

TECHNICAL SPECIFICATIONS FOR:

PROJECT:

Glenforest Secondary School
City of Mississauga - Pool Demolition

Mississauga, ON
April 12, 2024

CLIENT:

PEEL DISTRICT SCHOOL BOARD

Tender No.:

ITTMA24-5030

Project No.:

222113

SPECIFICATION BINDER:

Architectural
Abatement
Mechanical
Electrical

ARCHITECT:

ETUDE ARCHITECTS INC.
30 Kern Road, Suite 106
Toronto, Ontario M3B 1T1

STRUCTURAL ENGINEER:

CPE Structural CONSULTANTS.
69 Lesmill Road, Suite 200,
Toronto, Ontario, M3B 2T2

MECHANICAL/ELECTRICAL
CONSULTANT:

Suri & Associates Ltd.
1022 White Clover Way
Mississauga, Ontario, L5V 1C8

PEEL DISTRICT SCHOOL BOARD
PROJECT MANAGER:

Michael Arruda
5650 Hurontario Street
Mississauga, Ontario L5R 1C6

1 **Consultants**

1.1 The Consultants who have prepared Drawings and/or Specifications and reports for the Work of the Contract are as follows;

.1	Architect: Ahmad Motamed Etude Architects Inc. 30 Kern Road, Suite 106 Toronto, Ontario M3B 1T1 Tel: 416.226.5779 Fax: 416.226.9844	Project Manager Vivian St-Pierre 30 Kern Road, Suite 106 Toronto, Ontario M3B 1T1 Tel: 416.226.5779 x. 227 Fax: 416.226.9844 Email: vivian@etudearchitect.com
.2	Structural Engineer: Renee Tang CPE Structural CONSULTANTS. 69 Lesmill Road, Suite 200, Toronto, Ontario M3B 2T2 Tel: 416.447.8555 Fax: 416.447.1419	Project Manager TBD Tel: 416.447.8555 Fax: 416.447.1419 Email: cpe@cpestructural.ca
.3	<u>Mechanical and Electrical Engineers:</u> Suri & Associates Ltd Rohin Suri, CEM, CEA, CBCP 1022 White Clover Way, Mississauga, Ontario. L5V 1C8 C: (647)-981-7621	Project Managers/ Site Inspectors Rohin Suri rsuri@suriassoc.com Mechanical – TBD Electrical - TBD
.4	<u>Haz Mat:</u> WSP 6925 Century Avenue Mississauga, Ontario. L5N 7K2 Canada M+ 1.519.389.0811	Shelby McCullough EHS Consultant

Design Discipline

Documents prepared by the respective Consultants are designated by the following discipline symbols:

- Architect (A)
- Building Code Consultant (BC)
- Commissioning Consultant (COMM)
- Civil Consultant (C)
- Electrical Consultant (E)
- Hardware Consultant (H)
- Interior Designer (ID)
- Landscape Consultant (L)
- Mechanical Consultant (M)
- Owner (O)
- Sprinkler Consultant (SP)
- Structural Consultant (S)

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

Document	Title	Discipline	Pages
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DIVISION 01 - GENERAL REQUIREMENTS

Section	Title	Discipline	Pages
01 11 00	Summary of Work	A	8
01 21 00	Allowances	A	2
01 26 15	Requests for Interpretation	A	2
01 29 00	Payment Procedures	A	2
01 31 00	Coordination	A	5
01 31 19	Project Meetings	A	3
01 32 00	Construction Progress Documentation	A	6
01 33 00	Submittal Procedures	A	9
01 35 20	Site Safety Protocol for Occupied Buildings	A	4
01 40 00	Quality Requirements	A	6
01 41 00	Regulatory Requirements	A	5
01 42 13	Abbreviations and Symbols	A	4
01 50 00	Temporary Controls and Facilities	A	12
01 60 00	Products Requirements	A	11
01 71 00	Examination and Preparation	A	3
01 73 29	Cutting and Patching	A	4
01 74 00	Cleaning and Waste Management	A	4
01 77 00	Closeout Procedures	A	3
01 78 00	Closeout Submittals	A	5
01 78 36	Warranties	A	1

DIVISION 02 - EXISTING CONDITIONS

Section	Title	Discipline	Pages
02 40 00	Demolition and Removals	A	10
02 80 00	Hazardous Material abatement		95
	Appendix A – Bulk Asbestos Sampling Report		25
	Roof Assesment of Indoor Pool (WSP)		
	Appendix B Hazardous Buidling Materials Assessment (Pre-Construction)		319
	Glenforest Secondary School Indoor Pool Demolition (Pinchin)		

DIVISION 04 - MASONRY

Section	Title	Discipline	Pages
04 20 00	Unit Masonry	A	12

DIVISION 05 - METALS

Section	Title	Discipline	Pages
05 50 00	Miscellaneous and Metal Fabrications	A	8

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

Section	Title	Discipline	Pages
06 10 00	Rough Carpentry	A	5

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

Section	Title	Discipline	Pages
07 11 00	Dampproofing	A	3
07 13 00	Sheet Waterproofing	A	4
07 21 00	Thermal Insulation	A	3
07 21 19	Sprayed Foam Insulation	A	6
07 26 00	Vapour Retarders	A	6
07 50 00	Roof and Roof Openings	A	8
07 62 00	Flashing and Sheet Metal	A	3
07 85 00	Firestopping and Smoke Seals	A	7
07 92 00	Sealants	A	6

DIVISION 08 - OPENINGS

Section	Title	Discipline	Pages
08 11 13	Metal Doors and Frames	A	7

08 51 13	Aluminum Windows	A	9
08 70 00	Finish Hardware	A	5
	Schedule	HWC	18
08 80 00	Glazing	A	6

DIVISION 09 - FINISHES

Section	Title	Discipline	Pages
09 01 62	Terrazzo Restoration	A	5
09 51 00	Acoustical Ceilings	A	6
09 65 00	Resilient Base	A	2
09 67 23	Epoxy Flooring	A	4
09 91 00	Painting	A	9

DIVISION 10 – SPECIALTIES

10 80 00	Miscellaneous Specialties	A	2
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DIVISION 22 - PLUMBING

Section	Title	Discipline	Pages
	See attached Mechanical Table of Contents.	M	

DIVISION 23 - HEATING, VENTILATING AND AIR CONDITIONING

Section	Title	Discipline	Pages
	See attached Mechanical Table of Contents.	M	

DIVISION 26 - ELECTRICAL

Section	Title	Discipline	Pages
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DIVISION 31 - EARTHWORK

Section	Title	Discipline	Pages
31 00 00	Earthwork	A	9

DIVISION 32 - EXTERIOR IMPROVEMENTS

Section	Title	Discipline	Pages
32 01 17	Asphalt Patching and Repair	A	5
32 91 21	Fine grading and Topsoil	A	4
32 92 23	Sodding	A	5

DIVISION 33 - UTILITIES

Section	Title	Discipline	Pages
33 46 13	Foundation Drainage	A	3

END OF DOCUMENT

1 GENERAL

- 1.1 Requirements of the Articles of Agreement, Conditions of the Contract, and Division 1 apply to and form all Sections of the Contract Documents and the Work.
- 1.2 Work in this Specification is divided into descriptive sections which are not intended to identify absolute contractual limits between Subcontractors, nor between the Contractor and their Subcontractors. Contractor is solely responsible for organizing division of labour and supply of materials essential to complete the Work. The Consultant and Owner assume no liability to act as an arbiter to establish Subcontract limits between Sections or Divisions of Work.
- 1.3 It is intended that Work supplied under these Contract Documents shall be complete and fully operational in every detail for the purpose required. Provide all items, articles, materials, services and incidentals, whether or not expressly specified or shown on Drawings, to make finished Work complete and fully operational, consistent with the intent of the Contract Documents.
- 1.4 Mention in the specifications or indication on the drawings of materials, Products, operations, or methods, requires that the Contractor provide each item mentioned or indicated of the quality or subject to the qualifications noted; perform according to the conditions stated in each operation prescribed; and provide labour, materials, Products, equipment and services to complete the Work.
- 1.5 Conform with the requirements of the dated [...] appended to the Supplementary Conditions. Requirements applicable to 'tenant contractors' apply to this Contract where applicable.
- 1.6 Specifications, Schedules and Drawings are complementary and items mentioned or indicated on one may not be mentioned or indicated on the others.
- 1.7 Contractors finding discrepancies or ambiguities in, or omissions from the Drawings, Specifications or other Contract Documents, or having doubt as to the meaning and intent of any part thereof shall contact the Consultant for clarification.

2 SPECIFICATION LANGUAGE, STYLE, AND DEFINITIONS

- 2.1 These specifications are written in the imperative mood and in streamlined form. The imperative language is directed to Contractor, unless stated otherwise.
- 2.2 Complete sentences by reading "shall", " Contractor shall", "shall be", and similar phrases by inference. Where a colon (:) is used within sentences and phrases, read the words "shall be" by inference.
- 2.3 Fulfill and perform all indicated requirements whether stated imperatively or otherwise.

- 2.4 Where the singular or masculine is used in the Contract Documents, it shall be read and construed as if the plural, feminine or neuter had been used when the context or the statement so requires and as required to complete the Work, and the rest of the sentence, clause, paragraph, or Article shall be construed as if all changes in grammar, gender or terminology thereby rendered necessary had been made.
- 2.5 Work designated as "N.I.C." is not included in this Contract.
- 2.6 When used in the context of a Product, it shall be understood the word "Provide" to mean supply, install, and connect as applicable, complete and in place including accessories, finishes, tests, and services required for a complete installation ready for its intended use.
- 2.7 The terms 'approved', 'review', 'reviewed', 'accepted', 'acceptance', 'acceptable', 'satisfactory', 'selected', 'directed', 'Ainstructed', 'required', 'submit', 'permitted', 'approved alternative', 'approved equal', or similar words or phrases are used in standards or elsewhere in Contract Documents, it shall be understood, that words 'by (to) the Consultant' follow, unless context provides otherwise.
- 2.8 The term 'or approved alternative' following a list of Products, systems, or manufacturers used in the Contract Documents shall be construed to mean approved by Consultant. Specified products to be Base Bid. Contractor to follow 'Substitution' procedures specified in Section 01 25 00 for submitting proposed Products, systems, and manufacturers and obtain Consultant's approval of the same prior to proceeding with ordering proposed Products and systems or engaging manufacturers. Contractors who purchase Products and systems or engage manufacturers prior to Consultant's review and acceptance do so at their own risk.
- 2.9 Where the words 'submit', 'acceptable' and 'satisfactory' are used in the Contract Documents, they shall be considered to be followed by the words 'to the Consultant' unless the context provides otherwise.
- 2.10 The terms Aexposed@ or Aexposed to view@ refers to surfaces that are within the line of vision of persons from any accessible viewpoint, both within and without the building. Where any part of a surface is exposed to view, all other portions of that surface shall also be considered as exposed to view.
- 3 CONTRACT DOCUMENTS FOR CONSTRUCTION PURPOSES**
- 3.1 Owner will supply Contractor with a complete set of Contract Documents in electronic format before commencement of the Work. Contractor may print hard copies for construction purposes as required.
- 4 DOCUMENTS AT THE SITE**
- 4.1 Keep the following documents at Place of the Work, stored securely and in good order and available to Owner and Consultant, in hard copy and electronic form:
- .1 Current Contract Documents, including Drawings, Specifications, and addenda.

- .2 Change Orders, Change Directives, and Supplementary Instructions.
- .3 Reviewed Shop Drawings, Product data, and samples.
- .4 Field test reports and records.
- .5 Construction progress schedule.
- .6 Meeting minutes.
- .7 Manufacturer's certifications.
- .8 Permits, inspection certificates and other documents required by authorities having jurisdiction.
- .9 Current as-built drawings.
- .10 Material Safety Data Sheets (MSDS) for all controlled Products.
- .11 Daily log including:
 - .1 Weather conditions.
 - .2 Excavation conditions
 - .3 Start and finish date of each Trade Contractor.
 - .4 Erection and removal dates of formwork.
 - .5 Date, quantities and particulars of each concrete pour.
 - .6 Dates and quantities and particulars of roofing and waterproofing work.
 - .7 Visits to the Site by Owner, Consultants, Jurisdictional Authorities, Testing and Inspection companies, and material and equipment supplier representatives.
- .12 [...].

5 PHASING

- 5.1 Provide a phasing plan for various stages of the Work to be implemented for the duration of the Project. Submit phasing plan for the Consultant's review.
- 5.2 The phasing plan must consider the following minimum criteria:
 - .1 Satisfy the requirements to meet the Project completion dates.
 - .2 Providing strategies to minimize disruptions to existing building operations during the construction period. Any proposed disruptions shall be subject to Owner's approval.
 - .3 All proposed work shall fully address noise, vibrations and dust/air quality resulting from the Work.
 - .4 Provision of parking needs at each phase of the Work.

- .5 Provision of clear wayfinding and signage for pedestrian and vehicular passage for students, staff, visitors, the public and emergency personnel, when approaching and navigating the Site through each phase of the Work.
- .6 Maintain emergency and fire vehicle access routes during all phases of the Work to meet requirements of authorities having jurisdiction.

6 EXISTING SITE CONDITIONS

- 6.1 Make a careful examination of the site, and investigate and be satisfied as to all matters relating to the nature of the Work to be undertaken, as to the means of access and egress thereto and therefrom, as to the obstacles to be met with, as to the extent of the Work to be performed, any limitations under which the work has to be executed, and any and all matters which are referred to in the Contract Documents. Claims for additional costs will not be entertained with respect to conditions which could reasonably have been ascertained by an inspection prior to Tender closing.
- 6.2 Report any inconsistencies, ambiguities, discrepancies, omissions, and errors between Site conditions and Contract Documents to the Consultant prior to the commencement of Work. If inconsistencies, ambiguities, discrepancies, omissions, and errors are not reported and clarified, the most stringent requirement shall govern, as determined by the Consultant. Ensure that each Subcontractor performing work related to the site conditions has examined it so that all are fully informed on all particulars which affect the Work thereon in order that construction proceeds competently and expeditiously.
- 6.3 Before commencing the Work of any Section or trade, carefully examine the Work of other Sections and trades upon which it may depend, examine substrate surfaces, and report in writing to the Consultant, defects which might affect new Work. Commencement of Work shall constitute acceptance of conditions and Work of other sections, trades, and Other Contractors upon which the new Work depends. If repair of surfaces is required after commencement of specific work it shall be included in the work of the trade providing the specific system or finish.

7 CONTRACTOR'S USE OF SITE

- 7.1 Except as otherwise specified, Contractor has unrestricted use of Place of the Work from time of Contract award until Ready-for-Takeover.
- 7.2 Accept full responsibility for the Work and storage areas from the time of Contract award until Ready-for-Takeover.
- 7.3 Confine Construction Equipment, Temporary Work, storage of Products, waste products and debris, and all other construction operations to limits required by laws, ordinances, permits, and Contract Documents, whichever is most restrictive. Do not unreasonably encumber Place of the Work.

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- 7.4 Check means of access and egress, rights and interests which may be interfered with. Do not block lanes, roadways, entrances of exits. Direct construction traffic and locate access to site as directed by municipality.
- 7.5 Where encroachment beyond property limits is necessary make arrangements with respective property owners.
- 7.6 Before vehicles or equipment enter the Site, obtain permission from the Owner/Consultant for storage and appropriate access route. Appropriately barricade, stake off, or snow fence access route and storage area and around construction area in order to minimize damage to buildings, grounds, planting, turf, and surrounding facilities at the Site, and to restrict unauthorized persons from entering the construction area. Be responsible for making good any/all damages caused by operations at the Site. Restoration of such damages shall be to original condition and to the satisfaction of the Owner.
- 7.7 Cost of providing temporary protection, roads and services, including removal of same at completion of the Work and restoration of the involved areas to original state, shall be included in the Contract Price.
- 7.8 Maintain the exterior of the building during performance of the work. provide proper housekeeping measures to maintain a neat and orderly site to eliminate any complaints from surrounding neighbours.
- 8 ACCESS/PROPERTY CONSTRAINTS**
- 8.1 Owner will occupy premises during entire construction period.
- 8.2 Cooperate with Owner in scheduling operations and sequencing work to minimize disruptions and to facilitate Owner usage.
- 8.3 Control access during the following times unless otherwise approved by the Owner:
- .1 Prior to June 26 and after September 02:
 - .1 Limit access (no deliveries) to the site between the hours of 8:15am - 8:45am and between 2:30pm -3:00pm.
 - .2 Adhere to city of Mississauga Noise Control by-law.
- 8.4 Provide and maintain access facilities as may be required for access to the Work.
- 8.5 Minimize disruption, noise and dust to the functions of existing operational areas of existing buildings. Times of entry, routes of access and time required to complete the Work shall be arranged and scheduled in cooperation with the Owner.
- 8.6 Confine Work and operations of employees to limits indicated by the Contract Documents. Do not unreasonably encumber the premises with products.

- 8.7 Organize delivery of materials/equipment to and removal of debris and equipment from place of Work to permit continual progress of work and suitable for restricted site conditions.
- 8.8 Determine and make arrangement as required for loading and unloading of equipment and Products at times that will not affect public traffic flow and that will be permitted by the City of Renfrew. Conform to City by-laws with regard to parking restrictions and other conditions.
- 8.9 Make provisions and arrangements and provide allowances if times for loading and unloading allowed by the City of Renfrew are other than regular working hours.
- 8.10 All Products, materials and equipment required on Site shall be portable and/or size suitable for access and movement on Site and without causing damage to buildings.
- 8.11 The Work shall be confined to the area defined on the drawings and by the property lines except that services connections and certain portions of landscaping, hard paving and curb work shall be executed on Municipal property under regulation of authorities.
- 8.12 Provide locked doors in barriers, permit access by Owner and Consultant to Work areas and to areas Contractor is responsible for.
- 8.13 Workers shall not enter existing building beyond construction areas except where required for connection or modification to existing services or other such work. Arrange such requirements with Owner prior to entering existing occupied areas.
- 8.14 Personnel access and material deliveries to the Site shall be only by routes designated by the Owner. Do not deliver Products during Owner's normal business hours which are Monday to Friday between the hours of 8:00 am - 6:00 p.m. except when permitted otherwise by the Owner. Owner's equipment such as trucks, bins, dollies, and other such equipment/facilities shall not be used by Contractors. Arrangements for handling items weighty or bulky enough to require special treatment must be made and reviewed with the Owner.
- 8.15 Advise the Owner 48 hours in advance of large or cumbersome item deliveries. Give particulars of item size and weight, protection to existing surfaces to be provided and safety precautions during movement.

9 CONTINUITY OF LIFE SAFETY SYSTEMS

- 9.1 Maintain operational life safety systems and public access to exits in occupied areas during all stages of the Work.
- 9.2 Determine nature and exact locations of existing fire and smoke sensors prior to the commencement of the Work. Avoid direct or indirect jarring or damage while working in adjacent areas and exercise caution to avoid triggering these devices.
- 9.3 Be responsible for costs incurred by Owner on account of false fire alarms activated as a result of the execution of the Work without adequate precautions.

10 CONTINUITY OF EXISTING SERVICES

- 10.1 Shutdowns and planning of operations that may affect Owner's use of services shall be coordinated with, approved by, and in accordance with the Owner's written directions. Provide advanced notice for all required interruptions to utility, heating, cooling, mechanical, electrical, and life safety systems.
- 10.2 Coordinate and provide necessary services, access, exiting and other facilities as required.
- 10.3 Make written requests for shutdown at least 5 working days in advance, unless specifically stated herein or as otherwise instructed by the Owner.
- 10.4 Shutdowns shall be scheduled in advance with Owner and shutdown period shall be minimized to Owner's convenience. Facilities in existing adjacent areas will be occupied during the Work.
- 10.5 Major shutdowns shall take place on weekends or at night by prior arrangement with and at no additional cost to the Owner.
- 10.6 Tag and mark switches and valves used by the Contractor to isolate services with name of Contractor, tradesman's name, date and time of shut-off, and date and time to be turned back on.
- 10.7 Arrange work so that physical access to existing adjacent facilities is not unduly interrupted at any one time except as approved by the Owner.
- 10.8 Protect existing work to remain at the commencement of each work shift in occupied areas, as completely as possible to hold the replacing of damaged work to a minimum. Provide covering and other protection material. Include protection for access routes and temporary storage areas. Make good damage to existing surfaces caused by lack of adequate protection. Protection in such areas shall be removed at the end of each work shift.
- 10.9 All areas shall be cleaned and left in condition suitable for use by Owner and building operations before commencement of their work day.
- 10.10 Minimize disruption, noisy work, vibration, and dust to the function of existing building and to avoid disturbances to building occupants. Percussion noise, noisy work, and vibration shall not be permitted between the hours to be determined by the Board.
- 10.11 These requirements are for security reasons and for the consideration of the Owner. Requirements shall not be construed as cause for elimination or restriction of Contractor's working schedule, claims for delay or work, nor additional cost.

11 **WORK BY OTHERS**

11.1 Work of the Contract executed prior to the start of or during the Work of this Contract, and which is specifically excluded from this Contract:

.1 Reserved

12 **SECURITY**

12.1 Be responsible for security of all areas affected by Work of this Contract until taken over by Owner. Take steps to prevent entry to the Work by unauthorized persons and guard against theft, fire and damage by any cause.

12.2 Provide suitable surveillance equipment and /or employ guard services, as required to adequately protect the work.

12.3 Make provisions to permit Owner's security personnel to view areas where all Work is being performed.

12.4 Use of facilities such as building entrances, washrooms, elevators and access corridors as directed by Owner's security personnel and as specified.

12.5 Take acceptable precautions to guard Work site, premises, materials and the public during and after working hours due to the Work of this Contract.

12.6 A regular full time watchman is generally required on Site during School year. Confirm start and completion of school year.

12.7 Any security service provided by the Owner is for the protection of the Owner's interest in the Work on the Site and shall not relieve the Contractor of the responsibility to protect the Site and the Work of the Contract.

13 **WEATHER**

13.1 Incorporate into the Contract Schedule allowances for the number of working days lost due to inclement weather, which can be anticipated, on the basis of analysis of information available from Environment Canada, for weather conditions on and near the Site, over the last ten (10) years. The Contractor may be entitled to a schedule extension for those activities on the critical path which are delayed on account of inclement weather, assessed on a quarterly basis, by the number of days in excess of the anticipated number of working days for the quarter in question by more than 20%. No additional payment will be made on account of any such schedule extension.

13.2 For the purpose of this clause the quarters are defined as January 1 to March 31, April 1 to June 30, July 1 to September 30, and October 1 to December 31.

END OF SECTION

1 GENERAL

- 1.1 Allowances included herein are for items of Work which could not be fully quantified prior to Bidding.
- 1.2 Progress payments for Work and Products authorized under allowances will be made in accordance with the payment terms set out in Conditions of the Contract.
- 1.3 A schedule and scope of work shall be prepared jointly by the Consultant and Contractor to show when items called for under allowances must be authorized by the Consultant for ordering purposes so that the progress of the Work will not be delayed.
- 1.4 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.

2 EXPENDITURE OF CASH ALLOWANCE(S)

- 2.1 Owner, through Consultant, will provide Contractor with documentation required to permit pricing of a cash allowance item.
- 2.2 Where a Cash Allowance is for work performed under a Subcontract, Owner, through Consultant, will request Contractor to identify potential Suppliers and Subcontractors, as applicable, and to obtain at least three competitive prices for each cash allowance item.
- 2.3 Contractor will provide to the Owner and Consultant bids, quotations, and other price related information received from potential Suppliers and Subcontractors complete with Contractor's recommendations for approval.
- 2.4 Owner, through Consultant, will determine by whom and for what amount each cash allowance item will be performed. Obtain Owner's prior written approval in the form of a Change Order before entering into a subcontract, amending an existing subcontract, or performing own forces work included in a cash allowance. Upon issuance of the Change Order, the Contractor's responsibilities for a cash allowance item shall be the same as for other work of the Contract.
- 2.5 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.
- 2.6 Amount of each cash allowance does not include Contractor's overhead and profit, and other related costs, which shall be included in the Contract Price and not in the cash allowance.

3 CASH ALLOWANCE(S)

- 3.1 Cash allowances, unless otherwise specified, cover the net cost to Contractor of services, Products, supply, construction machinery and equipment, freight, delivery, handling, unloading, storage, installation where indicated, all related costs, and other authorized expenses incurred in performing the Work.
- 3.2 Cash allowances shall not be included by a Subcontractor in the amount for their Subcontract work.
- 3.3 Supply only allowances shall include:
- .1 Net cost of Products as invoiced by Supplier.
 - .2 Delivery to Site.
 - .3 Applicable taxes and duties, excluding HST.
- 3.4 Supply and install allowances shall include:
- .1 Net cost of Products.
 - .2 Subcontractor's overhead and profits related to the Cash Allowance.
 - .3 Delivery, unloading, storing, handling or Products on Site.
 - .4 Installation, finishing and commissioning of Products.
 - .5 Applicable taxes and duties, excluding HST.
- 3.5 Inspection and testing allowances shall include:
- .1 Net cost of inspection and testing services.
 - .2 Applicable taxes and duties, excluding HST.
- 3.6 Other costs related to work covered by cash allowances are not covered by the allowance but shall be included in the Contract Price.

4 CONTINGENCY ALLOWANCE(S)

- 4.1 For Glenforest Secondary School – Pool Demolition include in the Contract Price a Contingency Allowance as specified in the Form of Tender, not including H.S.T.
- 4.2 Expend Contingency Allowance as directed by the Consultant, in writing, in accordance with the Board's Stipulated Price Contract, Standard Document, PDSB-2011, as attached, Changes in Work and Contingency Allowance.
- 4.3 Contractor's charges for expenses and profit on Contingency Allowance expenditure shall not be included in Contract Price. Refer to Stipulated Price, Standard Document PDSB-2011, as attached, for percentages of mark-ups.
- 4.4 Such charges shall be added to the net trade cost of each expenditure from the Contingency Allowance at the percentage rates noted in the Stipulated Price, Standard Document PDSB-2011, as attached.

4.5 Changes to the Work shall be added to, or deducted from, the Contingency Allowance, not from the Board approved Contract. The Contract shall be adjusted by Board approval, only once - at the end of the Project. Credit the Contract with any unused portion of the Contingency Allowance only in the final payment statement.

5 SCHEDULE OF ALLOWANCES

5.1 Inspections and Testing: The following is a summary of the scope Cash Allowance for testing and Inspections to be included in the contract:

- .1 Topsoil Chemical Analysis and Nutrient Analysis.
- .2 Subgrade Testing.
- .3 Paving Inspection and Testing.
- .4 Concrete Inspection.
- .5 Firestopping Inspection.
- .6 Steel Inspection.
- .7 Roof Deck Inspection.
- .8 Aluminum Windows Testing.
- .9 Roof Inspections.
- .10 Insulation/Vapour Barrier Inspection.
- .11 Masonry and Mortar Inspection.
- .12 Hollow Metal Door Inspection.
- .13 Finish Hardware Inspection.

5.2 Communications and Security:

- .1 PA system connections and terminations.
- .2 Security system wiring connections and terminations.

5.3 Other Cash Allowances:

- .1 Structural investigations and reinforcing of existing roof structure not shown on drawings.
- .2 Digital As-builts – (Architectural and Structural).

END OF SECTION

1.1 REQUEST FOR INTERPRETATION (RFI)

- .1 A Request for Interpretation (RFI) is a formal process used during the Work to obtain an interpretation of the Contract Documents or to obtain additional information.
- .2 An RFI shall not constitute notice of claim for a delay.

1.2 SUBMITTAL PROCEDURES

- .1 Number RFIs consecutively in one sequence in order submitted, in numbering system as established by the Contractor and agreed to by the Consultant.
- .2 Submit one distinct subject per RFI form. Do not combine unrelated items on one form.
- .3 RFI form:
 - .1 Submit RFIs to the Contractor on "Request for Interpretation" form, appended to this Section. The Consultant shall not respond to an RFI except as submitted on this form.
 - .2 Where RFI form does not have sufficient space to provide complete information thereon, attach additional sheets as required.
 - .3 Submit with RFI form all necessary supporting documentation.
- .4 RFI log:
 - .1 Maintain log of RFIs sent to and responses received from the Consultant, complete with corresponding dates.
 - .2 Submit updated log of RFIs with each application for payment submission.
- .5 Submit RFIs sufficiently in advance of affected parts of the Work so as not to cause delay in the performance of the Work. Costs resulting from failure to do so will not be paid by the Owner.
- .6 Only the Contractor shall submit RFIs to the Consultant.
- .7 RFIs submitted by Subcontractors or Suppliers directly to the Consultant shall not be accepted.

