mA so that up to 14 sensors may be connected to a single power pack.
- F. Upon initial power up, sensors must immediately turn on. Power packs may be wired on the line or load side of local switching and must not exhibit any delays when switch is energized.
- G. Each designated zone shall contain one sensor with a SPDT class 2 auxiliary relay, providing an input to building automation system (BAS). All sensors in designated zone shall communicate to sensor with relay for status to BAS. Sensor relay coil shall energize in the unoccupied state to load share the low voltage current from power pack. Note that power pack must be installed on the Line side of the local toggle switch for auxiliary relay to work properly.
- H. Sensors shall have test mode that temporarily shortens/disable all time delays (e.g., minimum on, occupancy, photocell transition, dimming rates) such that an installer can quickly test operation of sensor. Test mode shall time out and return sensor to normal operation should the installer forget to disable test mode after installation.
- I. Sensors shall have optional features for on/off photocell control, automatic dimming control photocell, high/low occupancy based dimming, and usage in low temperature/high humidity environments.
- J. Sensors with a recessed profile are acceptable substitutes for above ceiling mount sensors (e.g. CM => RM)
- K. Fixture mounted box sensors are acceptable substitutes for above ceiling mount sensors (e.g. CM => CMB)
- L. Sensors shall be the following SensorSwitch model numbers.
 - 1. CM (PIR, Ceiling Mount, Standard Range)
 - 2. CM PDT (PIR/Microphonics, Ceiling Mount, Standard Range)
 - 3. RM (PIR, Ceiling Mount, Extended Range)
 - 4. RM PDT (PIR/Microphonics, Ceiling Mount, Extended Range)
 - 5. WV 16 (PIR, Corner Mount, Wide View)
 - 6. WV PDT 16 (PIR/Microphonics, Corner Mount, Wide View)
 - 7. HW 13(PIR, Wall Mount, Hallway View)
 - 8. HMB 10 (PIR, Box Mount, High Bay Aisle Way)
 - 9. MSD
 - 10. MSOD
 - 11. TLS

2.7 Power Packs

- A. Power packs shall accept and switch 120 or 277 VAC, be plenum rated, and provide class 2 power for up to 14 remote sensors.

- B. Power pack shall securely mount to junction location through a threaded ½ inch chase nipple. Plastic clips into junction box shall not be accepted. All class 1 wiring shall pass through chase nipple into adjacent junction box without any exposure of wire leads. Note: UL Listing under Energy Management or Industrial Control Equipment automatically meets this requirement, whereas Appliance Control Listing does not meet this safety requirement.
- C. When required by local code, power pack must install inside standard electrical enclosure and provide UL recognized support to junction box. All class 1 wiring is to pass through chase nipple into adjacent junction box without any exposure of wire leads.
- D. Power pack shall incorporate a Class 1 relay and an AC electronic switching device. The AC electronic switching device shall make and break the load, while the relay shall carry the current in the on condition. This system shall provide full 20 Amp switching of all load types, and be rated for 400,000 cycles.
- E. Power packs shall be single circuit, or two circuits. Slave packs may be used to control additional circuits. When two circuit power packs, or slave packs are used, the power packs must be wired directly to circuit breaker. Otherwise, power packs may be wired on the line or load side of the local switch.
- F. MP20 used as a dry contact relay to connect BMS, HVAC, Fan, etc....
- G. Power packs shall be the following SensorSwitch model numbers.
 - 1. PP20 (Single Pole)
 - 2. SP20 (Secondary Pack)
 - 3. MP20
 - 4. PP16 Shunt
 - 5. PP5LV Shunt
 - 6. PP5 SSA (wireless)

2.8 Line Voltage Occupancy Sensors

- A. Sensors shall be self-contained and accept Class 1 wiring directly without the use of a power pack.
- B. The installing contractor shall install one or more sensors with PIR coverage areas that cover the entire space and all entrance points. Exact placement and quantity required shall be per manufacturer's best practice recommendations.
- C. In areas with periodic or permanent obstruction to a sensor's field of view, sensors that utilize dual technology (PIR/Microphonics) detection shall be used (as specified in above section 2.2, Occupancy Sensor Technology Requirements).
- D. Sensors shall utilize a digital PIR detector (dual element pyro-electric detector) component, so as to provide a high degree of RF immunity.
- E. Line and load wire connections shall be interchangeable, such that installer cannot make an improper connection to a line/load in a manner that will cause malfunction or damage to the sensor.
- F. Multiple sensors controlling the same load shall be wired in parallel.
- G. For applications requiring independent control of two loads, a sensor with two dual relays shall be required. Each relay shall have independent programmable occupancy time delays.
- H. Dual relay sensors shall have an optional operational mode called "Alternating On" where when during unoccupied periods, one relay is always left closed (thus one load is always on). The particular relay that is left closed alternates each cycle so that the aging of the connected lamps is even.
- I. Sensors shall be capable of switching both 120 VAC and 277 VAC and run off 50/60 Hz power. Many devices include intermediate voltage ratings at 220 and 230 VAC. A version capable of

-
- switching 347 VAC shall also be available. Load ratings shall be 800 W @ 120 VAC, 1200 W @ 277 VAC, 1500 W @ 347 VAC, and ¼ HP motor load.
- J. Specific sensors capable of switching 5 Amps of two-phase power (208/240 or 480 VAC) shall be available. These sensors shall always simultaneously switch both phases as per NEC guidelines.
 - K. Wall mounted sensors must be installed at 7 to 8 feet above the floor. Single and two circuit units shall be available.
 - L. Sensors shall have test mode that temporarily shortens/disable all time delays (e.g., minimum on, occupancy, photocell transition, dimming rates) such that an installer can quickly test operation of sensor. Test mode shall time out and return sensor to normal operation should the installer forget to disable test mode after installation.
 - M. Sensors shall have optional features for on/off photocell control, automatic dimming control photocell, high/low occupancy based dimming, and usage in low temperature/high humidity environments.
 - N. Sensor settings may be programmed via pushbutton or via mobile application, check the most recent datasheet for more information.
 - O. Sensors shall be the following SensorSwitch model families.
 - 1. CMR / CMR 2P (Standard Range 360°, PIR, Ceiling Mount – Single / Two Pole)
 - 2. CMR PDT / CMR PDT 2P (Standard Range 360°, PIR/Microphonics Dual Technology, Ceiling Mount – Single / Two Pole)
 - 3. CMRB / CMRB 12P (Extended Range 360°, PIR, Fixture Mount Box – Single / Two Pole)
 - 4. WVR 16 / WVR 16 2P (Wide View, PIR, Wall Mount – Single / Two Pole)
 - 5. WVR PDT 16 / WVR PDT 2P (Wide View, PIR/Microphonics Dual Technology, Wall Mount – Single / Two Pole)
 - 6. HMRB 10 (High Bay End-of-Aisle, PIR, Fixture Mount Box)
 - 7. HWR 13
 - 8. LSXR
 - 9. SBGR
 - 10. SBOR
 - P. Sensors with a recessed profile are acceptable substitutes for above ceiling mount or fixture mount sensors (e.g. CMR=> RMR)
- 2.9 Indoor Photocells and Daylight Harvesting Controls
- A. Low voltage photocell shall accept 12 to 24 VAC or VDC and provide a SPDT relay for interface with remote switching system. Sensor shall interface with occupancy sensors, directly with power pack, or other system as shown.
 - B. Photocell shall provide for an on/off set-point, and a deadband to prevent the artificial light from cycling. Delay shall be incorporated into the photocell to prevent rapid response to passing clouds.
 - C. Photocell set-point and deadband shall be automatically calibrated through the sensor's microprocessor by initiating an "Automatic Set-point Programming" procedure. Further adjustment may be made manually if needed.
 - D. Deadband setting shall be verified and modified by the sensor automatically every time the lights cycle to accommodate physical changes in the space (i.e., furniture layouts, lamp depreciation, or lamp outages).

-
- E. Low voltage dimming sensors shall accept 12 to 24 VAC or VDC (from power pack or other low voltage source) and control 0 to 10 VDC dimmable ballasts by sinking up to 20 mA of class 2 current (typically 40 or more fixtures).
 - F. Low voltage dimming sensor's set point shall be automatically calibrated through the sensor's microprocessor by initiating the "Automatic Set-point Programming" procedure. Min and max dim settings as well as set-point may be manually entered.
 - G. Combination photocell/dimming sensors shall accept 12 to 24 VAC or VDC (from power pack or other low voltage source) and control the on/off function as well as the dimming function of 0 to 10 VDC dimmable ballasts.
 - H. Combination photocell/dimming sensor's set-point and deadband shall be automatically calibrated through the sensor's microprocessor by initiating the "Automatic Set-point Programming" procedure. Min and max dim settings as well as set point may be manually entered.
 - I. Dual zone option shall be available for photocell, dimming, or combination units. The second zone shall be controlled as an "offset" from the primary zone and shall be the zone farthest from the natural light source.
 - J. Line voltage versions of the above described photocell and combination photocell/dimming sensors shall be capable of switching both 120 VAC and 277 VAC and run off of 50/60 Hz power. A version capable of switching 347 VAC shall also be available. Load ratings shall be 800 W @ 120 VAC, 1200 W @ 277 VAC, 1500 W @ 347 VAC, and ¼ HP motor load.
 - K. Line voltage versions of the above described dimming sensors shall be capable of powering off 120/277 VAC. Many devices include intermediate voltage ratings at 220 and 230 VAC check product specification sheet for more details
 - L. Line voltage versions of the above described photocell and combination photocell/dimming sensors shall be capable of switching 5 Amps of two phase power (208/240 or 480 VAC) shall be available. These sensors shall always simultaneously switch both phases as per NEC guidelines.
 - M. Sensors shall be the following SensorSwitch model numbers.
 - 1. CM PC (Photocell, On/Off, Low Voltage, Ceiling Mount)
 - 2. CM ADC (Dimming Photocell, Low Voltage, Ceiling Mount)
 - 3. CM PC ADC (Combination Photocell/Dimming Sensor, Low Voltage, Ceiling Mount)
 - 4. CM PC DZ, CM ADC DZ, or CM PC ADC DZ (Dual Zone, Low Voltage)
 - 5. CMR PC (Photocell, On/Off, Line Voltage, Ceiling Mount)
 - 6. CMR ADC (Dimming Photocell, Line Voltage, Ceiling Mount)
 - 7. CMR PC ADC (Combination Photocell/Dimming Sensor, Line Voltage, Ceiling Mount)
 - 8. CMR PC DZ, CMR ADC DZ (Dual Zone, Line Voltage)
 - 9. LSXR PC
 - 10. SBOR PC
 - N. Sensors with a recessed profile are acceptable substitutes for above ceiling mount or fixture mount sensors (e.g. CMR PC => RMR PC)
Fixture mounted box sensors are acceptable substitutes for above ceiling mount sensors (e.g. CMR PC => CMRB PC)

2.10 Wireless Devices and Systems

- A. Automatically sync for system operation
 - 1. Shall conform to SOC2 criteria
 - 2. Must not use a predefine PIN.
- B. Send and receive messages for real-time operation and feedback
- C. Use industry standard RF protocols (list is subject to change)
 - 1. Bluetooth Devices must be listed with the Bluetooth SIG organization
 - 2. Conform to EnOcean communication requirements
- D. All devices are FCC / Industry Canada compliant with most devices certificated under Mexico's IFETAL and European Union CE check product specification for more detail.
- E. Settings shall be programmable via push-button or mobile device application (Apple iOS and Android Operating Systems).
- F. The following SensorSwitch family of devices: color and optional features are specified within the product datasheets.
 - 1. SensorSwitch AIR Product line Family of Devices
 - a. SPODMRA SSA
 - b. WSXA SSA
 - c. PP5 SSA
 - d. CMS SSA
 - e. Fixture Embedded under nomenclature SSAIR and SSAIRVTX
 - 2. BTP Family of Devices
 - a. Haleon BTP
 - b. LSX BTP
 - c. SBG BTP
 - d. SBO BTP
 - 3. RDT Family of Devices
 - a. SPODMR(A) WR
 - b. CM WR
- G. There are many lighting fixture families with embedded SensorSwitch wireless controls. All wireless devices and fixtures shall have accurate markings per its certification compliance

PART 3: EXECUTION

3.1 Installation

- A. Follow manufacturer's instructions for all installation steps
- B. Provide a complete installation per Contract Documents
- C. Where applicable provide FAQs and Quick Start Guides

3.2 Startup and Programming

- A. Provide telephone support via toll free line
- B. Factory trained service available for purchase
- C. Where applicable training video and elearning content

3.5 Maintenance

- A. Factory trained service technicians available within the continental US
- B. Offer integrated help on-screen and via online videos
- C. Factory telephone support via toll free line

END OF SECTION

APPENDIX 'A'

00850	LIST OF DRAWINGS
00860	ROOM FINISH SCHEDULE
00861	DOOR AND FRAME SCHEDULE
00865	COLOUR SCHEDULE
00870	LIST OF DETAIL DRAWINGS
	DETAIL DRAWINGS

1.1 ARCHITECTURAL

- A0-0 COVER PAGE INC. BUILDING CODE ANALYSIS
 (OBC MATRIX)
- A1-1 SITE PLAN- OVERALL
- A2-0 OVERALL 1 ST, 2ND AND 3RD FLOOR PLANS
- A2-1 OVERALL FIRST FLOOR PLAN
- A2-2 PARTIAL FIRST FLOOR PLANS - UNIVERSAL WASHROOM
 DEMO, NEW , CEILING AND INT. ELEVATIONS.
- A2-3 PARTIAL FIRST FLOOR PLANS -
 STAIR LIFT EXISTING & NEW

1.2 STRUCTURAL

- S1-1 GENERAL NOTES AND TYPICAL DETAILS
- S2-1 FRAMING PLANS AND ELEVATION

1.3 MECHANICAL

- M1 MECHANICAL LEGEND AND NOTES
- M2 FIRST FLOOR KEY PLAN
- M3 MECHANICAL PART PLANS

1.4 ELECTRICAL

- E1 ELECTRICAL LEGEND AND NOTES
- E2 FIRST FLOOR KEY PLAN
- E3 SECOND FLOOR KEY PLAN
- E4 THIRD FLOOR KEY PLAN
- E5 ELECTRICAL PART PLANS
- E6 ELECTRICAL PART PLANS
- E7 SCHEDULES & SCHEMATIC

END OF SECTION

Room Finish Schedule

Room No.	Room Name	Floor		Base		Wall		Ceiling			Remarks
		mat'l	finish	mat'l	finish	mat'l	finish	mat'l	finish	height	
111	Universal Washroom	CONC.	POR	-	RUB	CONC BLK	SG-PT	ACT	-	2500	POR ON PLUMBING WALLS (SINK & TOILET)
112	Existing Custodian	CONC	EX	-	EX	CONC BLK	EX	EX	-	EX	
113	Existing Corridor	CONC	EX	-	EX	EX	EX	EX	-	EX	MAKE GOOD AFFECTED AREA
114	New Storage	CONC	VCT	-	RUB	EX / BLK	SG-PT	ACT	-	MATCH EX	
115	Existing Corridor	CONC	EX	-	MATCH EX	EX	SG-PT	EX	-	EX	MAKE GOOD AFFECTED AREA

LEGEND:

ACRYL	INTERIOR ACRYLIC PAINT	EP	EPOXY	P.LAM	PLASTIC LAMINATE	S/S	STAINLESS STEEL
ACT	ACOUSTIC CEILING TILE	EX	EXISTING	POR	PORCELAIN TILE	TER	TERRAZZO
BLK	BLOCK	EXP	EXPOSED	PT	PAINT	RUB	RUBBER BASE
CONC	CONCRETE	GYP	GYPSUM BOARD	SFT	SAFETY FLOORING	VCT	VINYL COMPOSITE TILE
CPT	CARPET	LEP	LATEX EPOXY	SG	SEMI-GLOSS		
EG	EGGSHELL	LVT	LUXURY VINYL TILE	SPF	SPORTS FLOORING		

End of Section

Door and Frame Schedule

Door No.	Door										Frame			Fire Rating	Remarks
	no. of leaves - width	height	thick	type	mat'l	finish	glass	ADO	HO	AI & CR	type	mat'l	finish		
	FIRST FLOOR														
1-1	3-EX.	EX	EX	EX	EX HM	PT EP	EX	✓		✓	EXT. EX	EX. HM	PT EP	-	<u>Main Entrance 1.</u> Provide new ADO & push button, for only one door and AI & CR as a separate price-
OFF-1	1-EX.	EX	EX	EX	EX WD	EX	EX		✓		EX	EX HM	PT EP	EX. 45MIN	<u>Main Office.</u> Office/Corridor wall is an ex. 1hr FRR fire separation
OFF-2	1-EX.	EX	EX	EX	EX WD	EX	EX		✓		EX	EX HM	PT EP	EX. 45MIN	<u>Counselling Office.</u> Counselling Office/Corridor wall is an ex. 1hr FRR fire separation
CAF-1	2-EX.	EX	EX	EX	EX WD	EX	EX	✓			EX	EX HM	PT EP	EX. 45MIN	<u>Cafeteria.</u> Cafeteria/Corridor wall is an ex. 1hr FRR fire separation
WR-1	1-EX.	EX	EX	EX	EX HM	PT EP	EX	✓			EX	EX HM	PT EP	-	<u>BF. Washroom.</u>
COR-1-1	1-EX	EX	EX	EX	EX. HM	PT EP	EX.	✓			EX	EX. HM	PT EP	EX. 45MIN	<u>Ex. Corridor</u> Corridor wall is an ex. 1hr FRR fire separation since it is open onto the classrooms area. <u>Recessed wall mounted electromagnetic hold-open</u>
COR-1-2	1-EX	EX	EX	EX	EX. HM	PT EP	EX.	✓			EX	EX. HM	PT EP	EX. 45MIN	<u>Ex. Corridor</u> Corridor wall is an ex. 1hr FRR fire

Abbreviations

ADO–BF. Automatic Door Operator AI–AI Phones AL–Aluminum AN–Anodized Clear B/S–Both Sides B.F.–Barrier Free CR–Card Reader EP–Epoxy
 Ex–Existing Ext–Exterior FG–Fire Rated Tempered Glass HO– Hold-Open Device (Electromagnetic) IGU–Insulated Glazed Unit LG–Laminated Glass
 PL–P.Lam w/ High Quality Transparent Finish PRE–Prefinished PSF–Pressed Steel Frame PT–Paint TB –Thermally Broken TG–Clear Tempered Glass
 VAR–Varnish WD–Wood

Door and Frame Schedule

Door No.	Door										Frame			Fire Rating	Remarks
	no. of leaves - width	height	thick	type	mat'l	finish	glass	ADO	HO	AI & CR	type	mat'l	finish		
															separation since it is open onto the classrooms area. <u>Recessed wall mounted electromagnetic hold-open</u> .
COR-1-3	3-EX	EX	EX	EX	EX. HM	EX.	EX.		✓		EX	EX. HM	PT EP	EX. 45MIN	<u>Ex. Corridor</u> Corridor wall is an ex. 1hr FRR fire separation. Only one door (middle door) to receive a <u>ceiling mounted hold-open</u> .
UNI-1	950	2150	45	A	HM	PT EP	-	✓			-	HM	PT EP	-	<u>New Univ. WR.</u>
STO-1	850	2150	45	A	HM	PT EP	-				-	HM	PT EP	-	<u>New Storage Room</u>
COR-1-4	2-EX	EX	EX	EX	EX. HM	PT EP	EX.		✓		EX	EX. HM	PT EP	EX. 45MIN	<u>Ex. Corridor</u> Corridor wall is an ex. 1hr FRR fire separation. Only one door to receive a wall mounted hold-open.
RES-1	2-EX.	EX.	EX.	EX.	EX.	EX.		✓			EX.	EX.	EX.	EX. 45MIN	<u>Resource Centre.</u> Resource centre/Corridor Wall is 45min. FRR.
7-1	2-EX.	EX.	EX.	EX.	EX. HM	PT EP	EX.	✓		✓ CR ONLY	EXT. EX.	EX. HM	PT EP.	-	<u>BF. Entrance 7</u>