1.3 SCREENING OF RFIs

- .1 Subcontractor and Contractor shall satisfy themselves that an RFI is warranted by undertaking a thorough review of the Contract Documents to determine that the claim, dispute, or other matters in question relating to the performance of the Work or the Interpretation of the Contract Documents cannot be resolved by direct reference to the Contract Documents.

- .2 Contractor shall describe in detail this review on the RFI form as part of the RFI submission. RFI submittals that lack such detailed review description, or where the detail provided is, in the opinion of the Consultant, insufficient, shall not be reviewed by the Consultant and shall be rejected.

1.4 **RESPONSE TO RFI**

- .1 Consultant shall review RFIs from the Contractor submitted in accordance with this Section with the following understandings:
 - .1 Consultant's response shall not be considered as a Change Order or Change Directive, nor does it authorize changes in the Contract Price or Contract Time or changes in the Work.
 - .2 Only the Consultant shall respond to RFIs. Responses to RFIs received from entities other than the Consultant shall not be considered valid.

1.5 **RESPONSE TIMING**

- .1 Allow 5 Working Days for review of each RFI by the Consultant.
- .2 Consultant's review of RFI commences on date of receipt of RFI submission by the Consultant from Contractor and extends to date RFI returned by Consultant.
- .3 When the RFI submission is received by Consultant before noon, review period commences that day. When RFI submittal is received by Consultant after noon, review period begins on the next Working Day.
- .4 If, at any time, the Contractor submits a large enough number of RFIs or the Consultant considers the RFI to be of such complexity that the Consultant cannot process these RFIs within 5 Working Days, the Consultant, will confer with the Contractor and the originator of the RFI within 3 Working Days of receipt of such RFIs, and the Consultant, the Contractor, and the originator will jointly prepare an estimate of the time necessary for processing same as well as an order of priority among the RFIs submitted. The Contractor and originator shall accommodate such necessary time at no increase in the Contract Time and at no additional cost to the Owner.

END OF SECTION

1.1 SCHEDULE OF VALUES

- .1 Prior to the first application for payment, submit for Consultant's review an initial schedule of values. Modify the initial schedule of values if and as requested by Consultant. Obtain Consultant's written acceptance of the initial schedule of values prior to the first application for payment.
- .2 Together with the first and all subsequent applications for payment, submit updated versions of the schedule of values to indicate the values, to the date of application for payment, of work performed and Products delivered to Place of the Work.
- .3 Provide the schedule of values in an electronic spreadsheet format based on a format acceptable to all parties to the Contract, that provides for inclusion of the following information:
 - .1 Identifying information including title and location of the Work, name of Contractor, number and date of application for payment, and period covered by the application for payment.
 - .2 A work breakdown structure that is sufficiently detailed and comprehensive to facilitate Consultant's evaluation of applications for payment at an appropriate level of detail.
 - .3 Provisions for approved Change Orders, allowances, and other relevant values, so that the breakdown amounts indicated in the schedule of values aggregate to the current total Contract Price. Also provide for indicating the estimated value of Change Directives within the schedule of values, separately from the current total Contract Price.
 - .4 For each item in the work breakdown structure, provide as a minimum the following information, under headings as indicated:
 - .1 Breakdown Amount: A dollar amount, including an appropriate pro rata portion of Contractor's overhead and profit.
 - .2 Performed to Date: The value of Work performed and Products delivered to Place of the Work up to the date of the application for payment, stated as a percentage of the Contract Price and in dollars.
 - .3 Previously Performed: The value of Work performed and Products delivered to the Place of the Work for which payment has been previously certified, stated in dollars.
 - .4 Current Period: The value of Work performed and Products delivered to Place of the Work for which Contractor is currently applying for payment, stated in dollars.
 - .5 Balance to Complete: The value of Work not yet performed and Products not yet delivered to Place of the Work, stated in dollars.

1.2 CASH FLOW PROJECTION

- .1 Prior to the first application for payment submit, for Consultant's review, a forecast of approximate monthly progress payments for each month of the Contract Time.
- .2 Submit revised cash flow forecasts on a monthly basis when required due to significant changes in rate of progress of the Work or significant changes in the Contract Price or as requested by Consultant.

1.3 WORKERS' COMPENSATION CLEARANCE

- .1 Submit proof of workers' compensation clearance with each application for payment.

1.4 STATUTORY DECLARATIONS

- .1 Submit a statutory declaration in the form of CCDC 9A – Statutory Declaration of Progress Payment Distribution by Contractor with each application for payment except the first.

END OF SECTION

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- 1 **GENERAL**
- 1.1 Coordination of the Work of all Sections of the specifications as required to complete the Project is the responsibility of the Contractor.
- 1.2 Cooperate and coordinate with Other Contractors including Other Contractor's employed by Owner.
- 1.3 Ensure that Subcontractors and trades cooperate with other subcontractors and trades whose work attaches to or is affected by their own work. Ensure that minor adjustments are made to make adjustable work fit fixed work.
- 1.4 Allow access of Owner's Other Contractors on site and to areas of Work. Cooperate and coordinate with such Other Contractors. Schedule work to complement work of such Other Contractors.
- 1.5 Entry by the Owner's own forces and by Other Contractors shall not mean acceptance of the Work and shall not relieve the Contractor of their responsibility to complete the Contract.
- 1.6 Placing, installation, application and connection of work by the Owner's own forces or by Other Contractors on and to the Contractor's Work shall not relieve the Contractor of his responsibility to provide and maintain the specified warranties.
- 1.7 Coordinate with removals/installations specified in other Divisions and Other Contracts.
- 1.8 Coordinate the work of this Contract with work of designated substance removal work and demolition work under separate contract. No allowance shall be made subsequently by the Owner or Consultant for lack of coordination and no claim will be considered for circumstances and omissions which could have been coordinated, prevented or included for had these procedures been followed.
- 1.9 Coordination of the installation of systems specified in Divisions 13, 21, 22, 23 and 26, including the interrelating operation and functioning between components of a system and between systems, is the responsibility of those performing the work of those Divisions, with final coordination the responsibility of the Contractor.
- 1.10 Coordinate relocation of existing mechanical and electrical items with work specified in Divisions 13, 21, 22, 23, and 26.
- 1.11 Existing equipment shall remain in present locations unless designated otherwise. Protect from damage. Remove, store and reinstall existing fixed equipment, fixtures and components which interfere with construction and which are scheduled for relocation.

- 1.12 Pay particular attention to types of ceiling construction and clearances throughout, especially where recessed fixtures are required. Coordinate work with Other Contractors and Subcontractors wherever ventilation ducts or piping installations occur to ensure that conflicts are avoided.
- 1.13 Install ceiling mounted components in accordance with final ceiling plans. Inform Consultant of conflicting installations.
- 1.14 Install and arrange ducts, piping, tubing, conduit, equipment, fixtures, materials and product to conserve headroom and space with minimum interference and in neat, orderly and tidy arrangement. Run pipes, ducts, tubing and conduit, vertical, horizontal and square with building grid unless otherwise indicated. Install piping, ducts, and conduit as close to underside of structure as possible unless shown otherwise.
- 1.15 Make provision, without interference or restriction by items located within the ceiling space, for unrestricted relocation of light fixtures to replace ceiling panels at grid spaces of the same size.
- 1.16 Where supports or openings are to be left for the installation of various parts of the Work furnish the necessary information to those concerned in ample time so that proper provision can be made for such items. Have cutting, drilling and other remedial work, and the subsequent patching or other work required for failing to comply with this requirement, performed at a later date at no additional Cost to Owner.
- 1.17 Properly coordinate the work of the various Sections and trades, taking into account the existing installations to assure the best arrangement of pipes, conduits, ducts and mechanical, electrical and other equipment, in the available space. Under no circumstances will any extra payment be allowed due to the failure by the Contractor to coordinate the work. If required, in critical locations, prepare interference and/or installation drawings showing the work of the various Sections as well as the existing installation, and submit these drawings to the Consultant for review before the commencement of work. Proceed with work in these areas only as, and when directed by the Consultant.
- 1.18 Coordinate with mechanical and electrical trades to ensure protecting supporting, disconnecting, cutting off, capping, diverting, relocating or removing of existing services in areas of Work before commencement of alteration work.
- 1.19 Execute Work at times to ensure a minimum of disturbance to building occupants and in compliance with the Tenant Leasehold Improvement Manual.
- 1.20 In case of damage to active services on utilities, notify Consultant and respective authorities immediately and make all required repairs under direction of Consultant and respective authorities. Carry out repairs to such damaged services and utilities continuously to completion, including working beyond regular working hours. Costs to be borne by the Contractor.

1.21 Existing areas shall remain in use except where alteration work is actually in progress. Confine effects of Work to areas indicated on Drawings unless otherwise approved by Owner.

2 **METRIC DIMENSIONS**

2.1 Measurements in this specification are expressed in metric (SI) units and depending on the progress made in the various sectors of the industry are either hard or soft converted units.

2.2 All metric units specified shall be taken to be the minimum acceptable unless otherwise noted.

2.3 It is the Contractor's responsibility to check and verify with manufacturers and suppliers on the availability of materials and products in either metric or imperial sizes. Be responsible for coordinating products supplied in metric (SI) and imperial units into the overall layout.

2.4 Where both metric and imperial sizes or dimensions are shown, the metric size or dimension shall govern.

3 **BUILDING DIMENSIONS**

3.1 Take necessary job dimensions for the proper execution of the work. Assume complete responsibility for the accuracy and completeness of such dimensions, and for coordination.

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

3.3 Check and verify dimensions referring to the work and the interfacing of services.

3.4 Do not scale directly from the Drawings. If there is ambiguity or lack of information, immediately inform the Consultant. Changes required through the disregarding of this clause shall be the responsibility of the Contractor.

3.5 All details and measurements of any work which is to fit or to conform with work installed shall be taken at the building.

3.6 Advise Consultant of discrepancies and if there are omissions on Drawings, particularly reflected ceiling plans and jointing patterns for surfaces finishes, which affect aesthetics, or which interfere with services, equipment or surfaces. Do not proceed with work affected by such items without direction from the Consultant.

- 3.7 Provide written requirements for site conditions and surfaces necessary for the execution of respective work, and provide setting drawings, templates and all other information necessary for the location and installation of material, holes, sleeves, inserts, anchors, accessories, fastenings, connections and access panels. Inform respective contractors whose work is affected by these requirements and preparatory work.

4 **INTERFERENCE AND COORDINATION DRAWINGS**

- 4.1 Coordinate placement of equipment to ensure that components will be properly accommodated within the spaces provided prior to commencement of work.
- 4.2 Prepare interference and equipment placing drawings to ensure that all components will be properly accommodated within the spaces provided. Provide copies of interference drawings to Consultant when requested by Consultant.
- 4.3 Prepare drawings to indicate coordination and methods of installation of a system with other systems where their relationship is critical. Ensure that all details of equipment apparatus, and connections are coordinated.
- 4.4 Take complete responsibility for any remedial work that results from failure to coordinate any aspect of the Work prior to its fabrication/installation.
- 4.5 Ensure that accesses and clearance required by jurisdictional authorities and/or for easy maintenance of equipment are provided in the layout of equipment and services.

5 **SLEEVING AND INSERT DRAWINGS AND TEMPLATES**

- 5.1 Prepare sleeving drawings for work of Divisions 13, 21, 22, 23, and 26, showing size and location of all penetrations through load bearing elements. Submit sleeving drawings in the form of one transparency and 4 prints to Consultant for review not less than 15 days prior to construction of affected elements.
- 5.2 Prepare insert setting drawings for work to be cast into concrete and/or mortared into masonry elements. Submit insert setting drawings in the form of a transparency and 4 prints to Consultant for review not less than 15 days prior to construction of affected elements.
- 5.3 Ensure that setting drawings, templates, and all other information necessary for the location and installation of materials, fixtures, equipment, holes, sleeves, inserts, anchors, accessories, fastenings, connections, and access panels are provided by each Section whose work requires cooperative location and installation by other Sections, and that such information is communicated to the applicable installer.

- 5.4 Provide cutting, fixing and making good to the work of Other Contractors, Subcontractors and trades as required for sleeving and inserts and make up time lost as a result of failure to comply with this requirement, at no additional cost to the Owner.

END OF DOCUMENT

1 CONSTRUCTION START-UP MEETING

- 1.1 Promptly after Contract award, Consultant will establish the time and location of a construction start-up meeting to review and discuss administrative procedures and responsibilities. Consultant will notify Contractor at least 5 Working Days before the meeting.
- 1.2 Contractor will prepare and distribute copies of Agenda prior to meeting.
- 1.3 Senior representatives of Owner, Consultant(s), and Contractor, including Contractor's project manager and site superintendent, and major Subcontractors, shall be in attendance.
- 1.4 Consultant will arrange attendance of other interested parties not responsible to the Contractor.
- 1.5 Be prepared to provide specific information relative to agenda items as they are pertinent to the Contract.
- 1.6 Contractor's representative will chair the meeting and record and distribute the minutes within 5 Working Days of meeting date.
- 1.7 Agenda will include but not be limited to the following topics as are pertinent to the Contract.
 - .1 Review project communications procedures.
 - .2 Contract Documents for construction purposes.
 - .3 Construction progress meetings.
 - .4 Review contract administration requirements including submittals, cash allowances, payment, and change modification procedures.
 - .5 Construction progress schedule, including long lead time items for positive action.
 - .6 Submittals schedule and procedures.
 - .7 Identify any product availability problems and substitution requests.
 - .8 Contractor's mobilization and construction facilities.
 - .9 Establish work restrictions, site arrangements, and temporary facilities.
 - .10 Review Consultants inspection requirements.
 - .11 Quality requirements, including testing and inspection procedures.

- .12 Temporary controls, utilities, barriers and enclosures.
- .13 Field engineering and layout of work.
- .14 Site safety and security.
- .15 Cleaning and waste management.
- .16 Review any points which, in Owner's, Consultants, and Contractor's opinion, require clarification.

2 CONSTRUCTION PROGRESS MEETINGS

- 2.1 Attend regularly scheduled progress meetings to be held on Site at times and dates that are mutually agreed to by the Owner, Consultant, and Contractor. Consultant will notify Contractor at least 5 Working Days before the meeting.
- 2.2 Contractor to arrange for and provide physical space for meetings
- 2.3 Consultant will prepare and distribute copies of Agenda prior to meeting.
- 2.4 Coordinate and organize attendance of individual Subcontractors and Suppliers when requested. Relationships and discussions between Subcontractor participants are not the responsibility of the Consultant and do not form part of the meetings content.
- 2.5 Ensure that Contractor representatives in attendance at meetings have required authority to commit Contractor to actions agreed upon. Assign same persons to attend such meetings throughout the contract period.
- 2.6 Consultant will arrange attendance of other interested parties not responsible to the Contractor.
- 2.7 Inform the Consultant in advance of meetings regarding all items to be added to the agenda.
- 2.8 Be prepared to provide specific information relative to agenda items at each meeting as they are pertinent to the Contract.
- 2.9 Contractor representative will chair the meeting and record and distribute the minutes within 5 Working Days of meeting date.
- 2.10 Agenda will include but not be limited to the following topics as are pertinent to the Contract.
 - .1 Review and agreement of previous minutes.

- .2 Construction safety.
- .3 Work progress since previous meeting.
- .4 Field observations, including any problems, difficulties, or concerns.
- .5 Construction progress schedule.
- .6 Submittal schedule and status of submittals.
- .7 Quality control.
- .8 Coordination.
- .9 Contract Schedule.
- .10 Work plan up to next scheduled meeting.
- .11 Requests for information/clarification.
- .12 Proposed changes in the Work.
- .13 Other business.

3 MEETINGS WITH OTHER CONTRACTORS

- 3.1 Consultant will arrange and organize coordination meetings with Other Contractors working on the Project.
- 3.2 Attend all such meetings and ensure that representative has required authority to commit Contractor to actions agreed upon.
- 3.3 Consultant will document and distribute minutes to participants.

END OF SECTION

1 GENERAL

- 1.1 Be responsible for planning and scheduling the Construction Progress Documentation of the Work.
- 1.2 Be responsible for ensuring that Subcontractors plan and schedule their respective portions of the Work. Subcontractor's schedules shall form part of the above mentioned schedules.

2 SCHEDULE MANAGEMENT

- 2.1 A schedule submitted as specified and accepted by Consultant shall become the baseline schedule and shall be used as the baseline for updates.
- 2.2 At each regular progress meeting, review and discuss current construction progress and submittals schedules with Consultant and Owner, including activities that are behind schedule and planned measures to regain schedule slippage in key areas on or near the critical path.
- 2.3 Activities considered behind schedule are those with start or completion dates later than the dates shown on the baseline schedule.

3 CASH FLOW CHART

- 3.1 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.
- 3.2 Update cash flow chart whenever changes occur to scheduling and in manner and at times satisfactory to Consultant.

4 CONTRACT SCHEDULE

- 4.1 Prepare and submit, in a PDSB requests project schedule is in Gantt format acceptable to the Owner, the Contract Schedule within 10 Working Days following award of Contract. This schedule, once it is reviewed by the Consultant and Owner and if it meets the project requirements, will form part of the Contract.
- 4.2 Contract Schedule shall be developed using a logic network technique for planning and scheduling.
- 4.3 Contract Schedule shall be submitted for approval in its optimum levelled form. This presentation may be in either a time scaled network or a bar chart form. It shall be subdivided into either work areas or systems as applicable.

- 4.4 Contract Schedule shall include but not be limited to the following information. Information to be provided in a sufficient level of detail to effectively manage the construction process.
- .1 Starting and ending dates, milestones, and key activities of each activity including the float periods.
 - .2 Work Packages.
 - .3 Manpower requirements for each activity.
 - .4 Order and delivery dates for long delivery Products and major or critical equipment.
 - .5 Interdependency with activities of other Contractors.
 - .6 Dates specified in the Contract Documents.
 - .7 Milestone date[s] for Ready-for-Takeover and Substantial Performance of the Work.
 - .8 Inspection and testing activities.
 - .9 Dates on which specific data will be required for submittal, i.e., Vendor data, shop drawings, samples, etc.
 - .10 Preparation and review of Mock-ups.
 - .11 Shutdown or closure activities.
 - .12 Demonstration and training activities.
- 4.5 Submit updated schedule to the Consultant and Owner monthly indicating as a minimum actual and projected start and finish dates, report date line and progress, activity relationships, float, Contract changes as well as major changes to the schedule.

5 DETAILED CONSTRUCTION SCHEDULE

- 5.1 Prepare and submit a detailed construction schedule within 10 Working Days of final review and acceptance of the Contract Schedule. This schedule, once reviewed and accepted by the Consultant, will be updated and submitted monthly with the Contract Schedule and weekly once the Contractor starts on Site.
- 5.2 This schedule shall cover the construction period. It will show, in detail, activities on a daily basis indicating durations, manpower and constraints. The activities shown on this schedule shall further clarify or detail the activities shown on the Contract Schedule.
- 5.3 The detailed construction schedule shall be presented in a bar chart form.

5.4 Include a written report with each updated progress schedule. Indicate work status to date comparing baseline to actual progress, current forecasts, identifying problem areas, anticipated delays and impact on schedule, and planned corrective actions.

6 SUBMITTALS SCHEDULE

6.1 Format and Content:

- .1 Prepare schedule identifying all required Shop Drawing, Product data, and sample submissions, including samples required for testing.
- .2 Prepare schedule in electronic format acceptable to Owner.
- .3 Provide a separate line for each required submittal, organized by Specification section names and numbers, and further broken down by individual Products and systems as required.
- .4 Allow time in schedule for review of submittals and resubmission of submittals, should resubmission be necessary.

6.2 Submission:

- .1 Submit initial schedule to Consultant within 15 Working Days after Contract award.
- .2 Submit schedule in format acceptable to Owner.
- .3 Consultant will review format and content of initial schedule and request necessary changes, if any, within 10 Working Days after receipt.
- .4 If changes are required, resubmit finalized schedule within 5 Working Days after return of review copy.
- .5 Submit updated submittals schedule monthly to Owner and Consultant.

7 PROGRESS RECORDS

7.1 Maintain on site, permanent written records of daily progress of the Work. Records shall be open to review by Consultant and Owner at all times and a copy shall be furnished to Consultant on a weekly basis.

7.2 Records shall show dates of commencement, progress and completion of various trades and items of work. Particulars pertaining to number of employees of various trades and type and quantity of equipment employed daily, temperature, protection methods and other such data shall be noted.

- 8 **RECORDING ACTUAL SITE CONDITIONS ON AS-BUILT DRAWINGS**
- 8.1 Obtain from Consultant an electronic copy of the construction Drawings for the purpose of creating as-built drawings. Record information in electronic form, clearly identifying as-built deviations from the originally obtained construction Drawings.
- 8.2 Clearly label each drawing as "AS-BUILT DRAWING prepared by _____ (name of Contractor)". Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- 8.3 Authorized deviations from drawings shall be marked in red accurately on one set of drawing prints in a neat, legibly printed manner and shall be dated. Prior to final inspection, neatly transfer the recorded information to a second set of drawing prints of the most recent revision to the drawings and submit both sets to the Consultant.
- 8.4 Maintain as-built drawings up to date as Work progresses. Status of maintained as-built drawings may be considered as a condition for validation of applications for payment. Make as-built drawings available to the Consultant at all times.
- 8.5 Record actual construction including but not limited to the following:
- .1 Accurate dimensioned record of deviations and changes in Work from drawings.
 - .2 Measured depths of elements of foundation in relation to finish first floor datum.
 - .3 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .4 Measured locations of pipes, ducts, conduits, outlets, fixtures, access panels, and appurtenances, referenced to visible and accessible features of construction.
 - .5 Field changes of dimension and detail.
 - .6 Changes made by Change Orders and Supplemental Instructions
 - .7 References to Shop Drawings, where Shop Drawings show more detail.
 - .8 Do not use as-built drawings for construction purposes.
- 8.6 Accurately record locations of concealed structure, mechanical and electrical services and similar Work not clearly in view, the location of which is required for maintenance, alteration Work and future additions. Do not conceal such Work until the location has been recorded.
- 8.7 Accurately record locations of equipment bases, anchors, concrete pads and roof curbs, sleeves, piping, conduits, ducts, maintenance holes and valves, etc. located either below, outside or within structure.

- 8.8 Where piping, conduits and ducts are underground, underfloor, embedded in concrete or otherwise in inaccessible locations, accurately record with respect to structure column lines or walls and elevations with respect to finished floor levels or grades referenced to the centre line of components.
- 8.9 Accurately record any components which will be in inaccessible locations for Consultant's review before the component is covered, or buried, or made inaccessible.
- 8.10 As-built drawings shall be signed and dated by Contractor.
- 8.11 Submit as-built drawing to Consultant for review and make corrections as directed by Consultant.

9 **PROGRESS PHOTOGRAPHS**

- 9.1 Concurrently with monthly application for payment submit 2 CD's or DVD's of digital pictures in high definition, in format acceptable to Owner, illustrating the progress of the Work as follows:
- .1 A minimum of 20 pictures that best illustrate the progress on the site.
 - .2 Pictures shall be in focus and properly illuminated; view shall be unobstructed.
 - .3 Pictures shall be taken with a minimum 10 megapixel camera or better such that quality and details can be discerned from photo.
 - .4 Pictures shall either have an accurate date-stamp present in the photo, or be numbered and dated in the digital filename.
 - .5 The CD or DVD containing the photo's shall be labeled with the following information: The project name, date taken, the period the pictures are taken in, name of photographer, description of view and date of photograph taken, and the monthly application number which the pictures are associated with.
- 9.2 Do not use progress or any other Project photographs for promotional purposes without Owner's written consent.

10 **PROGRESS REPORTS**

- 10.1 Prepare a monthly progress report current to the last Friday of each month. The report shall indicate the period covered and include but not be limited to the following:
- .1 Executive Summary.
 - .2 Areas of Concern/Action Required.
 - .3 Work Accomplished This Period.

- .4 Work Planned Next Period.
 - .5 Schedule Status.
 - .6 Budget Status.
 - .7 Status of Submittals.
 - .8 Quality Control.
 - .9 Contract Changes.
 - .10 Outstanding Actions.
- 10.2 Submit the monthly progress report such that it is received by the Consultant no later than the Wednesday following the last Friday of the month, regardless of whether or not the Monday is a public holiday.

END OF SECTION

- 1 **GENERAL**
- 1.1 Provide labour, Products, equipment, services tools and supervision necessary for submittals work.
- 1.2 Submit electronic copies of submittals in a format acceptable to Owner where submittals are specified in technical Specifications.
- 1.3 Submit submittals to Consultant for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in the Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time or for Product substitutions or other deviations from the Drawings and Specifications.
- 1.4 Verify accuracy and completeness of submittals prior to submission.
- 1.5 Verify field measurements, field construction criteria, catalogue numbers and similar data.
- 1.6 Coordinate each submittal with requirements of the Work, Stipulated Price Contract for Peel District School Board and the Contract Documents.
- 1.7 Where required by authorities having jurisdiction, provide submittals to such authorities for review and approval.
- 1.8 Do not proceed with Work affected by a submittal until review is complete.
- 1.9 Present Shop Drawings, Product data, and samples in SI metric units. Where items or information is not produced in SI metric units, converted values are acceptable.
- 1.10 Supplement standard information to include details applicable to Project.
- 1.11 Review submittals and affix Contractor's review stamp prior to submission to Consultant. Contractor's review stamp represents that necessary requirements have been determined and verified, and that the submittal has been checked and coordinated with requirements of the Work and Contract Documents.
- 1.12 Submittals not meeting specified requirements will be returned with comments.
- 1.13 Reproduction of construction Drawings to serve as background for Shop Drawings is not permitted without written permission of Consultant.
- 1.14 Do not propose Substitutions or deviations from Contract Documents via Shop Drawing, Product data and sample submittals.
- 1.15 Notify Consultant in writing at time of submission, of any deviation in submittals from requirements of the Contract Documents.

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- 1.16 Submit in accordance with dates established under Section 01 32 00 for shop drawings, fabrication, manufacture, erection and installation to provide adequate time for reviews, securing necessary approvals, possible revisions and resubmittals, placing orders, securing delivery and to avoid construction delays.
- 1.17 Accompany each submittal with a letter of transmittal in duplicate containing all pertinent information required for identification and checking of submittals including but not limited to the following:
- .1 Date of initial submission and date of each subsequent submission if required.
 - .2 Project title and Consultant's project number.
 - .3 Names and address of:
 - .1 Contractor.
 - .2 Subcontractor.
 - .3 Supplier/manufacturer/fabricator as applicable.
 - .4 Identification of each submittal item and quantity.
 - .5 Specification section numbers to which submission is related.
 - .6 Countersigned stamp of Contractor certifying that they have reviewed the submission.
- 1.18 Allow 10 Working Days for Consultant's review of each submittal and incorporate in submittals schedule specified in Section 01 32 00. Allow additional 5 Working Days where sub-Consultant review is required.
- 1.19 When submittals are resubmitted, transmit under a new letter of transmission.
- 1.20 Where a submittal includes information not applicable to the Work, clearly identify applicable information and strike out non-applicable information.
- 1.21 If upon Consultant's review no errors or omissions are discovered, or if only minor corrections are required as indicated, submittal will be returned and fabrication or installation of Work may proceed.
- 1.22 If upon Consultant's review significant errors or omissions are discovered, a so noted copy will be returned for correction and resubmission. Do not commence fabrication or installation.
- 1.23 Consultant's notations on submittals are intended to ensure compliance with Contract Documents and are not intended to constitute a change in the Work requiring change to the Contract Price or Contract Time.
- 1.24 Resubmit corrected submittals through same procedure indicated above, before any fabrication or installation of the Work proceeds. When resubmitting, notify Consultant in writing of any revisions other than those requested by Consultant.

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- 1.25 Do not carry out Work until Consultants review of submittals has been completed.
- 1.26 Be responsible for payment of charges for delivery of submissions and resubmission to Consultant.
- 2 SHOP DRAWINGS AND PRODUCT DATA**
- 2.1 The term "Shop Drawings" means drawings, diagrams, schematics, illustrations, schedules, performance charts, product data, brochures and other data which are required to illustrate details of the Work.
- 2.2 Arrange for the preparation of Shop Drawings as called for in the Contract Documents or as may be reasonably requested by the Consultant. The Contractor and each Subcontractor shall operate as experts in their respective fields and all Shop Drawings and samples shall conform to the requirements of the Contract Documents.
- 2.3 In addition to Shop Drawings specified in the specification sections, submit Shop Drawings required by jurisdictional authorities in accordance with their requirements.
- 2.4 Shop Drawings for openings, sleeving and conduit:
- .1 Prior to preparation of Shop Drawings, coordinate sizes of all structural openings and sleeves with respective fabricators for mechanical ducting. Adjustments to the opening sizes indicated on the Contract Drawings shall not be made without the approval of the Consultant.
 - .2 Prior to detailing structural reinforcement on Shop Drawings, arrange for the Structural Engineer to review formed holes, recesses and sleeving. Completely dimension openings, recesses and sleeves and relate to appropriate grid line(s) and elevation(s).
 - .3 Prior to forming of the structure, arrange for the preparation of Shop Drawings for review by the Consultant showing embedded conduit to be cast within the structure. Shop Drawings shall include conduit from all sources.
- 2.5 Shop Drawings shall indicate the following minimum criteria and any additional criteria indicated in the individual specification sections requiring Shop Drawings:
- .1 Clear and obvious notes of any proposed changes from the Contract Documents.
 - .2 Indicate Products, methods of construction, and attachment or anchorage, fabrication and erection diagrams, dimensions, connections, explanatory notes and other information necessary for completion of the Work.
 - .3 Provisions for allowable construction tolerances and deflections provided for live loading.

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- .4 Where Products attach or connect to other Products, indicate construction arrangements and details of the parts and their connections, and interconnections with other work and that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross-references to Drawings, Specifications and other already reviewed Shop Drawings.
 - .5 Location and type of anchors and exposed fastenings.
 - .6 Materials, physical dimensions including thicknesses, and finishes.
 - .7 Descriptive names of equipment.
 - .8 Mechanical and electrical characteristics when applicable.
 - .9 Information to verify that superimposed loads will not affect function, appearance, and safety of the work detailed as well as of interconnection work.
 - .10 Assumed design loadings, and dimensions and material specifications for load-bearing members.
- 2.6 Include in Shop Drawing submissions detailed information, templates, and installation instructions required for incorporation and connection of the Work.
 - 2.7 Ensure shop drawings are of one uniform size and based on field measurements.
 - 2.8 Before submitting to the Consultant, review all Shop Drawings to verify that the Products illustrated therein conform to the Contract Documents. By this review, the Contractor agrees that it has determined and verified all field dimensions, field construction criteria, materials, catalogue numbers and similar data and that it has checked and coordinated each Shop Drawing with the requirements of the Work and of the Contract Documents. Contractor's review of each Shop Drawing shall be indicated by stamp, date and signature of a qualified person possessing the appropriate authorization from the Contractor.
 - 2.9 Be responsible for dimensions, confirmed at the 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.
 - 2.10 Submit Shop Drawings for the Consultant's review with reasonable promptness and in orderly sequence so as to cause no delay in the Work nor in the work of Other Contractors. At the time of submission, notify the Consultant in writing of any deviations in the Shop Drawings from the requirements of the Contract Documents. The Contractor will be held responsible for changes made from the Contract Documents which are not indicated or otherwise communicated in writing with the submission.
 - 2.11 Drawings submitted by the Contractor as required herein are the property of the Owner who may use and duplicate such drawings where required in association with the Work.

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- 2.12 Submit Shop Drawings signed and sealed by a licensed Professional Engineer registered in the place of the Work where indicated in individual Sections.
- 2.13 Shop Drawings shall have distinct, uniform letters, numerals and line thicknesses that will ensure the production of clear legible prints at original as well as reduced size.
- 2.14 Shop Drawing submissions shall be made as follows:
- .1 In all instances where practical, submit Shop Drawings in electronic Portable Document Format (PDF) format delivered via the web-based Rform Contract Administration software to the Consultant in accordance with Consultant's directions.
- 2.15 Shop Drawings shall include the following minimum information:
- .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, date, and signature of Contractor's authorized representative responsible for Shop Drawing review, indicating that each Shop Drawing has been reviewed for compliance with Contract Documents and, where applicable, that field measurements have been verified.
- .5 Details of appropriate portions of the 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 Relationships to other parts of the Work.
- .6 On submissions subsequent to the first, the following additional identification:
- .1 The revised submission number.
- .2 Identification of the item(s) revised.
- 2.16 Dimensions and designations of elements shall be shown in the same system of measurement used on the applicable Contract Drawings.
- 2.17 Consultant reserves the right to refuse acceptance of drawing submissions not meeting the above requirements.

- 2.18 Consultant's review will be for conformity to the design concept and for general arrangement only and such review shall not relieve the Contractor of responsibility for errors or omissions in the Shop Drawings or of responsibility for meeting all requirements of the Contract Documents unless a deviation on the Shop Drawings has been approved in writing by the Consultant. Review does not mean that Consultant approves detail inherent in Shop Drawings, responsibility which shall remain with Contractor submitting same.
- 2.19 Only drawings noted for revision and resubmission need be resubmitted.
- 2.20 File one copy of each submitted Shop Drawing at the Site.
- 2.21 Product Data:
- .1 Before delivery of Products to the Site, submit of Product data as specified in each section or as requested by the Consultant.
 - .2 Product data submittals shall include material safety data sheets (MSDS) for all controlled Products.
 - .3 Submit manufacturer's Product data for systems, materials, and methods of installation proposed for use. Such literature shall identify systems, each component, and shall certify compliance of each component with applicable/specified standards.
- 3 **SHORING DESIGN DRAWINGS**
- 3.1 It is the contractor's responsibility to provide in advance of any demolition work requiring shoring, detailed Shoring design drawings bearing the seal of a Professional engineer registered in the Province of Ontario and also a Method Statement describing the work sequence and timing/duration of each stage.
- 3.1 Sentence above is particularly applicable to the work involving:
- .1 Support of any floor or wall structures in existing wings during demolition.
 - .2 Partial or entire loadbearing wall removals in various locations.
- 3.1 Submit to the Consultants as shop drawings in advance of the work. Discuss and update as required and at all regular job site meetings.
- 3.1 Recognize that shoring design may be required for both dead and live load conditions adjacent to occupied areas. Shoring shall be designed to avoid interruptions in the use of the occupied areas.
- 3.1 Costs for shoring and design as required above shall be included in the Tender price.

4 SHOP DRAWINGS BEARING THE SEAL OF A PROFESSIONAL ENGINEERS

4.1 In addition to any the similar requirements for shop drawings of any mechanical or electrical systems, Shop Drawings for all structural components or components required to perform in conjunction with other structural or building envelope components, cladding and the like shall bear the seal of a professional engineer licensed in the Province of Ontario.

4.1 In addition, all components to be attached to or suspended from the walls and ceiling areas shall also bear the seal of a professional engineer licensed in the Province of Ontario. This shall include but not be limited to the following as applicable to the scope of the project:

.1 Canopy and cladding panel.

.2 Window.

5 SAMPLES

5.1 Before delivery of Products to the Site, submit duplicate samples of Products as specified or as requested by the Consultant. Label samples as to origin and intended use in the Work and in accordance with the requirements of the Specification Sections. Samples must represent physical examples to illustrate materials, equipment or work quality and to establish standards by which completed Work is judged.

5.2 Deliver samples prepaid to Consultant's business address unless another mutually agreed to location is established.

5.3 Identify samples with Project name, Contract number, date, Contractor's name, number and description.

5.4 Where a required colour, pattern or texture has not been specified, submit full range of available Products meeting other specified requirements.

5.5 Ensure samples are of sufficient size and quantity, if not already specified, to illustrate:

.1 The quality and functional characteristics of Products, including integrally related parts and attachment devices.

.2 The full range of colours available.

5.6 Notify the Consultant in writing, at time of submission, of any deviations in samples from requirements of the Contract Documents, and state the reasons for such deviations.

5.7 Consultant selection from samples is not intended to change the Contract Price or Contract Time. If a selection would affect the Contract Price or Contract Time, notify Consultant in writing prior to proceeding with the Work.

- 5.8 If samples are not acceptable, both samples will be returned. If samples are acceptable, one sample will be so indicated and returned. Be responsible for the cost of samples that are not accepted and for resubmission of samples.
- 5.9 Resubmit samples as required by Consultant to comply with Contract Documents.
- 5.10 Reviewed and acceptable samples will establish the standard against which installed Work will be reviewed.
- 5.11 Each Product incorporated in the Work shall be precisely the same in all details as the acceptable sample.
- 5.12 Should there be any change to the accepted sample, submit in writing for approval of the revised characteristics and resubmit samples of the Product for approval if requested.
- 5.13 When samples are very large, require assembly, or require evaluation at the Site, they may only be delivered to the Site with approval and as directed.

6 CERTIFICATES

- 6.1 Submit certificates that are required by authorities having jurisdiction or that are requested in the applicable specification sections.
- 6.2 Clearly show on each certification the name and location of the Work, name and address of Contractor, quantity and date of shipment and delivery and name of certifying company.
- 6.3 Certificates shall verify that Products and/or methods meet the specified requirements and shall include test reports of testing laboratories approved to validate certificates.
- 6.4 Submit certificates in duplicate and signed by an authorized representative of the certifying company.

7 CERTIFICATION OF TRADESMEN

- 7.1 Provide certificates, at the request of the Consultant, to establish qualifications of personnel employed on the Work where such certification is required by authorities having jurisdiction, by the Consultant or by the Contract Documents.

8 EXTENDED WARRANTIES

- 8.1 Submit extended warranties as requested in sections of the Specifications showing title and address of Contract, warranty commencement date and duration of warranty.

8.2 Extended warranties shall commence on termination of the standard warranty specified in the conditions of the contract and shall be an extension of these provisions. Clearly indicate what is being warranted and what remedial action is to be taken under the warranty. Ensure warranty bears the signature and seal of the Contractor.

8.3 Submit each extended warranty on a form that is acceptable to the Owner and Consultant.

9 **INSPECTION AND TEST REPORTS**

9.1 Submit inspection and test reports as specified in the Sections of the specifications for "Source Quality Control" and "Field Quality Control" within 5 Working days of inspection or testing. If immediate action is required by the Contractor or Consultant inform the Consultant immediately and submit inspection and testing report within one working day.

9.2 Submit 3 copies of reports submitted with certificates of compliance indicating but not limited to the following:

.1 Project name and number.

.2 Date of inspection or test and date report is issued.

.3 Name and address of inspection and testing company.

.4 Name and signature of inspector or tester.

.5 Identification of Product and Specification Section covering inspected or tested work.

.6 Specified requirements for which the inspection or testing was performed and results of inspections or tests.

.7 Location of inspection or from which tested material was derived.

.8 Overview of inspection and testing methods and procedures.

.9 Remarks and observations on compliance with Contract Documents.

9.3 Inspection and test reports shall be signed by a responsible officer of the inspection and testing company.

10 **RECORD DOCUMENTS**

10.1 Submit record documents in accordance with Section 01 78 00

END OF SECTION

1 General

1.1 DESCRIPTION

- .1 This Section outlines the mandatory minimum Health and Safety protocols for all renovation, addition and new school construction Projects where all or a portion of the existing school building remains occupied and in use.
- .2 These Health and Safety protocols are mandatory minimum requirements, procedures and standards that the Peel District School Board insists are fully complied with by all parties involved with Peel District School Board Projects.

1.2 RELATED SECTIONS

- .1 These specifications apply to all Divisions of this Project specification. It is the responsibility of the Contractor to apply these provisions wherever practical within specification limits to all products and services used on this Project.
- .2 The requirements of this Section supersede those of all other specification Sections and Drawings. Where conflicts exist in procedures, methods or materials, they shall immediately be brought to the attention of the Consultant and Board Project Manager. Where clarification is not immediately available, the Contractor shall assume the specifications contained in this Section are a minimum standard and the more stringent specification shall apply.
- .3 The Contractor must receive approval from Board Project Manager for any deviations from this specification Section.
- .4 The General Contractor shall recognize that it is he who is the Constructor of the Project. The General Contractor shall also recognize that he is solely responsible for site safety at the Place of the Work and compliance with the requirements of this Section does not limit or remove his total responsibility for site safety as Constructor of the Project.

1.3 REFERENCES

- .1 Applicable related regulations, standards and laws related to safety include but are not limited to:
 - .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations.
 - .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
 - .3 Province of Ontario
 - .1 Occupational Health and Safety Act and Regulations for Construction Projects, R.S.O. [1990 June 2002].

1.4 **COMPLIANCE SPECIFICATION**

- .1 Notwithstanding the requirements of this Section, the Contractor must comply with all applicable health, safety and environmental regulations and statutes.

1.5 **BEYOND COMPLIANCE SPECIFICATION**

- .1 These specifications apply in addition to all applicable health, safety and environmental compliance regulations. They are incorporated here to reflect the Board's intention to develop a specification which provides the safest practical procedures and policies for construction project sites that are occupied and in use by staff, students and visitors during the execution of the Construction Contract.
- .2 Beyond compliance specifications recognize that performance well beyond the minimum regulatory standard is often desirable, possible and affordable, often with no cost or low cost options. It also recognizes that application methods or protocols may be as important as the material specified. Therefore, these specifications cover both material and methods.
- .3 These provisions apply to both indoor and outdoor applications equally.

2 **Products**

2.1 NOT USED

3 **Execution and Compliance Requirements**

3.1 **APPLICATION OF COMPLIANCE REQUIREMENTS**

- .1 The articles set out herein are to be applied together as a set of related policies and procedures to achieve a comprehensive Health and Safety working protocol.
- .2 The Contractor shall execute all of the procedures and meet all of the requirements set out herein and apply these protocols from the outset of the Construction Phase.
- .3 These procedures or requirements are to be maintained for the duration of the Construction Phase. The Contractor shall not discontinue any of the individual procedures or requirements without the prior approval of the Board Project Manager.

3.2 **SITE SUPERVISOR (SITE SUPERINTENDENT)**

- .1 A full-time Site Supervisor (Site Superintendent) is required for each site at any site, regardless of the number of active workers on site.
- .2 Site Superintendent shall have as a minimum:
 - .1 Recent, previous experience with renovation or addition projects involving occupied buildings including (but not limited to) school construction, sites with students, tenants, employees, retail customers, pedestrian and vehicular traffic.

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- .2 Successful completion of a multi-session Supervisor's training course conducted by a recognized Construction Association in Ontario.
- .3 Site Superintendent must carry a cell phone at all times during construction with the ability to be reached directly during all work hours and the ability to have voicemail recorded during all non-work hours including weekends and holidays.
- .4 Site Superintendent must have means of live phone or walkie-talkie communication with the site Flagman during all work hours.
- .5 Site Superintendent shall not be changed throughout project unless confirmed and approved by the Board Project Manager.

3.3 ONTARIO OCCUPATIONAL HEALTH & SAFETY ACT & REGULATIONS FOR CONSTRUCTION PROJECTS

- .1 General Contractor to comply with the Ontario Occupational Health & Safety Act and Regulations for Construction Projects, latest edition– including all amendments.
- .2 Beyond compliance in item .1 above, regardless of the number of labourers active on the Project, the General Contractor shall form a contractors' Health & Safety Committee at the outset of construction. This Committee shall then follow the standard requirements for such a Committee as set out in the Occupational Health & Safety Act and Regulations for Construction Projects.

3.4 ON-SITE COMMUNICATIONS

- .1 At the outset of the project the General Contractor shall provide to the Board Project Manager all relevant contact information for the Site Superintendent, GC Project Manager and key sub-contractors including names and cell phone numbers.
- .2 The General Contractor shall provide at least one "emergency contact" telephone number at which the Contractor's representative can be reached directly during all work hours and have the ability to have voicemail recorded during all non-work hours including weekends and holidays. As outlined below, this may be designated to the Site Superintendent's cell phone number.
- .3 Regardless of compliance method for the emergency contact telephone number stated above, the Site Superintendent must carry a cell phone at all times during construction with the ability to be reached directly during all work hours and the ability to have voicemail recorded during all non-work hours including weekends and holidays.
- .4 Site Superintendent must have means of live phone or walkie-talkie communication with the site Flagman during all work hours.

- .5 The Contractor is to ensure that the Board Project Manager is immediately apprised of any safety issues as each arises and the related request and/or resolution. The Board Project Manager is responsible for any decisions that have an effect on the contract execution.
- .6 Notwithstanding the reporting to the Project Manager noted above the Site Superintendent shall liaise with school principal or designate on all safety related matters as required on a daily basis.
- .7 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.

3.5 FULL-TIME ON-SITE FLAGMEN

- .1 A full-time, designated Flagman is required at all vehicular construction entrances.
- .2 In the event there is more than one entrance to the hoarded/fenced construction area, there must be a separate Flagman for each entrance.
- .3 Flagman may not be same person as Site Superintendent or other construction worker.
- .4 Flagman shall not be changed throughout the Project unless confirmed and approved by the Board Project Manager.
- .5 Flagman must have means of phone communication with Site Superintendent (phone or walkie-talkie).
- .6 The Flagman shall not be designated for any other duties than to act as a Flagman for safety purposes as described herein.
- .7 The Flagman shall meet and escort any construction traffic from the site entrance into and out of the hoarded/fenced construction area (including through open site areas until entrances to hoarding).
- .8 The Flagman shall only open hoarded areas when construction traffic moves through and immediately re-close gates.
- .9 The Flagman shall control construction parking at the school site (including vehicles parking or traveling in unauthorized areas).
- .10 The location of the Flagman shall be set to ensure the safe guarding of staff, student, and pedestrian traffic.
- .11 If not designated on the Contract Documents, the location of the Flagman shall be confirmed with the Board Project Manager and Consultant at the outset of the project and before the placement of hoarding and fencing.

- .12 In order for the Flagman to carry out the required full-time duties, the cost of a temporary shelter shall be included in the Tender Price.
- .13 The Flagman shall be properly attired to carry out his duties, including the use of safety equipment (e.g. wear reflective vest, have appropriate traffic hand-held "Stop" sign and have a visible identification tag).

3.6 SITE SAFETY SIGNAGE

- .1 Standardized Safety Signage is required at all construction entrances. Refer to detail drawings for types and requirements.
- .2 If not designated on 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 Safety Signage is to be posted at all street entrances to school site and at each entrance to hoarded/fenced construction area.
- .4 Total surface area of signage is to avoid exceeding municipal standards that would require a separate signage permit.
- .5 Access signage text shall include cell phone contact number for Site Superintendent.
- .6 Signage posted at gates shall state restrictions on hours of entry and egress as described in the Contract Documents and under no circumstances shall construction traffic be allowed within 30 minutes prior to school start, during recess, lunch break, and 30 minutes after dismissal periods.

3.7 ACCESS/EGRESS CONTROLS

- .1 At the outset of the Contract, the General Contractor shall advise all suppliers and subcontractors of the protocols listed herein and of the requirement to contact the Site Superintendent by Cell phone prior to entering the site.
- .2 The drivers of all construction vehicles entering the site, including delivery vehicle drivers, are to contact site Superintendent by cell phone prior to entering site; the Site Superintendent shall, in turn, give notice to the Flagman to be aware of the traffic and authorize the Flagman to allow entry of that vehicle.
- .3 Vehicular Gates are only for entry and exit of for construction purposes such as construction personnel, Authorities performing inspections, Board representative, delivery personnel, and disposal pickup and ONLY under escort by the Flagman. As such vehicular gates must remain closed and locked at all times and only opened for access/egress under escort by the Flagman, then closed and locked again.
- .4 Gates are to be lockable swing gates for vehicles and man gates at all access points to the hoarded/fenced construction area.

3.8 CONTRACTOR PARKING

- .1 Contractor parking shall be restricted to hoarded areas or designated parking areas only where pre-approved by Board Project Manager and Principal.
- .2 Contractor parking is restricted from all off-site street areas that interfere with site specific parent drop-off and parking areas.

3.9 REQUIRED PRECONSTRUCTION MEETINGS

- .1 Meeting 1: Contractor shall receive approval from the Architect and the Board Project Manager for parking, vehicular movement, access/egress strategies at a Preconstruction meeting taking place in advance of mobilizing on site.
- .2 Meeting 2: Once hoarding and fencing is erected BEFORE site construction is fully active and vehicles or equipment is mobilized on site, an initial site meeting shall take place at which time the layout of trailers and staging, deliveries, storage of materials, parking areas and vehicular movement to be reviewed and approved by the Board Project Manager.
- .3 See article 3.12- 'Site Meetings' following.

3.10 CONSTRUCTION FENCING AND HOARDING

- .1 Construction hoarding requirements shall be a site based decision to be determined by the Architect and the Board Project Manager at the design stage and shown on Contract Documents.
- .2 No fencing or hoarding shall be less than a continuous 1800 mm high.
- .3 In portions of the site where chain link is approved, it shall be continuous 1800 mm high chain link fencing, wire-tied to staked iron 'tees' at 1800 mm on centre - OR - leased, modular 'quick fencing' if staked down and wire tied together.
- .4 All fenced and hoarded areas to be gated with lockable vehicular and man gates minimum
- .5 Construction to be steel rail and chain link construction.
- .6 Plastic snow fencing is NOT permitted.
- .7 All hoarding and fencing shall be maintained in a stable condition, for duration of construction period as part of the base contract price and to include Superintendent's inspection at the beginning and end of each work day.
- .8 All Fire Routes to be outside all fenced and hoarded areas and maintained clear at all times.

- .9 'Covered way' protection shall be provided when accesses or pathways are in proximity to construction, in accordance with Ministry of Labour Occupational Health & Safety Act Regulations.

3.11 PEEL DISTRICT SCHOOL BOARD HEALTH, WELLNESS & SAFETY DEPARTMENT REPRESENTATIVE

- .1 A representative of the Board's Health, Wellness & Safety Dept. ('Environment, Health and Safety Officer') may visit site at 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.

3.12 SITE MEETINGS

- .1 Initial site meeting to take place after erecting fencing and hoarding but prior to the mobilization of any vehicles, equipment or start of Work.
- .2 Contractor shall ensure that the Board Project Manager, School Principal and a representative of the Board's Health, Wellness & Safety Department and the School Principal attend the initial site meeting.
- .3 The initial meeting shall review and approve a standardized agenda for all site meetings and a thorough review of the Site Safety Protocol.
- .4 The standardized agenda shall include a Checklist and Report of Health and Safety items at the beginning of the agenda. This Checklist shall be included and each item reviewed at all site meetings for the duration of the project.
- .5 The Checklist of Site Safety items shall include but not be limited to:
 - .1 Contractor's report of site safety record and report of recent site activities, precautions or actions.
 - .2 Review any visits to the site and actions required by Ministry of Labour or Board Health, Wellness & Safety representatives or other Authorities Having Jurisdiction.
 - .3 Contractor's Health & Safety policy manual posted in site trailer.
 - .4 Copy of Ministry of Labour Occupational Health & Safety Act and Regulations for Construction Projects in site trailer.
 - .5 Name of General Contractor H&S representative.
 - .6 Continuing compliance with Safety Signage.
 - .7 Hoarding & fencing layout and condition.
 - .8 Access and egress measures and any breaches of requirements.

- .9 Confirmation of communications link between Site Superintendent & Flagman.
 - .10 Work that may produce any noxious odours and the containment measures, (i.e.: schedule, type, approvals required therefore).
 - .11 Copies of Material Safety Data sheets in site trailer.
 - .12 Complete meeting minutes including details of Safety Checklist shall be copied to Architect, Board Project Manager and Principal.
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- .6 Contractor to produce record of written Memorandum to all subtrades and suppliers detailing but not limited to: hours of delivery; site access procedures and restrictions; use of existing facilities.
 - .7 Contractor to prepare detailed and accurate written record of all meetings to be kept and issued to all parties.

3.13 CONTRACTOR'S HEALTH AND SAFETY COMMITTEE MEETINGS

- .1 As required in item 3.1.2, the Contractor shall form a Health and Safety Committee, hold meetings and record minutes of meetings for the duration of the Contract.
- .2 Contractor to maintain a copy of Health & Safety Committee minutes on site for review by Ministry of Labour or Board representative(s).

END OF SECTION

1 CONSTRUCTOR

- 1.1 For the purposes of the Contract, the term "Constructor", as defined in the Occupational Health and Safety Act, shall mean the Contractor who shall be responsible for ensuring that the provisions of the statutes, regulations and by-laws pertaining to the safe performance of the Work are to be observed. The "Constructor" shall submit the Notice of Project.
- 1.2 In the event of conflict between any of the provisions of Statues, Regulations and By-laws, and other requirements of authorities, the most stringent provision applies.
- 1.3 The Contractor's representative shall be responsible for ensuring that the provisions of statutes, regulations and by-laws pertaining to safe performance of the Work and the work of Other Contractors and Owner's own forces working on the Site are observed and that the methods of performing the Work do not endanger the personnel employed thereon nor the general public, and are in accordance with the latest edition of the Occupational Health and Safety Act. Include on the Joint Health and Safety Committee representatives of Other Contractors working on Site.
- 1.4 Prior to the Contractor's representative being absent from the Site for an extended period during execution of the Work, the Contractor's representative will name, in writing to the Consultant, another person who is competent to assume these responsibilities. The Contractor shall advise the Consultant of change of the individual identified as the Contractor's representative.
- 1.5 At the discretion of the Consultant, the "Constructor" designation may be transferred to/from a Contractor at any time at no additional cost to the Owner.

2 PROJECT RESPONSIBILITIES

- 2.1 The Contractor's representative shall ensure that:
- 2.2 All measures and procedures prescribed by the following Acts and Regulations are carried out on Site:
- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
 - .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .3 Material Safety Data Sheets (MSDS).
 - .4 Province of Ontario: Occupational Health and Safety Act and Regulations for Construction Projects, R.S.O. [1990, June 2002].
 - .5 The Occupational Health and Safety Act;
 - .6 The Regulations for Construction Projects;

- .7 WHMIS Regulations;
- .8 The Environmental Protection Act and regulations,
- .9 All other legislation, regulations and standards as applicable.

2.3 Every employer and every worker performing Work on the Site must comply with the requirements referred to above.

2.4 Ensure that the health and safety of workers, employees of the Owner and the general public are protected in relation to the Work performed on the Site.

3 **WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM (WHMIS)**

3.1 Be familiar with and comply with WHMIS regulations.

3.2 Properly label controlled products. Provide proper warning labels and training at the Site.

3.3 Maintain on site for duration of Contract a hazardous materials log containing all required SDS. Log shall be open for inspection by Owner, Consultant and all personnel on Site.

3.4 Provide copies of safety data sheets (SDS) for any controlled products prior to delivery to the Site.

3.5 Be responsible for all applicable requirements of the regulations.

3.6 Before commencing any Work on Site, attend the pre-construction meeting and provide the Consultant with a proposal as to how hazardous materials will be stored and dispensed on Site. In addition, specifically outline the measures which will be undertaken to prevent damage or injury in the event of an accidental spill.

3.7 Provide "Handling Procedure for Hazardous Materials".

4 **JOINT HEALTH AND SAFETY COMMITTEE**

4.1 The Contractor shall be responsible for the establishment and operation of the Joint Health and Safety Committee as required by the Occupational Health and Safety Act.

5 **DELIVERABLES**

5.1 The Contractor shall deliver to the Consultant:

- .1 The Contractor's Occupational Health and Safety Policy.