Abbreviations

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 VAR–Varnish WD–Wood

Door and Frame Schedule

Door No.	Door										Frame			Fire Rating	Remarks
	no. of leaves - width	height	thick	type	mat'l	finish	glass	ADO	HO	AI & CR	type	mat'l	finish		
GYM-1	1-EX.	EX.	EX.	EX.	EX. HM	PT EP	EX.	✓			EX.	EX. HM	PT EP.	EX. 45MIN	<u>Gymnasium A</u> GYM/Corridor wall is an ex. 1hr FRR fire separation.
GYM-2	2-EX.	EX.	EX.	EX.	EX. HM	PT EP	EX.	✓			EX.	EX. HM	PT EP.	EX. 45MIN	<u>Gymnasium B</u> GYM/Corridor wall is an ex. 1hr FRR fire separation.
GYM-3	2-EX.	EX.	EX.	EX.	EX. HM	PT EP	EX.	✓			EX.	EX. HM	PT EP.	EX. 45MIN	<u>Gymnasium C</u> GYM/Corridor wall is an ex. 1hr FRR fire separation.
AUD-1	2-EX.	EX.	EX.	EX.	EX. WD	EX.	EX.	✓			EX.	EX. HM	PT EP.	EX. 45MIN	<u>Auditorium</u> AUD/Corridor wall is an ex. 1hr FRR fire separation.
AUD-2	2-EX.	EX.	EX.	EX.	EX. WD	EX.	EX.	✓			EX.	EX. HM	PT EP.	EX. 45MIN	<u>Auditorium</u> AUD/Corridor wall is an ex. 1hr FRR fire separation.
COR-1-5	2-EX	EX	EX	EX	EX. WD	EX.	EX.		✓		EX	EX. HM	PT EP	EX. 45MIN	<u>Ex. Corridor</u> Corridor wall is an ex. 1hr FRR fire separation. Only one door to receive a wall mounted hold-open.
9-1	2-EX.	EX.	EX.	EX.	EX. HM	PT EP	EX.	✓		✓ CR ONLY	EXT. EX.	EX. HM	PT EP.	-	<u>BF. Entrance 9</u>

Abbreviations

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 PL–P.Lam w/ High Quality Transparent Finish PRE–Prefinished PSF–Pressed Steel Frame PT–Paint TB –Thermally Broken TG–Clear Tempered Glass
 VAR–Varnish WD–Wood

Door and Frame Schedule

Door No.	Door										Frame			Fire Rating	Remarks
	no. of leafs - width	height	thick	type	mat'l	finish	glass	ADO	HO	AI & CR	type	mat'l	finish		
9-2	2-EX.	EX.	EX.	EX.	EX. HM	PT EP	EX.	✓			EX.	EX. HM	PT EP.	-	<u>BF. Entrance Vestibule 9</u>
	SECOND FLOOR														
COR-2-1	2-EX	EX	EX	EX	EX. HM	PT EP	EX.		✓		EX	EX. HM	PT EP	EX. 45MIN	<u>Ex. Corridor</u> Corridor wall is an ex. 1hr FRR fire separation. Only one door to receive a wall mounted hold-open. <u>Ensure hold-open armature length is enough to reach wall mounted magnetic coil</u>
COR-2-2	2-EX	EX	EX	EX	EX. HM	PT EP	EX.		✓		EX	EX. HM	PT EP	EX. 45MIN	<u>Ex. Corridor</u> Corridor wall is an ex. 1hr FRR fire separation. Only one door to receive a wall mounted hold-open. <u>Ensure hold-open armature length is enough to reach wall mounted magnetic coil</u>
	THIRD FLOOR														
COR-3-1	1-EX	EX	EX	EX	EX. HM	PT EP	EX.		✓		EX	EX. HM	PT EP	EX. 45MIN	<u>Ex. Corridor</u> Corridor wall is an ex. 1hr FRR fire separation.
306-1	1-EX.	EX.	EX.	EX.	EX. WD	EX.	EX.	✓			EX.	EX. HM	PT EP.	EX. 45MIN	<u>306 SPEC. ED</u> Classroom/Corridor wall is an ex.

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 VAR–Varnish WD–Wood

Door and Frame Schedule

Door No.	Door										Frame			Fire Rating	Remarks
	no. of leaves - width	height	thick	type	mat'l	finish	glass	ADO	HO	AI & CR	type	mat'l	finish		
															1hr FRR fire separation.
300-1	1-EX.	EX.	EX.	EX.	EX. HM	PT EP	EX.	✓			EX.	EX. HM	PT EP.	EX. 45MIN	306 SPEC. ED Classroom/Corridor wall is an ex. 1hr FRR fire separation.
COR-3-1	1-EX	EX	EX	EX	EX. HM	PT EP	EX.		✓		EX	EX. HM	PT EP	EX. 45MIN	Ex. Corridor Corridor wall is an ex. 1hr FRR fire separation.
COR-3-2	2-EX	EX	EX	EX	EX. HM	PT EP	EX.		✓		EX	EX. HM	PT EP	EX. 45MIN	Ex. Corridor Corridor wall is an ex. 1hr FRR fire separation. Only one door to receive a wall mounted hold-open.
COR-3-3	2-EX	EX	EX	EX	EX. HM	PT EP	EX.		✓		EX	EX. HM	PT EP	EX. 45MIN	Ex. Corridor Corridor wall is an ex. 1hr FRR fire separation. Only one door to receive a wall mounted hold-open.
307-1	1-EX.	EX.	EX.	EX.	EX. WD	EX.	EX.	✓			EX.	EX. HM	PT EP.	EX. 45MIN	307 RESOURCE ROOM Classroom/Corridor wall is an ex. 1hr FRR fire separation.

General Notes:

•	All ex. HM doors and frames proposed to be painted "PT", to be well prepared first to receive new painting -see specs and should be painted both sides.
•	Reuse ex. HM frames where new doors to be installed in ex. openings. All ex. HM frames to be repainted.
•	Refer to Colour Schedule for paint colors of HM doors and frames.

Abbreviations

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Door and Frame Schedule

•	Turn in all the old hardware on ex. Doors to be removed and/or replaced to TDSB but temporary remove & reuse the cylinder cores. Before temporarily storing the cylinder cores, label by marking on the core itself, which room number it came out from.
•	Site verify ex. door openings widths before door manufacturing. Wherever ex. door openings widths do not allow for installation of a min. 950mm wide door for new doors to be installed in ex. openings, GC to inform K+/TDSB to provide further direction.
•	All tempered, fire rated glass/firelite to be labelled by the manufacturer as such.
•	All fire rated doors to be labelled by Intertek or equivalent as such.
•	All new electromagnetic hold opens to be connected to the fire alarm system – see elec.
•	Refer to floor plan for the location side of the door operator, regardless GC is responsible to site verify the side the door operator can be mounted on where there is enough headroom to ceiling above the door. Preference is to mount the door operator on the push side, however if no enough headroom to ceiling ceiling space exists. GC to install on the opposite side and door operator to be specified as such. If no enough headroom to ceiling exists on either side, door operator to be installed within the ceiling bulkhead and be of the “recessed” type. Wherever an ADO is proposed for a double door, on door to be ADO operated and the other leaf to have a door closer.
•	Installation of new doors cylinders for <u>existing doors</u> , will be done by TDSB hardware vendor (N.I.C.). All permanent cylinders will be purchased by the TDSB and installed by the school board hardware vendor-see hardware schedule. However, where indicated in the hardware schedule to provide new locksets for existing doors, the new locksets to have <u>compatible</u> temporary construction cylinders within and both to be provided by GC. Locksets to also be <u>compatible</u> with permanent construction cylinders which in turn will be provided by TDSB.
•	GC to install temporary construction cylinders within permanent locksets, compatible with the school’s master keying system of interchangeable core, for all <u>new doors</u> requiring keying. All permanent cylinders will be purchased by the TDSB after and installed by the school board hardware vendor-see hardware schedule.
•	AI and Card readers will be provided by TDSB. GC to provide and allow for the electric strikes and electrical connections and install only the AI and Card readers.

End of Section

Abbreviations

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Colour Schedule

PART 1 - GENERAL

1.1 Reference

- .1 Comply with requirements of Division 1. This Colour Schedule is to be read in conjunction with all other contract documents.
- .2 Colour selections are based on specific manufacturers products and that further review and adjustments will be made once successful suppliers and/or manufacturers are known.

PART 2 - LIST OF FINISHES

1. Porcelain Tile:

1. **(POR-1):**

Manufacturer:	Olympia Tile	
Series:	Pinch	
	Through body, glazed porcelain	
Colour:	Light Grey	Looks like terrazzo
Code:	MZ.PC.LGR.2424.MT	
Finish:	Matte	
Shade Variation:	V-2	
Size:	600mm x 600mm (24" x 24")	
Thickness:	9 mm (3/8")	
Application:	Floor	
2. **(POR-2):**

Manufacturer:	Olympia Tile	
Series:	Blend	
	Through body, glazed porcelain	
Colour:	Elite (Turquoise Blue-Green)	Looks like slate
Code:	BC.BL.ELT.1224	
Finish:	Matte	
Sade Variation:	V-2	
Size:	300mm x 610mm (12" x 24")	
Thickness:	9 mm (3/8")	
Application:	Wall	

2. Grout:

1. **(GT-1)**

Manufacturer:	Mapei	
Colour:	11 Sahara Beige	
Application:	Floor – sanded Karalastic/ Karabond	
Paired with Tile(s):	POR-1	
2. **(GT-2)**

Manufacturer:	Mapei	
Colour:	11 Sahara Beige	
Application:	Wall – unsanded Ultra/ Mastic 1 with Plastijoint acrylic latex grout additive	
Paired with Tile(s):	POR-2	
Contact:	Mapei	Jeff McCoppen 905-799-6884

Colour Schedule

PART 2 - LIST OF FINISHES (cont'd)

3. Paint:

- | | | | | |
|----|---------------|---------------|---------------------------|--------------------|
| 1. | (PT-1) | Manufacturer: | Dulux Paints | |
| | | Colour: | Winter Bird | (white) |
| | | Code: | 30YY 78/018 | |
| | | Application: | Wall – Universal Washroom | |
| 2. | (PT-2) | Manufacturer: | Dulux Paints | |
| | | Colour: | Sea Gull Grey | (warm medium grey) |
| | | Code: | 30YY 42/083 | |
| | | Application: | Ceilings | |

DIVISION – 1

1-101	Standard abbreviations
1-102	Standard abbreviations
1-103	Standard symbols

DIVISION 4 – 1

4-101	Control Joint at Interior Door
4-103	Typical Bullnose Block Corner Detail.
4-107	Typ. Door Jamb at Block Wall

DIVISION – 8 – 4

8-401	Door Types
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DIVISION 10 – 1

10-100	Barrier-Free Washroom Front Elevation
10-101	Barrier-Free Washroom Side Elevation
10-102	Barrier-Free Washroom Accessory Installation

End of Section

AC/ACT	ACOUSTIC CEILING TILE	DF	DRINKING FOUNTAIN	GR	GRADE
ACR	ACRYLIC	DG	DOUBLE GLAZE	GSR	GAS SERVICE REGULATOR
AD	AREA DRAIN	DH	DOUBLE HUNG	GRA	GRAVEL
ADJ	ADJUSTABLE	DIA.	DIAMETER	GWG	GEORGIAN WIRE GLASS
AFF	ABOVE FINISHED FLOOR	DIM	DIMENSION	GYP	GYPSUM
AGGR	AGGREGATE	DISP	DISPENSER		
AL	ALUMINUM	DK	DECK	HB	HOSE BIB
AP	ACOUSTIC PANEL	DN	DOWN	HC	HOLLOW CORE
APG	ARMoured PLATE GLASS	DO	DOOR OPENING	HDWD	HARDWOOD
APPROX.	APPROXIMATE	DS	DOWNSPOUT	HD	HAND DRYER
ARCH	ARCHITECTURAL	DW	DISHWASHER	HDWE	HARDWARE
AS SPEC.	AS SPECIFIED	DWG	DRAWING	HGT	HEIGHT
ASPH	ASPHALT	DWR	DRAWER	HM	HOLLOW METAL
ASS'Y	ASSEMBLY			HORIZ.	HORIZONTAL
ATTEN.	ATTENUATION	E	EAST	HP	HYDRO POLE
A/V	AIR VAPOUR	EA.	EACH	HR	HOUR
		EF	EXHAUST FAN	HSS	HOLLOW STEEL SECTION
BAT	BATTENS	EJ	EXPANSION JOINT	HTG	HEATING
BC	BOTTOM CURB	EL	ELEVATION	HW	HOT WATER HEATER
BD	BOARD	ELECT	ELECTRICAL		
BF	BARRIER-FREE	EMER	EMERGENCY	ID	INSIDE DIAMETER
BITUM.	BITUMINOUS	EN	ENAMEL	IFOB	INSIDE FACE OF BLOCK
BKCS	BOOKCASE	ENCL	ENCLOSURE	IMP	INSULATED METAL PANEL
BLDG	BUILDING	EP	EPOXY	INV	INVERT
BLK	BLOCK	EQ	EQUAL	INSUL	INSULATION
BLKHD	BULKHEAD	EQMT	EQUIPMENT	INT	INTERIOR
BM	BEAM	ES	EGG SHELL		
BOT	BOTTOM	EX.	EXISTING	JAN	JANITOR
BRK	BRICK	EXPAN	EXPANSION	JT	JOINT
BUR	BURLAP	EXP	EXPOSED		
		EXT	EXTERIOR	KIT	KITCHEN
C	CHAIR				
CB	CATCH BASIN	FA	FIRE ALARM	LAM	LAMINATE
CFI	CONCRETE FACED INSULATION	FAAP	FIRE ALARM ANNUNCIATION PANEL	LAV	LAVATORY
CEM	CEMENT	FD	FLOOR DRAIN	LDIG	LIGHT DIFFUSING INSULATED GLASS
CER	CERAMIC TILE	FDC	FIRE DEPARTMENT CONNECTION	LEP	LATEX EPOXY PAINT
CG	CORNER GUARD	FDN	FOUNDATION	LF	LATERAL FILE
CHBD	CHALKBOARD	FE	FIRE EXTINGUISHER	LF	LATERAL FILE
CI	CAST IRON	FEC	FIRE EXTINGUISHER CABINET	LKR	LOCKER
CJ	CONTROL JOINT	FF	FORCED FLOW HEATER	LP	LIGHTING PANEL
CL	CENTRE LINE	FG	FIXED GLASS	LS	LIGHT STANDARD
CLB	CENTRE LINE OF BLOCK	FHC	FIRE HOSE CABINET	LT WT	LIGHT WEIGHT
CLG	CEILING	FIN	FINISH	LV	LATERAL FILE
CLO	CLOSET	FL	FLOOR	LVT	LUXURY VINYL TILE
CLR	CLEAR	FLASH	FLASHING		
CM	COFFEE MACHINE	FLEX.	FLEXIBLE	M	METAL
CNTR	COUNTER	FLUOR	FLUORESCENT	MAX.	MAXIMUM
CO	CASED OPENING	FLT	FLOAT	MCT	MARMOLEUM COMPOSITE TILE
COL	COLUMN	FOB	FACE OF BLOCK	M.D.F.	MEDIUM DENSITY FIBREBOARD
CONC	CONCRETE	FOB(EX.)	FACE OF BLOCK (EXISTING)	MECH	MECHANICAL
CONN	CONNECTION	F.PT	FLAT PAINT	MEMB	MEMBRANE
CONSTR.	CONSTRUCTION	FR	FRIDGE	MFR	MANUFACTURER
CONT.	CONTINUOUS	F.RET	FIRE RETARDENT	MGAT	MAKE GOOD ALL TRADES
CORR	CORRIDOR	FRR	FIRE-RESISTANCE RATED	MH	MAINTENANCE HOLE
CP	CONTROL PANEL	FT	FOOT or FEET	MIN	MINIMUM
CPAN	COMPOSITE PANEL	FTG	FOOTING	MIR	MIRROR
CPT	CARPET	FURR	FURRING	MISC	MISCELLANEOUS
CTG	COATING	FUT	FUTURE	MO	MASONRY OPENING
CTR	CENTRE	F&G	FELT & GRAVEL	MOR	MORTAR
CTSK	COUNTER SUNK			MR	MOISTURE RESISTANT
C/W	COMPLETE WITH	GA	GAUGE	MSB	MEDIUM SAND BLAST
CV	CONVECTOR	GALV	GALVANIZED	MTD	MOUNTED
		GB	GRAB BAR	MUL	MULLION
		GL	GLASS	MW	MICROWAVE
DBL	DOUBLE	GL.BL.	GLAZED BLOCK		
DEPT	DEPARTMENT	GND	GROUND		
DET.	DETAIL				


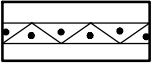
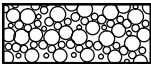
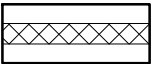
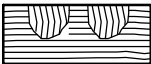
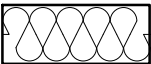



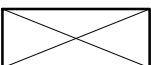
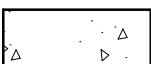
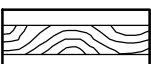
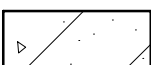
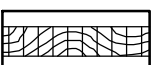
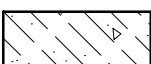
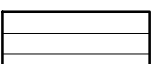
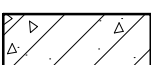
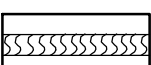
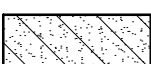
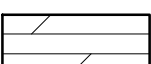
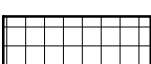
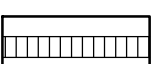
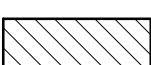



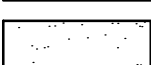
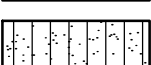
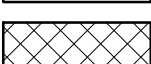

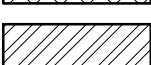
FOR CONTINUATION SEE DWG. NO. 1-102

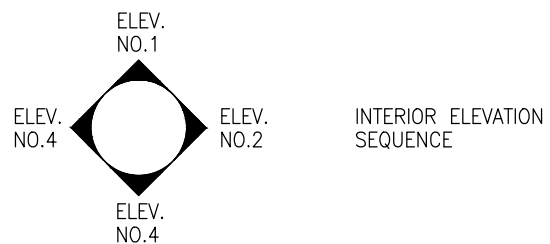
Kingsland + ARCHITECTS INC.	ISSUED:	DRAWING NAME: STANDARD ABBREVIATIONS		DATE: MAR 2026		SCALE: N.T.S.	
		PROJECT NAME: Sir Oliver Mowat-Bundle 5		DRAWN: K+		PROJECT NO: A25007	
				CHECKED: K+		DWG NO: 1-101	REV. 0