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- .2 The Contractor's safety program to implement the Occupational Health and Safety Policy for the Contract, which will effectively prevent and control accidents for the Contract.
 - .3 A copy of all communications with, and including all orders by, the Ministry of Labour or other occupational health and safety enforcement authority.
 - .4 A copy of all accident/injury investigation reports, not just the WSIB Form 7. Each report must contain a statement of actions that will be taken to prevent a recurrence.
 - .5 A copy of all inspection reports made by the Contractor in compliance with the employer's responsibility under the Occupational Health and Safety Act.
 - .6 A copy of all safety information pertaining to the Contract made and furnished by the Contractor's own "Safety Personnel" or outside consultants/advisers engaged for the purpose of inspecting the workplace for occupational health and safety.
 - .7 A verification that all workers in the employ of the Contractor on Site, have had a WHMIS training or refresher course within the last twelve months.
 - .8 A verification that all workers in the employ of the Contractor have had "Explosive Activated Tool Training" on the type of tools being used.
 - .9 A verification that the instruction manuals are on Site for all tools and equipment being used.
 - .10 A copy of the most recent workers compensation experience rating account, i.e. CAD-7, NEER, and/or an insurance carrier's experience rating account.
 - .11 Statistical information for the purpose of determining injury frequency and severity rates (hours worked, first-aid injuries, medical aid injuries, lost time injuries, restricted workday injuries, near-miss accident/incident and significant occurrence data), in a timely manner as required by the Consultant.
 - .12 The immediate reporting to the Consultant of all instances that are defined in the Occupational Health and Safety Act as "Notices of Injuries" and "Occurrences" and any occasion that a worker exercises their "Right to Refuse Unsafe Work".
- 5.2 The Consultant reserves the right to require additional or amended deliverables pertaining to safety during the duration of the Work at no additional cost to the Owner.
 - 5.3 Items specified above shall be delivered to the Consultant prior to the Contractor commencing Work on the Site.
- 6 **DUE DILIGENCE**

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- 6.1 The Contractor acknowledges that it has read and understands the measures and procedures relating to occupational health and safety as prescribed above. The Contractor acknowledges and understands its duties as therein set out and hereby expressly undertakes and agrees to comply with all such requirements and standards in their entirety and at the Contractor's expense.
- 6.2 The Contractor further agrees to fully cooperate with all health and safety requirements, rules, regulations, standards and criteria set out in the Contract Documents, which agreement is in furtherance of the Contractor's duties and responsibilities under occupational health and safety legislation.
- 6.3 The Contractor agrees that if, in the opinion of the Consultant or Owner, the health and safety of a person or persons is endangered or the effective operation of the system put in place to ensure the health and safety of workers on the Site is not being implemented, the Consultant or Owner may take such action as it deems necessary and appropriate in the circumstances, including, without limitation, the following:
- .1 Require the Contractor to remedy the condition forthwith at its own expense;
 - .2 Require that the Site be shut down in whole or in part until such time as the condition has been remedied;
 - .3 Remedy the problem and the Owner shall back-charge the Contractor for the cost of such remedial work, together with an appropriate overhead factor as determined by the Owner in its sole discretion; and
 - .4 Terminate the Contract without further liability in the event the Contractor fails to comply with these provisions.
- 6.4 If a lien is registered, in respect to any monies held back, back-charged or assessed in accordance with these paragraphs, the Contractor shall consent to an order vacating such registration and shall indemnify the Owner for any and all loss, whereby direct or consequential which the Owner may sustain as a consequence of such registration.
- 7 **SITE SAFETY PERSONNEL**
- 7.1 In the event the Consultant deems it necessary, because of the Work, the Contractor shall assign a "Competent Safety Person" to assist the Contractor's representative in the discharging of safety responsibility, at no additional cost to the Owner.

8 BEYOND COMPLIANCE SPECIFICATION

- 8.1 These specifications apply in addition to all applicable health, safety and environmental compliance regulations. They are incorporated here to reflect the Owner's intention to develop a specification which maximizes environmentally "friendly" materials and methods wherever possible within current technical and budget limitations.
- 8.2 Beyond compliance specifications recognize that performance well beyond the minimum regulatory standard is often desirable, possible and affordable, often with no cost or low cost options. It also recognizes that application methods or protocols may be as important as the material specified. Therefore these specifications cover both material and methods.
- 8.3 The primary goal of beyond compliance specification is to reduce the use of products or methods which have negative health and environmental impacts both during and after construction. These considerations may include full life cycle impacts, associated with raw materials, manufacturing, transport, deconstruction and their eventual fate.
- 8.4 These specifications will specifically address primary categories of readily identifiable products, ingredients and methods.
- 8.5 These provisions apply to both indoor and outdoor applications equally.

9 HAZARDOUS MATERIALS

- 9.1 The Ontario Health and Safety Act requires the Board to provide a list of Designated Substances to all prospective contractors and they in turn must supply the list to their sub-trades who are likely to handle or disturb the material. The Successful Bidder will arrange for the removal of readily identifiable hazardous materials that would impact on Construction as indicated in the report prepared by PINCHIN and WSP in particular, Asbestos-containing building materials (designated substance) and PCB-containing electrical equipment (non-designated substance) during the work of this project.
- 9.2 Other materials that may be present in the area of construction may include any or all of the following and would be expected in normal construction:
 - .1 Lead found in paint films, in solder or pipe for drinking water, in solder for other pipe or electrical components;
 - .2 Mercury found in elemental form in an ampoule in thermostats or in electrical soft switches, as a gas in fluorescent light tubes or in paint films and caulk; and
 - .3 Silica as primarily Quarts bound in building materials including but not limited to concrete, brick and block.
 - .4 Also note avoidance of other products noted below.

- .5 In accordance with the Ontario Health and Safety Act and regulations enacted under the Act the Contractor and sub trades shall take appropriate precautions for the building and their work force.

10 EXCEPTIONS

- 10.1 These specifications recognize that not all substitutes are equal and therefore exceptions can be made based on substantive evidence of necessary and superior performance. Special considerations may be given to restricted substances when secondary provisions are made such as sealed in place (contained) applications. All such exceptions must be approved in writing by the Consultant.

11 PRODUCTS OR SUBSTANCES TO BE AVOIDED OR LIMITED IN USE

- 11.1 No product containing the following substances may be used on this project when an equivalent product without or with a lower concentration of this substance is suitable and available. All products containing substances which are known to cause health effects including but not limited to cancer, mutagenic, neurological, or behavioral effects should be avoided if suitable substitutes not containing or containing lower concentrations are available. This provision shall be limited to information contained on Material Safety Data Sheets, therefore MSDS sheets must be reviewed for all products for which such sheets are required. Applications for exceptions must be accompanied by related MSDS and product application and performance sheets, clearly showing a need for the exception.

12 VOLATILE ORGANIC COMPOUNDS

- 12.1 No product containing volatile organic compounds (in over simplified terms volatile petro chemical or similar plant derived solvents) may be used on this project when a suitable non VOC or failing that a low VOC substitute is available. Manufacturers may refer to the U.S. EPA definition of VOC's for guidance or alternatively use the low molecular weight organic compound descriptor.

- .1 Example: Paints, Coatings, Primer, Adhesives, Chalks, Firestops, etc.

- 12.2 Waterborne equivalents are available for most of the solvent borne products used in construction and in most cases would be the preferred alternative. Waterborne products may in some instances have high VOC contents; therefore the fact that a product is waterborne does not automatically make it acceptable.

13 CHLORINATED SUBSTANCES

- 13.1 Poly Vinyl Chloride (vinyl) and other chlorinated products should be avoided if suitable substitutes are available.

14 **PLASTICIZERS**

14.1 Plasticizers which off gas (low molecular weight) should be avoided.

15 **MAN MADE MINERAL FIBRES**

15.1 Products containing mineral fibres which can be emitted or abraded should be avoided.

.1 Examples: duct liner, mineral fibre ceiling tiles, etc.

16 **RADIATION**

16.1 Products or methods which result in the lowest emission of Electro Magnetic Fields are preferred.

17 **BIOCIDES**

17.1 Products containing biocides (pesticides, miticides, mildewicides, fungicides, rodenticides, etc.) are not to be used if suitable alternatives are available. Highly stable, low human toxicity biocides such as Portercept may be acceptable substitutes. Biocide formulas which break down, emit powders or off-gas should be avoided.

18 **HEAVY METALS**

18.1 Heavy metals such as lead, cadmium, mercury etc. should be avoided.

19 **ALUMINUM**

19.1 Raw aluminum should be avoided, anodized or factory painted aluminum is acceptable. This is particularly applicable to surfaces which people can touch.

20 **OZONE DEPLETING SUBSTANCES**

20.1 Products which contain or which use Ozone Depleting Substances such as Bromide, Chlorofluorocarbons (CFC) or Hydrofluorocarbons (HFC) etc. should be avoided if suitable substitutes are available.

21 **GREENHOUSE GASES**

21.1 Products which contain, use or generate Greenhouse gasses such as CO₂ should be avoided if suitable substitutes are available.

22 BITUMINOUS (TAR) PRODUCTS

- 22.1 Products containing tar compounds should not be used if suitable substitutes are available.

23 CHEMICAL COMPOUNDS

- 23.1 Products containing the following chemical compounds should not be used if suitable substitutes are available: Neoprene, Latex, Butyl, ABS, and Formaldehyde.

24 ADHESIVES

- 24.1 Adhesives containing solvents or other non preferred ingredients should be avoided if suitable substitutes are available, including systems designs which do not need adhesives or can use mechanical etc. fastening alternatives

25 COMPOSITE PRODUCTS

- 25.1 Some composite products contain adhesives such as formaldehyde which are not preferred, and some composites such as Fibre Reinforced Plastics are not practical for recycling. These products should be avoided if suitable substitutes are available.

26 ASBESTOS

- 26.1 Should the Contractor encounter limited areas of asbestos, the Contractor may be requested to engage an independent abatement company and testing and Inspection company to inspect the removal and make tests in the areas affected. If the contractor is requested to perform these duties, such costs will be reviewed in advance as possible additional work to the contract.
- 26.2 Significant findings of unanticipated asbestos shall be considered and reviewed by the Owner and the Consultant. Costs for such removal, testing and Inspection will be paid by Cash Allowance.
- 26.3 Any abatement or removal of unanticipated asbestos shall be considered at the sole discretion and direction of the Owner, in consultation with the Consultant.
- 26.4 For any areas of unforeseen asbestos, Comply with the requirements of Regulations respecting Asbestos on Construction Projects and in Buildings and Repair Operations made under the Occupational Health and Safety Act, as amended.
- 26.5 Comply with the requirements of the Peel Board of Education's Section 2 Procedures General, Subsection 2.2. | Asbestos Management Program.

27 **POLYCHLORINATED BIPHENYL (PCB)**

27.1 Conform to the Environmental Protection Act and Regulations, Ontario Regulation 11/82 as amended.

28 **LEAD**

28.1 Any operation involving lead based paints may potentially produce significant exposures to lead if adequate controls are not provided. Exposure varies with the type of operation being employed.

28.2 The presence of lead in building finishes left intact or found peeling in a few locations produces little exposure for workers to lead through contact, inhalation or ingestion.

28.3 Operations involving the hand sanding and scrapping of lead based paints can elevate exposure through inhalation. The use of a negative pressure respirator equipped with high efficiency particulate air (HEPA) filters is recommended to reduce exposure.

28.4 Operations involving the machine sanding or abrasive cutting of paint and other surface coatings containing lead can elevate levels of much finer dust. The spray application of a lead bearing paint or coating produces a respirable fume. These operations increase the likelihood of exposure by inhalation. A negative pressure air purifying respirator equipped with HEPA filters is recommended for these operations.

28.5 Operations involving oxyacetylene torches or other heating operations produces the most significant exposure to lead in particular through inhalation and by contact of lead fumes solidifying on skin. A powered air purifying respirator equipped with HEPA filters and full body covering is recommended for these operations.

28.6 The maintenance of the water pipe may produce some exposure to lead fume during the sweating on of lead solders but for a short duration of time. Inhalation is the source of entry and exposure is not very significant.

28.7 Lead found in solder of other pipe systems and electronic components poses no threat to the work force by inhalation, ingestion or by contact with the exception of maintenance or renovation activities. The maintenance of the pipe or electrical component may produce some exposure to lead fume during the sweating on of lead solders but for a short duration of time. Inhalation is the source of entry and exposure is not very significant.

28.8 All items identified in this section may be disposed of as regular non hazardous waste unless concentrated. Metallic lead may be reclaimed through scrap metal dealers.

29 **MERCURY**

29.1 Fluorescent light tubes contain small quantities of mercury gas. These sealed units do not pose any harm in the workplace except in the case of breakage. There are no liquid or residue present after breakage and spill cleaning is not a concern. A recommended practice is to evacuate the work area when breakage occurs. The gas will diffuse in about five to ten minutes and cleanup of the tubes can be performed. Mercury can be taken into the body by inhalation only from this source.

29.2 The same precautions as those indicated for lead based paints would apply to mercury in paints.

29.3 Elemental mercury found in ampoules in electrical equipment may be disposed of as regular waste and should be turned over to the Board for disposal through commercial recyclers. The other forms (light tubes and painted surfaces that have not been concentrated) can be disposed of as regular waste.

30 **SILICA**

30.1 Silica is presumed to be present in cement, cement blocks, bricks and mortar of the building. Unless the silica in these materials is reduced to respirable size (5 urn or less) and the airborne concentration exceeds the time weighted average exposure of 0.2 milligrams per cubic metre in air, no adverse health effects are expected to occur. Building construction, renovation or demolition do not normally raise excessive exposure to silica with the exception of jack hammering, dry saw cutting or sand blasting. There is little likelihood for the work force to be exposed to excessive levels of respirable silica dust if the material is suppressed with water spray or flow. Respiratory protection is dependent on the type and airborne concentration of respirable silica present in the particular work environment.

31 **CLEANERS AND SOLVENTS**

31.1 Products, equipment, and methods which require the use of cleaners and solvents are not preferred if suitable substitutes are available. Examples of preferred products would include No Wax floors, or primer-less caulks and adhesives, or products not requiring caulks and adhesives.

END OF SECTION

1 GENERAL

- 1.1 Be responsible for inspection and testing as required by the Contract Documents, statutes, regulations, by-laws, standards or codes or any other jurisdictional authority. Give the Consultant timely notice of the readiness for inspection, date and time for such inspection for attendance by the Consultant.
- 1.2 Employment of inspection and testing agencies by Contractor or Owner does not relieve Contractor from responsibility to perform the Work in accordance with Contract Documents.
- 1.3 Allow and arrange for inspection and testing agencies to have access to the Work, including access to off site manufacturing and fabrication plants.
- 1.4 Verify by certification that specified products meet the requirements of reference standards specified in the applicable specification sections.
- 1.5 Conduct testing, balancing and adjusting of equipment and systems specified in applicable mechanical and electrical specifications sections by independent testing company.

2 INSPECTION AND TESTING BY OWNER

- 2.1 The Owner may inspect and test Products during manufacture, fabrication, shop testing, installation, construction and testing phases of the Contract. The Consultant will ascertain the quantity and quality of testing to be performed. Inspection and testing may be performed at the place of manufacture/fabrication, storage, or at the Site as designated by the Consultant. Where inspection and testing is done either during manufacture, fabrication, or at Site, ensure that proper facilities and assistance are provided.
- 2.2 Owner retained inspection and testing:
 - .1 The Consultant, on behalf of the Owner may appoint an independent inspection and testing company to carry out quality control reviews of parts of the Work for conformance to the Contract Documents.
 - .2 Such costs for inspection and testing will be paid by the Owner. However, any additional inspection and testing due to non-conformance to the Contract Documents shall be at the Contractor's expense.

3 INSPECTION AND TESTING BY CONTRACTOR

- 3.1 Retain and pay for inspection and testing required for Contractor's own quality control, by regulatory requirements, to ensure performance of the work or where identified in the Contract Documents.

- 3.2 Source and Field Quality Control specified in Other Sections:
- .1 This Section includes requirements for performance of inspection and testing specified under Source Quality Control and Field Quality Control in other Sections of the specifications.
 - .2 Contractor's own inspection and testing quality control shall not include responsibilities and procedures that relate solely to an inspection and testing company's functions that are retained directly by the Owner or paid for under a cash allowance. Such information is included in this Section for Contractor's information only.
- 3.3 Do not limit responsibility for ensuring that products and execution of the work meet Contract requirements, and inspection and testing required to this end, to specified inspection and testing.
- 4 **QUALIFICATIONS OF INSPECTION AND TESTING COMPANIES**
- 4.1 Inspection and testing companies to be certified by the Standards Council of Canada (SCC) or Canadian Council of Independent Laboratories (CCIL).
 - 4.2 Companies engaged for inspection and testing shall provide equipment, methods of recoding and evaluation, and knowledgeable personnel to conduct tests precisely as specified in reference standards.
 - 4.3 If requested, submit affidavits and copies of certificates of calibration made by an accredited calibrator to verify that testing equipment was calibrated and its accuracy ensured within the previous twelve months.
- 5 **RESPONSIBILITIES OF INSPECTION AND TESTING COMPANIES**
- 5.1 Determine from specifications and Drawings the extent of inspection and testing required for Work of the Contract. Subcontractors shall notify Consultant of any omissions or discrepancies in the work inspected and/or tested.
 - 5.2 Perform applicable inspection and testing described in the Specifications and as may be additionally directed.
 - 5.3 Provide competent inspection and testing personnel when notified by the Contractor that applicable work is proceeding. Inspection personnel shall cooperate with the Consultant and Contractor to expedite the Work.
 - 5.4 Subcontractors shall notify the Consultant and Contractor of deficiencies and irregularities in the Work immediately when they are observed in the course of inspection and testing.

5.5 Inspection and testing companies shall not perform or supervise any of the Contractor's work, and shall not authorize:

- .1 Performance of work that is not in strict accordance with the Contract Documents.
- .2 Approval or acceptance of any part of the Work.

6 INSPECTION AND TESTING PROCEDURES

6.1 Perform specified inspection and testing only in accordance with specified Reference standards, or as otherwise approved.

6.2 Observe and report on compliance of the Work to requirements of Contract Documents.

6.3 Ensure that inspectors are on site or at fabricator's operations for full duration of critical operations, and as otherwise required to determine that the Work is being performed in accordance with the contract Documents.

6.4 Submit test samples required for testing in accordance with submittals schedule specified in Section 01 32 00.

6.5 Provide labour, Construction Equipment and temporary facilities to obtain and handle test samples on site.

6.6 Identify samples and sources of materials.

6.7 Review and report on progress of the work. Report on count of units fabricated and inspected at fabricator's operations.

6.8 Observe and report on conditions of significance to work in progress at time of inspection or at fabricator's operations. Include where applicable and if critical to the work in progress:

- .1 Time and date of inspection.
- .2 Temperature of air, materials, and adjacent surfaces.
- .3 Humidity of air, and moisture content of materials and adjacent materials.
- .4 Presence of sunlight, wind, rain, snow and other weather conditions.

6.9 Ensure that only materials from the work and intended for use therein are tested.

6.10 Determine locations for work to be tested.

7 INSPECTION AND TESTING REPORTS

- 7.1 For inspection and testing required by Contract Documents or by regulatory requirements, and performed by Contractor retained inspection and testing agencies, submit to Consultant and Owner copies of reports. Submit within 5 Working days after completion of inspection and testing.
- 7.2 For inspection and testing performed by Owner retained inspection and testing agencies, copies of inspection and testing agency reports will be provided to Contractor.
- 7.3 Include in reports all information critical to inspection and testing.

8 TOLERANCES FOR INSTALLATION OF WORK

- 8.1 Unless specifically indicated otherwise, work shall be installed plumb, level, square and straight.
- 8.2 Unless acceptable tolerances are otherwise specified in specification sections or are otherwise required for proper functioning of equipment, site services, and mechanical and electrical systems:
- .1 "Plumb and level" shall mean plumb or level within 1 mm in 1 m.
 - .2 "Square" shall mean not in excess of 10 seconds lesser or greater than 90 degrees.
 - .3 "Straight" shall mean within 1 mm under a 1 m long straightedge.
 - .4 "Flush" shall mean within:
 - .1 6 mm for exterior concrete, masonry, and paving materials.
 - .2 1 mm for interior concrete, masonry, tile and similar surfaces.
 - .3 0.5 mm for other interior surfaces.
- 8.3 Allowable tolerances shall not be cumulative.

9 REFERENCE STANDARDS

- 9.1 Perform inspection and testing in accordance with Standards quoted and as required by procedures described in specified reference standards that are applicable to the work being inspected and tested.

10 DEFECTS AND REMEDIAL WORK

- 10.1 Defective products, materials and workmanship found at any time prior to Ready-for-Takeover will be rejected regardless of previous inspections, testing, and reviews of the Work. Inspections, testing, and reviews shall not relieve the Contractor from their responsibility, but are a precaution against oversight or error. Remove and replace defective and rejected products, materials, systems, and workmanship. Be responsible for delays and expenses caused by rejection.

10.2 Notify Consultant of, and perform remedial work required to, repair or replace defective or unacceptable work. Ensure that properly qualified workers perform remedial work. Coordinate adjacent affected work as required.

11 **MOCK UPS**

11.1 Prepare mock-ups of Work as specified in the technical Specifications. If a mock-up location is not indicated in the Drawings or Specifications, locate where directed by Consultant. Construct mock-ups of Work as required by Contract Documents on site unless otherwise indicated herein or directed by Consultant.

11.2 Construct mock-ups prior to start of affected work. Allow sufficient time for Consultant's review. Work affected by mock-ups may not commence prior to acceptance of mock-ups.

11.3 Construct mock-ups to include all related specified materials and workmanship. Make revisions as directed by Consultant, in accordance with the intent of the Contract Documents, until mock-ups are acceptable.

11.4 Modify mock-up as required until Consultant approval is obtained.

11.5 Mock-ups, reviewed and accepted by Consultant, shall become the standard of quality against which installed work will be measured.

11.6 Protect mock-ups from damage until the Work they represent is complete.

11.7 Mock-ups, by prior arrangement, may be incorporated into finished work if approved by Consultant only.

11.8 Remove mock-ups only when the Work they represent is complete or when otherwise directed by Consultant.

12 **EXTERIOR WALL MOCK-UP**

12.1 For exterior wall elements, construct a 10 m² mock-up of wall system incorporating all wall components specified. Construct mock-up on Site in a location acceptable to Consultant.

12.2 The mock-up shall include the work of all trades involved in exterior wall elements, complete in all respects including masonry, air/vapour retarders, brick cladding, aluminum windows, sealants, etc., and shall establish a minimum standard for the work of the exterior wall elements, clear up any misunderstandings and point out any possible problems.

12.3 Upon completion of mock-up, and after being notified by the Contractor, Consultant will inspect mock-up and if necessary prepare and issue a list of deficiencies. Once mock-up has been accepted, it will form the minimum standard of quality for exterior wall elements.

- 12.4 Mock-up will not form part of the work and will be independent of building. Remove and dispose of mock-up from Site during final cleanup, or when directed by Consultant.
- 13 **BUILDING ENVELOPE**
- 13.1 Requirements specified herein apply to all elements of the exterior building envelope.
- 13.2 Continuity of air barrier/vapour retarder and insulation components is critical and must be maintained at all locations. Where different systems meet, ensure proper interface and continuity between adjacent components by implementing suitable construction sequences and by using compatible materials only.
- 13.3 Maximum air leakage shall be $0.10 \text{ L}/(\text{s}\cdot\text{m}^2)$ when measured with a warm-side relative humidity of 27-55% at 21°C and a measured air pressure difference of 75Pa.
- 13.4 Anchor exterior cladding components to structure in manner suitable to accommodate structural deflection and creep and to withstand loads from expected temperature gradients. Design anchorage to withstand expected wind loads, positive and negative, in accordance with applicable regulations.
- 13.5 Ensure that air spaces within exterior building components are firestopped in accordance with applicable regulations.
- 13.6 Ensure that air spaces on the outside of vertical air barrier/vapour retarder (walls), window systems, and curtain wall systems are constructed with adequate drainage provisions to the exterior.
- 13.7 Owner may complete a thermographic scan upon completion of the building envelope. Contractor will be responsible to correct identified thermal anomalies.
- 14 **DRAINAGE**
- 14.1 Layout and construct work to ensure that positive drainage is provided to floor drains, ditches, site drains and catch basins, as set in their final position, preventing undrained areas and ponding.
- 14.2 Ensure that allowable construction tolerances and structural deflection do not cause ponding of water.
- 14.3 Report to Consultant in writing prior to executing work affected, in case adequate drainage cannot be provided.

END OF SECTION

1 GENERAL

- 1.1 Provide Labour, Products, equipment, services, tools and Supervision to ensure that Work complies with minimum acceptable standards of materials and performance of Work in accordance with codes and standards referenced in the Specification.
- 1.2 Consider contract forms, codes, Specifications, standards, manuals, and installation and application instructions referred to in these specifications to be the latest published editions at the date of submission of the bid unless otherwise stated in the Specifications or otherwise required by the authorities having jurisdiction.

2 BY-LAWS, PERMITS, AND FEES

- 2.1 The Building Code - Ontario Regulation 332/12, including all amendments, shall govern the construction of the Work.
- 2.2 Comply with all By-Laws and regulations of authorities having jurisdiction. These codes and regulations constitute an integral part of the Contract Documents.
- 2.3 Owner shall apply and pay for Municipal Building Permit, and Contractor shall obtain and pay for all other permits, licenses, deposits, and certificates of inspection as part of the Contract Price as per Conditions of the Contract. Ensure that permits, licenses, deposits, and certificates included under specific Sections are provided as specified.
- 2.4 If required, pay for construction damage deposit required by authorities having jurisdiction.
- 2.5 Where permits, licences, and inspection fees are required by authorities having jurisdiction for specific trade functions, they shall be obtained by particular subtrade responsible for that work.
- 2.6 Arrange for inspection, testing of Work and acceptance required by the authorities having jurisdiction. Be responsible for necessary preparations, provisions and pay all associated costs.
- 2.7 Be responsible for ensuring that no work is undertaken which is conditional on permits, approvals, reviews, licences, fees, until all applicable conditions are met. No time extension will be allowed for delay in obtaining necessary permits.
- 2.8 Any additional work or changes to the materials due to Work not complying with the Ontario Building Code and Regulations as indicated by the Building Inspector shall be changed. All costs involved shall be borne by Contractor.
- 2.9 Obtain permit required to work on Municipal rights of way. Provide damage deposits for sidewalks, roads and services work, as applicable.
- 2.10 Give notice of completion of project prior to occupancy, as required by applicable legislation.

3 EXISTING PUBLIC SERVICE LINES

- 3.1 Where existing public services are indicated to be removed and/or relocated, perform Work in compliance with authorities having jurisdiction.
- 3.2 Make good public roads, walkways and curbs soiled or damaged due to construction to the requirements of local authorities.

4 CODES

- 4.1 Reference is made to standards in the specifications to establish minimum acceptable standards of materials, products and workmanship. Ensure that materials, products and workmanship meet or exceed requirements of the Reference standards specified.
- 4.2 In the event of conflict between documents specified herein, execute the Work in accordance with the most stringent requirements.

5 REFERENCE STANDARDS

- 5.1 "Reference standards" means consensus standards, trade association standards, guides, and other publications expressly referenced in Contract Documents.
- 5.2 Where an edition or version date is not specified, referenced standards shall be deemed to be the latest edition or revision issued by the publisher at the time of bid closing. However if a particular edition or revision date of a specified standard is referenced in an applicable code or other regulatory requirement, the regulatory referenced edition or version shall apply.
- 5.3 Where a material or product is specified in conjunction with a referenced standard, do not supply the material or product if it does not meet the requirements of the standard. Supply another specified material or product, or an acceptable material or product of other approved manufacturer which does meet the requirements of the standard, at no additional cost to the Owner.
- 5.4 Reference standards establish minimum requirements. If Contract Documents call for requirements that differ from a referenced standard, the more stringent requirements shall govern.
- 5.5 If compliance with two or more reference standards is specified and the standards establish different or conflicting requirements, comply with the most stringent requirement. Refer uncertainties to Consultant for clarification.
- 5.6 Where no standard is referred to, provide materials, products and workmanship which meet requirements of the applicable standards of the Canadian Standards Association, Canadian General Standards Board, Ontario Provincial Standard Specifications (OPSS), Ontario Provincial Standard Drawings (OPSD) and the applicable building code. References to "Measurement for Payment" and "Basis of Payment" in OPSS standard documents are not applicable to this Contract.

- 5.7 If there is question as to whether a material, product or system is in conformance with applicable standards, the Consultant reserves the right to have such materials, products or systems tested to prove or disprove conformance. The cost for such testing will be paid by the Owner in the event of conformance with Contract Documents or by the Contractor in the event of non-conformance.
- 5.8 Where application, installation and workmanship standards are cited, it is intended that referenced standards form the basis for minimum requirements of the specified item and specifications supplement the standards unless specified otherwise.
- 5.9 Matters may be dealt with in part by these specifications which are also dealt with, under the same or similar headings in cited standard. It is not intended that these specifications take the place of the standards but supplement them, unless specified otherwise.
- 5.10 Where reference is made to manufacturer's directions, instructions or specifications they shall include full information on storing, handling, preparing, mixing, installing, erecting, applying, or other matters concerning the materials pertinent to their use and their relationship to materials with which they are incorporated.
- 5.11 Within the Specifications, reference may be made to the following standards writing, testing, or certification organizations by their acronyms or abbreviations:

.1	AA	Aluminum Association
.2	AAMA	Architectural Aluminum Manufacturers Association
.3	AASHTO	American Association of State Highway and Transportation Officials
.4	ACI	American Concrete Institute
.5	AFBMA	Anti-Friction Bearing Manufacturer's Association
.6	AIEE	American Institute of Electrical Engineers
.7	AISC	American Institute of Steel Construction
.8	AISI	American Iron and Steel Institute
.9	AMCA	Air Movement and Control Association
.10	AMEU	Association of Municipal Electric Utilities
.11	ANSI	American National Standards Institute
.12	APA	American Plywood Association
.13	ARI	Air-Conditioning and Refrigeration Institute
.14	ASHRAE	American Society of Heating, Refrigeration and Air Conditioning Engineers
.15	ASME	American Society of Mechanical Engineers
.16	ASTM	American Society for Testing and Materials
.17	AWMAC	Architectural Woodwork Manufacturers Association of Canada
.18	AWPA	American Wire Producers Association
.19	CaGBC	Canadian Green Building Council
.20	CEMA	Canadian Electrical Manufacturer's Association
.21	CGSB	Canadian General Standards Board
.22	CISC	Canadian Institute of Steel Construction
.23	CPMA	Canadian Paint Manufacturers Association
.24	CPCI	Canadian Prestressed Concrete Institute
.25	CRCA	Canadian Roofing Contractors Association

.26	CSA	Canadian Standards Association
.27	CSSBI	Canadian Sheet Steel Building Institute
.28	CWB	Canadian Welding Bureau
.29	CWC	Canadian Wood Council
.30	EEMAC	Electrical and Electronic Manufacturers Association Canada
.31	FM	Factory Mutual
.32	ICEA	Insulated Cable Engineers Association
.33	IEEE	Institute of Electrical and Electronics Engineers
.34	IGMAC	Insulating Glass Manufacturers Association of Canada
.35	LEED	Leadership in Energy and Environmental Design
.36	MFMA	Maple Flooring Manufacturers Association
.37	MPI	Master Painters Institute
.38	MSS	Manufacturers Standardization Society of the Valve and Fittings Industry
.39	MTO	Ministry of Transportation Ontario
.40	NAAMM	National Association of Architectural Metal Manufacturers
.41	NAAWS	North American Architectural Woodwork Standards
.42	NEMA	National Electrical Manufacturers Association
.43	NFPA	National Fire Protection Association
.44	NHLA	National Hardwood Lumber Association
.45	NLGA	National Lumber Grades Authority
	NRC	National Research Council of Canada
.46	OPSS	Ontario Provincial Standard Specification
.47	SMACNA	Sheet Metal and Air Conditioning Contractors National Association
.48	SSPC	The Society for Protective Coatings
.49	TTMAC	Terrazzo, Tile and Marble Association of Canada
.50	ULC	Underwriters' Laboratories of Canada

6 FIRE RATINGS, ASSEMBLIES AND SEPARATIONS

6.1 Where a material, component, assembly, or separation is required to be fire rated, the fire rating shall be as determined or listed by one of the following testing authorities acceptable to the authorities having jurisdiction:

- .1 Underwriters' Laboratories of Canada.
- .2 Underwriters' Laboratories Inc.
- .3 Factory Mutual Laboratories.
- .4 The National Research Council of Canada.
- .5 The National Board of Fire Underwriters.
- .6 Intertek Testing Services.

- 6.2 Where reference is made to only one testing authority an equivalent fire rating as determined or listed by another of the aforementioned testing authorities is acceptable if approved by authorities having jurisdiction. Obtain and submit such approval of authorities, in writing when requesting acceptance of a proposed equivalent rating or test design.
- 6.3 Fire rated door assemblies shall include doors, frame, anchors, and hardware and shall bear label of fire rating authority showing opening classification and rating.
- 6.4 Material having a fire hazard classification shall be applied or installed in accordance with fire rating authorities printed instructions.
- 6.5 Fire rated assemblies shall be constructed in accordance with applicable fire test report information issued by fire rating authority. Deviation from fire test report will not be allowed.
- 6.6 Construct fire separations as continuous, uninterrupted elements except for permitted openings. Extend fire rated walls and partitions from floor to underside of structural deck above.
- 6.7 Fire separations may be pierced by openings for electrical and similar service outlets provided such boxes are non-combustible and are tightly fitted and sealed with a ULC approved sealant for the assembly being sealed.
- 6.8 Construction that abuts on or is supported by a non-combustible fire separation shall be constructed so that its collapse under fire conditions will not cause the collapse of the fire separation.
- 6.9 Do not use combustible members, fastenings, attachments and similar items to anchor electrical, mechanical or other fixtures to fire separations.
- 6.10 At penetration through fire rated walls, ceilings or floors, completely seal voids with ULC approved firestopping material; full thickness of the construction element. In locations that require a smoke seal, provide appropriate ULC approved system installed in accordance with the manufacturer's recommendations.

END OF SECTION

1 **ABBREVIATIONS AND SYMBOLS**

1.1 The following are typical abbreviations and symbols frequently used in the Contract Documents. See Contract Drawings for abbreviations and symbols used on Contract Drawings.

A	Ampere
ABS	Acrylonitrile-butadiene-styrene copolymer
AC	Alternating current
ACST	Acoustic
ACT	Acoustic tile
A/C	Air conditioning
AL	Aluminum
ANOD	Anodized
AWG	American wire gauge
°C	Degrees celsius
CACF	Central alarm and control facility
CBLK	Concrete block
CCTV	Closed circuit television
CEM BD	Cement board
CI	Cast iron
cfs	Cubic feet per second
cm	Centimetre
CONC	Concrete
CPE	Chlorinated polyethylene
CPT	Carpet
CT	Ceramic tile
c/w	Complete with
cu ft	Cubic feet
cu yd	Cubic yards
dB	Decibels
DC	Direct current
deg.	Degree
DFT	Dry film thickness
dia	Diameter
dwg	Drawing
EMT	Electrical metallic Tubing
EPA	Environmental protection agency
EP FLR	Epoxy flooring
EPT	Ethylene-propylene terpolymer
EPTM	Ethylene-propylene diene monomer
EXP	Exposed structure
°F	Degrees fahrenheit
fig	Figure
fpm	Feet per minute
FRE	Fiber reinforced epoxy
ft	Feet
F/A	Fresh air
g	Gram

ga	Gauge
gal.	Gallon
GFCI	Ground fault circuit interruptor
GL	Glass
GL BLK	Glass block
g/m^2	Grams per square metre
GYP BD	Gypsum board
ha	Hectare
hex.	Hexagonal
HM	Hollow metal
hp	Horsepower
HPF	High power factor
HPS	High pressure sodium
hr	Hour
HRD	Hardened
HVAC	Heating, ventilating and air conditioning
Hz	Hertz
i.d.	Inside diameter
igph	Gallons per hour (Imperial)
igpd	Gallons per day (Imperial)
in	Inch
Inc.	Incorporated
I/O	Input/output
J	Joule
K	kelvin
kg	Kilogram
kg/m^2	Kilogram per square metre
kg/m^3	kilogram per cubic metre
km	Kilometre
kPa	Kilopascal
Ksi	Kipps per square inch
kVA	kilovolt-ampere
kW	Kilowatt
kWh	Kilowatt hour
l	Litre
lb	Pound
lb/ft^2	Pounds per square foot
L/m^2	Litres per square metre
L/min	Litres per minute
L/sec	Litres per second
LCD	Liquid crystal display
LED	Light emitting diode
Lin ft	Linear foot
lin m	Linear metre
L.S.	Lump sum
m	Metre
mm	Millimetre
mm^2	Square millimetre
m^2	Square metre

m ³	Cubic metre
mA	Milliampere
M.I.	Mineral insulated
MICC	Mineral insulated copper sheathed cable
ml	Millilitre
m/s	Metre per second
max	Maximum
MET	Metal ceiling
min	Minimum
MCC	Motor control centre
MPa	Mega pascal
MH	Maintenance hole
MSDS	Material safety data sheet
N	Newton
N.C.	Normally closed
Nm	Newton metre
N.O.	Normally open
NPS	Nominal pipe standard
O/A	Outside air
o.c.	On centre
o.d.	Outside diameter
o/h	Overhead
OSHA	Occupational safety and health act
OWSJ	Open web steel joist
oz.	Ounce
Pa	Pascal
ph	Phase
P LAM	Plastic laminate
PLC	Programmable logic controller
ppm	Parts per million
psi	Pound per square inch
psig	Pound per square inch gauge
PT	Paint
PTD	Painted
PVC	Polyvinyl chloride
RB	Resilient base
rpm	Revolution per minute
s	Second
S/A	Supply air
SCADA	Supervisory control and data acquisition system
scfm	Standard cubic feet per minute
spec.	Specification
SPDT	Single pole double throw
SPST	Single pole single throw
sq ft	Square foot
sq m	Square metre
S.ST	Stainless steel
STL	Steel
STO	Stone

t	Tonne
TEFC	Totally enclosed fan cooled
TERR	Terrazzo
UPS	Uninterruptable power supply
US gpm	Gallons per minute (United States measure)
V	Volt
vt ft	Vertical foot
W	Watt
W.C.	Water closet
WD	Wood
WP	Waterproofing
Yd	Yard

END OF SECTION

1 TEMPORARY CONTROLS AND CONSTRUCTION FACILITIES

- 1.1 Provide temporary controls and construction facilities as necessary for performance of the Work and in compliance with applicable regulatory requirements.
- 1.2 Maintain temporary controls and construction facilities in good condition for the duration of the Work.
- 1.3 Remove controls and temporary construction facilities from Place of the Work when no longer required.

2 TEMPORARY CONTROLS

2.1 Hoarding and barriers:

- .1 Erect temporary hoarding and barriers around entire perimeter of Site to height determined by applicable regulatory requirements.
- .2 Before commencing operations, supply, erect and maintain hoarding as determined by applicable regulatory requirements to protect public and private property from injury or damage. Paint outside of hoarding in a colour selected by the Consultant and mark with "POST NO BILLS" signs.
- .3 Before commencing operations, supply, erect and maintain chain link as determined by applicable regulatory requirements to protect public and private property from injury or damage.
- .4 Provide temporary enclosures as required to protect the building in its entirety or in its parts, against the elements, to maintain environmental conditions required for work within the enclosure, and to prevent damage to materials stored within.
- .5 Provide lockable gates through hoarding and barriers for access to Site by workers and vehicles.

2.2 Prevent unauthorized entry to the Site. Barricade, guard or lock access points to the satisfaction of the Consultant and post "NO TRESPASSING" signs.

2.3 Provide hoarding, barriers and covered walkways required by governing authorities for public safety, public rights-of-way and for access to buildings. Snow fencing is not allowed as protection for sidewalk.

2.4 Install signs for movement of people around Work Site as required and directed by the Consultant.

2.5 Provide secure, rigid guide rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs as required for protection of Work, workers, and the public.

2.6 Remove hoarding, barriers, building enclosures, guide rails and barricades upon completion of Contract, unless otherwise noted on the Contract Drawings or as directed by the Consultant.

3 **SERVICE AND UTILITY SYSTEMS**

3.1 Consult with utility companies and other authorities having jurisdiction to ascertain the locations of existing services on or adjacent to site.

3.2 Information as to the location of existing services, if shown on the Drawings, does not relieve the Contractor of his responsibility to determine the exact number and location of existing services.

3.3 Give proper notices for new services as may be required. Make arrangements with authorities and utilities for service connections required.

3.4 Pay any charges levied by utilities or authorities for work carried out by them in connection with this Contract, unless specified otherwise.

3.5 Operate and maintain all utility systems affected by work of this Contract, until the building or specific portions thereof have been accepted by the Owner.

3.6 Report existing unknown services encountered during excavation to Consultant for instructions; cut back and cap or plug unused services. Be responsible for the protection of all active services encountered and for repair of such services if damaged.

4 **SCAFFOLDING, HOISTS AND CRANES**

4.1 Select, operate, and maintain scaffolding, hoisting equipment and cranes as may be required.

4.2 Do not erect or operate equipment that will endanger existing structures, local municipalities hydro installations, or traffic signals.

4.3 Design and construct scaffolding in accordance with CAN/CSA S269.2-M.

5 **TEMPORARY WORKS**

5.1 Installation and Removal: Provide temporary utilities, facilities, controls, and as otherwise necessary to perform the Work expeditiously. Remove from Site all such Work after use.

5.2 Arrange for connections with appropriate utility company and pay all costs for installation, maintenance and removal.

5.3 Pay all costs for temporary works consumed prior to completion of Contract.

- 5.4 Temporary Power and Lighting Systems:
- .1 Supply, install and maintain electrical power and necessary electrical equipment including overhead and underground feeders, transformers, motors, starters, panels, protective devices and equipment. Connections will be made available to any part of the Work within distance of a 30 m extension.
 - .2 Provide temporary lighting inside and outside structure of adequate intensity to illuminate construction activities. Provide temporary pedestrian lighting for sidewalk areas affected by the Work.
 - .3 Electrical power and lighting systems installed under this Contract may be used for construction requirements with prior approval of Consultant, provided that guarantees are not affected. Make good damage. Replace lamps which have been used over period of three (3) months.
 - .4 Basic temporary power is available from the school services. Temporary power may be routed from existing services, subject to after hours installation, access and provided no damage to existing facilities. Coordinate locations on site with consultants. Construction power shall be on independent circuits and connected at the expense of the Contractor. Power fluctuations in the school caused by construction shall not be tolerated. If this is not feasible, arrange, for and maintain separate, temporary electrical power supply in accordance with governing regulations and ordinances. Noise from on site generators is not acceptable during the occupied school year.
 - .3 Supply and install the type and quantity of minimum lighting equipment in each location to ensure adequate, continual illumination 24 hours per day, 7 days per week for the following:
 - .1 Emergency evacuation, safety and security throughout the Project at intensity levels required by jurisdictional authorities.
 - .2 General lighting for performance of the Work throughout the Project, evenly distributed, and at intensities to ensure that proper installations and applications are achieved.
 - .3 Performance of finishing trades in area as required evenly distributed, and of an intensity of at least 50 Lux.
 - .4 In locations approved by the Consultant. install and support the electrical plant, distribution and temporary lighting systems including service equipment and local hydro authority meter energized by the local hydro circuits. Installations shall be approved by the Consultant and shall be carried out in a neat manner to avoid interference with the application of finish material and to facilitate removal when the installed permanent lighting system is in operation.
 - .5 Make all necessary arrangements for a temporary electrical service of sufficient capacity to supply temporary lighting, operation of power tools, cranes and equipment for all construction, implementation, and inspection and testing purposes. Supply and install necessary temporary cables and other electrical equipment and make all temporary connections as required.

- .6 Temporary power distribution wiring shall comply with Ontario Hydro Electrical Safety Code. Obtain inspection certificates for temporary electrical work.
- .7 Maintain the lighting systems in operation during the life of the Contract. Replace burned or missing lamps immediately.
- .8 Upon completion of Contract, remove electrical plant and temporary lighting from the Site.

5.5 Water Supply:

- .1 Provide and pay for a continuous supply of potable water for construction use. Provide as a minimum one water connection on each floor level.
- .2 Provide and maintain all temporary lines, extensions and hoses as required. Remove all temporary connections and lines on completion of the Work and make good any damage.

5.6 Temporary heating and ventilating:

- .1 The existing building is heated. If required, provide additional temporary heating. The permanent heating system of the building or portions thereof may be used when available only upon written permission by Consultant. If permission to use heating system is obtained:
 - .1 Before using air handling systems, ensure that dust/debris is removed from the premises and install temporary filters to prevent construction dust/debris from entering via return air or intake openings. Keep unused ducts sealed to prevent entry of dust/debris. Replace filters frequently during construction.
 - .2 On completion of work, remove temporary filters and install new filters in accordance with Division 23. After temporary use of air handling system is complete and before turning over system to Owner, vacuum internally to ensure all dust/debris is removed.
- .2 Provide ventilation measures as required to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
- .3 Ventilate heated areas and keep the Work free from fumes, vapours, exhaust and combustion gases, dust, and other hazardous, noxious, or volatile substances in enclosed spaces, as required to maintain a safe work environment meeting applicable regulatory requirements.
- .4 Ensure that dust, vapours, gases, hazardous, noxious, or volatile substances do not migrate to Owner occupied spaces.
- .5 Ventilate temporary sanitary facilities.

5.7 Sanitary Facilities:

- .1 Provide sanitary facilities in accordance with occupational health and safety requirements in the place of the Work. Use of Owner's existing sanitary facilities or new sanitary facilities is not allowed.
- .2 Keep sanitary facilities clean and fully stocked with the necessary supplies.

6 **PROTECTION**

6.1 Protection of Public Area: Protect surrounding private and public property from damage during performance of the Work.

6.2 Take all necessary precautions to prevent damage to work affected by temperature, water, weather and other environmental conditions.

6.3 Protection of Building Finishes and Equipment:

- .1 Provide protection for existing structure, finished and partially finished building finishes, waterproofing systems, and equipment during performance of the Work.
- .2 Cover Owner's equipment and plant within the Site with 6 mil PVC sheet, or equal, taped to make it dust-tight. Equipment and existing work moved or altered to facilitate construction, movement of Products or equipment shall be stored, protected with dust-tight covers and subsequently returned to its original location.
- .3 Obtain approval from the Consultant prior to the installation of temporary supporting devices into existing roof, ceiling, or wall members for the erecting of equipment or machinery. Repair roof, ceiling, and wall members used for this purpose to the satisfaction of the Consultant.
- .4 Provide necessary screens, covers and hoarding as required.
- .5 Provide temporary weather tight, dust tight, and lockable partitions within the building where work is performed. Provide weather tight closures to unfinished door and window openings, top of shafts and other openings in floors and roofs.
- .6 Any Products or equipment damaged while carrying out the Work shall be restored with new Products or equipment matching the original equipment. Damage shall include harm resulting from all construction work, such as falling objects, wheel and foot traffic, failure to remove debris, operation of machinery and equipment, and scaffolding and hoisting operations.
- .7 Protect finished surfaces of new work from damage by restriction of access or by use of physical means suitable to the material and surface location. Where construction operations must be performed or traffic routed over finished floors, lay 6 mm plywood coverings tightly fitted and secured over surface in such areas.

- 6.4 Fire Protection:
- .1 Take precautions to prevent fires. Provide and maintain temporary fire protection equipment of a type appropriate to the hazard anticipated in accordance with authorities having jurisdiction, governing codes, regulations, by-laws and to the satisfaction of the Consultant and insurance authorities.
 - .2 Excessive storage of flammable liquids and other hazardous materials is not allowed on Site. Flammable liquids must be handled in approved containers. Remove combustible wastes frequently.
 - .3 Inspect temporary wiring, drop cords, extension cables for defective insulation or connections frequently.
 - .4 Open burning of rubbish is not permitted on the Site.
 - .5 Handle, transport, store, use and dispose of gasoline, benzene or other flammable materials with good and safe practice as required by authorities having jurisdiction.
 - .6 Provide fire extinguishers of the non-freezing chemical type in each temporary building, enclosure and trailer. Use only fire-proofed tarpaulins.
 - .7 A fire watch shall be required for each of the following activities regardless of the number, duration or size of the activity in operation:
 - .1 any open flame activities (e.g., soldering and welding);
 - .2 shutdown of fire detection system;
 - .3 shutdown of sprinkler system.
- 6.5 Maintain adequate cover over services as required by Utility Authorities.
- 6.6 Report any discharge of a contaminant to the Authorities having jurisdiction.
- 7 **TEMPORARY BUILDINGS**
- 7.1 Provide, and maintain until contract completion a temporary office as required for work, large enough to accommodate site administrative activities and site meeting, complete with lighting, heating, and air conditioning equipment to maintain 21 °C. Ventilation, telephone, facsimile machine on a separate line, copier (not combination fax/copier), table and chairs. Do not store materials, tools, equipment in meeting area; keep clean and tidy.
 - 7.2 For all trailers and temporary buildings, provide wood stairs, platform and boardwalk, painted and repainted as required with non-skid abrasive paint.
 - 7.3 Do not locate any buildings, structures or equipment in a manner that interferes with surveys along the control line and reference line tangents.
 - 7.4 Remove temporary buildings upon completion of Contract. Restore area(s) to match the existing surrounding area.

8 PEST CONTROL

8.1 Be responsible to provide control measures, restraining procedures, and treatments to prevent infestation and spread of insects, rodents and other pests deemed to be present at Site and/or noticed during course of the Work. Carry out fumigation, pest control procedure, and posting of warning signs, notices including contents of such notices in accordance with requirements of Pesticides Act and any other authorities having jurisdictions. Pesticides used shall be in accordance with Canada Pest Control Products Act, and provincial and municipal regulations.

9 FIRST-AID FACILITIES

9.1 Provide site equipment and medical facilities necessary to supply first-aid service to injured personnel in accordance with regulations of the Workmen's Compensation Act. Maintain facilities for duration of Contract.

10 USE OF NEW PERMANENT SERVICE & EQUIPMENT

10.1 Do not use any new permanent service or equipment without Owner's written approval.

10.2 Where permission is granted to use permanent services and equipment provide competent persons to operate services and equipment; inspect frequently and maintain facilities in proper operating condition at all times.

10.3 Permanent services and equipment shall be turned over to Owner in "as new" and perfect operating condition.

10.4 Use of permanent systems and equipment as temporary facilities shall not affect the warranty conditions and warranty period for such systems and equipment. Make due allowance to ensure that Owner will receive full benefits of equipment manufacturers warranty after project takeover.

11 PROJECT IDENTIFICATION

11.1 If required, obtain approvals from jurisdictional authorities for temporary signs.

11.2 No other signs or advertisements, other than safety, warning, or directional signs, are permitted without the Consultant's and Owners written consent.

11.3 Maintain signs in good condition for the duration of Contract.

12 **SITE MAINTENANCE**

- 12.1 Maintain the Site and adjacent premises in a clean and orderly condition, free from debris and other objectionable matter. Immediately remove rubbish and surplus Products, equipment and structures from the Site. If the Site is not cleaned (within 48 hours after the Contractor has been instructed to do so), the Consultant may clean the Site and retain the cost from monies due, or to become due, to the Contractor.
- 12.2 When the Work is substantially performed, remove surplus Products, tools, construction machinery and equipment not required for the performance of the remaining Work.

13 **SITE STORAGE AND OVER LOADING**

- 13.1 Confine the Work and operations of employees to limits indicated by the Contract Documents. Do not unreasonably encumber the Site with Products.
- 13.2 Products shall be stored only in areas designated or approved by the Consultant, and shall not be left lying on streets, sidewalks, boulevards or elsewhere within public view. Products which the Consultant may permit to be stored elsewhere than in the Contractor's storage areas shall be neatly stacked or otherwise disposed and shall be so maintained.
- 13.3 Fabrication shops shall not be set up within the structure except as directed by or with the permission of the Consultant.
- 13.4 Do not load or permit to be loaded any part of the Work with a weight or force that it is not calculated to bear safely. Be solely responsible and liable for damages resulting from violation of this requirement. Provide temporary supports as strong as permanent support.
- 13.5 Do not cut, drill or sleeve load bearing members unless shown on drawings or otherwise approved by the Consultant in writing for each location.
- 13.6 Site storage and loading requirements to be in accordance with the Ontario Occupational Health and Safety Act and Regulations for Construction Projects.

14 **PUBLIC CONVENIENCE AND SAFETY**

- 14.1 Maintain sidewalks at and adjacent to the Site in a safe condition throughout the Contract. Promptly remove ice and snow.
- 14.2 Keep haul routes free at all times from Products spilled on highway or street surfaces and clean highways and streets of deposits due to performance of the Work to the satisfaction of the Consultant and the highway and street authorities. Clean highways and streets within 24 hours of Consultant's instruction.
- 14.3 The Consultant may inspect haul routes, the Site and adjacent premises daily and may halt operations, withhold payment or carry out such additional operations as necessary, deducting the cost from monies due, or to become due, to the Contractor.

15 **VEHICULAR ACCESS**

15.1 Provide and maintain adequate access to Place of the Work.

15.2 Existing roads at Place of the Work may be used for access to Place of the Work, provided Contractor assumes responsibility for any damage caused by construction traffic, and prevents or promptly cleans up any mud tracking or material spillage.

16 **CONSTRUCTION PARKING**

16.1 Limited parking will be permitted at Place of the Work in locations as indicated by the Consultant, provided it does not disrupt the performance of Work, Site safety or the movement of vehicular or pedestrian traffic and is acceptable to the Consultant.

17 **PUBLIC TRAFFIC FLOW**

17.1 Provide and maintain flag persons, Police Officers, traffic signals, barricades and illumination as required by Authorities having jurisdiction and/or as necessary to perform the Work and protect the public.

18 **PUBLIC UTILITIES AND SERVICES**

18.1 Verify limitations imposed on project work by presence of utilities and services, and ensure no damage occurs to them.

18.2 Notify service authorities concerned so that they protect, remove, relocate, or discontinue them, as they may require.

18.3 Make arrangements and pay for connection charges for services required for project work.

18.4 Locate poles, pipes, conduit, wires, fill pipes, vents, regulators, meters, and sanitary services work in inconspicuous locations. If not shown on Drawings, verify location of service work with Consultant before commencing installation.

19 **ROADS, CURBS, GUTTERS, AND WALKS**

19.1 Include all curb cuts and making good of existing curbs, walks and paving on Municipal property to provide fully paved and finished approaches to requirements of authorities having jurisdiction.

20 **SITE VISITORS**

20.1 During the progress of the Work, afford access to visitors duly authorized by the Consultant and facilitate inspections or tests they may desire to make. Record site visitors in log book maintained on site.

20.2 Ensure Site visitors wear appropriate safety apparel.

21 **EROSION AND SEDIMENTATION CONTROL**

- 21.1 Control drainage on site to prevent flooding, erosion and run-off onto adjacent properties as a result of construction operations.
- 21.2 Dispose of water containing silt in suspension in accordance with requirements of jurisdictional authorities.
- 21.3 Conform to sedimentation and erosion control requirements of the conservation and/or municipal authority having jurisdiction. Provide and maintain until completion of work or until directed by Consultant to be removed, sediment control devices at catch basins, drainage courses and at other locations on site as directed. Comply with requirements of the local Conservation Authority.
- 21.4 Minimize amount of bare soil exposed at one time. Stabilize disturbed soils as quickly as practical to minimize erosion. Remove accumulated sediment resulting from construction activity from adjoining surfaces, drainage systems, and watercourses, and repair damage caused by soil erosion and sedimentation.
- 21.5 Do not disturb existing embankments or embankment protection.
- 21.6 Provide storm drain inlet protection consisting of a sediment control barrier or an excavated ponding area around storm drain inlet or curb inlet; add bracing where necessary to withstand high flow volumes and depth. Inspect inlet protection after each rainfall and repair damage. Sweep up accumulated sediment and dispose of in a controlled area. Remove inlet protection after area has been stabilized with permanent vegetation.
- 21.7 Periodically inspect erosion and sediment control measures to detect evidence of erosion and sedimentation. Promptly take corrective measures when necessary.
- 21.8 If soil and debris from site accumulate in ditches or other low areas, remove accumulation and restore area to original condition.

22 **TEMPORARY DRAINAGE AND DEWATERING**

- 22.1 Prevent surface water runoff from leaving the Site unless approved by authorities having jurisdiction.
- 22.2 Drainage lines, trenched, and gutters shall be kept open at all times. No flow of water shall be directed across or over pavements except through pipes or properly constructed troughs. Keep all portions of Work properly and efficiently drained during construction and until completion. Be responsible for all disturbances, dirt and damage which may be caused by or result from water backing up or flowing over, through, from or along any part of Work, or due to operations which may cause water to flow elsewhere.
- 22.3 Keep trenches and other excavations free of water at all times. Employ adequate means to remove water in a manner that will prevent loss of soil, and maintain the stability of excavation.