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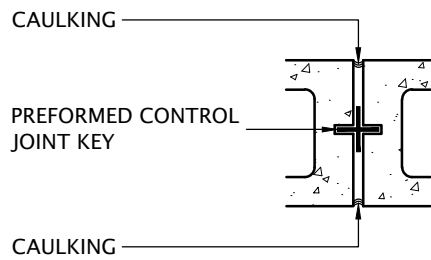
N	NORTH	S	SOUTH	VRT	VINYL REINFORCED TILE
ND	NAPKIN DISPOSAL	SC	SOLID CORE	VSF	VINYL SAFETY FLOOR
NIC	NOT IN CONTRACT	SCHED	SCHEDULE	VWC	VINYL WALLCOVERING
NO. or #	NUMBER	SD	SOAP DISPENSER		
NOM.	NOMINAL	SECT	SECTION		
NS	NON SLIP	SG	SEMI GLOSS	W	WEST
NTS	NOT TO SCALE	SH	SHELF	W/	WITH
		SHR	SHOWER	W.C.	WATER CLOSET
OA	OVER ALL	SHT	SHEET	WD	WOOD
OBS	OBSCURE	SIL	SILICONE	W/O	WITHOUT
O.C.	ON CENTRE	SIM	SIMILAR	WHBD.	WHITEBOARD
OFB	OUTSIDE FACE OF BLOCK	SL.BLK.	SLAG BLOCK	WP	WATERPROOF
OD	OUTSIDE DIAMETER	SP	SPRAYED	WR	WASHROOM
OHD	OVERHEAD DOOR	SPAN	SPANDREL PANEL	WSCT	WAINSCOT
OPNG	OPENING	SPEC.	SPECIFICATION	WT	WEIGHT
OPP	OPPOSITE	SPF	SPORTS FLOORING	WWM	WELDED WIRE MESH
OWSJ	OPEN WEB STEEL JOIST	SPG	SPANDREL GLASS		
		SP.BK.	SPLASHBACK		
P	PLASTIC	SQ	SQUARE		
PARG	PARGING	SS	STAINLESS STEEL		
PART	PARTITION	SSCG	STAINLESS STEEL CORNER GUARD		
PB	PARTICLE BOARD	SSKP	STAINLESS STEEL KICKPLATE		
PC	PRECAST	S.SUR.	SOLID SURFACE		
PERF	PERFORATED	ST	STOVE		
PG	PLATE GLASS	STA	STATION		
PL	PLATE	STD	STANDARD		
P.LAM	PLASTIC LAMINATE	STN	STAIN		
PLAS.	PLASTER	STL	STEEL		
PLY	PLYWOOD	STG	STORAGE		
PNEU	PNEUMATIC	STRUCT	STRUCTURAL		
POL	POLISHED	STY	STYLE		
POR	PORCELAIN TILE	SUP	SUPPORT		
PP	POWER PANEL	SUSP	SUSPENDED		
PPG	POLISHED PLATE GLASS	SVF	SHEET VINYL FLOORING		
PR	PAIR	SYM	SYMMETRICAL		
PREFIN	PREFINISHED				
PT	PAINT	T	TREADS		
PTD	PAPER TOWEL DISPENSER	TB	TOWEL BAR		
QT	QUARRY TILE	TBL	TABLE		
		TC	TOP OF CURB		
R	RISER	TEC	TECTUM		
RAD	RADIUS	TEL	TELEPHONE		
RD	ROOF DRAIN	TER	TERRAZZO		
REF	REFERENCE	T&G	TONGUE & GROOVE		
REFR	REFRIGERATOR	THK	THICK		
REINF	REINFORCED	THRES	THRESHOLD		
RESIL.	RESILIENT	TKBD	TACKBOARD		
REQ.	REQUIRED	T/O	TOP OF		
RFG	ROOFING	TPG	TEMPERED PLATE GLASS		
RGTR	REGISTER	TR	TRIM		
RH	ROOF HOPPER	TRAN	TRANSITION		
RM	ROOM	TTD	TOILET TISSUE DISPENSER		
RO	ROUGH OPENING	TV	TELEVISION		
RTT	RESILIENT TERRAZZO TILE	TW	TOP OF WALL		
RUB	RUBBER	TYP.	TYPICAL		
RWL	RAIN WATER LEADER				
		UNF	UNFINISHED		
		UNGL	UNGLAZED		
		UNIV.	UNIVERSAL		
		U.O.N.	UNLESS OTHERWISE NOTED		
		UR	URINAL		
		U/S	UNDERSIDE		

Kingsland + ARCHITECTS INC.	ISSUED:	DRAWING NAME:	DATE:	SCALE:	
		STANDARD ABBREVIATIONS	MAR 2026	N.T.S.	
		(CONT'D)	DRAWN:	PROJECT NO:	
KINGSLAND + ARCHITECTS INC 110 Cumberland Street, Suite 262 Toronto, Ontario M5R 3V5 ph 416.203.7799 fax 416.203.7763		PROJECT NAME:	K+	A25007	
		Sir Oliver Mowat—Bundle 5	CHECKED:	DWG NO:	REV.
			K+	1-102	0

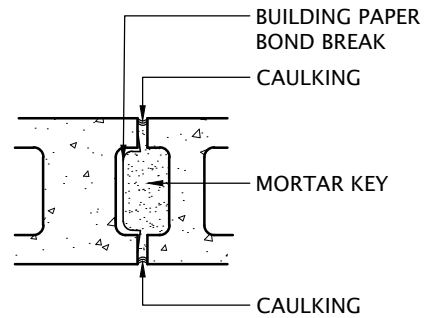
	EARTH		TERRAZZO
	CRUSHED STONE		QUARRY TILE
	ROCK		BATT INSULATION
	CINDER OR SLAG FILL		FINISHED WOOD
	SAND, PLASTER & CEMENT		WOOD BLOCKING
	CAST-IN-PLACE CONCRETE		WOOD STUD PARTITION
	PRECAST CONCRETE		INSULATION WOOD STUD PARTITION
	LIGHT WEIGHT CONCRETE		METAL STUD PARTITION
	CONCRETE BLOCK		INSULATION METAL STUD PARTITION
	SLAG BLOCK		PLYWOOD/M.D.F./PARTICLE BOARD
	GLAZED SLAG BLOCK		ACOUSTIC TILE
	FACE BRICK		METAL LATH & PLASTER
	FIRE BRICK		GYPSUM BOARD
	FACING STONE		TECTUM
	SPRAY FOAM INSULATION		RIGID INSULATION
	METAL, STEEL		



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			DRAWN: K+	PROJECT NO: A25007	
		PROJECT NAME: Sir Oliver Mowat—Bundle 5	CHECKED: K+	DWG NO: 1-103	REV. 0

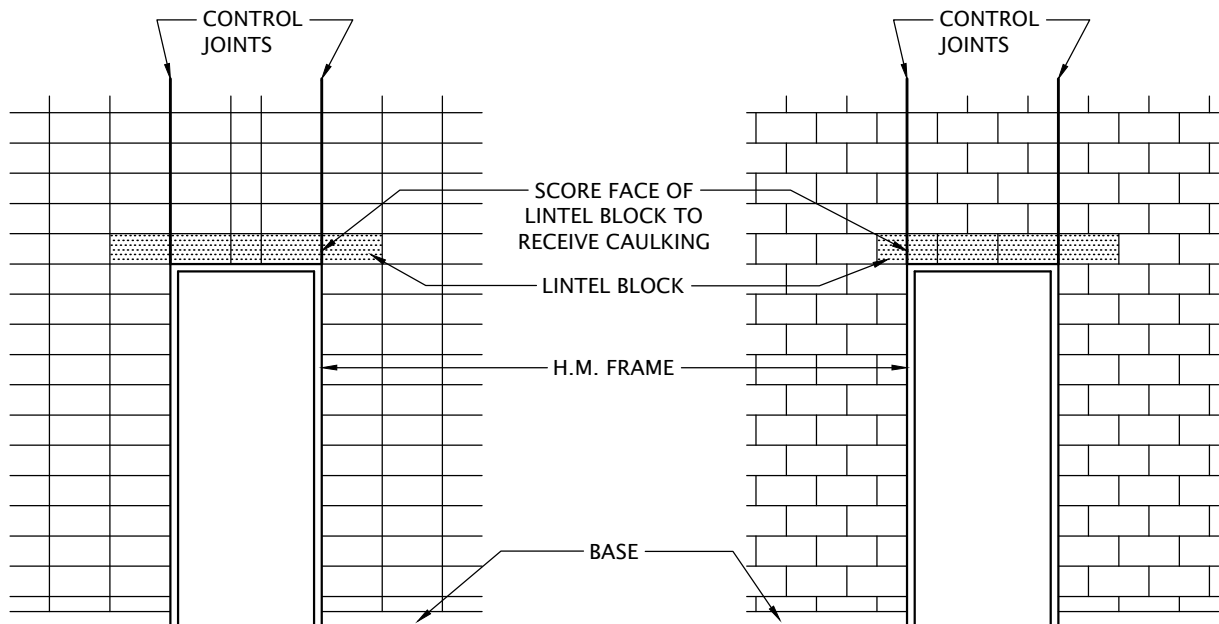


CONTROL JOINT FOR NON
LATERAL STABILITY OF WALL



CONTROL JOINT FOR
LATERAL STABILITY OF WALL

SECTIONS

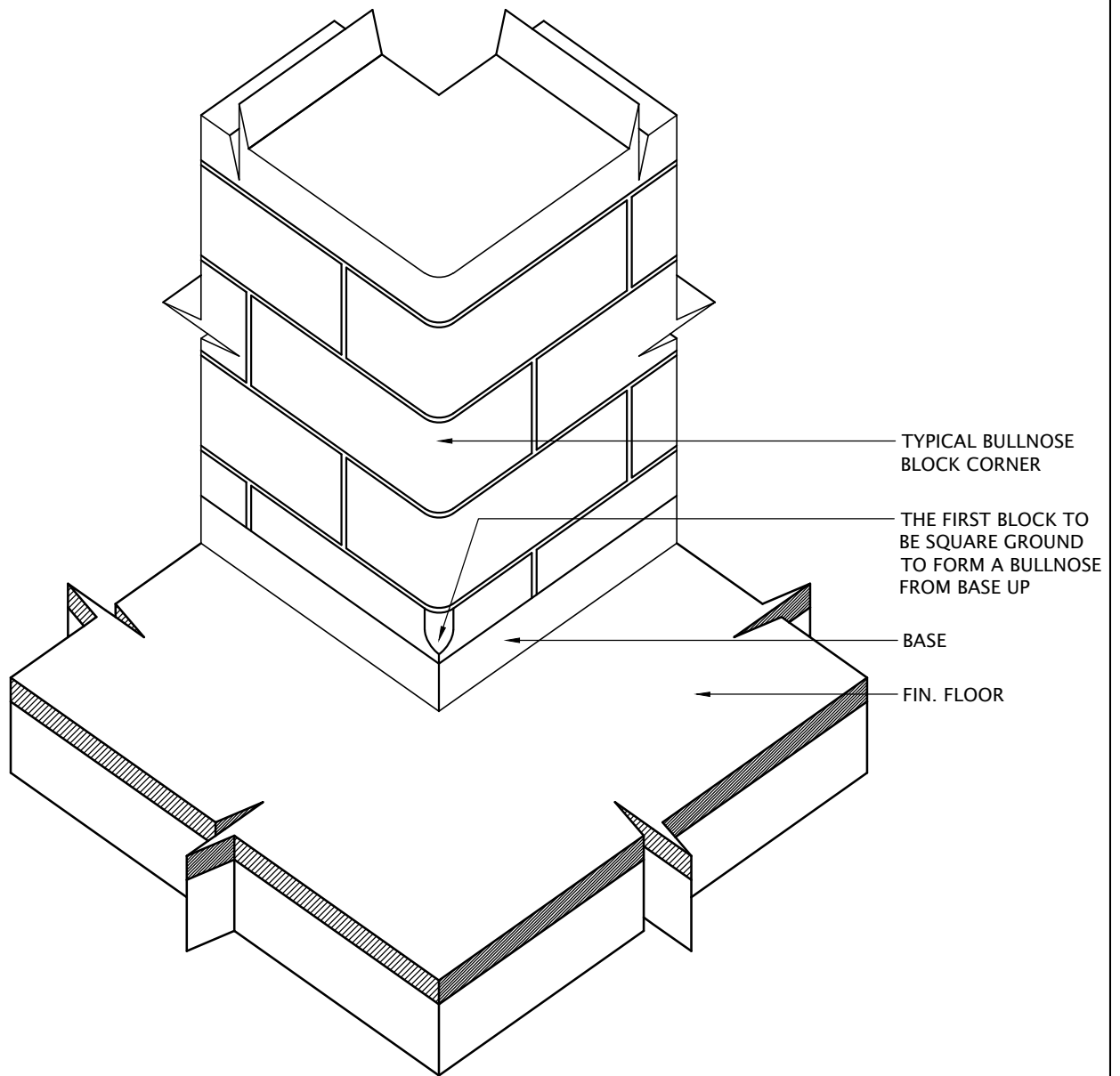


STACK BOND ELEVATION

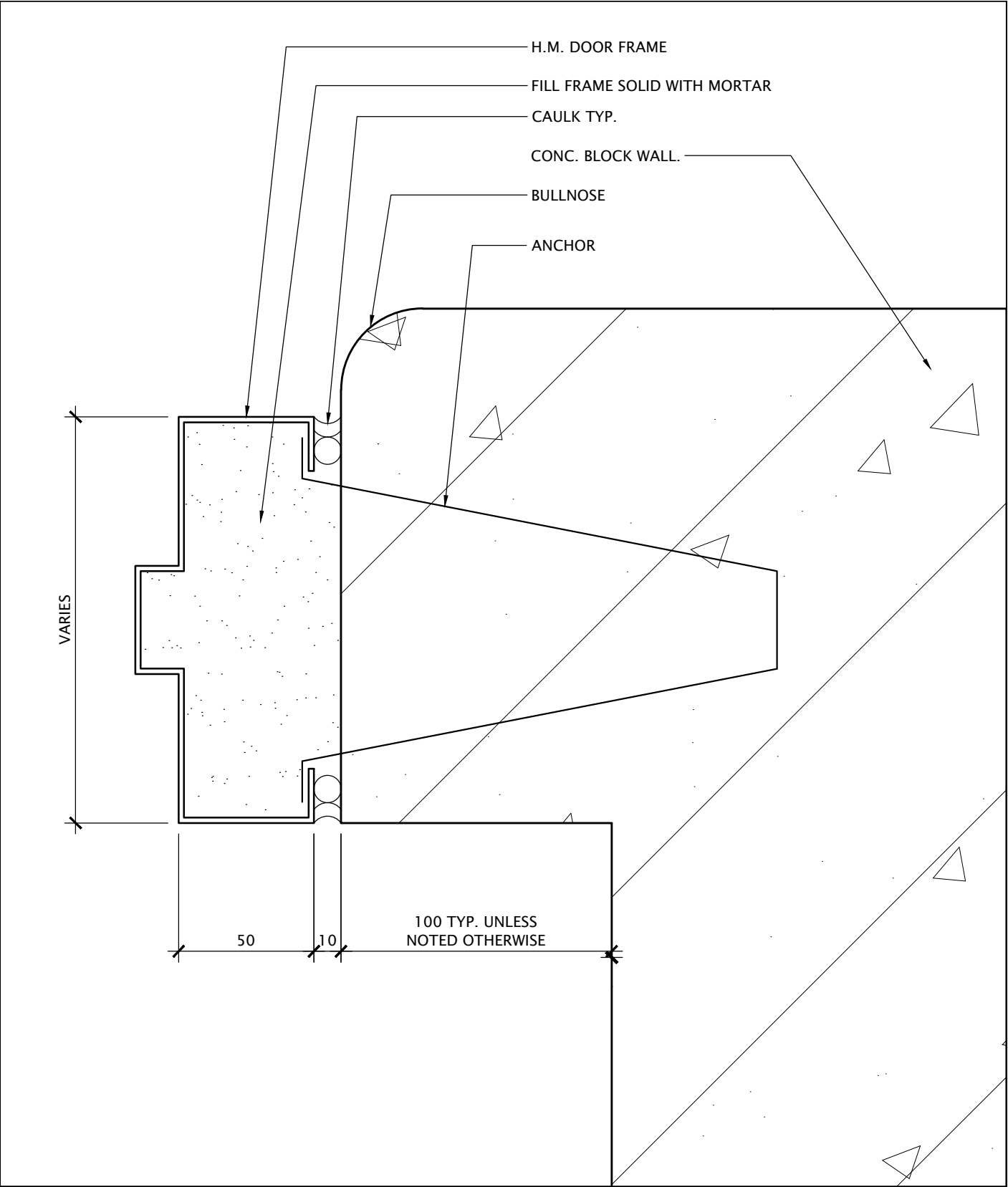
RUNNING BOND ELEVATION

NOTE: EXTEND CONTROL JOINT TO U/S OF STRUCTURE ABOVE

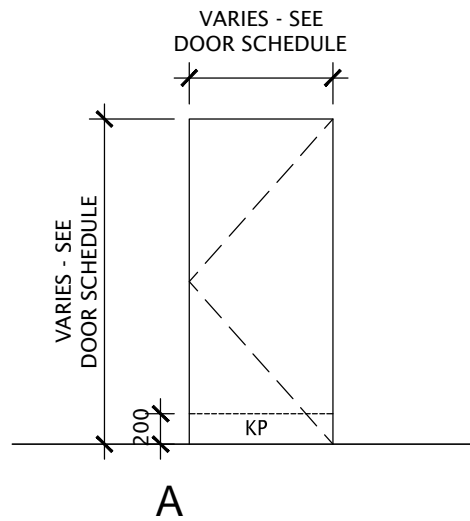
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			<div>DRAWN:</div> <div>K+</div>		<div>PROJECT NO:</div> <div>A25007</div>	
<div>KINGSLAND + ARCHITECTS INC 110 Cumberland Street, Suite 262 Toronto, Ontario M5R 3V5 ph 416.203.7799 fax 416.203.7763</div>			<div>PROJECT NAME:</div> <div>Sir Oliver Mowat—Bundle 5</div>	<div>CHECKED:</div> <div>K+</div>		<div>DWG NO:</div> <div>4-101</div>



Kingsland + ARCHITECTS INC.	ISSUED:	DRAWING NAME:	DATE:	SCALE:	
		TYP. BULLNOSE BLOCK CORNER DETAIL	MAR 2026	1:5	
		PROJECT NAME:	DRAWN:	PROJECT NO:	
KINGSLAND + ARCHITECTS INC 110 Cumberland Street, Suite 262 Toronto, Ontario M5R 3V5 ph 416.203.7799 fax 416.203.7763		Sir Oliver Mowat—Bundle 5	K+	A25007	
			CHECKED:	DWG NO:	REV.
			K+	4-103	0



<div><div>Kingsland + ARCHITECTS INC.</div><div>KINGSLAND + ARCHITECTS INC 110 Cumberland Street, Suite 262 Toronto, Ontario M5R 3V5 ph 416.203.7799 fax 416.203.7763</div></div>	ISSUED:	DRAWING NAME:	DATE:	SCALE:	
		TYP. DOOR JAMB AT BLOCK WALL	MAR 2026	1:2	
		PROJECT NAME:	DRAWN:	PROJECT NO:	
		Sir Oliver Mowat—Bundle 5	K+	A25007	
			CHECKED:	DWG NO:	REV.
			K+	4-107	0