- 22.4 Dispose of such water in a manner that will not be dangerous to public health, private property or to any portion of Work completed or under construction, nor which causes an impediment to the use of streets by the public.
- 22.5 Drainage of trenches or other excavation through newly laid storm drainage pipe will be allowed only with the express permission of the authority having jurisdiction.
- 22.6 When drainage is directed to existing catch basins, regularly inspect and clean such catch basins of debris and sediment.
- 22.7 Prevent precipitation from infiltrating or from directly running off stockpiled [waste] materials. Cover stockpiled materials with an impermeable liner during periods of work stoppage including at end of each Working Day.
- 22.8 Control surface drainage from cuts and fills, from borrow and waste disposal areas, from stockpiles, staging areas, and other work areas as required to prevent erosion and sedimentation.
- 22.9 Provide temporary drainage and pumping as necessary to dewater excavations, trenches, foundations, and other parts of the Work. Maintain such areas free of water arising from groundwater or surface run-off, as required to keep them stable, dry, and protected from damage due to flooding.
- 22.10 Maintain standby equipment necessary to ensure continuous operation of dewatering system.
- 22.11 Do not pump water containing suspended materials or other harmful substances into waterways, sewers or surface drainage systems. Treat or dispose of such water in accordance with applicable regulatory requirements

23 SNOW REMOVAL

- 23.1 Allow no accumulation of ice and snow on Site, and on roof deck when roofing operations are scheduled to take place.
- 23.2 Remove snow from access road, Site circulation paths and elsewhere as required to permit access to Work, parking and uninterrupted construction progress.

24 POLLUTION (DUST, DEBRIS, AND NOISE) CONTROL

- 24.1 Implement and maintain pollution control measures in accordance with applicable regulatory requirements.
- 24.2 Take measures to prevent contamination of soil, water, and atmosphere through uncontrolled discharge of noxious or toxic substances and other pollutants, potentially causing environmental damage.
- 24.3 Execute Work by methods that minimize dust from construction operations and spreading of dust on site or to adjacent properties.

- 24.4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.
- 24.5 Keep premises free of waste material.
- 24.6 Arrange and pay for removal of all waste generated by the work in manner acceptable to authorities having jurisdiction.
- 24.7 Limit noise levels in accordance with requirements of authorities having jurisdiction.
- 24.8 Maintain temporary erosion and pollution control features installed under this contract.
- 24.9 Control emissions from equipment and plant to local authorities emission requirements.
- 24.10 Prevent abrasive-blasting and other extraneous materials from contaminating air beyond application area, by providing temporary enclosures.
- 24.11 Use appropriate covers on trucks hauling fine, dusty, or loose materials.
- 24.12 Take immediate action to contain and mitigate harmful effects of the spill or release.

25 **TREE AND PLANT PROTECTION**

- 25.1 Within Contractor's assigned work and storage areas, where indicated on drawings, and adjacent to designated access routes, protect existing trees and plants scheduled to remain. Provide minimum 1.8 m high chain link fencing or other barriers outside of dripline of trees or groups of trees and other plants in accordance with authorities having jurisdiction.
- 25.2 Leave fenced areas undisturbed; do not use areas for storage, stockpiling or any other purpose. Do not dump or flush any contaminants in areas of tree feeder roots.
- 25.3 Do not attach rigging cables to trees.
- 25.4 Where limbs or portions of plants are required to be removed to accommodate new work, they shall be removed in accordance with accepted arboricultural practice.
- 25.5 For trees designated to remain, protect roots inside dripline from disturbance or damage during excavation and grading. Avoid traffic, dumping and storage of materials over root zones.
- 25.6 Where root systems of protected trees adjacent to construction are exposed or damaged, they shall be neatly trimmed and the area backfilled with suitable material to prevent desiccation.

- 25.7 Where necessary give trees an overall pruning to restore the balance between roots and top growth and/or to restore appearance.

- 25.8 Except at locations where specific procedures are included in Contract Documents do not alter grades around existing trees/plants without first obtaining Consultant's consent and directions.

- 25.9 Minimize stripping of topsoil and vegetation.

END OF SECTION

1 SPECIFIED PRODUCTS

- 1.1 Work of this Contract is based on Products specified by:
- .1 Manufacturer's catalogued trade names and/or;
 - .2 References to standards (i.e. CAN, CGSB, CSA, ASTM) or;
 - .3 Prescriptive Specifications or;
 - .4 Performance Specifications.
- 1.2 When one Product or manufacturer is specified by a single proprietary name, Provide the named Product only. Products by other manufacturers are subject to the Consultant's acceptance as an equivalent substitution in accordance with Section 01 25 00.
- 1.3 When more than one Product or manufacturer is specified along with a referenced standard, any one of the specified Products or manufacturer's will be acceptable on condition the Product complies with the referenced standard.
- 1.4 Whenever a Product is specified by reference to a standard only, Provide any Product that meets or exceeds the specified standard for the intended purpose. The onus shall be on the Contractor to establish that such Products meet the reference standard requirements. Products exceeding minimum requirements established by reference standards will be accepted for the Work if such Products are compatible with the Work with which they are incorporated. If requested by Consultant, submit information verifying that the proposed Product meets or exceeds the specified standard.
- 1.5 Whenever a Product is specified by prescriptive or performance requirements only, Provide any Product that meets or exceeds the specified requirements. If requested by Consultant, submit information verifying that the proposed Product meets or exceeds the specified standard.
- 1.6 When a Product is specified by reference to a standard or by prescriptive or performance requirements only, upon request of the Consultant, obtain from the manufacturer, an independent testing laboratory report showing that the Product meets or exceeds the specified requirements.
- 1.7 Provide Products that are not damaged or defective, and suitable for purpose intended, subject to specified requirements. If requested by Consultant, furnish evidence as to type, source and quality of Products provided.
- 1.8 Unless otherwise indicated in the Specifications, maintain uniformity of manufacture for any particular or like item throughout the Work.

2 APPROVAL OF PRODUCTS AND INSTALLATION METHODS

- 2.1 Wherever in the Specifications it is specified that Products and installation methods shall meet approval of Authorities having Jurisdiction, underwriters, the Consultant, or others, such approval shall be in writing.

3 PRODUCT DELIVERY CONTROL

- 3.1 It is the responsibility of the Contractor to ensure that the supplier or distributor of materials specified or alternatives accepted, which he intends to use, has materials on the site when required. The Contractor shall obtain confirmed delivery dates from the supplier.
- 3.2 Promptly upon Contract award and periodically during construction, review and confirm Product availability and delivery times. Order Products in sufficient time to meet the construction progress schedule and the Contract Time.
- 3.3 Contact the Consultant immediately upon receipt of information indicating that the specified Product is no longer available or if any material or item, will not be available on time, in accordance with the original schedule.
- 3.4 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.
- 3.5 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.
- 3.6 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.
- 3.7 In the event of failure to notify the Consultant at commencement of Work and should it subsequently appear that Work may be delayed for such reason, the Consultant reserves the right to direct the Contractor to take the following measures at no increase in Contract Price:
- .1 Substitute more readily available Products of similar or better quality and character, or
 - .2 Temporarily install another Product until such time as the specified Product becomes available, at which time the temporarily installed product shall be removed and the specified Product installed.
- or

- .3 Request Contractor to propose actions to maintain the construction progress schedule for Consultant's review and acceptance.

4 **TRADEMARKS AND LABELS**

- 4.1 Permanent labels, trademarks and nameplates on Products are not acceptable in the finished Work, except where required by authorities having jurisdiction, for operating instructions, or when located in service rooms.
- 4.2 Remove trademarks and labels by grinding, if necessary, painting out where the particular surface is being painted, or if on plated parts, replace with new plain plated or non-ferrous metal parts.

5 **DELIVERY, STORAGE, HANDLING AND PROTECTION**

- 5.1 Be responsible for handling and delivery of Products. Protect Products from damage during handling, storage and installation. Deliver store and handle items in accordance with manufacturer's instructions and as specified. Be responsible for all costs of delivery, loading and off-loading, and for transportation back to its origin for correction, if required, due to damage or defect. Reject materials and Products delivered to the Site which are damaged.
- 5.2 Manufacture, pack, ship, deliver, and handle Products so that no damage occurs to structural qualities and finish appearance, nor in any other way which is detrimental to their function and appearance.
- 5.3 Ensure that Products, while transported, are not exposed to an environment which would increase their moisture content beyond the maximum specified.
- 5.4 Organize delivery of materials, Products and equipment to, and removal of debris and equipment from, the site and surrounding property.
- 5.5 Schedule early delivery of Products to enable Work to be executed without delay. Before delivery, arrange for receiving at the Place of the Work.
- 5.6 Coordinate mechanical and electrical equipment and apparatus deliveries with the manufacturer's and suppliers such that equipment and apparatus is delivered to the site when it is required, or so that it can be stored within the building and protected from the elements.
- 5.7 Shop assemble work for delivery to site in size easily handled and to ensure passage through building openings.
- 5.8 Deliver packaged Products, in original unopened wrapping or containers, with manufacturer's seals and labels intact.
- 5.9 Label packaged products to describe contents, quantity, and other information as specified.

-
- 5.10 Labels attesting that materials conform to specified reference standards will be acceptable as verification that contents meet specified requirements. In the absence of labels, submit affidavits to validate conformance of Product to reference standards, as requested by the Consultant.
 - 5.11 Label fire-rated Products to indicate Underwriters' Laboratories approval.
 - 5.12 Handle and store materials and products in such a manner that no damage is caused to the materials and products, the Work, the site and surrounding property.
 - 5.13 Do not obstruct or disrupt local traffic flow during construction period.
 - 5.14 Allocate an area within the limits of the Work acceptable to the Owner for storage of Products brought to the site by all trades. Keep storage area tidy at all times and do not use other parts of the property for storage. Arrange and pay for off-site storage when required.
 - 5.15 Locate products on site in a manner to cause minimal interference with the Work and building activities.
 - 5.16 Adequately protect parts of the Work completed and in progress from any kind of damage.
 - 5.17 Store Products off the ground, in a manner to prevent damage, adulteration, deterioration and soiling to the Products, other building components, assemblies, other products, the structure, the site and surrounding property, and in accordance with manufacturer's instructions when applicable.
 - 5.18 Store packaged or bundled Products in original and undamaged condition complete with written application instructions. Keep manufacturer's seals and labels intact. Do not remove from packaging or bundling until required in the Work.
 - 5.19 Do not place or store materials and Products in corridors, public areas, streets, lanes, passageways or similar locations.
 - 5.20 Do not load or permit to be loaded any part of the Work with a weight or force that will endanger the safety or integrity of the Work.
 - 5.21 Store Products subject to damage from weather in weatherproof enclosures.
 - 5.22 Store cementitious Products clear of earth or concrete floors, and away from walls.
 - 5.23 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
 - 5.24 Store sheet materials and lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.

- 5.25 Store and handle flammable liquids and other hazardous materials in approved safety containers and as otherwise prescribed by safety authorities. Store no flammable liquids or other hazardous material in bulk within the Work.
- 5.26 Store and mix paints in a heated and ventilated room or area assigned for this purpose. Keep this room or area locked when unattended. Remove oily rags and other combustible debris from the Place of the Work daily. Take every precaution necessary to prevent spontaneous combustion.
- 5.27 Protect prefinished metal surfaces by protective coatings or wrappings until time of final cleanup specified in Section 01 74 00. Protection shall be easily removable under work of Section 01 74 00 without damage to finishes. Do not permit strippable tape or coatings to become baked on surfaces which they protect.
- 5.28 Touch-up damaged factory finished surfaces to Consultant's satisfaction. Use primer and paint to match original.
- 5.29 Protect glass and other finishes against heat, slag and weld splatter by provision of adequate shielding. Do not apply Visible markings to surfaces exposed to view in finished state or that receive transparent finishes.
- 5.30 Protect surfaces of completed work exposed to view from staining, disfigurement and all other damage by restriction of access or by use of physical means suitable of the material and surface location.
- 5.31 Adequately protect trowelled concrete floors from damage. Take special measure when moving heavy loads or equipment on them.
- 5.32 Keep finished concrete floors free from oils, grease or other material likely to damage or discolour them or affect bond of applied finishes. Once building is enclosed, keep floors as dry as possible after curing.
- 5.33 Protect finished flooring from pedestrian traffic with reinforced kraft paper as a minimum, secured in place and with joints sealed by reinforced pressure sensitive tape. Maintain protection in place until contract completion.
- 5.34 Protect finished flooring from continuing construction work and delivery of products with plywood panels of minimum 6 mm thickness with joints between panels sealed with reinforced pressure sensitive tape. Maintain protection in place until work and deliveries are complete.
- 5.35 Promptly remove, replace, clean, repair, or make good as directed by Consultant, work damaged as a result of inadequate protection.

6 **HAZARDOUS MATERIALS INFORMATION**

- 6.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of safety data sheets (SDS) in accordance with jurisdictional authorities.
- 6.2 Deliver copies of Safety Data Sheets (SDS) to the Consultant on all Products intended for use in the Work and designated as a "controlled product."

7 **MANUFACTURER'S INSTRUCTIONS**

- 7.1 Unless otherwise indicated in the Specifications, fabricate, apply, connect, install, erect, use, clean, and condition Products in accordance with manufacturer's instructions except where more stringent requirements are specified. Do not rely on labels or enclosures provided with Products. Obtain written instructions directly from manufacturers.
- 7.2 Notify the Consultant in writing, of conflicts between the Specifications and manufacturer's instructions, so that the Consultant may establish the course of action. If requested, make a copy of those instructions available at the Site.
- 7.3 Do not rely on labels or enclosures provided with Products. Obtain written instructions directly from manufacturers.
- 7.4 Provide manufacturer's representatives with access to the Work at all times. Render assistance and facilities for such access so that manufacturer's representatives may properly perform their responsibilities.
- 7.5 In cases of improper installation or erection of Products, due to failure in complying with these requirements, the Consultant may direct removal and re-installation at no increase in Contract Price.

8 **WORKMANSHIP**

- 8.1 Workmanship shall be the best quality, executed by workers experienced and skilled in the respective duties for which they are employed. Immediately notify the Consultant if required Work is such as to make it impractical to produce required results.
- 8.2 Do not employ any unfit person or anyone unskilled in their required duties. The Consultant reserves the right to require the dismissal from the Place of the Work, workers deemed incompetent, careless, insubordinate or otherwise objectionable.
- 8.3 Decisions as to the quality or fitness of workmanship in cases of dispute rest solely with the Consultant, whose decision is final.

- 8.4 Give particular attention to finished dimensions and elevations of the Work. Make finished Work fit indicated spaces accurately. Make finished Work flush, plumb, true to lines and levels and accurate in all respects.
- 8.5 Ensure that service poles, fill-pipes, vents, regulators, meters and similar service installations are located in inconspicuous locations. If not indicated on drawings, verify location of service installations with Consultant prior to commencing installation.
- 8.6 Ensure integrity of fire separations is maintained throughout the Work. When penetrating fire rated walls, ceiling, or floor assemblies, completely seal voids with fire-stopping materials, smoke seals, or both, in full thickness of the construction element as required to maintain the integrity of the fire rated assembly.
- 8.7 Finish access panels and doors to match adjacent wall and/or ceiling finish unless otherwise specified or indicated.
- 8.8 Keep surfaces, on which finished materials will be applied, free from grease, oil, and other contamination which would be detrimental in any way to the application of finish materials.
- 8.9 Enforce fire prevention methods at site. Do not permit fires, open flame heating devices or accumulation of debris. Use flammable materials only if all safety precautions are taken. Provide and maintain in working order ULC labelled fire extinguishers of types suitable for fire hazard in each case, and locate them in prominent location and to approval of jurisdictional authorities.
- 8.10 Where flammable materials are being applied, ensure that adequate ventilation is provided, spark-proof equipment is used, and smoking and open flames are prohibited.
- 9 DIMENSIONS**
- 9.1 Check all dimensions at the site before fabrication and installation commences and report discrepancies to the Consultant.
- 9.2 Where dimensions are not available before fabrication commences, ensure that dimensions required are agreed upon between the parties concerned.
- 9.3 Prior to commencing work, ensure that clearances required by jurisdictional authorities can be maintained
- 9.4 Wall thicknesses and openings shown on the drawings may be nominal only; ascertain actual sizes at the site.
- 9.5 Verify dimensions of shop fabricated portions of the Work at the site before shop drawings and fabrications are commenced. The Owner will not accept claims for extra expense by reason of non-compliance with this requirement.

- 9.6 Fabricate and erect manufactured items, shop fabricated items, and items fabricated on or off site, to suit site dimensions and site conditions.
- 9.7 In areas where equipment is to be installed, check dimensional data on equipment to ensure that area and equipment dimensions are compatible with necessary access and clearance provided. Ensure that equipment supplied is dimensionally suitable for space provided.
- 9.8 Leave areas clear where space is indicated to be reserved for future equipment, including access to such future equipment.
- 9.9 Whether shown on the Drawings or not, leave adequate space and provision for servicing of equipment and removal and reinstallation of replaceable items such as motors, coils and tubes.
- 10 **CONCEALMENT**
- 10.1 In finished areas, conceal pipes, ducts, conduit and wiring in floors, walls, ceilings, chases, or behind furring except where indicated otherwise:
- .1 After review by Consultant and authority having jurisdiction.
- .2 Where locations differ from those shown on Drawings, after recording actual locations on as-built drawings.
- 10.2 Provide incidental furring or other enclosures as required.
- 10.3 Notify Consultant in writing of interferences before installation.
- 11 **RELOCATION OF MECHANICAL AND ELECTRICAL ITEMS**
- 11.1 The mechanical and electrical drawings are intended to show approximate locations of mechanical apparatus, fixtures, equipment, piping and duct runs, electrical apparatus, fixtures, outlets, equipment, units, and conduit in diagrammatic form and wherein the mechanical and electrical items are not dimensioned, consider their locations to be approximate. Check the drawings and confer with the Consultant to determine the actual locations of these items as may be required to suit aesthetic and site conditions. Such relocation shall be done without change to the Contract Price.
- 11.2 Locate fixtures, outlets, and devices to provide minimum interference, maximum usable space, and as required to meet safety, access, maintenance, acoustic, and regulatory, including barrier free, requirements.
- 11.3 Promptly notify Consultant in writing of conflicting installation requirements for fixtures, outlets, and devices. If requested, indicate proposed locations and obtain approval for actual locations.

- 11.4 The Owner and the Consultant reserve the right to relocate outlets at a later date, but prior to installation, without additional cost to Owner, assuming that the relocation per outlet does not exceed 3000 mm from the original location. No credits will be anticipated where relocation per outlet of up to and including 3000 mm reduces materials, products and labour.
- 11.5 Should relocations per outlet exceed 3000 mm from the original location the Contract Price will be adjusted in accordance with the provisions for changes in the Contract Documents.
- 11.6 Alter the location of pipes and other equipment, without additional cost to the Owner, if approved, provided the change is made before installation.
- 11.7 Make necessary changes, due to lack of coordination, as required and when approved, at no additional cost, to accommodate structural and building conditions.
- 12 **EXPANSION, CONTRACTION, AND DEFLECTION**
- 12.1 Conform to manufacturer's recommended installation temperatures. If items, components, assemblies, systems, and finishes are installed at temperatures different from operation or service temperatures, make provisions for expansion and contraction in service as acceptable to manufacturer and consultant. Repair all resulting damage should expansion and contraction provisions provide inadequate.
- 12.2 Make provisions for expansion and contraction due to temperature changes within components, Products and assemblies, and between adjacent components, Products and assemblies, and due to building movements including but not limited to creep, column shortening, deflection, sway and twist. Ensure provisions for expansion, contraction and building movements prevent damages from occurring to and within components, Products and assemblies.
- 12.3 Make adequate allowance at wall and partition heads for deflection of the structure above. Determine requirements from Consultant where additional information is required. Where partitions butt to underside of floor assembly, or structural framing, the clearance shall be based on the span of the members supporting the floor or structural framing. In making such allowance use methods which maintain the integrity of the wall or partition as a sound, and/or fire barrier.
- 12.4 Make provisions in pipes, plenums, ducts and vessels containing air and fluids as is necessary to prevent damage due to fluid and air induced pressure, surges and vibrations, to pipes, plenums, ducts and vessels and to adjacent components, assemblies and construction to which pipes, ducts, plenums and vessels are attached or pass through.

13 **DIELECTRIC SEPARATION**

- 13.1 Ensure that a dielectric separator is provided in a permanent manner over entire contact surfaces to prevent electrolytic action (galvanic corrosion) between dissimilar materials. Similarly, prevent corrosion to aluminum in contact with alkaline materials such as contained in cementitious materials.

14 **PRODUCTS AT SOUND ATTENUATING PARTITIONS**

- 14.1 Avoid sound transfer at sound attenuating partitions by careful location and treatment of mechanical and electrical equipment, ducts, grilles, diffusers, electrical outlets and boxes, and similar items. Where electrical boxes are back to back, serving each side, locate them at least 250 mm apart laterally and, if interconnected, use flexible connections.

15 **FASTENINGS**

- 15.1 Include in the work of each section necessary fastenings, anchors, inserts, attachment accessories, and adhesives. Where installation of devices is in work or other sections, deliver and locate devices in ample time for installation.
- 15.2 Do not install fibre, plastic or wood plugs or blocking for fastenings in masonry, concrete, or metal construction, unless specified or indicated on drawings.
- 15.3 Install work with fastenings or adhesives in sufficient quantity to ensure permanent secure anchorage of materials, construction, components and equipment under static conditions, and to resist building thermal movement, creep and vibration.
- 15.4 Provide metal fastenings and accessories in same material, texture, colour, sheen and finish as metal on which they occur, unless indicated otherwise.
- 15.5 Prevent electrolytic action and corrosion between dissimilar metals and materials by using suitable non-metallic strips, washers, sleeves, or other permanent separators to avoid direct contact.
- 15.6 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior Work, high humidity spaces, and where attached to, or contained within, exterior walls and slabs, unless stainless steel or other material is specified. Leave steel anchors bare where cast in concrete.
- 15.7 Space anchors within their load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
- 15.8 Conceal fasteners where indicated. Keep exposed fastenings to a minimum, space evenly and in an organized symmetrical pattern.
- 15.9 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.

- 15.10 Bolts shall not project more than one diameter beyond nuts.
- 15.11 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.
- 15.12 Powder Actuated Fastenings:
- .1 Do not use powder actuated fasteners for the support of ceilings.
 - .2 Do not use powder actuated fastenings on any portion of the Work, unless written consent for a specific use is obtained from the Consultant.
 - .3 Only low velocity tools will be permitted under any condition. Operators to be qualified and to be in possession of a valid operator's certificate.
- 16 **ADJUSTING**
- 16.1 Ensure that all components of assemblies fit snugly, accurately and in true planes, and that moving parts operate positively and freely, without binding and scraping.
- 16.2 Verify that work functions properly and adjust it accordingly to ensure satisfactory operation. Lubricate Products as recommended by manufacturer.

END OF SECTION

1 LAYOUT AND SURVEY

- 1.1 Engage a registered land surveyor, licensed to practice in Place of the Work.
- 1.2 Existing grades, lines, and site conditions shown on drawings were taken from survey information established by persons engaged directly by the Owner. The accuracy of survey information is not the Consultant's responsibility. The Contractor will establish location of property lines.
- 1.3 Be responsible for setting out the Work. Prior to setting out the Work, verify dimensions and elevations shown on the Contract Documents and report to the Consultant any unsatisfactory conditions that may adversely affect the proper completion of the Work.
- 1.4 Prior to starting work at Site, set up and maintain permanent reference points and be responsible for the accuracy of such reference points. Preserve and protect permanent reference points on site during construction. Establish lines and levels required for the performance of the Work.
- 1.5 Report to Consultant when a reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations. Require registered land surveyor to replace reference points in accordance with original survey. Do not change or relocate reference points without prior written notice to Consultant.
- 1.6 Accurately set out the Work from levels and lines. Where Work of this Contract is dependent upon grades and elevations of existing structures or facilities, such grades or elevations shall take precedence over those determined by reference to established elevations. Advise the Consultant of any discrepancies.
- 1.7 During any activity of the Work, layout and check all features, including but not limited to the following:
 - .1 Lay out building on the Site.
 - .2 Establish a permanent bench mark, or markers as widely separated as possible.
 - .3 Establish and maintain temporary bench marks set in suitable locations.
 - .4 Provide general dimensions, lines and elevations required by Subcontractors.
 - .5 Verify elevations of floor and roof levels as construction proceeds and relate to bench mark datum.
 - .6 Verify that present or known future restrictions are not violated by construction on the site or lines of traverse to all public utilities.
 - .7 Correlate geodetic elevation of bench mark datum with elevations in use by public utilities adjacent to Project.

- .8 Verify accuracy of site dimensions shown on Drawings.
- .9 Provide a survey to verify location of footings immediately adjacent to property lines, before construction of footings proceeds.
- .10 Provide a survey to verify location of building related to property lines when foundation walls are completed to grade level.
- .11 Provide a survey prior to placement of asphalt and concrete paving to confirm that grades conform to grades indicated on drawings.
- .12 Provide a survey to verify location of completed building on Site.
- 1.8 Maintain a complete, accurate log of control and survey work as it progresses. Record locations with horizontal and vertical data in project record documents.
- 1.9 Examine, preserve and protect established bench marks. Re-establish a lost or displaced bench mark by a Land Surveyor licensed to practice in the place of Work at no cost to the Owner. Accept responsibility for setting out the Work.
- 1.10 In the event of a discrepancy between the Owner and the Contractor regarding horizontal and/or vertical alignment conditions, that are beyond allowable specified tolerance, the Owner may engage the services of an independent Land Surveyor. The surveyor shall investigate the disputed condition and the results of the independent investigation shall determine the bearer of costs for this service, being either the Owner or the Contractor.
- 1.11 If the Contractor is found to be in error, all costs incurred to correct the condition shall be assumed by the Contractor.
- 2 **EXISTING UTILITIES AND STRUCTURES**
- 2.1 Before commencing excavation, drilling or other earthwork, establish or confirm location and extent of all existing underground utilities and structures in work area.
- 2.2 Promptly notify Consultant if underground utilities, structures, or their locations differ from those indicated in Contract Documents or in available project information. Consultant will provide appropriate direction.
- 2.3 Record locations of maintained, re-routed and abandoned utility lines.
- 3 **VERIFICATION OF EXISTING CONDITIONS**
- 3.1 Where work specified in any Section is dependent on the work of another Section or Sections having been properly completed, verify that work is complete and in a condition suitable to receive the subsequent work. Commencement of work of a Section that is dependent on the work of another Section or Sections having been properly completed, means acceptance of the existing conditions.

- 3.2 Verify that ambient conditions are suitable before commencing the work of any Section and will remain suitable for as long as required for proper setting, curing, or drying of Products used.
- 3.3 Ensure that substrate surfaces are clean, dimensionally stable, cured and free of contaminants.
- 3.4 Notify Consultant in writing of unacceptable conditions.

END OF SECTION

1 GENERAL

- 1.1 Provide labour, Products, equipment, services, tools, and supervision necessary for cutting and patching work in accordance with the Contract Documents.
- 1.2 Obtain Consultant's approval prior to cutting, boring or sleeving load-bearing members.

2 DEFINITION(S)

- 2.1 The terms "make good", "making good", "made good", "restore to existing", "patch", "repair", or similar words or phrases are used in standards and these Contract Documents to mean the following, unless context provides otherwise:
 - .1 Make good materials and finishes which are damaged or disturbed during the process of additions and reconstruction under the Contract.
 - .2 Where existing work is to be made good, match new work exactly with the existing work in material, form, construction and finish unless otherwise noted or specified.
 - .3 Where existing work is to be made good, there shall be no visible difference in appearance, or aesthetics between the existing work and the new work by the naked eye at a distance of 3 metres [10 feet] from the surface being made good. There shall be no difference in performance between existing materials and new materials.

3 SUBMITTALS

- 3.1 Submit written request in advance of cutting or alteration which affects:
 - .1 Structural integrity of any element of the Structure or Contract.
 - .2 Integrity of weather-exposed or moisture-resistant elements.
 - .3 Efficiency, maintenance, or safety of any operational element.
 - .4 Visual qualities of sight-exposed elements.
 - .5 Work of Owner's or Other Contractors.
 - .6 Warranty of Products affected.
- 3.2 Include in request:
 - .1 Identification of Project.
 - .2 Location and description of affected Work, including drawings and sketches as required.
 - .3 Statement of 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's or Other Contractors.

.7 Written permission of affected Other Contractors.

.8 Date and time Work will be executed.

3.3 Obtain Consultant's approval of proposed method of cutting prior to proceeding with the Work.

4 **PRODUCTS**

4.1 Same quality or better than Products incorporated in original installation.

4.2 Unless otherwise specified, when replacing existing or previously installed Products in the course of cutting and patching work, use replacement Products of the same character and quality as those being replaced.

4.3 If an existing or previously installed Product must be replaced with a different Product, submit request for substitution in accordance with Section 01 25 00.

5 **PREPARATION**

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

5.2 After uncovering, inspect conditions affecting performance of the Work.

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

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

5.5 Provide protection from elements for areas which may be exposed by uncovering Work; maintain excavations free of water.

6 **EXECUTION**

6.1 Coordinate and perform the Work to ensure that cutting and patching work is kept to a minimum.

6.2 Execute Work to avoid damage to other Work.

6.3 Ensure that cutting, patching, and remedial work does not jeopardize manufacturers' warranties.

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- 6.4 Perform cutting, fitting, patching, and remedial work including excavation and fill, to make the affected parts of the Work come together properly and complete the Work.
 - 6.5 Perform cutting, patching, and remedial work using competent and qualified specialists familiar with the Products affected, in a manner that neither damages nor endangers the Work.
 - 6.6 Fit Work segments together, to integrate with penetrations through surfaces and with other Work.
 - 6.7 Remove and replace defective and non-conforming Work.
 - 6.8 Do any drilling, cutting, fitting, patching and finishing that may be required to make the various classes and kinds of other Work fit together in a professional and finished manner. Make watertight connections with adjoining structures.
 - 6.9 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
 - 6.10 Execute Work by methods to avoid damage to other Work and which will provide proper surfaces to receive patching and finishing.
 - 6.11 Cut Products using proper equipment and methods. On rigid materials, use a masonry saw or core drill. Do not use pneumatic or impact tools without Consultant's prior approval.
 - 6.12 Where new Work connects with existing structures, cut, patch and make good existing work to match original condition.
 - 6.13 Be responsible for correct formation and bridging of openings in masonry and structural walls as required.
 - 6.14 Ensure compatibility between installed Products and security of installation.
 - 6.15 Restore Work with new Products in accordance with requirements of the Contract Documents.
 - 6.16 Fit Work airtight to pipes, sleeves, ducts, conduits and other penetrations through surfaces.
 - 6.17 Provide proper surfaces to receive patching, remedial work, and finishing.
 - 6.18 Refinish surfaces to match adjacent finishes. For continuous surfaces refinish to nearest intersection; for an assembly, refinish entire unit.
 - 6.19 Fit work to pipes, sleeves, ducts, conduit, and other penetrations through surfaces with suitable allowance for deflection, expansion, contraction, acoustic isolation, and firestopping.

- 6.20 Maintain fire ratings of fire rated assemblies where cutting, patching, or remedial work is performed. Completely seal voids or penetrations of assembly with firestopping material to full depth or with suitably rated devices
- 6.21 Existing utilities:
- .1 When breaking into or connecting to existing services' utilities, execute the Work at times directed by local governing authorities, with a minimum of disturbance to the Work, pedestrian and vehicular traffic, and ongoing Owner operations. Inform Owner and Consultant a minimum of 72 hours prior to breaking into or connecting to existing services' and utilities.
 - .2 Maintain excavations free of water.
 - .3 Keep duration of interruptions to a minimum.
 - .4 Carry out interruptions after regular working hours of occupants, preferably on weekends, unless Owner's prior written approval is obtained.
 - .5 Protect and maintain existing active services. Record location of services, including depth, on as-built drawings.
 - .6 Construct or erect barriers in accordance local governing authorities as required to protect pedestrian and vehicular traffic.

END OF SECTION

1 REGULATORY REQUIREMENTS

- 1.1 Comply with applicable regulatory requirements when disposing of waste materials.
- 1.2 Obtain permits from authorities having jurisdiction and pay disposal fees where required for disposal of waste materials and recyclables.

2 GENERAL CLEANING REQUIREMENTS

- 2.1 Provide adequate ventilation during use of volatile or noxious substances. [Do not rely on building ventilation systems for this purpose.]
- 2.2 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- 2.3 Prevent cross-contamination during the cleaning process.
- 2.4 Notify the Consultant of the need for cleaning caused by Owner or other contractors.

3 PROGRESS CLEANING AND WASTE MANAGEMENT

- 3.1 Maintain the Work in a tidy and safe condition, free from accumulation of waste materials and construction debris.
- 3.2 Ensure that only cleaning materials are used which are recommended for the purpose by both the manufacturer of the surface to be cleaned and of the cleaning material.
- 3.3 Provide appropriate, clearly marked, containers for collection of waste materials and recyclables.
- 3.4 Remove waste materials and recyclables from work areas, separate, and deposit in designated containers at end of each Working Day. Collect packaging materials for recycling or reuse.
- 3.5 Maintain building work areas "broom clean" at least on a daily basis, but shall also be done immediately before finishing work.
- 3.6 Remove from finish work, spatters, droppings, soil, labels, and debris, before they set up.
- 3.7 No waste material may be burned or buried at site. Remove as often as required to avoid accumulation, no less than, at the end of each working day.
- 3.8 Remove packaging materials and debris from the site immediately after product and equipment is unwrapped or uncrated.
- 3.9 Ensure that volatile fluid wastes are not disposed of in storm or sanitary sewers, in open drain courses, or anywhere on site.

- 3.10 Do not allow waste material and debris to accumulate in an unsightly or hazardous manner. Sprinkle dusty accumulations with water. Provide containers in which to collect waste material and debris. Dispose of hazardous products in accordance with requirements of jurisdictional authorities.
- 3.11 Clean interior building areas prior to start of finish work and maintain free of dust and other contaminants during finishing operations.
- 3.12 Ensure that cleaning operations are scheduled to avoid deposits, of dust or other foreign matter on surfaces during finishing work and until wet or tacky surfaces are cured.
- 3.13 Provide instructions for final cleaning of finishing work, and for inclusion in Maintenance and Operating Manuals.

4 **FINAL CLEANING**

- 4.1 In addition to requirements for progress cleaning, Work shall include final cleaning by professional cleaning specialists on completion of construction.
- 4.2 Before final cleaning, arrange a meeting at Place of the Work to determine the acceptable standard of cleaning. Ensure that Owner, Consultant, Contractor and cleaning company are in attendance.
- 4.3 Remove from Place of the Work surplus Products, waste materials, recyclables, Temporary Work, and Construction Equipment not required to perform any remaining work.
- 4.4 Before final inspection, replace glass and mirrors broken, damaged, and etched during construction, or which are otherwise defective.
- 4.5 Remove waste material and debris from crawlspaces and other accessible concealed spaces.
- 4.6 Remove temporary protections and make good defects before commencement of final cleaning.
- 4.7 Final cleaning shall remove dust, stains, paint spots, soil, grease, fingerprints, and accumulations of construction materials, interior and exterior to the building for all new work throughout new and existing Building. Work shall be done in accordance with manufacturer's instructions for each material. This work shall include:
 - .1 Washing of exterior paved surfaces, and of interior stone, brick, and concrete floors.
 - .2 Remove stains, spots, marks, and dirt from exterior facades.
 - .3 Clean exterior and interior window glass and frames.
 - .4 Cleaning and polishing of glass, mirrors, porcelain, enamel and finish metals.

- .5 Remove dust from lighting reflectors, lenses, lamps, bulbs, and other lighting surfaces.
- .6 Vacuum cleaning of ceilings, walls and floors, and behind grilles, louvres and screens.
- .7 Cleaning and polishing of terrazzo and ceramic and quarry tile floors.
- .8 Cleaning of resilient flooring.
- .9 Buffing of resilient flooring followed by two light coats of wax, each buffed.
- .10 Washing clean of glazed wall surfaces.
- .11 Cleaning of hardware, mechanical fixtures, plumbing fixtures, lighting fixtures, cover plates, and equipment, including polishing of their finish metal, porcelain, vitreous, and glass components. Replace filters for mechanical equipment if equipment is used during construction.
- .12 Cleaning of windows, entrances and skylights, both interior and exterior surfaces.
- 4.8 Lock or otherwise restrict access to each room or area after completing final cleaning in that area.
- 4.9 Re-clean as necessary areas that have been accessed by Contractor's workers prior to Owner occupancy.
- 5 **WASTE AUDIT, MANAGEMENT AND DISPOSAL**
- 5.1 Prepare and submit waste audit and waste reduction plan in accordance with Ontario Regulation 102/94 Waste Audits and Waste Reduction Workplans.
- 5.2 Prepare and submit source separation plan in accordance with Ontario Regulation 103/94 Industrial, Commercial and Institutional Source Separation Programs.
- 5.3 Dispose of waste materials and recyclables at appropriate municipal landfills and recycling facilities in accordance with applicable regulatory requirements.
- 5.4 Deliver to nearest appropriate depot all materials accepted for recycling by the region or municipality having jurisdiction over the Place of Work, including but not limited to cardboard, paper, plastic, aluminum, steel, and glass. Deliver to nearest appropriate depot all scrap and excess gypsum wallboard for recycling of this material. Pay all costs for this work.
- 5.5 Do not burn or bury waste materials at Place of the Work.

- 5.6 Do not dispose of volatile and other liquid waste such as mineral spirits, oil, paints and other coating materials, paint thinners, cleaners, and similar materials together with dry waste materials or on the ground, in waterways, or in storm or sanitary sewers. Collect such waste materials in appropriate covered containers, promptly remove from Place of the Work, and dispose of at recycling facilities or as otherwise permitted by applicable regulatory requirements.
- 5.7 Cover or wet down dry waste materials to prevent blowing dust and debris.

END OF SECTION

1 DEMONSTRATION AND INSPECTION OF PRODUCTS AND SYSTEMS

- 1.1 Arrange for a demonstration of equipment, systems and operating Products upon the 100% completion of their installation, testing, adjusting and balancing has been performed, equipment and systems are fully operational, completed operation and maintenance manual is available, and prior to application for Ready-for-Takeover.
- 1.2 Include in the arrangements for the attendance of the Consultant, Owner, jurisdictional authorities, and personnel assigned by the Owner for the operation of the systems and/or Products.
- 1.3 Demonstrations shall be conducted by the Subcontractor responsible for the installation of the systems and/or Product, assisted by representatives of the manufacturer or supplier. All personnel conducting the demonstration shall be completely knowledgeable of all conditions of the operating, functioning and maintenance of the systems and/or Products.
- 1.4 Subcontractor to demonstrate start up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment and system.
- 1.5 Owner's representative will acknowledge the successful completion of each demonstration on a form provided by the Contractor. The form shall be agreed to by the Owner, Consultant and Contractor prior to demonstration and testing.
- 1.6 Submit report(s) within 5 Working Days after completion of demonstration and inspection:
 - .1 Identifying time and date of each demonstration and training session,
 - .2 Summarizing the demonstration and training performed, and
 - .3 Including a list of attendees.
- 1.7 Submit copies of letters from manufacturers of Systems and/or Products before making application for Ready-for-Takeover to verify that the Products have been installed and connected correctly, and that they are operating in a satisfactory manner. The certification shall be based upon inspection and testing of the Products by competent technical personnel. Include in letter of certification the names of personnel conducting the testing and inspection, the methods of inspection utilized, and the location in the building of the Products certified.
- 1.8 Following submission of letters of certification and their acceptance by the Owner, the Owner shall have the right to use the Products on a trial basis and for instructing their personnel in its use.

2 FINAL INSPECTIONS AND CLOSE OUT

- 2.1 Submit proposed closeout procedures and schedule of inspection to Consultant for approval before final demonstrations and inspections commence.

- 2.2 Submit layout and survey requirements required by Owner and Authorities having jurisdiction.
- 2.3 Arrange for, conduct and document final demonstrations, inspections, close-out and take-over at completion of the Work in accordance with procedures described in OAA/OGCA TAKE-OVER PROCEDURES, OAA/OGCA Document No. 100. Where "Architect" is referred to in Document No. 100 it shall mean Consultant.
- 3 CERTIFICATE OF COMPLIANCE**
- 3.1 Submit Certificates of Compliance, prior to the application for Ready-for-Takeover for each of the following items.
- .1 An affidavit relative to the use of lead-free solder for all domestic water lines, regardless of location.
- .2 Products for which Safety Data Sheets have been submitted and accepted.
- .3 Other Work/Products identified in the Contract Documents as requiring a Certificate of Compliance.
- 3.2 Each Certificate of Compliance shall indicated names and addresses of the project, the Owner, the date of issue, product description including name, number, manufacturer, with a statement verifying that the Work/Product installed meets specified requirements and, if applicable, complies with the submitted and accepted Safety Data Sheets.
- 3.3 Each Certificate of compliance shall be issued on the subcontractor's letterhead, properly executed, under whose work the prospective Work/Product has been provided.
- 3.4 Each Certificate of Compliance shall be endorsed by the Contractor with his authorized stamp/signature. Ensure that submissions are made to allow sufficient time for review without delaying progress of scheduled completion.
- 4 READY-FOR-TAKEOVER**
- 4.1 The prerequisites to attaining Ready-for-Takeover of the Work are described in the General Conditions of the Contract.
- 5 INSPECTION AND REVIEW BEFORE READY-FOR-TAKEOVER**
- 5.1 Contractor's Inspection: Before applying for the Consultant's review to establish Ready-for-Takeover of the Work:
- .1 Ensure that the specified prerequisites to Ready-for-Takeover of the Work are completed.
- .2 Conduct an inspection of the Work to identify defective, deficient, or incomplete work.

- .3 Prepare a comprehensive and detailed list of items to be completed or corrected.
- .4 Provide an anticipated schedule and costs for items to be completed or corrected.
- 5.2 **Consultant's Review:** Upon receipt of the Contractor's application for review, together with the Contractor's list of items to be completed or corrected, the Consultant and the Contractor shall arrange a mutually satisfactory agreed date and time to jointly review the Work. The Consultant will advise the Contractor whether or not the Work is Ready-for-Takeover and will add additional items, if any, to the Contractor's list of items to be completed or corrected. Provide the Consultant with a copy of the revised list.
- 5.3 Maintain the list of items to be completed or corrected and promptly correct or complete defective, deficient and incomplete work. The Contractor's inspection and Consultant's review procedures specified above shall be repeated until the Work is Ready-for-Takeover and no items remain on the Contractor's list of items to be completed or corrected.
- 5.4 When the Consultant determines that the Work is Ready-for-Takeover, the Consultant will notify the Contractor and the Owner in writing to that effect.
- 6 **PREREQUISITES TO FINAL PAYMENT**
- 6.1 After Ready-for-Takeover of the Work and before submitting an application for final payment in accordance with the General Conditions of Contract:
 - .1 Correct or complete all remaining defective, deficient, and incomplete work.
 - .2 Remove from the Place of the Work all remaining surplus Products, Construction Equipment, and Temporary Work.
 - .3 Perform final cleaning and waste removal necessitated by the Contractor's work performed after Ready-for-Takeover, as specified in Section 01 74 00.
- 7 **SUBSTANTIAL PERFORMANCE OF THE WORK**
- 7.1 The prerequisites to, and the procedures for, attaining Substantial Performance of the Work, or similar such milestone as provided for in the lien legislation applicable to the Place of the Work, shall be:
 - .1 Independent of those for attaining Ready-for-Takeover of the Work, and
 - .2 In accordance with the lien legislation applicable to the Place of the Work.

- 7.1 Submit one copy of completed volumes in final form 15 days prior to substantial performance. For equipment put into use with Owner's permission during construction, submit Operating and Maintenance Manuals within 10 days after start up. For items of Work delayed materially beyond date of Substantial Performance, provide updated submittal within 10 days after acceptance, listing date of acceptance as start of warranty period.
- .1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
 - .2 Copy will be returned after inspection with Consultant's comments.
 - .3 Revise content of documents as required prior to final submittal.
 - .4 Submit 2 copies of revised volumes of data in final form within 10 days after final inspection, and submit one digital copy on USB.
 - .5 For contract drawings (architectural, structural, mechanical, and electrical), transfer neatly as built notations onto second and third set and submit all three sets. Preliminary submission of all manuals is required for Substantial Completion to be issued. Submission of final manuals to the Consultant is a mandatory requirement of Total Performance of the Contract.

END OF SECTION

1 **GENERAL**

- 1.1 Prepare closeout submittals and comprehensive operation and maintenance manual, using personnel qualified and experienced for this task.
- 1.2 Hand over to the Consultant two (2) copies of closeout submittals and comprehensive operations and maintenance manual and material suitable for the Owner's maintenance employees. Manuals shall cover all Products supplied and installed under the Contract.
- 1.3 Closeout submittals to be in a format acceptable to Owner.
- 1.4 Submit draft of closeout submittals including operation and maintenance manuals for the Consultant's review at least 15 days before testing systems and equipment. Incorporate alterations and additions, as found to be necessary during testing, and prepare the final version of the manual from the corrected draft.
- 1.5 Submit final version of closeout submittals including operation and maintenance manuals prior to Ready-for-Takeover.
- 1.6 Testing of systems and equipment will not be deemed to be complete until the requisite number of copies of the final version of the manuals has been handed over to Consultant.
- 1.7 If standard literature is incorporated into the operations and maintenance manual, any irrelevant information shall be deleted, or suitably noted.
- 1.8 The manuals shall have sufficient detail in order that the Owner can totally maintain the equipment without outside help.
- 1.9 Submit all material in English.

2 **FORMAT**

- 2.1 Organize data in the form of an instructional manual.
- 2.2 Arrange content by systems or process flow, under Section numbers and sequence of Table of Contents.
- 2.3 Provide tabbed fly leaf for each separate Product and system, with typed description of Product and major component parts of equipment.
- 2.4 Provide tabbed fly leaf for Products and systems which are supplied by the Owner but installed as part of the Work of this Contract.
- 2.5 Text: Manufacturer's printed data, or typewritten data.
- 2.6 Provide electronic copy of manual in PDF format.

- 2.7 Provide electronic copy of Shop Drawings in manual as 1:1 scaled CAD files in .dwg format on electronic media acceptable to Owner.
- 3 **OPERATION AND MAINTENANCE MANUAL CONTENT**
- 3.1 Operation and maintenance manuals shall contain the following minimum information and data:
- .1 Table of contents.
 - .2 Introductory information:
 - .1 Provide date of manual submission.
 - .2 Title of Contract, complete contact information for Consultants, subconsultants, Contractor, and subcontractors with name of responsible parties.
 - .3 Schedule of Products and systems, indexed to content of the volume.
 - .3 For each Product or system: Include complete contact information for Subcontractors, suppliers, manufacturer's, and service representatives, including local source of replacement supplies and parts.
 - .4 Product Data:
 - .1 Mark each sheet to clearly identify specific products, options, and component parts, and data applicable to installation. Delete or strike out inapplicable information. Supplement with additional information as required.
 - .2 Drawings: Supplement Product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams and as required in the Specifications.
 - .3 Typed text: As required to supplement Product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions and as required in the Specification.
 - .5 Complete set of reviewed Shop Drawings.
 - .6 Permits, certificates, letters of assurance and other relevant documents issued by or required by authorities having jurisdiction.
 - .7 Warranties: Warranties are between the Contractor and Owner. Warranties shall include, as a minimum:
 - .1 Separate each warranty with index tab sheets keyed to Table of Contents listing.
 - .2 List each warrantor with complete contact information.
 - .3 Verify that documents are in proper form and contain full information. Ensure that warranties are for the correct duration and are in Owner's name.
 - .4 Description of warranty coverage.
 - .5 Date warranty starts (being date of Ready-for-Takeover).
 - .6 Date warranty expires.

- .7 Contact name, address and phone number (the Contractor shall also be responsible for advising the Owner of changes in contact information during the warranty period).
- .8 Equipment and components performance curves.
- .9 Hydro certificates.
- .8 Reports: For each Product or system provide the following:
 - .1 Manufacturer's certified reports.
 - .2 Factory test reports.
 - .3 Field testing reports.
- .9 Details of design, construction and/or fabrication features, component function and maintenance requirements, to permit effective start-up, operation, maintenance, repair, modification, extension and expansion of any portion or feature of the installation.
- .10 Technical data, Product data, supplemented by bulletins, component illustrations, detailed views, technical descriptions of items and parts lists.
- .11 Operating and maintenance procedures, incorporating manufacturer's operating and maintenance instructions, in a logical sequence.
- .12 Equipment and systems content:
 - .1 Each item of equipment and each system: Include description of unit or system and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
 - .2 Schematic and wiring diagrams, wiring interconnection lists and diagrams fully cross referenced and coordinated, printed circuit board layouts including the component identification, component parts list with electronic substitution equivalent. Provide cross referenced components lists and sequence of operations.
 - .3 Panel board circuit directories: Provide electrical service characteristics, controls, and communications.
 - .4 Include installed colour coded wiring diagrams.
 - .5 Operating procedures: Include start up, break in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut down, and emergency instructions. Include summer, winter, and any special operating instructions.
 - .6 Maintenance requirements: Include routine procedures and guide for trouble shooting and fault location; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
 - .7 Provide servicing, preventative maintenance, and lubrication schedule, and list of lubricants required.
 - .8 Include manufacturer's printed operation and maintenance instructions.
 - .9 Include sequence of operation by controls manufacturer.
 - .10 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

- .11 Provide installed control diagrams by controls manufacturer.
 - .12 Provide Contractor's coordination drawings, with installed colour coded piping diagrams.
 - .13 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
 - .14 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
 - .15 Include testing and balancing reports.
 - .16 Include additional content as specified in technical Specifications sections.
- .13 Product and finishes:
- .1 Include Product data, with specific Product, component parts, and catalogue number, options selected, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured Products. Delete inapplicable information.
 - .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
 - .3 Include an outline of requirements for routine and special inspections and for regular maintenance to ensure that on-going performance of the building envelope will meet the initial building envelope criteria.
 - .4 Include additional content as specified in technical Specifications sections.
- .14 As-built drawings: Submit final as-built drawings in the form specified in Section 01 32 00.
- .15 Training materials.

4 TRANSMITTAL

- 4.1 Forward storage media to the Owner through the Consultant with a transmittal form. Transmittal shall contain the list of file names contained on the storage media.
- 4.2 Data forwarded to the Owner shall contain the following files in addition to the design information:
- .1 Library parts used in the design files.
 - .2 Level convention used for each design file.
 - .3 Plotting instructions used to prepare hard copies including colour tables, pen tables and plot scale.
 - .4 Working units of the design files.
 - .5 Font library, if the standard is not used.

5 PROJECT RECORD DRAWINGS

- 5.1 Transfer all information marked up on the as-built drawings during the progress of the Work to a master set of record drawing files provided by Consultant, in electronic format agreed to with Owner.
- 5.2 Mark revised drawings as "RECORD DRAWINGS".
- 5.3 Submit completed record drawings in electronic form to Owner.
- 5.4 Retain the services of a CAD drafting company acceptable to the Consultant;
 - .1 Transfer to digital file all information recorded on As Built drawings. Layering of information as per Consultant's instructions;
 - .2 The Consultant will provide CAD file of contract document.
 - .3 The cost for preparing digital As Built drawings will be deducted from the Cash Allowances.

6 SPARE PARTS, MAINTENANCE MATERIALS AND SPECIAL TOOLS

- 6.1 Supply spare parts, maintenance materials, and special tools in quantities specified in technical Specifications sections.
- 6.2 Ensure spare parts and maintenance materials are new, not damaged nor defective, and of same quality, manufacturer, and batch or production run as installed Products.
- 6.3 Provide tags for special tools identifying their function and associated Product.
- 6.4 Deliver to and store items at location directed by Owner at Place of the Work. Store in original packaging with manufacturer's labels intact and in a manner to prevent damage or deterioration.
- 6.5 Catalogue all items and submit to Consultant an inventory listing organized by Specifications section. Include Consultant reviewed inventory listing in operation and maintenance manual.

END OF SECTION

1 EXTENDED OR SPECIAL WARRANTIES

- 1.1 Conform to requirements of Warranty General Conditions.
- 1.2 Provide in writing, extended warranties having warranty periods greater than 1 year in duration.
- 1.3 Provide extended warranties for the stipulated Work and for duration's specified in each trade Section.
- 1.4 Wherever equipment manufacturers make available extended warranties/guarantees on parts and components of equipment, the Contractor shall be responsible for obtaining product extended warranties/guarantees on behalf of the Corporation from the manufacturers.

2 LIST OF EXTENDED OR SPECIAL WARRANTIES

- 2.1 The following is a compilation of extended or special warranties which extend beyond the 12 months required under the General Conditions of Contract or which have special conditions attached to them.
- 2.2 This list is given for convenience only and may not be complete. There may exist warranties in Specifications or elsewhere in Contract Documents, or warranties may be available for products supplied for the Work without such warranties being stipulated in the Contract Documents. All such warranties are applicable and in force whether listed in this summary or not.

SECTION	WORK, SYSTEM OR PRODUCT	WARRANTY PERIOD
07 50 00	Roof and Roof Openings -CRCA Warranty - Roof and Sheet Metal	2 years 5 years
07 52 00	Modified Bituminous Roof -CRCA Warranty - Manufacturer warranty	2 years 10 years
07 92 00	Sealants	2 years
08 44 00	Aluminum Windows Sealed Unit	5 years 10 years
08 70 00	Finish Hardware - Door Closer	3 years 5 years
09 91 00	Painting	2 years

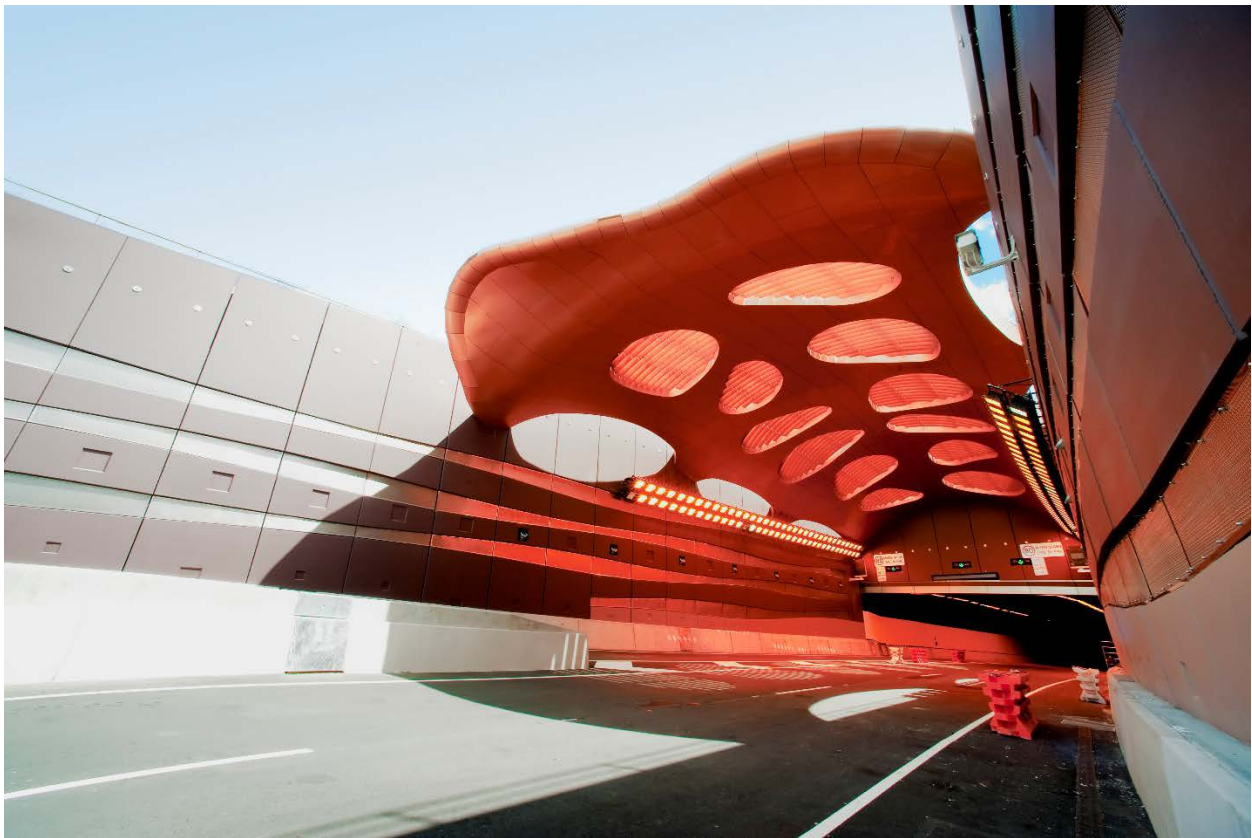
END OF SECTION

REPORT NO. CA0021623.7941 Task 002

DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS ABATEMENT SPECIFICATIONS

GLENFOREST SECONDARY SCHOOL - INDOOR POOL DEMOLITION

February 22, 2024



SECTION 02 80 00.00

**HAZARDOUS MATERIAL
ABATEMENT OVERVIEW**



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Mississauga, ON

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PART 1 - GENERAL

1.1 General and Related
Work

- .1 Read this section in conjunction with all other sections, so as to comply with the requirements of this bid.
 - .2 Where there is conflict of information and/or requirements specified between the specification, reports and drawings, the most stringent shall apply.
 - .3 Related work specified elsewhere:
 - Section 02 8200 Asbestos Abatement [Type 1].
01
 - Section 02 8200 Asbestos Abatement [Type 2].
02
 - Section 02 8200 Asbestos Abatement [Type 3].
03
 - Section 02 8310 Lead Disturbance Minimum (Class 1) Precautions
 - Section 02 8311 Lead Disturbance Intermediate (Class 2) Precautions
 - Section 02 8312 Lead Disturbance Maximum (Class 3) Precautions

Appendix A *"Bulk Asbestos Sampling Report - Roof Assessment of Indoor Pool - Glenforest Secondary School, Mississauga, ON"* (Report issued by WSP dated February 12, 2024) and *"Hazardous Building Materials Assessment (Pre-construction) Glenforest secondary School Indoor Pool Demolition 3575 Fieldgate Drive, Mississauga, Ontario"* (Report issued by Pinchin dated August 1, 2023)
 - .4 The assessment reports identify the locations and condition of all known asbestos-containing materials to be disturbed by the work of this project. The specification fulfills the requirements of the report required by Ontario Regulation 278/05, Section 10, and Subsections (1) to (6).
 - .5 Contractor shall be responsible for procurement and payment of all permits and inspections required to complete the decommissioning from the appropriate authorities. Submit copies of all permits and certifications to the Owner's representative.
-

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- .6 The following identified asbestos-containing materials are expected to be disturbed as part of the project:

Friable

- Previously identified parging cement insulation on piping on the Balcony.