LEGEND:**TG** - TEMPERED GLASS / FRR
TEMPERED GLASS**KP** - KICK PLATE**Kingsland** +
ARCHITECTS INC.KINGSLAND + ARCHITECTS INC
110 Cumberland Street, Suite 262
Toronto, Ontario M5R 3V5
ph 416.203.7799
fax 416.203.7763

ISSUED:

DRAWING NAME:

DOOR TYPES

PROJECT NAME:

Sir Oliver Mowat—Bundle 5

DATE:

MAR 2026

DRAWN:

K+

CHECKED:

K+

SCALE:

1:50

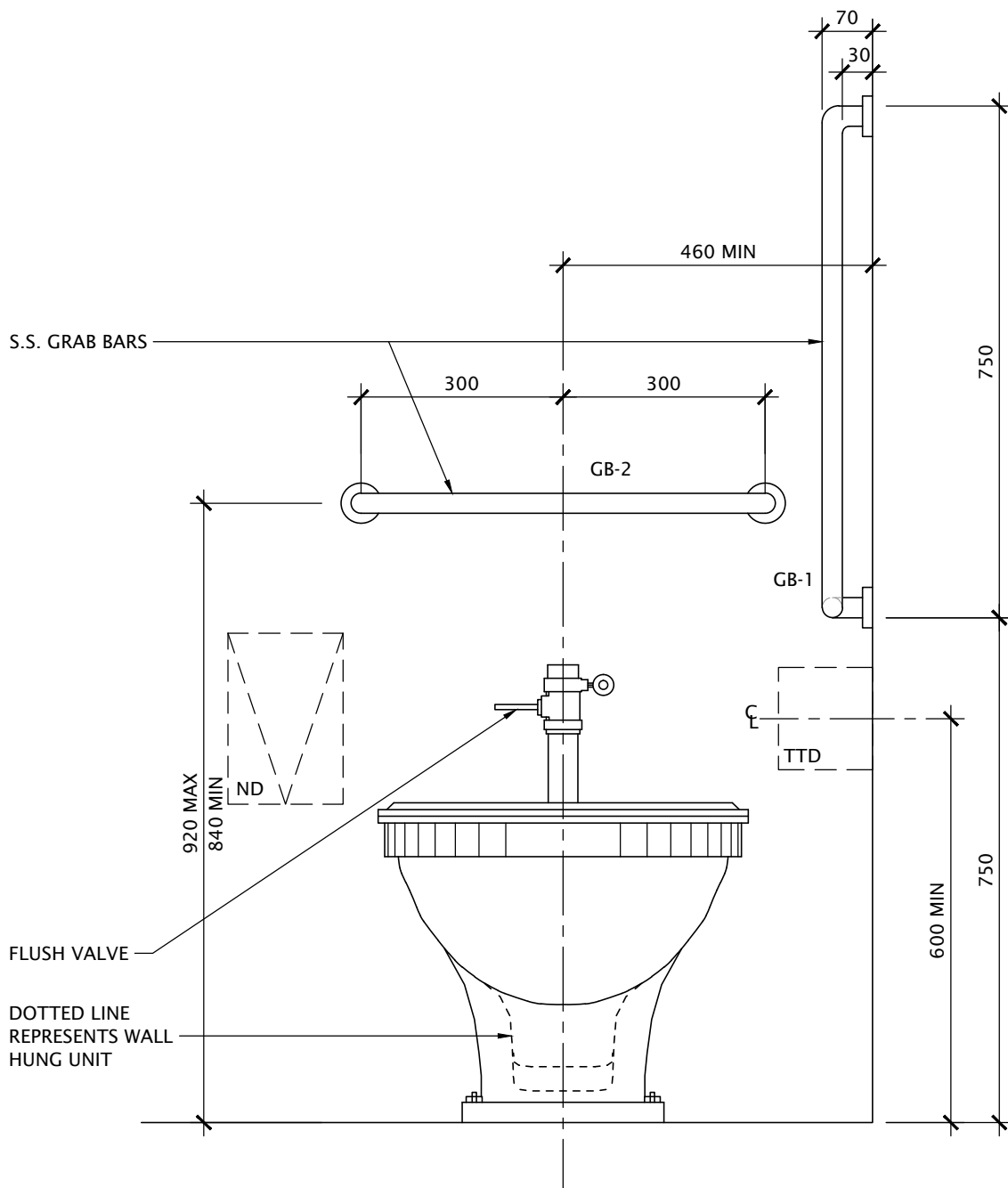
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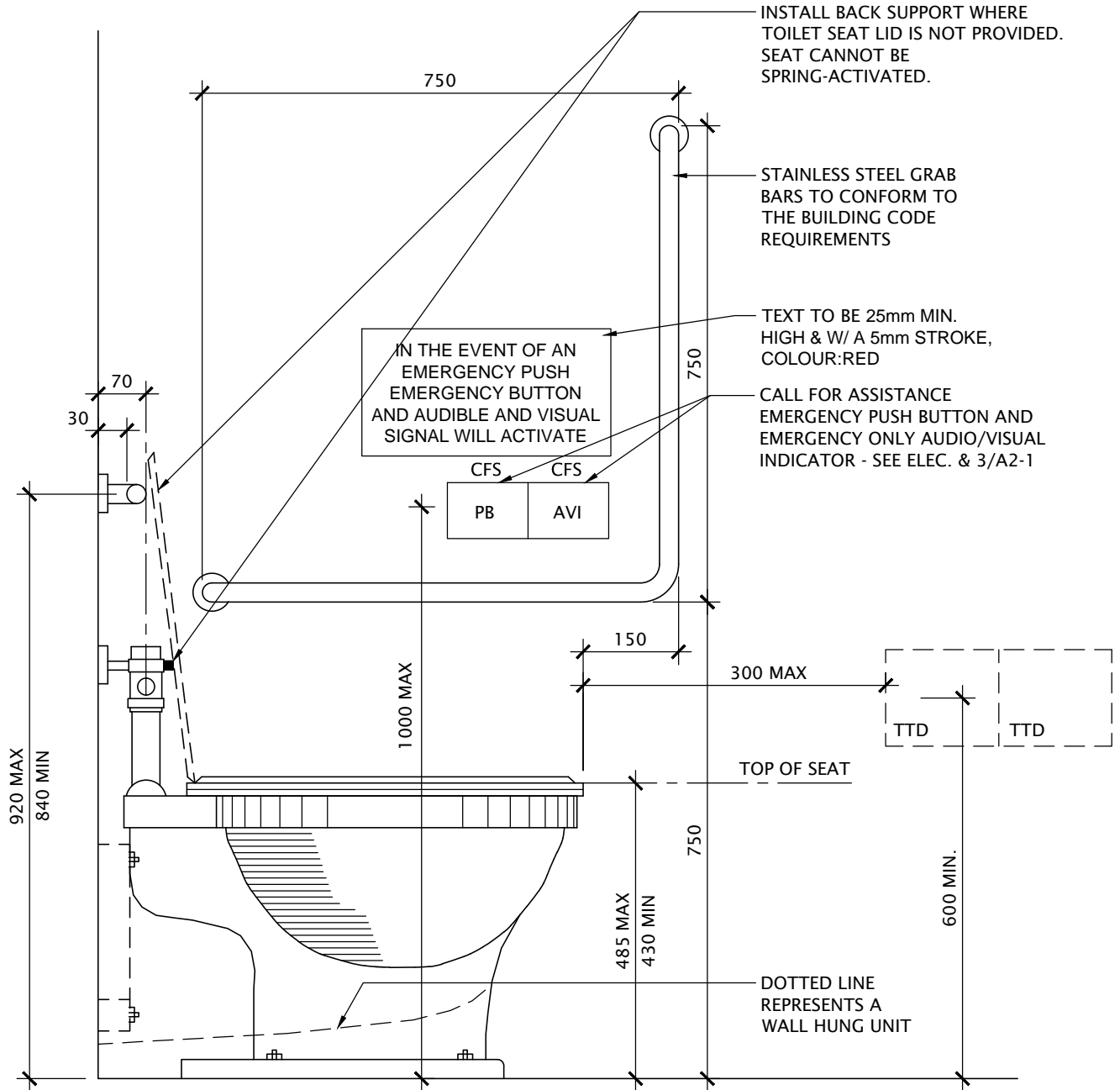
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8-401

REV.



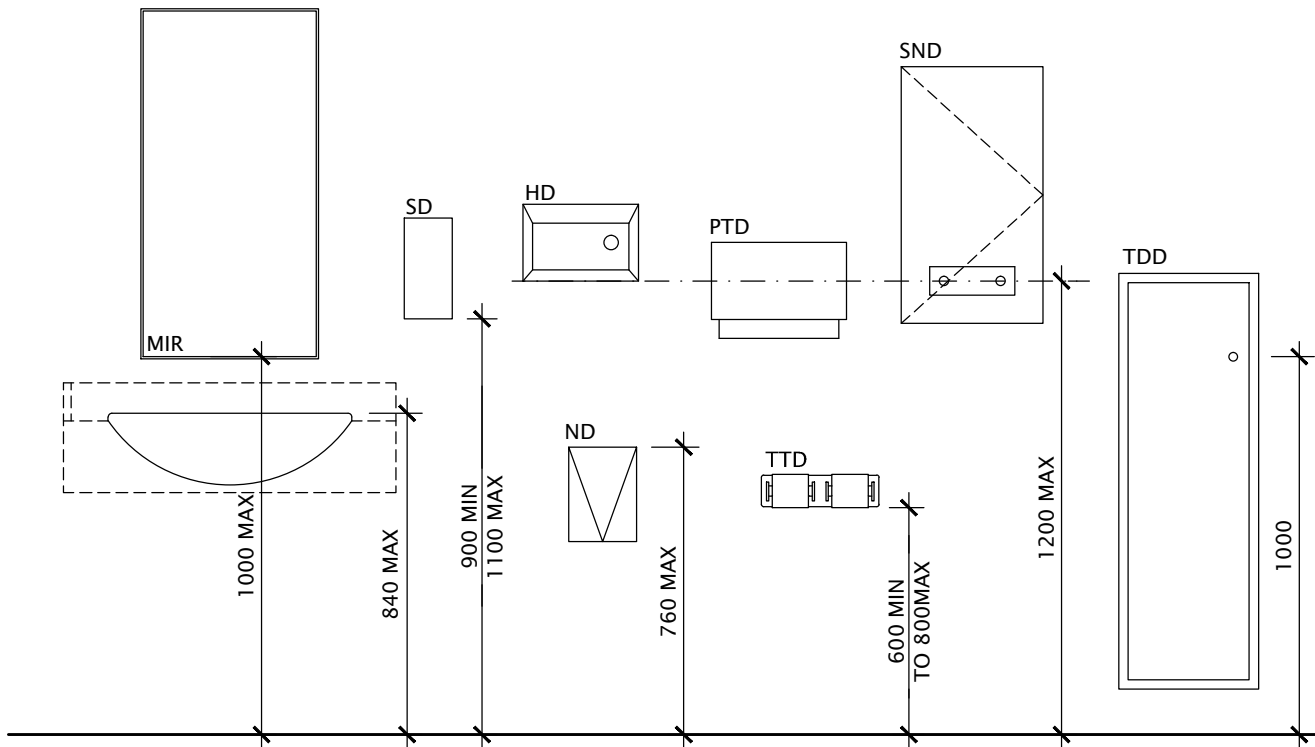
<div>Kingsland + ARCHITECTS INC.</div>	ISSUED:	DRAWING NAME: BARRIER-FREE WASHROOM FRONT ELEVATION	DATE: MAR 2026		SCALE: 1:10	
			DRAWN: K+		PROJECT NO: A25007	
KINGSLAND + ARCHITECTS INC 110 Cumberland Street, Suite 262 Toronto, Ontario M5R 3V5 ph 416.203.7799 fax 416.203.7763		PROJECT NAME: Sir Oliver Mowat-Bundle 5	CHECKED: K+		DWG NO: 10-100	REV. 0



NOTE:
 INSTALLATION OF GRAB BARS, WASHROOM ACCESSORIES & W.C. TO CONFORM TO BUILDING CODE REQUIREMENTS (FOR ONTARIO - O.B.C. SECTION 3.8 BARRIER FREE DESIGN.
 SEE FLOOR PLANS FOR LOCATION OF WASHROOM ACCESSORIES.

<div>Kingsland + ARCHITECTS INC.</div>	ISSUED:	<div>DRAWING NAME:</div> <div>BARRIER-FREE WASHROOM SIDE ELEVATION</div>	<div>DATE:</div> <div>MAR 2026</div>		<div>SCALE:</div> <div>1:10</div>	
			<div>DRAWN:</div> <div>K+</div>		<div>PROJECT NO:</div> <div>A25007</div>	
<div>KINGSLAND + ARCHITECTS INC 110 Cumberland Street, Suite 262 Toronto, Ontario M5R 3V5 ph 416.203.7799 fax 416.203.7763</div>			<div>PROJECT NAME:</div> <div>Sir Oliver Mowat-Bundle 5</div>	<div>CHECKED:</div> <div>K+</div>		<div>DWG NO:</div> <div>10-101</div>

LEGEND - NEW			
AVI	CFS EMERGENCY AUDIO/VISUAL INDICATOR	RUB	RUBBER BASE
CFS	CALL FOR ASSISTANCE SYSTEM- SEE ELEC.	MOS	MOSAIC WALL TILES TO MATCH EX.
HD	HAND DRYER-SEE ELEC.	OI	OCCUPANCY INDICATOR
LPS	LOW PROFILE SINK - SEE MECH. & SPECS	PL	PUSH TO LOCK BUTTON
MIR	TILTED MIRROR	PB	CFS PUSH BUTTON
MOS	MOSAIC WALL TILES TO MATCH EX.	PT	PAINT FINISH
ND	NAPKIN DISPOSAL	PTD	PAPER TOWEL DISPENSER
PT	PAINT FINISH	POR	PORCELAIN FLOORING TILES /BASE TO MATCH EX.
POR	PORCELAIN FLOORING TILES /BASE TO MATCH EX.	RUB	RUBBER BASE
		SND	SANITARY NAPKIN DISEPNSER
		SD	SOAP DISPENSER
		TTD	TOILET TISSUE DISPENSER
			WALL FINISH
			FLOOR FINISH



NOTES:

INSTALLATION OF WASHROOM ACCESSORIES TO CONFORM TO THE BUILDING CODE REQUIREMENTS FOR BARRIER FREE DESIGN.

A COAT HOOK MUST BE MOUNTED WITHIN THE STALL ON THE SIDE WALL NOT MORE THAN 1100 MM ABOVE THE FLOOR AND EXTENDING NOT MORE THAN 50 MM OUT FROM WALL.

IN UNIVERSAL TOILET ROOMS PROVIDE A SHELF LOCATED NOT MORE THAN 1100 MM ABOVE THE FLOOR. SEE FLOOR PLANS FOR LOCATION OF WASHROOM ACCESSORIES.

REFER TO MANUFACTURES SPECIFICATIONS FOR MOUNTING DETAILS OF SPECIFIED ACCESSORIES.

<div><div>Kingsland </div><div>ARCHITECTS INC.</div></div>	ISSUED:	DRAWING NAME: BARRIER-FREE ACCESSORY INSTALLATION	DATE: MAR 2026		SCALE: 1:20	
			DRAWN: K+		PROJECT NO: A25007	
			PROJECT NAME: Sir Oliver Mowat—Bundle 5		CHECKED: K+	DWG NO: 10-102
KINGSLAND + ARCHITECTS INC 110 Cumberland Street, Suite 262 Toronto, Ontario M5R 3V5 ph 416.203.7799 fax 416.203.7763						

APPENDIX 'B' REPORTS

Report 1

Designated Substances and Hazardous Building Assessment Report
dated March 6, 2026 prepared by SafeTECH Environmental Ltd.

DESIGNATED SUBSTANCES AND HAZARDOUS BUILDING MATERIALS ASSESSMENT REPORT

**Accessibility Upgrade Project
Sir Oliver Mowat Collegiate Institute
5400 Lawrence Avenue East
Scarborough, Ontario
M1C 2C6**

***Prepared for:*
Sandra Chen
Project Supervisor**

**Toronto District School Board
15 Oakburn Crescent
Toronto, Ontario
M2N 2T5**

***Prepared by:*
Safetech Environmental Limited**

A handwritten signature in black ink, appearing to read "Dan Whittal".

**Dan Whittal
Occupational Health and Safety Technician**

Reviewed by:

A handwritten signature in black ink, appearing to read "Daniel D'Aloisio".

**Daniel D'Aloisio, B.Sc., A.M.R.T
Senior Project Manager**

Safetech Project Number: 1-3260230

**Date of Site Work: March 6, 2026
Date of Issue: March 20, 2026**

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EXECUTIVE SUMMARY

Safetech Environmental Limited (Safetech) was commissioned by Toronto District School Board to conduct a designated substances and hazardous materials assessment in project specific locations of 5400 Lawrence Avenue East, Scarborough, Ontario.

The objective of the assessment was to determine the presence, location, condition and quantities of designated substances and other hazardous materials that have the potential to be disturbed as part of planned construction activities (i.e. Accessibility Upgrade Project) so that appropriate control measures can be implemented to protect workers during the work.

A summary of the assessment results and general recommendations based on our findings are provided in the following table. This table should be considered a summary only. Please refer to the Results (Section 2.0), Conclusions and Recommendations (Section 3.0), Summary of ACM Occurrences (Appendix A) and Site Drawings (Appendix B) of our report for additional details.

Table 1: Summary of Hazardous Materials and Designated Substances

Designated Substance	Findings	Recommendations
Asbestos	<p>The following asbestos-containing materials were identified in the subject area that may be impacted during the project:</p> <ul style="list-style-type: none"> - block filler paint 	<p>Disturbance of asbestos-containing materials must be conducted in accordance with Ontario Regulation 278/05 <i>Designated Substance – Asbestos on Construction Projects and in Building and Repair Operations</i>. Refer to Table 3 (Results of Assessment for Asbestos-Containing Materials), Section 3.1.1 (Conclusions and Recommendations), Appendix A (Summary of ACM Occurrences) and Appendix B (Site Drawings). Asbestos-containing waste must be disposed of in accordance with R.R.O. 1990, Regulation 347, <i>General - Waste Management</i>.</p>
Lead	<p>White paint was confirmed to be not lead-containing (<0.1% lead content).</p>	<p>Disturbance of lead-containing materials must be conducted in</p>

Lead (cont'd)	<p>The following materials are assumed to be lead-containing:</p> <ul style="list-style-type: none"> - paints and surface coatings (not sampled) - glazing associated with ceramic tiles - solder in copper pipe fittings - solder in electrical components 	<p>accordance with the Ontario Ministry of Labour, Immigration, Training and Skills Development (MLITSD) <i>Lead on Construction Projects</i> guideline (2011) and/or the Environmental Abatement Council of Canada (EACC) <i>Lead Guideline</i> (October 2014). For additional details, refer to Section 2.1.2 (Results) and Section 3.1.2 (Conclusions and Recommendations). Lead-containing wastes should be recycled if practicable or handled and disposed of according to R.R.O. 1990, Regulation 347, <i>General- Waste Management</i>.</p>
Mercury	<p>Sources of mercury were observed in the subject area and include the following:</p> <ul style="list-style-type: none"> - vapour in fluorescent lamps - liquid in thermostats - thermometers associated with mechanical equipment 	<p>If required, handle lamps with care and keep intact. All waste lamps are recommended to be sent to a lamp recycling facility.</p>
Silica	<p>Building materials identified that are suspected to contain crystalline silica and may be disturbed as part of the planned construction project include:</p> <ul style="list-style-type: none"> - plaster - drywall walls/drywall joint compound - concrete - mortar - sprayed fireproofing 	<p>Any work involving the disturbance of silica-containing materials should follow the procedures outlined in the Ontario MLITSD <i>"Silica on Construction Projects"</i> guideline. For additional information, refer to Section 2.1.4 (Results) and Section 3.1.4 (Conclusions and Recommendations).</p>
Other Designated Substances	<p>No other designated substances are expected to be present in any significant quantities or in a form that would represent an exposure concern.</p>	<p>No protective measures or procedures specific to acrylonitrile, arsenic, benzene, coke oven emissions, ethylene oxide, isocyanates, and vinyl chloride are considered necessary.</p>
Other Hazardous Materials	Findings	Recommendations
Urea Formaldehyde Foam Insulation	<p>No UFFI was identified or is suspected in the subject area.</p>	<p>No action required.</p>
Mould Contamination	<p>No suspect mould contamination was observed on building finishes in the subject area.</p>	<p>No action required.</p>
Pest Infestation	<p>No pest infestations were observed in the areas assessed.</p>	<p>No action required.</p>
Polychlorinated Biphenyls	<p>Fluorescent light ballasts are assumed to contain PCB's.</p>	<p>PCB-containing ballasts should be removed, separated from other waste and disposed of as PCB waste at an authorized destruction facility.</p>
Ozone Depleting and Global Warming Substances	<p>No equipment was observed that is suspected to contain ozone depleting and/or global warming substances</p>	<p>No action required.</p>

This assessment satisfies the Owner's requirements under Section 30 of the Ontario Occupational Health and Safety Act (OHSA), Revised Statutes of Ontario 1990, as amended.

Should you have any questions regarding the information contained in the report, please contact our office.

Safetech Environmental Limited

A handwritten signature in black ink, appearing to read 'Dan Whittal', is positioned above the printed name.

Dan Whittal
OH&S Technician



March 20, 2026

Toronto District School Board
15 Oakburn Crescent
Toronto, Ontario
M2N 2T5

Attention: Sandra Chen
Project Supervisor

**RE: Designated Substances and Hazardous Materials Assessment
Accessibility Upgrade Project
Sir Oliver Mowat Collegiate Institute
5400 Lawrence Avenue East, Scarborough, Ontario**

1.0 INTRODUCTION

1.1 Background and Objectives

Safetech Environmental Limited (Safetech) was commissioned by Toronto District School Board to conduct a designated substances and hazardous materials assessment in project specific locations at 5400 Lawrence Avenue East, Scarborough, Ontario (project specific areas). The objective of the assessment was to determine the presence, location, condition and quantities of designated substances and other hazardous materials in the project specific areas that have the potential to be disturbed as part of planned construction activities (i.e. Accessibility Upgrade Project) so that appropriate control measures can be implemented to protect workers during the work.

This assessment satisfies the Owner's requirements under Section 30 of the Ontario Occupational Health and Safety Act (OHSA), Revised Statutes of Ontario 1990, as amended. Section 30(1) requires a building owner to determine if there are any designated substances present at a project site prior to construction or demolition activities. Sections 30(2), (3) and (4) require the Owner and constructors for a project to provide the findings in this report as part of the tendering information for any tendered project or to prospective contractors (and subcontractors) of a project before entering into a binding contract.

This report documents findings of our on-site inspection that was conducted on March 6, 2026 and provides conclusions and recommendations based on our findings and knowledge of the planned construction project.

1.2 Scope of Work

In accordance with our fee proposal document, our scope of work included the following activities:

- A review of existing documents, including renovation documents and drawings, floor plans and existing environmental assessment reports, etc., where available;
- A visual assessment of accessible area(s) in the project specific areas to identify the presence, location, condition and quantities of designated substances and other hazardous materials;
- Collection, analysis and interpretation of representative bulk samples of suspect asbestos-containing building materials for the determination of asbestos content and material classification;
- Collection, analysis and interpretation of representative paint chip samples for the determination of lead content; and
- Preparation of a report to document findings and provide recommendations regarding control measures and/or special handling procedures for designated substances or specific hazardous materials that may be disturbed as part of planned construction activities.

Documents reviewed to aid in the assessment included the following:

- “Designated Substances and Hazardous Materials Assessment Report – Fire Alarm System Upgrade Project” Project # 1-3230245, dated March 2023 as prepared by Safetech Environmental for Sir Oliver Mowat Collegiate Institute
- Sir Oliver Mowat Collegiate Institute, Project Floor Plans

This assessment only identified designated substances and hazardous materials that were deemed to be part of the building or somehow otherwise incorporated into the building structure and its finishes. **The following items were not included in our scope of work:**

- Assessing occupant items such as stored products, furnishings, items and materials used or produced as part of a manufacturing process;
- Investigating underground materials or equipment (vessels, drums, underground storage tanks, duct-banks, pipes, or cables);
- Assessing enclosed wall or ceiling cavities; and
- Assessing risers, pipe chases or elevator shafts.

1.3 Description of Area(s) Assessed

The area(s) investigated included all accessible locations of the project specific areas. The extent of the area investigated is indicated on the floor plan(s) provided in Appendix B.

2.0 RESULTS

Results of our visual assessment and bulk sample analytical findings are summarized in the sections below.

2.1 Designated Substances

2.1.1 Asbestos

Results of bulk sample analysis for the determination of asbestos content are summarized in the following table. Materials have been classified as “ACM”, “Non-ACM”, “Suspected ACM” or “Presumed Non-ACM” based on analytical results. Materials classified as Suspected ACM or Presumed Non-ACM may require further analysis (depending on site-specific conditions) to verify whether the material should be classified as ACM or Non-ACM. Please refer to the Limitations section of this report (Section 4.0) for additional details. The Laboratory Certificate of Analysis is included in Appendix C.

Table 2: Bulk Sample Analytical Results for Determination of Asbestos Content

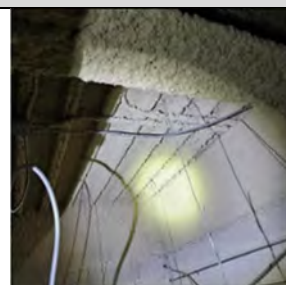
Sample No.	Material Description	Sample Location	Asbestos Content	Material Classification
1a	Grey with Black & White Speck Vinyl Floor Tile	Level 1 Corridor, Adjacent Door 7 (17008-1)	None Detected	NON-ACM
1b	Grey with Black & White Speck Vinyl Floor Tile	Level 1 Corridor, Adjacent Door 7 (17008-1)	None Detected	NON-ACM
1c	Grey with Black & White Speck Vinyl Floor Tile	Level 1 Corridor, Adjacent Door 7 (17008-1)	None Detected	NON-ACM
2a	White with Beige Speck Vinyl Floor Tile	Level 3 Corridor, Adjacent Stair 4 (16940)	None Detected	NON-ACM
2b	White with Beige Speck Vinyl Floor Tile	Level 3 Corridor, Adjacent Stair 4 (16940)	None Detected	NON-ACM
2c	White with Beige Speck Vinyl Floor Tile	Level 3 Corridor, Adjacent Stair 4 (16940)	None Detected	NON-ACM
3a	Cream with Beige Speck Vinyl Floor Tile	Level 3 Corridor, Adjacent Stair 4 (16940)	None Detected	NON-ACM
3b	Cream with Beige Speck Vinyl Floor Tile	Level 3 Corridor, Adjacent Stair 4 (16940)	None Detected	NON-ACM
3c	Cream with Beige Speck Vinyl Floor Tile	Level 3 Corridor, Adjacent Stair 4 (16940)	None Detected	NON-ACM
4a	White with Faint Streaks Vinyl Floor Tile	Level 1, Meter Room (17109-2)	None Detected	NON-ACM

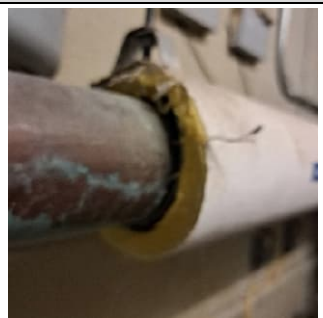

Sample No.	Material Description	Sample Location	Asbestos Content	Material Classification
	Mastic		None Detected	NON-ACM
4b	White with Faint Streaks Vinyl Floor Tile	Level 1, Meter Room (17109-2)	None Detected	NON-ACM
	Mastic		None Detected	NON-ACM
4c	White with Faint Streaks Vinyl Floor Tile	Level 1, Meter Room (17109-2)	None Detected	NON-ACM
	Mastic		None Detected	NON-ACM
5a	Light Pink Vinyl Sheet Floor	Level 1 Corridor, Adjacent Door 5 (17125)	None Detected	NON-ACM
5b	Light Pink Vinyl Sheet Floor	Level 1 Corridor, Adjacent Door 5 (17125)	None Detected	NON-ACM
5c	Light Pink Vinyl Sheet Floor	Level 1 Corridor, Adjacent Door 5 (17125)	None Detected	NON-ACM
6a	Concrete Block Mortar	Level 1, Meter Room (17109-2)	None Detected	NON-ACM
6b	Concrete Block Mortar 1	Level 1, Meter Room (17109-2)	None Detected	NON-ACM
	Mortar 2		None Detected	NON-ACM
6c	Concrete Block Mortar	Level 1 Corridor, Adjacent Door 5 (17125)	None Detected	NON-ACM
7a	Brick Mortar	Level 1 Corridor, Adjacent Cafeteria (17127)	None Detected	NON-ACM
7b	Brick Mortar	Level 1 Corridor, Adjacent Cafeteria (17127)	None Detected	NON-ACM
7c	Brick Mortar	Level 1 Corridor, Adjacent Cafeteria (17127)	None Detected	NON-ACM

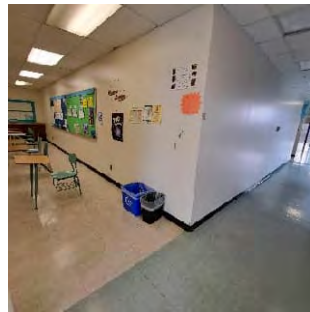

As per O.Reg. 278/05, ACM contains $\geq 0.5\%$ asbestos by dry weight.

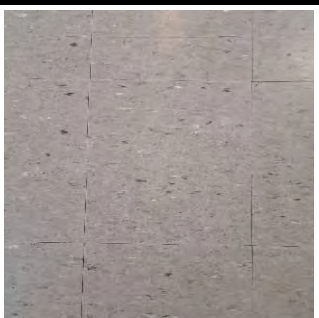



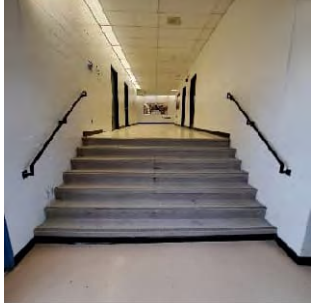
Materials assessed for asbestos content are summarized in the following table based on the type/use of the material.


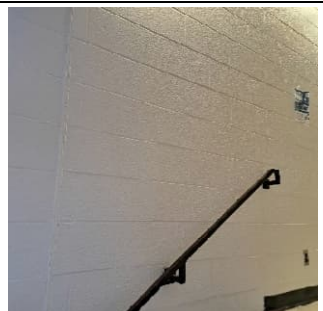

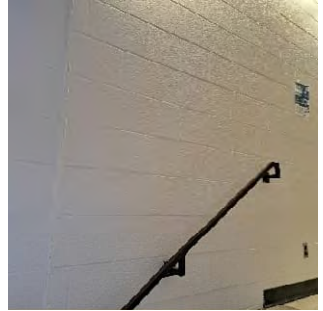
Table 3: Results of Assessment for Asbestos-Containing Materials

Sprayed and Loose Fill Insulating Materials	Location/Description	
Sprayed Fireproofing	During the 2023 Safetech survey, sprayed fireproofing was observed in the subject building. Bulk samples were collected during the assessment and results of analysis confirmed that this building material is not asbestos-containing.	

Loose Fill / Vermiculite Insulation	None identified in project specific areas. Interior portions of concrete block walls could not be assessed. However, it is not expected that these walls are insulated with loose fill or vermiculite insulation	
Thermal System Insulation	Location/Description	
Mechanical Pipe Insulation – Straights	Mechanical pipe insulation in the project specific areas was observed to be made of fiberglass which is known to be not asbestos-containing.	
	<p>Preformed Block On Straight Run Pipe was previously observed in the subject building. Bulk samples were previously collected and results of analysis confirmed that this building material contains 50% chrysotile asbestos. Refer to the location, condition, friability, and estimated quantity in Appendix A.</p> <p>The material is not expected to be disturbed under the scheduled project.</p>	
Mechanical Pipe Insulation – Fittings (elbows, valves, tees, hangars, etc.)	Pipe fitting insulation in the project specific areas was observed to be made of fiberglass or PVC which are known to be not asbestos-containing.	
	<p>Parging Cement On Fittings was previously observed in the subject building. Bulk samples were previously collected and results of analysis confirmed that this building material contains 50% chrysotile asbestos. Refer to the location, condition, friability, and estimated quantity in Appendix A.</p> <p>The material is not expected to be disturbed under the scheduled project.</p>	
HVAC Duct Insulation	None identified in project specific areas.	
Breeching / Exhaust Insulation	None identified in project specific areas.	

Tank Insulation	None identified in project specific areas.	
Boiler Insulation	None identified in project specific areas.	
Other Mechanical Equipment Insulation	None identified in project specific areas.	
Architectural Finishes & Finishing Materials	Location/Description	
Sprayed Texture / Stucco Finishes	None identified in project specific areas.	
Plaster Finishes	None identified in project specific areas.	
Drywall Joint Compound	<p>During the 2023 Safetech survey, drywall joint compound was observed in the project specific areas. Bulk samples were collected during the assessment and results of analysis confirmed that this building material contains 2% chrysotile asbestos. Refer to Appendix A for the location, condition, friability, and estimated quantity.</p>	
Ceiling Tiles	Location/Description	
Lay-in Acoustic Ceiling Tiles	<p>2x4 Fissure and pinhole lay-in ceiling tiles were observed in the project specific areas. This building material was noted to contain a manufacturer's date stamp following the year 2000 and is therefore not suspected to contain asbestos.</p>	
Glued-on Acoustic Ceiling Tiles	None identified in project specific areas.	
Cement Ceiling Panels	None identified in project specific areas.	
Flooring	Location/Description	

Vinyl Floor Tiles	<p>Grey with black & white specks vinyl floor tiles were observed in the project specific areas. Bulk samples were collected during the assessment and results of analysis confirmed that this building material is not asbestos-containing. Refer to sample set 1 in Table 2.</p>	
	<p>White with beige specks vinyl floor tiles were observed in the project specific areas. Bulk samples were collected during the assessment and results of analysis confirmed that this building material is not asbestos-containing. Refer to sample set 2 in Table 2.</p>	
	<p>Cream with beige specks vinyl floor tiles were observed in the project specific areas. Bulk samples were collected during the assessment and results of analysis confirmed that this building material is not asbestos-containing. Refer to sample set 3 in Table 2.</p>	
	<p>White with faint streaks vinyl floor tiles were observed in the project specific areas. Bulk samples were collected during the assessment and results of analysis confirmed that this building material is not asbestos-containing. Refer to sample set 4 in Table 2.</p>	
Vinyl Sheet Flooring	<p>Light pink vinyl sheet flooring was observed in the project specific areas. Bulk samples were collected during the assessment and results of analysis confirmed that this building material is not asbestos-containing. Refer to sample set 5 in Table 2.</p>	

Mastic	Mastic associated with vinyl floor tiles was observed in the project specific areas. Bulk samples were collected during the assessment and results of analysis confirmed that this building material is not asbestos-containing. Refer to sample set 4 in Table 2.	
Asbestos Cement Products	Location/Description	
Piping	None identified in subject area.	
Roofing, Siding, Wallboard	None identified in project specific areas.	
Other Cement Products	Concrete block mortar was observed in the project specific areas. Bulk samples were collected during the assessment and results of analysis confirmed that this building material is not asbestos-containing. Refer to sample set 6 in Table 2.	
	Brick mortar was observed in the project specific areas. Bulk samples were collected during the assessment and results of analysis confirmed that this building material is not asbestos-containing. Refer to sample set 7 in Table 2.	
	During the 2023 Safetech survey, Block filler was observed in the subject building. Bulk samples were collected during the assessment and results of analysis confirmed that this building material contains 1% chrysotile asbestos. Refer to Appendix A for the location, condition, friability, and estimated quantity.	
Exterior Building Materials	Location/Description	
Caulking	None identified in project specific areas.	
Shingles	None identified in project specific areas.	

2.1.2 Lead

Laboratory analytical results for paints tested to determine lead content are summarized in the following table. The Laboratory Certificate of Analysis is included in Appendix D. Refer to Section 3.1.2 of this report for recommended lead abatement procedures (if any) that correspond to the type of proposed construction, renovation, or demolition work.

Table 4: Results of Paint Condition and Lead Content Assessment

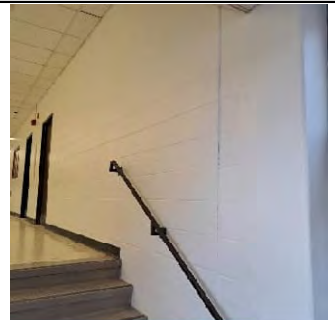
Sample No.	Location	Surface	Paint Colour	Condition	Lead Conc. (% by wt.)	Material Classification
L1	Corridor Adjacent Door 5 (17125)	Concrete Block Wall	White	Good	<0.0064%	NLC

LCP: Lead-Containing Paint (>0.1% Lead Content); LLLP: Low-Level Lead Paint (≤0.1% Lead Content)

Suspect lead-containing materials observed in the project specific areas included the following:

- paints and surface coatings (not sampled)
- glazing associated with ceramic tiles
- solder in copper pipe fittings
- solder in electrical components

Table 5: Results of Assessment for Lead-Containing Materials

Location/Description	Picture
White paint associated with concrete block walls in corridor adjacent to door 5 (17125) was sampled during our investigation. Results of analysis did not indicate the presence of any detectable concentrations of lead. Therefore, the white paint is not considered to be lead-containing. Refer to sample L1 in Table 4.	

2.1.3 Mercury

Mercury is present in the project specific areas in the form of:

- vapour in fluorescent lamps
- liquid in thermostats
- thermometers associated with mechanical equipment

2.1.4 Silica

A number of building materials were identified in the project specific areas that are ***suspected to contain crystalline silica***. This includes the following materials:

- plaster
- drywall walls/drywall joint compound
- concrete
- mortar
- sprayed fireproofing

2.1.5 Other Designated Substances

Acrylonitrile, arsenic, benzene, coke oven emissions, ethylene oxide, isocyanates, and vinyl chloride were not included in the assessment as these substances are not expected to be a significant component of building materials or present in a form that would represent an exposure concern. Additionally, no specific information regarding their use was provided to us.

2.2 Other Hazardous Materials

2.2.1 Chemical Hazards

No visible evidence of UFFI installation (i.e. injection openings) or overspray of foam insulation at wall/ceiling joints was identified in the project specific areas.

2.2.2 Biological Hazards

2.2.2.1 Mould Contamination

There was no visible evidence of obvious mould growth on building finishes in the project specific areas at the time of the assessment. In addition, there was no visible evidence of any significant water staining or discolouration to building finishes in the project specific areas that would suggest the potential for hidden mould growth behind these finishes.

2.2.2.2 Pest Infestation

There was no visible evidence of a pest infestation in the project specific areas.

2.2.3 Environmental Hazards

2.2.3.1 Polychlorinated Biphenyls (PCBs)

Fluorescent light ballasts are assumed to contain PCB's.

2.2.3.2 Ozone Depleting and Global Warming Substances

No fixed equipment suspected to contain ODS/GWS was observed in the project specific areas.

3.0 CONCLUSIONS AND RECOMMENDATIONS

3.1 Designated Substances

3.1.1 Asbestos

As results summarized in Table 2 indicate, no asbestos was detected in any of the bulk samples of vinyl floor tile, vinyl floor tile mastic, concrete block mortar or brick mortar retrieved for analysis. Therefore, these building materials are considered to be Non-ACM and there are no requirements for management, disturbance or removal of these materials under O. Reg. 278/05. No other suspect asbestos-containing materials were observed in the subject area.

Results of the assessment indicated that the following asbestos-containing materials are present in the project specific areas that may be disturbed as part of the construction project.

- block filler paint

Refer to Appendix A (Summary of ACM Occurrences) and Appendix B (Site Drawings) for types, locations, estimated quantities, and condition of asbestos-containing materials identified in the subject area.

Removal or disturbance of identified asbestos-containing materials must be conducted in accordance with O.Reg. 278/05. Asbestos containing materials in Poor condition must be removed and/or repaired immediately following applicable asbestos abatement procedures. Asbestos-containing materials in Good condition can remain in place until major system upgrading, maintenance or demolition which could result in disturbance of this material.

Block Filler Paint: The block filler paint is considered to be a non-friable ACM. As per O. Reg. 278/05, removal of non-friable ACM can be conducted following Type 1 operations; as long as the material can be removed without being broken, cut, drilled or otherwise similarly disturbed. If the material cannot be removed without it breaking or being similarly disturbed then the work should be conducted using non-powered hand tools and the material should be wetted to control the spread of dust. If the material cannot be wetted or if power tools attached to dust-collecting devices equipped with HEPA (high efficiency particulate aerosol) filters are used during removal or disturbance, then work should be performed following Type 2 operations. If non-friable materials are removed or disturbed using power tools that are not attached to dust-collecting devices that are equipped with HEPA filters then work should be conducted following Type 3 operations.

General Recommendations: The removal or disturbance of ACM must follow the measures and procedures indicated in O. Reg. 278/05. This work should be conducted by workers who have received proper training by a “competent person” in the hazards of asbestos exposure, personal hygiene and work practices, and the use and care of respirators and protective clothing. Any worker/supervisor who works in a Type 3

operation must successfully complete the Asbestos Abatement Worker or Supervisor Training Program approved by the Ministry of Labour, Immigration, Training and Skills Development. It is recommended that all work involving the removal or disturbance of ACM be subject to inspection and testing to document conformance with O. Reg. 278/05 requirements. The degree of inspection and testing is dependent on site-specific conditions such as the type, duration, size and location of the work. In most circumstances Type 3 operations require a visual inspection and clearance air testing to be conducted by a competent worker on completion of the work. The inspection should be conducted to ensure that the enclosure and the work area inside the enclosure are free from visible dust, debris or residue that may contain asbestos. Clearance air testing for Type 3 operations requires a minimum number of air samples to be taken (depending on the size of the work area) following specific sampling and analytical procedures and all samples taken must meet the clearance criteria set out in O. Reg. 278/05.

3.1.2 Lead

Paints and surface coatings not sampled are assumed to be lead-containing (>0.1% lead content) in the subject area.

Emergency lighting is present on perimeter walls in the project specific areas and are suspected to contain lead-acid batteries. If emergency lighting is removed/replaced as part of the scheduled work activities, the batteries are recommended to be sent to a recycling facility for proper treatment.

Additional suspect lead-containing products includes solder on pipe fittings and electrical components. Future testing of these materials and specific handling/disposal requirements may be necessary if/when these materials are to be disturbed.

Any disturbance of the lead-containing materials should be conducted in accordance with the procedures outlined in the Environmental Abatement Council of Canada (EACC) "Lead Guideline" (October 2014) and/or the Ontario Ministry of Labour, Immigration, Training and Skills Development (MLITSD) "Lead on Construction Projects" guideline (April 2011). The extent of procedures required depends on the type of work to be conducted.

At this time the method of disturbance, if any, of lead-containing materials is unknown. It is recommended that any contractor whose work requires lead-containing materials to be disturbed consult the EACC or Ontario MLITSD guidelines prior to the start of work to determine the Class/Type of operation(s) and the corresponding control measures (engineering controls, work/hygiene practices, protective clothing and equipment and worker training) necessary to conduct the work in a manner that will prevent worker overexposure to lead. The following table outlines the classification of lead disturbance based on the EACC guideline.

Operation	Description
Class 1	<ol style="list-style-type: none"> 1. Removal of lead-containing or lead-based paints and surface coatings with a chemical gel/stripper or paste; 2. Application of lead-containing or lead-based paints and surface coatings with a brush, roller or sponge. 3. Installation or removal of lead sheeting or flashing. 4. Installation or removal of lead-containing packing, babbitt, caulking, gasket or similar material. 5. Removal of materials coated with lead-containing or lead-based paints and surface coatings, using non-powered hand tools, where the material remains chiefly intact and is not crumbled, pulverized or powdered. 6. Operating construction or demolition equipment (e.g. excavator, bulldozer) during building renovation or demolition where lead-based paints or surface coatings are present on building materials and are being disturbed. 7. Soldering with lead solder. 8. Removing lead-containing or lead-based paints or surface coatings with a heat gun. 9. Removing lead-containing and lead-based paints and surface coatings using a high-pressure water jet (e.g. pressure washer).
Class 2a	<ol style="list-style-type: none"> 1. Removal of lead-containing or lead-based paints and surface coatings or lead-containing materials using a power tool that has an effective dust collection system equipped with a HEPA filter*. 2. Welding, torching or high temperature cutting of lead-containing materials indoors when using an effective fume collector or smoke eater that filters and exhausts lead fume and expels it directly outdoors (away from occupants, entrances, walkways, rest areas, etc.). Fume collector or smoke eater must have effective source control and capture velocity, minimum of 0.5 metres per second (100 feet per minute) at the work surface. 3. Welding, torching or high temperature cutting of lead-containing and lead-based paints and surface coatings or lead-containing materials outdoors. 4. Removal of lead-containing mortar using handheld non-powered tools. 5. Removal of lead-containing and lead-based paints and surface coatings or lead-containing materials by scraping or sanding (including wet sanding) using non-powered hand tools. 6. Demolition of plaster or building components that crumble, pulverize or powder and are covered with lead-containing or lead-based paints or surface coatings. 7. Clean up and removal of a significant amount of lead-containing dust and debris (that can be made easily airborne) using wet methods or HEPA vacuums.
Class 2b	<ol style="list-style-type: none"> 1. Spray application of lead-containing paints and surface coatings

Operation	Description
Class 3a	<ol style="list-style-type: none"> 1. Removal of lead-containing or lead-based paints and surface coatings or lead-containing materials using a power tool without an effective dust collection system equipped with a HEPA filter. 2. Welding, torching or high temperature cutting of lead-containing materials indoors or in a confined space (e.g. within a ditch or pit). 3. Removal of lead-containing mortar using a powered cutting device. 4. Burning of a material containing lead. 5. Removal, cleaning or repair of a ventilation system or ductwork used for controlling lead exposure. 6. Spray application of lead-based paints and surface coatings. 7. In the absence of an exposure assessment: <ol style="list-style-type: none"> a. demolition or cleanup of a facility where lead-containing products were manufactured and significant dust and debris, which can be made easily airborne, is present. b. cleanup of dust and debris down range of a firing station in an indoor firing range. an operation that may expose a worker to lead dust, fume or mist that is not a Class 1, Class 2, or Class 3B operation.
Class 3b	<ol style="list-style-type: none"> 1. Abrasive blasting of lead-containing and lead-based paints and surface coatings or lead-containing materials (including wet, slurry and dry abrasive blasting and dry-ice blasting).

* Effective implies that the dust collection system should be capable of controlling airborne lead concentration levels to below 0.05 mg/m³. Employers should follow manufacturer's recommendations and maintenance specifications for optimal function.

If practicable, all bulk lead waste materials should be separated from other wastes and sent to a recycling facility. If not practicable, lead-containing waste should be handled and disposed of according to R.R.O. 1990, Regulation 347, *General - Waste Management* (Reg. 347) made under the Environmental Protection Act. Under this regulation (and depending on the quantity of waste generated) the waste may be subject to analysis following the Toxicity Characteristic Leaching Procedure (TCLP) to determine if it is a "leachate toxic waste" based on the leachate quality criteria provided in Schedule 4 of the regulation. Such wastes must meet specific treatment requirements (Schedule 5) or undergo alternative treatment for hazardous debris (Schedule 8) prior to land disposal.

3.1.3 Mercury

Fluorescent and HID lamps that require removal should be handled with care and kept intact to avoid potential exposure to mercury vapour present within the lamps. To prevent the release of mercury into the environment, Safetech recommends that all waste lamps be sent to a lamp recycling facility and not disposed of in landfill.

Liquid mercury is suspected to be present in thermometers, barometers and other measuring devices (pressure gauges/sensors, vacuum gauges, manometers, etc.), thermostats and a variety of other electrical switches (temperature sensitive, tilt switches, float switches, etc.) associated with mechanical equipment. These items are expected to be removed as part of the construction project. Care should be taken not to disturb these items during the work as breakage could cause a spill of liquid mercury. If any of these items are to be removed it should be done so carefully to avoid spillage and

stored/packaged in a manner that will prevent breakage or spillage. Any mercury-containing equipment that is to be removed is recommended to be recycled rather than disposed of in landfill.

Although no mercury was visibly identified in other equipment, dismantling of equipment was not conducted to verify the presence/absence of mercury. It is cautioned that thermometers, barometers and other measuring devices (pressure gauges/sensors, vacuum gauges, manometers, etc.), thermostats and a variety of other electrical switches (temperature sensitive, tilt switches, float switches, etc.) may contain mercury that may not be visible without dismantling the equipment. Such devices should be assumed to contain mercury until proven otherwise and similar precautions to those outlined above should be taken if any of these items are to be disturbed or taken out of service in the future.

3.1.4 Silica

Suspect silica-containing materials were identified to be present in the project specific areas. In their current state, building materials containing silica do not represent a risk to building occupants or construction workers. Risks associated with exposure to silica arise during demolition activities that cause silica dust to be created (particularly grinding, drilling or cutting operations and during major demolition), resulting in a crystalline silica inhalation hazard.

If any materials suspected to contain silica are to be removed or otherwise disturbed as a result of renovation/demolition activities it is recommended that procedures be put in place to control the generation of dust (such as routine water misting) and thus reduce the potential for worker exposure. Workers that have the potential to be exposed to airborne silica should also wear appropriate protective clothing and respiratory protection. Any work involving the disturbance of silica-containing materials should follow the procedures outlined in the Ontario MLITSD “Silica on Construction Projects” guideline (April 2011). The appropriate engineering controls, work practices, hygiene practices, personal protective measures and training necessary to conduct the work in a safe manner are provided in this guideline. The general measures and procedures (or Type of operation) necessary depends on the type of work to be conducted. The following table outlines the classification of silica disturbance based on the Ontario MLITSD guideline.

Operation	Description
Type 1	<ol style="list-style-type: none"> 1. The drilling of holes in concrete or rock that is not part of a tunneling operation or road construction. 2. Milling of asphalt from concrete highway pavement 3. Charging mixers and hoppers with silica sand (sand consisting of at least 95% silica) or silica flour (finely ground sand consisting of at least 95% silica) 4. Any other operation at a project that requires the handling of silica-containing material in a way that may results in a worker being exposed to airborne silica. 5. Entry into a dry mortar removal or abrasive blasting area while airborne dust is visible for less than 15 minutes for inspection and/or sampling. 6. Working within 25 metres of an area where compressed air is being used to remove silica-containing dust outdoors.

Operation	Description
Type 2	<ol style="list-style-type: none"> 1. Removal of silica containing refractory materials with a jackhammer 2. The drilling of holes in concrete or rock that is part of a tunneling or road construction. 3. The use of a power tool to cut, grind, or polish concrete, masonry, terrazzo or refractory materials. 4. The use of a power tool to remove silica containing materials. 5. Tunneling (operation of the tunnel boring machine, tunnel drilling, and tunnel mesh installation). 6. Tuckpoint and surface grinding 7. Dry mortar removal with an electric or pneumatic cutting device 8. Dry method dust cleanup from abrasive blasting operations 9. The use of compress air outdoors for removing silica dust 10. Entry into area where abrasive blasting is being carried out for more than 15 minutes
Type 3	<ol style="list-style-type: none"> 1. Abrasive blasting with an abrasive that contains >1% silica 2. Abrasive blasting of a material that contains >1% silica

3.1.5 Other Designated Substances

No other designated substances are expected to be a component of building materials in the project specific areas in a form that would represent an exposure concern. Therefore, no protective measures or procedures specific to acrylonitrile, arsenic, benzene, coke oven emissions, ethylene oxide, isocyanates, and vinyl chloride are considered necessary.

3.2 Other Hazardous Materials

3.2.1 Chemical Hazards

As no UFFI was identified or is suspected to be present in the project specific areas, no further action is required. However, given that no destructive testing was conducted, there is a remote possibility that UFFI could be hidden within locations such as exterior wall cavities. If suspect foam insulation is identified during renovation/demolition activities work should be stopped and the area should be re-assessed to evaluate conditions and determine appropriate control measures and worker protection, if necessary.

3.2.2 Biological Hazards

3.2.2.1 Mould Contamination

No mould contamination was identified in the project specific areas and no further action is required at this time. Although no obvious mould contamination or evidence to suggest possible hidden mould contamination was identified in the project specific areas, there is still a potential for hidden mould growth to exist behind or underneath building finishes. Should suspect mould growth be discovered during the course of renovation or demolition work, Safetech recommends that all work stop so that the area can be assessed to evaluate proper control measures and remediation protocols in order to avoid worker exposure to mould and possible contamination of adjacent areas.

3.2.2.2 Pest Infestation

No visual evidence of any significant pest infestation was observed in the project specific areas. Therefore, no additional precautionary measures are deemed necessary for protection against biological contaminants potentially associated with pest infestation.

3.2.3 Environmental Hazards

3.2.3.1 Polychlorinated Biphenyls (PCBs)

The federal government has set strict regulations for the handling, storage and disposal of PCBs. The PCB Regulations (SOR/2008-273) came into effect on September 5th, 2008 and consolidates and replaces the Chlorobiphenyls Regulations (SOR/91-152) and the Storage of PCB Material Regulations (SOR/92-507). The purpose of the PCB Regulations is to improve the protection of Canada's environment and the health of Canadians by minimizing the risks posed by the use, storage and release of PCBs by accelerating the elimination of these substances.

Newer T8 lamps present in fluorescent light fixtures indicate that a lighting retrofit has taken place. These newer T8 lamps use ballasts that do not contain PCBs. Therefore, light fixtures containing T8 lamps are not expected to contain PCB ballasts. However, should renovation/demolition work result in removal and disposal of existing fluorescent light fixtures containing T8 lamps it is still recommended that each fixture is individually assessed for the presence of PCB-containing ballasts and if discovered should be handled and disposed of accordingly as described above.

3.2.3.2 Ozone Depleting and Global Warming Substances

No equipment was identified in the project specific areas that is expected to contain ozone depleting or global warming substances. As such, no recommendations are considered necessary at this time.

4.0 LIMITATIONS

The information and recommendations detailed in this report were carried out by trained professional and technical staff in accordance with generally accepted environmental and industrial hygiene work practices and procedures. Recommendations provided in this report have been generated in accordance with accepted industry guidelines and practices. These guidelines and practices are considered acceptable as of the date of this report.

In preparation of this report, Safetech relied on information supplied by others, including without limitation, information pertaining to the history and operation of the site, test results and reports of other consultants and testing services provided by independent laboratories. Except as expressly set out in this report, Safetech has not made any independent verification of information provided by independent entities.

The collection of samples at the location noted was consistent with the scope of work agreed-upon with the person or entity to whom this report is addressed and the information obtained concerning prior site investigations. As conditions between samples may vary, the potential remains for the presence of unknown additional contaminants for which there were no known indicators.

The analytical method used for determination of asbestos content meets the requirements of O. Reg. 278/05. However, small asbestos fibres may be missed by PLM due to resolution limitations of the optical microscope. Interfering binder/matrix and/or low asbestos content may also hinder positive identification by PLM. These conditions are common for vermiculite attic insulation (VAI) and non-friable organically bound (NOB) materials such as vinyl floor tiles, roofing materials, mastics and caulking and can lead to “false negative” results. If PLM analytical results for these types of materials indicate no asbestos detected they have been reported as “Presumed Non-ACM”. Due to limitations of the analytical method we cannot confirm that low quantities of asbestos are not present in these samples using solely PLM analysis. Additional analytical procedures should be considered for such materials to rule out false negative results.

Conclusions are based on site conditions at the time of inspection and can only be extrapolated to an undefined limited area around inspected locations. The extent of the limited area depends on building construction and conditions. Building materials that are not detailed within this survey due to inaccessibility during the time of survey and/or are uncovered during renovation/demolition activities should be properly assessed by a qualified person prior to their disturbance. Safetech cannot warrant against undiscovered environmental liabilities. If any information becomes available that differs from the findings in this report, we request that we be notified immediately to reassess the conclusions provided herein.

No other person or entity is entitled to use or rely upon this report without the express written consent of Safetech and the person or entity to who it is addressed. Any use that a third party makes of this report, or any reliance based on conclusions and recommendations made, are the responsibility of such third parties. Safetech accepts no responsibility for damages suffered by third parties as a result of actions based on this report.

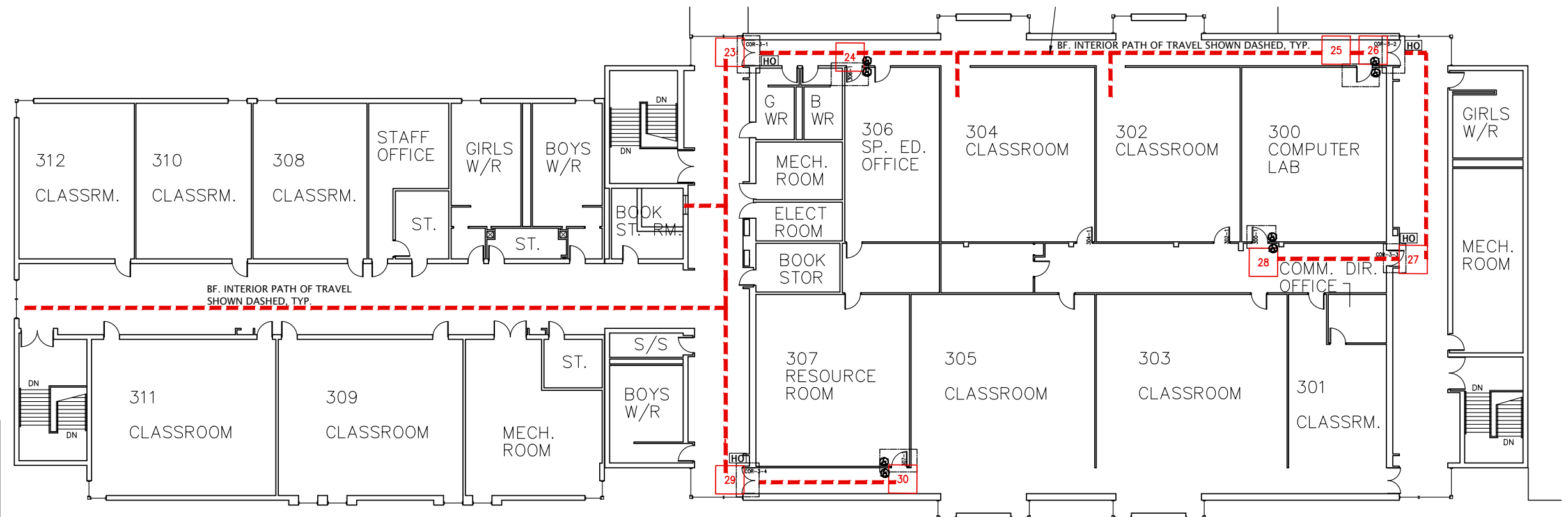
Appendix A: Summary of ACM Occurrences

Floor	Room No.	Room Description	System	Material	Description	Classification	Friable/ Non-Friable	Condition	Est. Quantity	Unit	Access	Action
1,2,3	Throughout	Throughout	Wall	Paint	Concrete Block Filler	ACM	Non-Friable	Good	ND		A	7

Appendix B: Site Drawings

LEGEND

AREAS ASSESSED



ASBESTOS CONTAINING
CONCRETE BLOCK FILLER
COAT WAS IDENTIFIED
THROUGHOUT THE PROJECT
SPECIFIC AREAS



- 1) THIS FLOOR PLAN MUST BE READ IN CONJUNCTION WITH THE DESIGNATED SUBSTANCE AND HAZARDOUS MATERIALS ASSESSMENT REPORT.
- 2) NOT ALL ASBESTOS-CONTAINING MATERIALS ARE INDICATED IN THE FLOOR PLAN. REFER TO THE DESIGNATED SUBSTANCE AND HAZARDOUS MATERIALS REPORT FOR FURTHER DETAILS.
- 3) REMOVAL OR DISTURBANCE OF ASBESTOS-CONTAINING BUILDING MATERIALS MUST BE CONDUCTED IN ACCORDANCE WITH ONTARIO REGULATION 278/05 "DESIGNATED SUBSTANCE - ASBESTOS ON CONSTRUCTION PROJECTS AND IN BUILDINGS AND REPAIR OPERATIONS".

LEVEL 3

ACCESSIBILITY UPGRADE

SIR OLIVER MOWAT CI

DRAWING NO.

DS-3

DATE: MARCH 6, 2026

SAFETECH PROJECT NO.
1-3260230

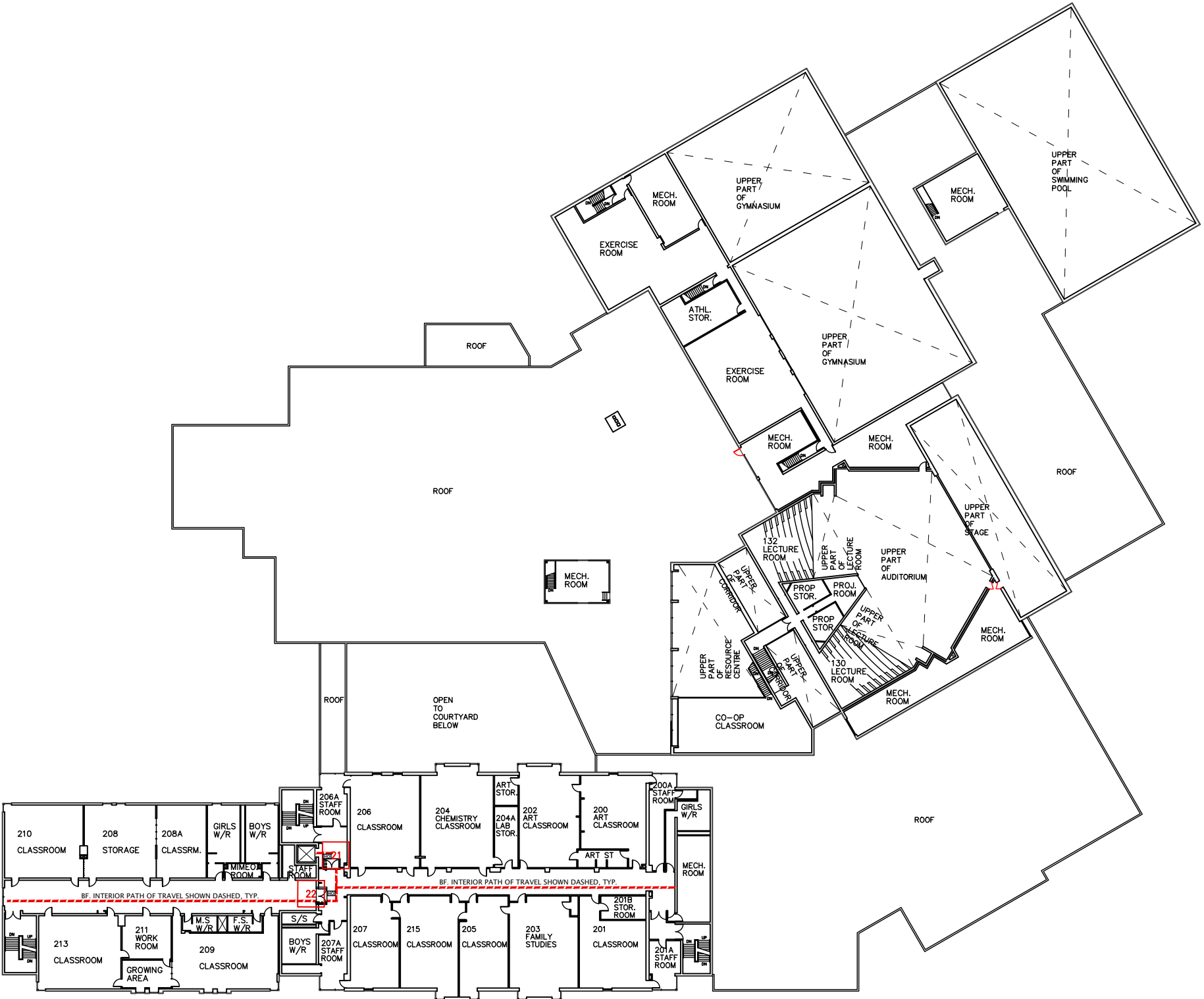


3045 SOUTHCREEK RD, UNIT 14
MISSISSAUGA, ONTARIO
L4X 2X7

LEGEND

AREAS ASSESSED

ASBESTOS CONTAINING
CONCRETE BLOCK FILLER
COAT WAS IDENTIFIED
THROUGHOUT THE PROJECT
SPECIFIC AREAS



1) THIS FLOOR PLAN MUST BE READ IN CONJUNCTION WITH THE DESIGNATED SUBSTANCE AND HAZARDOUS MATERIALS ASSESSMENT REPORT.
2) NOT ALL ASBESTOS-CONTAINING MATERIALS ARE INDICATED IN THE FLOOR PLAN. REFER TO THE DESIGNATED SUBSTANCE AND HAZARDOUS MATERIALS REPORT FOR FURTHER DETAILS.
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LEVEL 2

ACCESSIBILITY UPGRADE

SIR OLIVER MOWAT CI

DRAWING NO.

DS-2

DATE: MARCH 6, 2026

SAFETECH PROJECT NO.
1-3260230

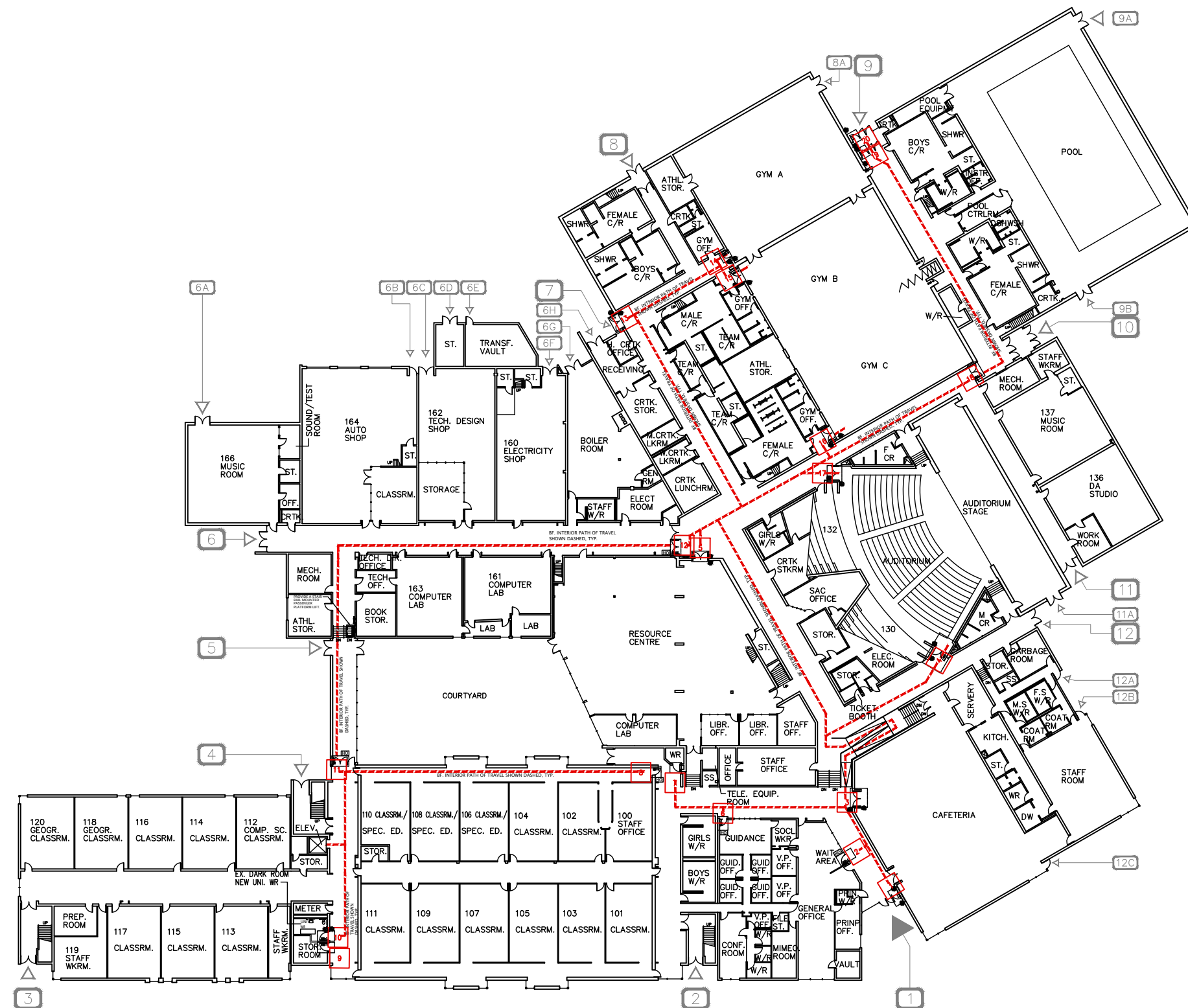


3045 SOUTHCREEK RD, UNIT 14
MISSISSAUGA, ONTARIO
L4X 2X7

LEGEND

AREAS ASSESSED

ASBESTOS CONTAINING
CONCRETE BLOCK FILLER
COAT WAS IDENTIFIED
THROUGHOUT THE PROJECT
SPECIFIC AREAS



- 1) THIS FLOOR PLAN MUST BE READ IN CONJUNCTION WITH THE DESIGNATED SUBSTANCE AND HAZARDOUS MATERIALS ASSESSMENT REPORT.
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- 3) REMOVAL OR DISTURBANCE OF ASBESTOS-CONTAINING BUILDING MATERIALS MUST BE CONDUCTED IN ACCORDANCE WITH ONTARIO REGULATION 278/05 "DESIGNATED SUBSTANCE - ASBESTOS ON CONSTRUCTION PROJECTS AND IN BUILDINGS AND REPAIR OPERATIONS".

LEVEL 1

ACCESSIBILITY UPGRADE

SIR OLIVER MOWAT CI

DRAWING NO.

DS-1

DATE: MARCH 6, 2026

SAFETECH PROJECT NO.
1-3260230



3045 SOUTHCREEK RD, UNIT 14
MISSISSAUGA, ONTARIO
L4X 2X7

Appendix C: Laboratory Certificate of Analysis – Asbestos



EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: (289) 997-4602 / (289) 997-4607
<http://www.EMSL.com> / torontolab@emsl.com

EMSL Canada Order 552604884
Customer ID: 55SELI62
Customer PO: 1-3260230
Project ID:

Attn: Dan Whittal
Safetech Environmental Limited
3045 Southcreek Road
Unit 14
Mississauga, ON L4X 2X7
Phone: (905) 624-2722
Fax: (905) 624-4306
Collected: 3/11/2026
Received: 3/11/2026
Analyzed: 3/16/2026
Proj: 1-3260230 - Sir Oliver Mowat CI, Scarborough, ON

Summary Test Report for Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05

Client Sample ID: 1a **Lab Sample ID:** 552604884-0001

Sample Description: Level 1 Corridor, Adjacent Door 7 (17008-1)/Grey with Black & White Speck Vinyl Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/14/2026	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 1b **Lab Sample ID:** 552604884-0002

Sample Description: Level 1 Corridor, Adjacent Door 7 (17008-1)/Grey with Black & White Speck Vinyl Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/14/2026	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 1c **Lab Sample ID:** 552604884-0003

Sample Description: Level 1 Corridor, Adjacent Door 7 (17008-1)/Grey with Black & White Speck Vinyl Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/16/2026	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 2a **Lab Sample ID:** 552604884-0004

Sample Description: Level 3 Corridor, Adjacent Stair 4 (16940)/White with Beige Speck Vinyl Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/14/2026	White	0.0%	100.0%	None Detected	

Client Sample ID: 2b **Lab Sample ID:** 552604884-0005

Sample Description: Level 3 Corridor, Adjacent Stair 4 (16940)/White with Beige Speck Vinyl Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/14/2026	White	0.0%	100.0%	None Detected	

Client Sample ID: 2c **Lab Sample ID:** 552604884-0006

Sample Description: Level 3 Corridor, Adjacent Stair 4 (16940)/White with Beige Speck Vinyl Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/16/2026	White	0.0%	100.0%	None Detected	

Client Sample ID: 3a **Lab Sample ID:** 552604884-0007

Sample Description: Level 3 Corridor, Adjacent Stair 4 (16940)/Cream with Beige Speck Vinyl Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/14/2026	White	0.0%	100.0%	None Detected	



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Phone/Fax: (289) 997-4602 / (289) 997-4607
<http://www.EMSL.com> / torontolab@emsl.com

EMSL Canada Order 552604884
Customer ID: 55SELI62
Customer PO: 1-3260230
Project ID:

Summary Test Report for Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05

Client Sample ID: 3b **Lab Sample ID:** 552604884-0008

Sample Description: Level 3 Corridor, Adjacent Stair 4 (16940)/Cream with Beige Speck Vinyl Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/14/2026	White	0.0%	100.0%	None Detected	

Client Sample ID: 3c **Lab Sample ID:** 552604884-0009

Sample Description: Level 3 Corridor, Adjacent Stair 4 (16940)/Cream with Beige Speck Vinyl Floor Tile

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/16/2026	White	0.0%	100.0%	None Detected	

Client Sample ID: 4a-Floor Tile **Lab Sample ID:** 552604884-0010

Sample Description: Level 1, Meter Room (17109-2)/White with Faint Streaks Vinyl Floor Tile & Mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/14/2026	White	0.0%	100.0%	None Detected	

Client Sample ID: 4a-Mastic **Lab Sample ID:** 552604884-0010A

Sample Description: Level 1, Meter Room (17109-2)/White with Faint Streaks Vinyl Floor Tile & Mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/14/2026	Black	0.0%	100.0%	None Detected	

Client Sample ID: 4b-Floor Tile **Lab Sample ID:** 552604884-0011

Sample Description: Level 1, Meter Room (17109-2)/White with Faint Streaks Vinyl Floor Tile & Mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/14/2026	White	0.0%	100.0%	None Detected	

Client Sample ID: 4b-Mastic **Lab Sample ID:** 552604884-0011A

Sample Description: Level 1, Meter Room (17109-2)/White with Faint Streaks Vinyl Floor Tile & Mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/14/2026	Black	0.0%	100.0%	None Detected	

Client Sample ID: 4c-Floor Tile **Lab Sample ID:** 552604884-0012

Sample Description: Level 1, Meter Room (17109-2)/White with Faint Streaks Vinyl Floor Tile & Mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/16/2026	White	0.0%	100.0%	None Detected	

Client Sample ID: 4c-Mastic **Lab Sample ID:** 552604884-0012A

Sample Description: Level 1, Meter Room (17109-2)/White with Faint Streaks Vinyl Floor Tile & Mastic

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/16/2026	Black	0.0%	100.0%	None Detected	



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EMSL Canada Order 552604884
Customer ID: 55SELI62
Customer PO: 1-3260230
Project ID:

Summary Test Report for Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05

Client Sample ID: 5a **Lab Sample ID:** 552604884-0013

Sample Description: Level 1 Corridor, Adjacent Door 5 (17125)/Light Pink Vinyl Sheet Floor

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/14/2026	Pink/Beige	25.0%	75.0%	None Detected	

Client Sample ID: 5b **Lab Sample ID:** 552604884-0014

Sample Description: Level 1 Corridor, Adjacent Door 5 (17125)/Light Pink Vinyl Sheet Floor

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/14/2026	Pink/Beige	25.0%	75.0%	None Detected	

Client Sample ID: 5c **Lab Sample ID:** 552604884-0015

Sample Description: Level 1 Corridor, Adjacent Door 5 (17125)/Light Pink Vinyl Sheet Floor

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/16/2026	Pink/Beige	25.0%	75.0%	None Detected	

Client Sample ID: 6a-Mortar 1 **Lab Sample ID:** 552604884-0016

Sample Description: Level 1, Meter Room (17109-2)/Concrete Block Mortar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/14/2026	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 6a-Mortar 2 **Lab Sample ID:** 552604884-0016A

Sample Description: Level 1, Meter Room (17109-2)/Concrete Block Mortar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/14/2026	Gray/White	0.0%	100.0%	None Detected	

Client Sample ID: 6b **Lab Sample ID:** 552604884-0017

Sample Description: Level 1, Meter Room (17109-2)/Concrete Block Mortar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/14/2026	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 6c **Lab Sample ID:** 552604884-0018

Sample Description: Level 1 Corridor, Adjacent Door 5 (17125)/Concrete Block Mortar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/16/2026	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 7a **Lab Sample ID:** 552604884-0019

Sample Description: Level 1 Corridor, Adjacent Cafeteria (17127)/Brick Mortar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/14/2026	Gray	0.0%	100.0%	None Detected	



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2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: (289) 997-4602 / (289) 997-4607
<http://www.EMSL.com> / torontolab@emsl.com

EMSL Canada Order 552604884
Customer ID: 55SELI62
Customer PO: 1-3260230
Project ID:

Summary Test Report for Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05

Client Sample ID: 7b

Lab Sample ID: 552604884-0020

Sample Description: Level 1 Corridor, Adjacent Cafeteria (17127)/Brick Mortar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/14/2026	Gray	0.0%	100.0%	None Detected	

Client Sample ID: 7c

Lab Sample ID: 552604884-0021

Sample Description: Level 1 Corridor, Adjacent Cafeteria (17127)/Brick Mortar

TEST	Analyzed Date	Color	Non-Asbestos		Asbestos	Comment
			Fibrous	Non-Fibrous		
PLM	3/16/2026	Gray	0.0%	100.0%	None Detected	

Analyst(s):

Diana Costantino PLM (8)
Olivia Zeppieri PLM (17)

Reviewed and approved by:

Matthew Davis or other approved signatory
or Other Approved Signatory

None Detected = <0.1%. EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This is a summary report; official reports are available on LabConnect or upon request and relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted. The above analyses were performed in general compliance with Appendix E to Subpart E of 40 CFR (previously EPA 600/M4-82-020 "Interim Method") but augmented with procedures outlined in the 1993 ("final") version of the method. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis. Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample. Estimation of uncertainty is available on request.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 03/16/2026 16:30:27

School Name:	Sir Oliver Mowat CI									
Date:	March 6 2026									
Location			Sample No	Lab Results	Material	System	Quantity		Access	Notes
Floor	Location Name	Monument No					Condition	Total		
1	Level 1 Corridor, Adjacent Door 7	17008-1	1A	None Detected	Grey with Black & White Speck Vinyl Floor Tile	Floor	Good		A	
1	Level 1 Corridor, Adjacent Door 7	17008-1	1B	None Detected	Grey with Black & White Speck Vinyl Floor Tile	Floor	Good		A	
2	Level 1 Corridor, Adjacent Door 7	17008-1	1C	None Detected	Grey with Black & White Speck Vinyl Floor Tile	Floor	Good		A	
1	Level 3 Corridor, Adjacent Stair 4	16940	2A	None Detected	White with Beige Speck Vinyl Floor Tile	Floor	Good		A	
1	Level 3 Corridor, Adjacent Stair 4	16940	2B	None Detected	White with Beige Speck Vinyl Floor Tile	Floor	Good		A	
2	Level 3 Corridor, Adjacent Stair 4	16940	2C	None Detected	White with Beige Speck Vinyl Floor Tile	Floor	Good		A	
1	Level 3 Corridor, Adjacent Stair 4	16940	3A	None Detected	Cream with Beige Speck Vinyl Floor Tile	Floor	Good		A	
1	Level 3 Corridor, Adjacent Stair 4	16940	3B	None Detected	Cream with Beige Speck Vinyl Floor Tile	Floor	Good		A	
2	Level 3 Corridor, Adjacent Stair 4	16940	3C	None Detected	Cream with Beige Speck Vinyl Floor Tile	Floor	Good		A	
1	Level 1, Meter Room	17109-2	4A	None Detected	White with Faint Streaks Vinyl Floor Tile & Mastic	Floor	Good		A	
1	Level 1, Meter Room	17109-2	4B	None Detected	White with Faint Streaks Vinyl Floor Tile & Mastic	Floor	Good		A	
1	Level 1, Meter Room	17109-2	4C	None Detected	White with Faint Streaks Vinyl Floor Tile & Mastic	Floor	Good		A	
1	Level 1 Corridor, Adjacent Door 5	17125	5A	None Detected	Light Pink Vinyl Sheet Floor	Floor	Good		A	
1	Level 1 Corridor, Adjacent Door 5	17125	5B	None Detected	Light Pink Vinyl Sheet Floor	Floor	Good		A	
1	Level 1 Corridor, Adjacent Door 5	17125	5C	None Detected	Light Pink Vinyl Sheet Floor	Floor	Good		A	
1	Level 1, Meter Room	17109-2	6A	None Detected	Concrete Block Mortar	Wall	Good		A	
1	Level 1, Meter Room	17109-2	6B	None Detected	Concrete Block Mortar	Wall	Good		A	
2	Level 1 Corridor, Adjacent Door 5	17125	6C	None Detected	Concrete Block Mortar	Wall	Good		A	
1	Level 1 Corridor, Adjacent Cafeteria	17127	7A	None Detected	Brick Mortar	Wall	Good		A	
1	Level 1 Corridor, Adjacent Cafeteria	17127	7B	None Detected	Brick Mortar	Wall	Good		A	
1	Level 1 Corridor, Adjacent Cafeteria	17127	7C	None Detected	Brick Mortar	Wall	Good		A	

Appendix D: Laboratory Certificate of Analysis – Lead

**EMSL Canada Inc.**

2756 Slough Street, Mississauga, ON L4T 1G3

Phone/Fax: (289) 997-4602 / (289) 997-4607

<http://www.EMSL.com>torontolab@emsl.com

EMSL Canada Or 552604876

CustomerID: 55SELI62

CustomerPO: 1-3260230

ProjectID:

Attn: **Dan Whittal**
Safetech Environmental Limited
3045 Southcreek Road
Unit 14
Mississauga, ON L4X 2X7

Phone: (905) 624-2722
Fax: (905) 624-4306
Received: 3/11/2026 03:53 PM
Collected:

Project: 1-3260230 - Sir Oliver Mowat CI, Scarborough, ON

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

<i>Client Sample</i>	<i>Description</i>	<i>Collected</i>	<i>Analyzed</i>	<i>Weight</i>	<i>RDL</i>	<i>Lead Concentration</i>
L1			3/12/2026	0.2515 g	0.0064 % wt	<0.0064 % wt
552604876-0001	Site: White Paint - Corridor Adjacent Door 5 (17125) - Concrete Block Wall					

Rowena Fanto, Lead Supervisor
or other approved signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted. * Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.0064% wt based on the minimum sample weight per our SOP. "<" (less than) result signifies the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. Definitions of modifications are available upon request.

Samples analyzed by EMSL Canada Inc. Mississauga, ON AIHA LAP, LLC-ELLAP Accredited #196142

Initial report from 03/16/2026 09:52:47

Appendix E: Methodology

A. METHODOLOGY

The presence of hazardous materials was assessed by visual inspection. For the purpose of this assessment and this document, hazardous materials include designated substances as well as other chemical, biological and environmental hazards as defined below:

- Designated Substances (as prescribed by Ontario Regulation 490/09):
 - Acrylonitrile, Arsenic, Asbestos, Benzene, Coke Oven Emissions, Ethylene Oxide, Isocyanates, Lead, Mercury, Silica and Vinyl Chloride.
- Other Hazardous Materials:
 - **Chemical Hazards** – Urea Formaldehyde Foam Insulation (UFFI)
 - **Biological Hazards** – Mould Contamination and Pest Infestation
 - **Environmental Hazards** – Polychlorinated Biphenyls (PCBs) and Ozone Depleting & Global Warming Substances

Concealed locations such as above solid plaster or drywall ceilings, within plaster or drywall wall cavities, enclosed mechanical/pipe shafts and bulkheads, etc. were not investigated, unless otherwise stated in Section 1.3. Similarly, motors, blowers, electrical panels, etc., were not de-energized or disassembled to examine concealed conditions. Building materials that are not detailed within this assessment due to inaccessibility at the time of our site visit and/or uncovered during renovation/demolition activities should be assessed by a qualified person prior to their disturbance.

Bulk sampling followed by laboratory analysis was also conducted to confirm the presence/absence of select hazardous materials. Bulk sampling was limited to asbestos in building materials and lead in paint on building finishes (if flaking paint was present). All other hazardous materials were identified by visual inspection only. Where possible, observations regarding the location, quantity and condition of the hazardous materials identified were made in order to determine the potential for exposure and provide appropriate recommendations for remedial action, if necessary. Specific methodology for each individual hazardous material assessed is further detailed below.

A.1 Designated Substances

A.1.1 Asbestos

A visual inspection for the presence of both friable and non-friable asbestos-containing material (ACM) was performed in the subject area.

If an existing asbestos survey was available for review, Safetech relied on the information present. Building materials that were visually similar to materials previously tested and that were confirmed to be either ACM or non-ACM were considered to have consistent content and were not re-sampled. Additional sampling was only conducted where the investigator believed a need existed.

Bulk samples of building materials suspected to contain asbestos were retrieved by Safetech only for materials that were deemed to have a potential to be disturbed as part

of the construction project. Some suspect materials may not have been sampled during our investigation. Bulk samples were retrieved in accordance with Section 3 and Table 1 of Ontario Regulation 278/05, "Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations". The number of samples collected for each material was based on the type and quantity of the material present in the subject area. Each individual sample was placed in a labeled zip-lock bag for transportation to an independent laboratory (EMSL). EMSL is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) for bulk asbestos fiber analysis.

Analysis for asbestos content was performed by the independent laboratory in accordance with the U.S. Environmental Protection Agency (EPA) Test Method *EPA/600/R-93-116: Method for the Determination of Asbestos in Bulk Building Materials (June 1993)*. This method identifies the asbestos fibre content of building materials using polarized light microscopy (PLM) analytical techniques, with confirmation of presence and type of asbestos made by dispersion staining optical microscopy. This analytical method meets the requirements set forth in Section 3 of O. Reg. 278/05.

In accordance with O. Reg. 278/05, an asbestos-containing material is defined as material that contains 0.5 per cent or more asbestos by dry weight. The laboratory was instructed to conduct "stop-positive" analysis for all materials. If a sample was found to be asbestos-containing no further analysis was conducted for samples taken from the same homogeneous material.

Locations where ACM have been identified are detailed in this report. Recommendations pertaining to ACM were made based on the friability, accessibility and condition of the material in conjunction with the potential for the planned renovation work to disturb the ACM.

A.1.2 Assessment of Asbestos-Containing Building Materials

Accessibility, Condition and Action (Priority) ratings for individual items, or defined areas were developed by Safetech to determine remedial action plans specific to the facility's needs.

A.1.2.1 Accessibility

Accessibility has been assessed as: (A) Accessible to all non-maintenance occupants of the building; (B) Accessible to maintenance staff without a ladder; (C) Accessible to maintenance staff with a ladder and exposed to view without moving a building component; (D) Accessible to maintenance staff with a ladder and concealed from view due to a building component; (E) Not accessible without demolition or removal of fixed building components or building systems

A.1.2.2 Condition

The condition of asbestos-containing materials identified in the subject area was assessed as Good (G), Fair (F) or Poor (P). The assessment criteria used to determine condition is dependent on material characteristics, such as friability. The following table summarizes the criteria used by Safetech to evaluate the condition of ACM.

Sprayed Fireproofing, Sprayed Insulation and Sprayed Texture Finishes	
Good	<ul style="list-style-type: none"> Surface shows no significant signs of damage, deterioration, or delamination (i.e. <1%). Unencapsulated or unpainted fireproofing or texture finishes, where no delamination or damage is observed. Encapsulated fireproofing or texture finishes where encapsulation applied after damage or fallout.
Fair	<ul style="list-style-type: none"> Not utilized as part of condition assessment for these materials.
Poor	<ul style="list-style-type: none"> Greater than 1% damage, delamination, or deterioration to surface.
In areas where damage exists in isolated locations, both Good and Poor may be applicable.	
Mechanical Insulation (boilers, breeching, ductwork, piping, tanks, equipment, etc.)	
Good	<ul style="list-style-type: none"> Insulation completely covered in jacketing and exhibits no evidence of damage or deterioration. Jacketing may have minor damage (i.e. scuffs or stains), but is not penetrated.
Fair	<ul style="list-style-type: none"> Minor penetrating damage to jacketed insulation (cuts, tears, nicks, deterioration or delamination). Undamaged insulation that had never been jacketed. Insulation is exposed but not showing surface disintegration. Extent of missing insulation ranges from minor to none. Damage that can be repaired.
Poor	<ul style="list-style-type: none"> Original insulation jacket is missing, damaged, deteriorated, or delaminated. Insulation is exposed and significant areas have been dislodged. Damage that cannot be easily repaired.
Non-Friable and Potentially Friable Materials (includes materials such as plaster finishes, drywall compound, ceiling tiles, asbestos cement products, vinyl asbestos tile and asbestos paper backed vinyl sheet flooring, etc., which have the potential to become friable when handled)	
Good	<ul style="list-style-type: none"> No significant damage. Material may be cracked or broken but is stable and not likely to become friable upon casual contact. No friable debris present
Fair	<ul style="list-style-type: none"> Not utilized as part of condition assessment for these materials.
Poor	<ul style="list-style-type: none"> Material is severely damaged. Debris is present or binder has disintegrated to the point where the material has become friable.
Asbestos-Containing Debris (noted separately from the presumed source material)	
Poor	<ul style="list-style-type: none"> Debris is always considered to be in Poor condition.

A.1.2.3 Action

Recommended ACTION for compliance and for management of identified asbestos-containing materials has been provided for each condition and component outlined in the above table. Recommendations have been classified under the following 8 ACTIONS:

1. Action dealing with the immediate clean-up 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 regulations.
4. Action dealing with Type 2 asbestos procedures for ceiling entry where friable ACM debris is present on the top side 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 regulation.
8. Action for dealing with material that may contain asbestos but was not conclusively identified in the survey.

A.1.2.4 Quantity

The approximate quantity and the units of measure related to the quantity (i.e.: linear feet (LF), square feet (SF) or each (EACH) as appropriate to the item) have only been provided for materials requiring remedial or corrective action (i.e. materials in Fair or Poor condition). In such circumstances any quantities provided should be considered rough estimates only and should not be solely relied upon for bidding purposes. It is the responsibility of the selected Contractor to obtain actual quantities.

A.2 Lead

If paint samples were collected, they would be collected by scraping the paint down to the base material substrate to ensure collection of all layers of paint. Care would be taken to avoid collection of the underlying substrate to reduce analytical substrate matrix interference.

If collected, paint samples would be submitted to an independent laboratory for the determination of lead content. The laboratory would participate in and accredited by the EPA (U.S. Environmental Protection Agency) for analysis of lead in paint chips through the American Industrial Hygiene Association (AIHA) Environmental Lead Laboratory Accreditation Program (ELLAP). Analysis would be conducted by the laboratory following the EPA "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (SW-846), Method 7000B "Flame Atomic Absorption Spectrophotometry". Result of analysis would be reported by the laboratory as the percentage of lead by weight of the total sample (% by wt.).

The presence of lead in other materials, such as lead sheeting, pigmented mortar, lead piping, lead solder, etc. would be noted where observed but not sampled to verify lead content. Lead can be present in these materials to varying degrees, depending on their age of application and should be considered lead-containing until proven otherwise.

A.3 Mercury

The type, quantity and location of mercury-containing equipment and devices in the subject area were determined by visual inspection based on appearance, age and knowledge of historical uses. Sampling for mercury-containing building materials and dismantling of suspect mercury-containing equipment was not performed. Where possible, attempts were made to verify the presence/absence of mercury by gathering additional information such as equipment model number, serial number, etc.

A.4 Silica

The presence of crystalline silica in building materials was determined through visual inspection of building materials only, based on knowledge of the historic use of silica-containing materials in certain building materials. Sampling to verify the presence/absence of silica in building materials was not performed.

A.5 Other Designated Substances

Other designated substances (i.e. acrylonitrile, arsenic, benzene, coke oven emissions, ethylene oxide, isocyanates, and vinyl chloride) are typically not expected to be encountered in building materials as significant constituents or in a form that would represent an exposure concern. These substances were not included in the assessment unless specific information regarding their use (e.g. in a manufacturing process) was provided to us. No sampling for these designated substances was performed.

A.6 Other Hazardous Materials

A.6.1 Chemical Hazards

A.6.1.1 Urea Formaldehyde Foam Insulation (UFFI)

A visual inspection to evaluate the possible presence of Urea Formaldehyde Foam Insulation (UFFI) was conducted in the subject area. Our visual inspection was limited to identifying evidence of possible UFFI installation (i.e. repaired nozzle holes in walls) and overspray at wall/ceiling joints, etc. No destructive testing or material sampling was conducted as part of the assessment.

A.7 Biological Hazards

A.7.1.1 Mould Contamination

A visual inspection to determine the possibility of mould growth was conducted in the subject area. The assessment was limited to identifying evidence of mould growth and water damage (staining, material deterioration, efflorescence, etc.) on the surface of building materials, which may be an indicator of hidden mould growth. No moisture content readings of building materials were taken to determine their current condition. Additionally, destructive testing to confirm the presence/absence of hidden mould growth and material sampling to verify the presence/absence of mould on suspect surfaces was beyond the scope of this assessment.

A.7.1.2 Pest Infestation

The presence and extent of pest infestation in the subject area was based on visually inspecting for evidence of significant pest activity, including signs of nesting, droppings/fecal accumulation, dead insects/carcass accumulation, etc. Evidence of minor pest presence was not considered to be indicative of pest infestation.

A.8 Environmental Hazards

A.8.1 Polychlorinated Biphenyls (PCBs)

The presence of PCB-containing electrical equipment in the subject area was identified through visual inspection and knowledge of the timeline of historical use.

For stand-alone transformers and capacitors, information from the manufacturer nameplate (such as the date of manufacture, dielectric fluid trade name or “Type Number”, etc.) was gathered, where possible, to further evaluate if the equipment may contain PCBs. This information was then compared to the information provided in the Environment Canada document entitled “Handbook on PCB’s in Electrical Equipment” (Third Edition, April 1988) to aid in identification. Transformers and capacitors confirmed to be manufactured after 1979 were assumed to not contain PCBs. If appropriate information could not be obtained it was assumed that the transformer or capacitor contained PCBs.

For fluorescent light ballasts, a representative number of fixtures were inspected, if possible, for assessment areas that were constructed prior to 1980 and where there was no history or evidence of a complete lighting retrofit. The light fixtures were examined by removing any lenses and ballast covers to expose the ballast and identify information such as ballast make, model number, serial number, and date code. This information was then compared to the information provided in the Environment Canada document entitled “Identification of Lamp Ballasts Containing PCBs” (Report EPS 2/CC/2 (revised) August 1991) to aid in identification. Ballasts that could not be confirmed Non-PCB-containing were assumed to contain PCBs. The light fixtures were not de-energized and ballasts were not removed to obtain manufacturer information that may be on the back of the ballast. If visual confirmation of ballast type could not be made it was assumed that light fixtures in areas constructed prior to 1980 that have not undergone a complete lighting retrofit have PCB-containing ballasts until proven otherwise.

No sampling of materials or fluids within equipment was conducted to verify the presence/absence of PCBs. Inspection and testing of other materials for PCB content, including (but not limited to) caulking, asphalt, oil-based paint, plastics, switches, electric cables and hydraulic fluids was beyond the scope of the assessment.

A.8.2 Ozone Depleting and Global Warming Substances

The presence of fixed equipment likely to contain ozone-depleting substances (ODS) and/or global-warming substances (GWS) was identified through visual inspection and

knowledge of the timeline of historical use. This included equipment such as chillers, air-conditioners, walk-in refrigeration and freezer units and fixed dry-chemical fire extinguishers, where chemicals such as hydrochlorofluorocarbons (HCFCs), hydrofluorocarbons (HFCs) or halons may be present. Where possible, information regarding the type and quantity of refrigerant present was obtained from the manufacturer nameplate. Our visual assessment was limited to fixed equipment in the subject area and did not include portable equipment such as stand-alone refrigerators, freezers, water coolers, air-conditioners and fire extinguishers, etc.