Non-Friable

- Black tar on the wall near Lower Roof 2.
- Previously identified drywall joint compound in the Lobby and Custodian Room.
- Previously identified mortar of exterior brick of the building.
- Previously identified mortar of block walls in the Gym Storage and Custodian Room.
- Previously identified grey caulking on control joints in the Pool Area and on Exterior window and door frames.
- Previously identified black caulking between the wall and door frame of the Entrance Vestibule.
- Previously identified beige caulking between the wall and door frame of the Gym Storage.
- Previously identified Transite piping in the Phys. Ed. Room and Gym Storage.
- Previously identified gaskets in Filter Room.

- .7 Contractor is responsible for reviewing the architectural, mechanical and electrical specifications to determine the quantities of the above noted materials that may be disturbed as part of the project.
- .8 In addition, other designated substances identified within the "*Bulk Asbestos Sampling Report - Roof Assessment of Indoor Pool - Glenforest Secondary School, Mississauga, ON*" (Report issued by WSP dated February 12, 2024) and "*Hazardous Building Materials Assessment (Pre-construction) Glenforest secondary School Indoor Pool Demolition 3575 Fieldgate Drive, Mississauga, Ontario*" (Report issued by Pinchin dated August 1, 2023); may be disturbed as part of this scope of work.
- .9 If unidentified materials (i.e., buried service lines, sealants on pipe threads, etc.) are discovered during construction, work is required to halt, and the owner is notified.
- .10 Any disturbances to the identified designated substances must follow the procedures outlined in Sections 02 8200 01 - Asbestos Abatement Type 1, 02
-

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8200 02 - Asbestos Abatement Type 2 and 02 8200 03 - Asbestos Abatement Type 3, 02 83 10 - Lead Abatement Minimum Precautions, 02 83 11 - Lead Abatement Intermediate Precautions and 02 83 12 - Lead Abatement Maximum Precautions.

PART 2 - SITE CONDITIONS

2.1 General

- .1 The work area will be occupied during this project unless noted otherwise in the bid documents.
- .2 The water supply within the building will be available for the Contractor's use.
- .3 Use of permanent building power will be available during the work.
- .4 The reports entitled "*Bulk Asbestos Sampling Report - Roof Assessment of Indoor Pool - Glenforest Secondary School, Mississauga, ON*" (Report issued by WSP dated February 12, 2024) prepared by WSP and "*Hazardous Building Materials Assessment (Pre-construction) Glenforest secondary School Indoor Pool Demolition 3575 Fieldgate Drive, Mississauga, Ontario*" (Report issued by Pinchin dated August 1, 2023) prepared by Pinchin form parts of the Site Conditions of this Section of the Specification. The aforementioned reports are listed in Appendix A of the Specifications. These reports will be referred to in the Specifications as the "Hazardous Building Materials Reports".

2.2 Designated Substances

- .1 Mercury
 - .1 Mercury is present in fluorescent light tubes throughout the proposed work areas. If disturbed as a part of the scope of work for the project, the contractor is responsible for the verification of quantities and locations on site and removal of all mercury-containing materials and products prior to renovation.
 - .2 Mercury is presumed to be present in within ampules the thermostats throughout the proposed work areas. If disturbed as a part of the scope of work for the project, the contractor is responsible for the verification of quantities and locations on site and removal of all mercury-containing materials and products prior to renovation.
- .2 Silica
 - .1 Crystalline silica is present in all brick, concrete, cement and mortar throughout the building.
- .3 Lead
 - .1 Lead is assumed to be present as a component in ceramic building products such as tiles and bricks throughout the building.
 - .2 Lead is assumed to be present as a component of the

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- solder on sweated joints between copper pipe and fittings throughout the building.
- .3 Lead is assumed to be present as a component of the solder on wire connections of electric components throughout the building.
- .4 Lead was found to be present in the following paint materials:
- Brown paint observed on the metal flashing throughout the roof.
 - Red paint observed on ladder on the roof.
 - Yellow paint observed on pipes (natural gas lines) throughout the lower roofs.
 - Previously identified grey paint on concrete floor in Fan Room.
 - Previously identified light grey paint on concrete floor in Filter Room.
 - Previously identified red paint on concrete floor in Filter Room.
 - Previously identified off-white paint on metal duct in Filter Room.
 - Previously identified off-white paint on masonry wall in Filter Room.
 - Previously identified yellow paint on concrete floor in Filter Room.
 - Previously identified white paint on concrete wall in Filter Room.
 - Previously identified off-white paint on block wall on Balcony.
 - Previously identified dark grey paint on concrete floor on Balcony.
 - Previously identified green paint on block wall underneath on Balcony.
 - Previously identified black paint on concrete wall in East Stairwell.
 - Previously identified dark grey paint on metal door on Balcony.
 - Previously identified beige paint on block wall in Men's Change Room.
 - Previously identified light grey paint on block wall in Supervisor Office.
 - Previously identified grey paint on metal door in Mechanical Room and Stairwell.
 - Previously identified blue on metal door in Pool Office.
 - Previously identified light beige paint on block wall in Indoor Pool.
 - Previously identified dark red paint on structural steel in Men's Washroom.
 - Previously identified beige paint on block wall in Gym Storage.
 - Previously identified blue paint on concrete floor in Gym Storage.
-

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- Previously identified light teal paint on metal door in Phys. Ed. Room.
- Previously identified teal paint on concrete wall in Storeroom.
- Previously identified light yellow paint on drywall in Custodian.
- Previously identified light yellow paint on block wall in Custodian.
- Any paint observed to be visually similar to the above noted lead-containing paints.

Refer to the Tables and Drawings in the Hazardous Building Materials Reports for more details on approximate locations.

- .4 Asbestos
- .1 Approximate locations are provided in the Drawings in the Hazardous Building Materials Reports. The locations are just approximations to be used as an aid for Contractors and is not to be used solely for bidding purposes. Refer to 1.1.6 above for expected abatement scope of work. Contractor is responsible for reviewing the architectural, mechanical and electrical specification to determine the asbestos-containing materials that require removal as part of this project. The following list summarizes the materials which have been identified as asbestos-containing within the work areas.
- .1 Black Tar
- .1 Black tar observed on the wall near Lower Roof 2. Refer to the Tables and Drawings in the Hazardous Building Materials Report for more details on approximate locations.
- .2 Previously Identified Drywall Joint Compound
- .1 Previously identified drywall joint compound observed in the Lobby and Custodian Room. Refer to the Tables and Drawings in the Hazardous Building Materials Report for more details on approximate locations.
- .3 Previously Identified Mortar
- .1 Previously identified mortar observed on the exterior brick of the building. Refer to the Tables and Drawings in the Hazardous Building Materials Report for more details on approximate locations.
- .4 Previously Identified Mortar
- .1 Previously identified mortar observed on the block walls in the Gym Storage and Custodian Room. Refer to the Tables and Drawings in the Hazardous Building Materials Report for more details on approximate locations.
- .5 Previously Identified Parging Cement Insulation
- .1 Previously identified parging cement

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insulation observed on the piping on the Balcony. Refer to the Tables and Drawings in the Hazardous Building Materials Report for more details on approximate locations.

- .6 Previously Identified Grey Caulking
 - .1 Previously identified grey caulking observed on control joints in the Pool Area and on Exterior window and door frames. Refer to the Tables and Drawings in the Hazardous Building Materials Report for more details on approximate locations.
- .7 Previously Identified Black Caulking
 - .1 Previously identified black caulking observed between the wall and door frame of the Entrance Vestibule. Refer to the Tables and Drawings in the Hazardous Building Materials Report for more details on approximate locations.
- .8 Previously Identified Beige Caulking
 - .1 Previously identified beige caulking observed between the wall and door frame of the Gym Storage. Refer to the Tables and Drawings in the Hazardous Building Materials Report for more details on approximate locations.
- .9 Previously Identified Transite Piping
 - .1 Previously identified Transite piping observed in the Phys. Ed. Room and Gym Storage. Refer to the Tables and Drawings in the Hazardous Building Materials Report for more details on approximate locations.
- .10 Previously Identified Gaskets
 - .1 Previously identified gaskets observed in the Filter Room. Refer to the Tables and Drawings in the Hazardous Building Materials Report for more details on approximate locations.
- .5 PCB's
 - .1 Light ballasts containing PCBs should be expected to be present in original fluorescent light fixtures throughout the building. It is not expected that these will be disturbed during this work.

PART 3 - OUTLINE OF WORK

- 3.1 General
 - .1 Provide heat where necessary to perform the work.
 - .2 Provide necessary cranes, lifting devices, scaffolding, elevated work platforms, safety equipment and testing to ensure worker safety.
 - .3 Develop and submit to Owner a Site-Specific Health,

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Safety and Environment Plan detailing handling of hazardous materials and proposed disposal alternatives for hazardous waste at the site.

- .4 All waste must be removed from the property as soon as possible and disposed of following all Federal, Provincial and Municipal Regulations.
- .5 Hazardous waste materials must be properly identified, handled, stored, and transported in accordance with all applicable legislation (i.e. Dangerous Goods Transportation Act, Occupational Health and Safety Act, Environmental Protection Act, etc.).

3.2 Designated Substances

- .1 Mercury
 - .1 If required, collect and recycle all mercury contained in fluorescent light bulbs and metal halide lights.
- .2 Lead
 - .1 Remove and dispose of all lead-containing materials in accordance with the applicable Sections 02 83 00 of this Specification as well as in accordance with the Ministry of Labour, Immigration, Training and Skills Development (MLITSD) Guideline - Lead on Construction Projects, September 2004 (Revised April 2011). Contractor is responsible for the verification and removal of all lead-containing materials including leachate analysis.
 - .2 Grinding, cutting or demolition of materials containing lead shall be completed only with proper respiratory protection and adequate worker safety protection. Fume generating activities should not be utilized for removal.
- .3 Asbestos
 - .1 Removal of articles remaining in the facility at commencement of the work is the responsibility of Contractor.
 - .2 Wipe down or HEPA vacuum all loose articles and equipment prior to asbestos removal work.
 - .3 Remove and dispose of all asbestos-containing materials identified in the Project Drawings and Hazardous Building Materials Report in accordance with the applicable Sections of this Specification. Contractor is responsible for the verification and removal of all asbestos-containing materials prior to any interior renovation work that has the potential to disturb such materials.
 - .4 The removal of all asbestos-containing materials must be conducted in accordance with the requirements of Ontario Regulation 278/05 and Sections 02 8200 01, 02 8200 02 and 02 8200 03.
- .4 Silica
 - .1 Construction disturbance of silica-containing products may result in excessive exposure to airborne silica, especially if performed indoors.
 - .2 Grinding, cutting or demolition of materials containing silica shall be completed only with proper respiratory protection and adequate worker

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safety protection.

- .5 PCB's
- .1 If disturbed by the scope of the project, contractor is responsible for the verification and removal of all PCB-containing materials.

PART 4 - REMOVAL PROCEDURES4.1 Asbestos-Containing
Materials

- .1 Black Tar
- .1 Removal of black tar can be completed following Type 1 asbestos abatement procedures, provided that the material is wetted, and non-powered hand tools are used, as per Section 02 8200 01 and Ontario Regulation 278/05.
- .2 If power tools with a HEPA filter attachment are to be used, this material can be removed following Asbestos Abatement - Type 2 procedures as per Section 02 8200 02 and Ontario Regulation 278/05.
- .3 If power tools without a HEPA filter attachment are used, this material can be removed following Asbestos Abatement - Type 3 procedures as per Section 02 8200 03 and Ontario Regulation 278/05.
- .2 Previously Identified Drywall Joint Compound
- .1 Removal of drywall joint compound can be completed following Type 1 asbestos abatement procedures, provided less than one square meter is being removed, as per Section 02 8200 01 and Ontario Regulation 278/05.
- .2 If removal of one square meter or more, this material must be removed following Asbestos Abatement - Type 2 procedures as per Section 02 8200 02 and Ontario Regulation 278/05.
- .3 Previously Identified Mortar
- .1 Removal of mortar can be completed following Type 1 asbestos abatement procedures, provided that the material is wetted, and non-powered hand tools are used, as per Section 02 8200 01 and Ontario Regulation 278/05.
- .2 If power tools with a HEPA filter attachment are to be used, this material can be removed following Asbestos Abatement - Type 2 procedures as per Section 02 8200 02 and Ontario Regulation 278/05.
- .3 If power tools without a HEPA filter attachment are used, this material can be removed following Asbestos Abatement - Type 3 procedures as per Section 02 8200 03 and Ontario Regulation 278/05.
- .4 Previously Identified Parging Cement Insulation
- .1 Removal of parging cement insulation can be

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- completed following Type 2 asbestos abatement procedures, provided a proper seal can be achieved using a glove bag, as per Section 02 8200 01 and Ontario Regulation 278/05.
- .2 If a proper seal cannot be achieved, this material must be removed following Asbestos Abatement - Type 3 procedures as per Section 02 8200 03 and Ontario Regulation 278/05.
- .5 Previously Identified Caulking
- .1 Removal of caulking must be completed following Type 1 asbestos abatement procedures, provided that the material is wetted, and non-powered hand tools are used, as per Section 02 8200 01 and Ontario Regulation 278/05.
- .2 If power tools with a HEPA filter attachment are to be used, this material can be removed following Asbestos Abatement - Type 2 procedures as per Section 02 8200 02 and Ontario Regulation 278/05.
- .6 Previously Identified Transite Piping
- .1 Removal of Transite piping can be completed following Type 1 asbestos abatement procedures, provided that the material is wetted, and non-powered hand tools are used, as per Section 02 8200 01 and Ontario Regulation 278/05.
- .2 If power tools with a HEPA filter attachment are to be used, this material can be removed following Asbestos Abatement - Type 2 procedures as per Section 02 8200 02 and Ontario Regulation 278/05.
- .3 If power tools without a HEPA filter attachment are used, this material can be removed following Asbestos Abatement - Type 3 procedures as per Section 02 8200 03 and Ontario Regulation 278/05.
- .7 Previously Identified Gaskets
- .1 Removal of gaskets can be completed following Type 1 asbestos abatement procedures, provided that the material is wetted, and non-powered hand tools are used, as per Section 02 8200 01 and Ontario Regulation 278/05.
- .2 If non-powered hand-held tools are used, this material can be removed following Asbestos Abatement - Type 2 procedures as per Section 02 8200 02 and Ontario Regulation 278/05.
- .3 If power tools without a HEPA filter attachment are used, this material can be removed following Asbestos Abatement - Type 3 procedures as per Section 02 8200 03 and Ontario Regulation 278/05.
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- 4.2 Lead-Containing Paint
- .1 Remove and dispose of all lead-containing materials in accordance with the applicable Sections 02 83 10, 02 83 10, 02 83 11, 02 83 12 of this Specification as well as in accordance with the Ministry of Labour, Immigration, Training and Skills Development Guideline - Lead on Construction Projects, September 2004 (Revised April 2011). Contractor is responsible for the verification and removal of all lead-containing materials.
 - .2 Leachate testing was not performed on the lead-containing paint. If the lead-containing paint is to be removed from the substrate it is affixed to, then leachate test should be performed on a composite of the removed lead-containing paint.
- 4.3 General
- .1 Lead abatement work area isolation and work procedures shall be completed as per specifications in related sections.
 - .2 The removal methodology of lead-containing materials shall comply with recommendations in the *Hazardous Building Materials Reports*
 - .3 Any stored items (e.g., equipment, tools, supplies, stored materials etc.) shall be moved from a work area by the Contractor to an on-site location identified by the Owner's Representative. Stored items shall be returned following completion of abatement and reinstatement work.
 - .4 Any large non-porous items in work areas (e.g., garbage, debris, etc.) may be decontaminated and treated as non-asbestos waste (e.g., concrete blocks, wood, cans, etc.).
 - .5 Post warning signs stating Abatement work in progress, and type of Abatement (i.e. lead) at entrances to the work area, and on entrances to the individual work enclosures. Warning signs must be posted during any Type of abatement.
 - .6 Peel District School Board Joint Health and Safety Committee must be notified prior to any abatement and/or air sampling activity. 24-hour notification must be given to Peel District School Board prior to beginning any abatement activities.
 - .7 All work completed at heights (e.g., via ladders, working platforms, scaffolding, planking, etc.) shall comply with the Occupational Health & Safety Act. Contractor shall implement and maintain appropriate access to elevated work areas and
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implement and maintain appropriate safety precautions (e.g., travel restraint, fall arrest, etc.).

- .8 At no time shall waste bags be left openly visible to building occupants. Waste shall remain covered & concealed at all times.
 - .9 Include for Base Building Emergency Response Services, for entry into any Type of abatement work area, while Abatement set-up is in place. Emergency response shall include all labour and administration costs required to troubleshoot and rectify power related conditions.
 - .10 Protect all surfaces, building fabric and items not affected by work of this project (e.g. electrical, pneumatic lines, gauges, valves, sensors, etc.).
 - .11 Replace or repair any items damaged during work of this project.
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PART 5 - SUPERVISION

- .1 Provide on-site, a Superintendent dedicated solely to the project, with authority to oversee all aspects of the work, including but not limited to, estimating and negotiating changes to the project, updating of submission requirements, scheduling, manpower and equipment requirements, and direct communication and co-ordination with Owner or Consultant.
- .2 The Superintendent must be on site at all times during work at risk of disturbing ACM and other hazardous materials. Failure to comply with this requirement will result in a stoppage of all work at no cost to the Owner.
- .3 Replace supervisory personnel, with approved replacements, within 3 working days of a written request from the Owner. Owner reserves the right to request replacement of supervisory personnel without explanation.
- .4 Abatement Contractor cannot replace supervisory personnel without written approval from the Owner.

PART 6 - QUALITY ASSURANCE

- .1 Ensure the removal and handling of Hazardous Materials or contaminated materials are performed by persons experienced in the methods, procedures and industry practices of abatement. Ensure work proceeds to schedule, meeting all requirements of this specification.
 - .2 Complete work so that at no time airborne asbestos or lead, visible solid residue, or water runoff contaminates areas outside the Work Area. Consultant is empowered to order a shutdown of work when a leak has been detected or is likely to occur, at no cost to the Owner.
 - .3 All work of this section involving electrical, mechanical, carpentry, glazing etc., shall be performed by licensed persons experienced and qualified for the work required.
 - .4 The Owner or Consultant will not be responsible for and will not have control or in charge of construction means, methods, techniques, sequences or procedures, or for safety precautions and programs required for the Work in accordance with the applicable construction safety legislation, other regulations or general construction practice.
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The Owner or Consultant will not be responsible for or have control or charge over the acts or omissions of the Abatement Contractor, his Subcontractors or their agents, employees or other persons performing any of the Work.

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PART 7 - DEFINITIONS

- .1 Air Lock: Temporary chamber sealed with polyethylene sheeting. Curtained doorways constructed at either end with a minimum of 6 feet (2.0 metres) separation. Minimum width is 36 inches (900 mm).
 - .2 Amended Water: Water with wetting agent added for purpose of reducing surface tension to allow thorough wetting of ACM.
 - .3 Asbestos-Containing Material (ACM): Material identified under Site Conditions and over spray, fallen material and settled dust.
 - .4 Asbestos Work Area: Area where work takes place, which will, or may, disturb ACM.
 - .5 Authorized Visitors: Building Owner or representatives, Owner or Consultant or designated representatives, and persons representing regulatory agencies.
 - .6 Curtained Doorway: Doorway consisting of two flaps of rip-proof polyethylene.
 - .7 DOP/PAO Test: A testing method used to determine the integrity of the Negative Pressure unit using dioctyl phthalate (DOP) or polyalpha olefin (PAO) HEPA filter leak test.
 - .8 Friable Material: Material that when dry can be crumbled, pulverized or powdered by hand pressure and includes material that is crumbled, pulverized or powdered.
 - .9 Glove Bag: Prefabricated Glove Bag as follows:
 - .1 Minimum thickness 0.25 mm (10 mil) polyvinyl-chloride bag.
 - .2 Integral 0.25 mm (10 mil) thick polyvinyl-chloride gloves and elasticized port.
 - .3 Equipped with reversible double-pull double throw zipper on top.
 - .4 Straps for sealing ends of bag around pipe.
 - .5 Must incorporate internal closure strip if it is to be removed from pipe.
 - .10 HEPA Filter: High Efficiency Particulate Arrestance filter that is at least 99.97 percent efficient in collecting a 0.3 micrometre aerosol.
 - .11 Mechanical Systems: The components that make up a buildings plumbing, heating, ventilation, or
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process systems. Including but not limited to piping, fittings, vessels, pumps, tanks, ducts, air handling units, processing equipment, etc.

- .12 Milestone Inspection: Inspection of the Asbestos Work Area at defined point in the removal operation.
 - .13 Negative Pressure: A reduced pressure within the Asbestos Work Area established by extracting air directly from Asbestos Work Area and discharging this air outside Asbestos Work Area to exterior of building.
 - .14 Occupied Area: Any area of the building outside the Asbestos Work Area.
 - .15 Personnel: All Contractor Employees, Trade Sub-Contractor employees, supervisors and authorized visitors.
 - .16 Polyethylene: Either polyethylene sheeting or rip-proof polyethylene sheeting as specified with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide a continuous polyethylene membrane to protect underlying surfaces from water damage or damage by lock-down agents, and to prevent escape of asbestos fibres through sheeting into Occupied Areas.
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PART 8 - REGULATIONS

- .1 Comply with federal, provincial, and local requirements, provided that in any case of conflict among those requirements or with these Specifications the more stringent requirements shall apply. Work shall be performed under regulations in effect at the time work is performed. All current amendments to regulations apply. Regulations include but are not limited to the following:
 - .1 Occupational Health and Safety Act, the Construction Projects Regulation (O. Reg. 213/91), and the Designated Substance - Asbestos on Construction Projects and in Buildings and Repair Operations Regulation (O. Reg. 278/05).
 - .2 Dangerous Goods Transportation Act, R.S.O. 1990, c., D.1.
 - .3 General - Waste Management Regulation (O. Reg. 347/90).
 - .4 Waste Management - PCB's Regulation (O. Reg. 362/90).
 - .5 Federal Halocarbon Regulations, 2022 (SOR/2022.110).
 - .6 Ozone Depleting Substances and Other Halocarbons Regulation (O. Reg. 463/10).
 - .7 Designated Substances Regulation (O. Reg. 490/09).
 - .8 Ministry of Labour, Immigration, Training and Skills Development Guideline - Lead on Construction Projects, September 2004 (Revised April 2011)
 - .9 Ministry of Labour, Immigration, Training and Skills Development Guideline - Silica on Construction Projects, September 2004 (Revised April 2011)
 - .10 Environmental Abatement Council of Canada (EACC) Lead Guideline for Construction, Renovation, Maintenance or Repair, October 2014
 - .11 EACC Mould Abatement Guidelines, 2010
 - .12 EACC Pre-Construction Designated Substances and Hazardous Materials Assessment, Guideline for Construction, Renovation and Demolition Projects (2021).

PART 9 - NOTIFICATION

- .1 Notify Sanitary Landfill site as per Ontario Regulation 347/90.
- .2 Inform all Trade Subcontractors of the presence of ACM identified in the bid documents.

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- .3 Notify immediately the Ministry of Labour, Immigration, Training and Skills Development as required by Ontario Regulation 278/05, if friable materials not identified in the bid documents are discovered during the course of the work.
- .4 Ensure all necessary permits for asbestos work, variance, demolition, etc. are posted at the site prior to start of work.
- .5 Prior to any air monitoring, Peel District School Board Multi-Site Joint Health and Safety Committee (MJHSC) Representative is to be notified, 24 hours in advance, to allow them to be present if they so desire.

PART 10 - SUBMITTALS

- .1 Site Specific Health and Safety Plan for the removal of all Hazardous Materials from the facility.
 - .2 Permits for transportation of and location of landfill or receiver for all hazardous materials waste.
 - .3 Names and credentials of the:
 - .1 Asbestos Abatement Supervisors
 - .2 Asbestos Abatement Workers
 - .4 Proof in the form of a certificate that every supervisor of a worker involved in a Type 3 operation has successfully completed the Asbestos Abatement Supervisor Training Program approved by the Ministry of Training, Colleges and Universities requirements of O. Reg. 278/05.
 - .5 Proof with references that supervisory personnel have performed supervisory functions on at least three (3) other asbestos remediation projects.
 - .6 Proof that workers have received WHMIS training.
 - .7 Documentation including test results, fire and flammability data, and Safety Data Sheets for chemicals or material used in the course of the Project.
 - .8 Certificate proving that each worker on site has been fit tested for the respirator appropriate for the work being performed.
 - .9 Ministry of Labour, Immigration, Training and Skills Development Notice of Project form.
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END OF SECTION

SECTION 02 82 00.01

**ASBESTOS ABATEMENT
[TYPE 1]**



PART 1 - GENERAL

1.1 SUMMARY

- .1 Comply with requirements of this Section when performing following Work:
 - .1 Removal of less than one square meter of previously identified drywall with asbestos-containing joint compound observed in the Lobby and Custodian Room.
 - .2 Removal and/or disturbance of the following asbestos-containing materials, provided it is removed without being broken, cut, drilled, abraded, grounded, sanded or vibrated.
 - .1 Previously identified asbestos-containing Transite piping in the Phys. Ed. Room and Gym storage.
 - .3 Removal and/or disturbance of the following asbestos-containing materials, provided that non-powered hand-held tools are used, and the material is wetted to control the spread of dust or fibers:
 - .1 Asbestos-containing black tar observed on the wall near Lower Roof 2.
 - .2 Previously identified asbestos-containing mortar observed on the exterior brick of the building.
 - .3 Previously identified asbestos-containing mortar observed on the block walls in the Gym Storage and Custodian Room.
 - .4 Previously identified asbestos-containing grey caulking observed on control joints in the Pool Area and on Exterior window and door frames.
 - .5 Previously identified asbestos-containing black caulking observed between the wall and door frame of the Entrance Vestibule.
 - .6 Previously identified asbestos-containing beige caulking observed between the wall and door frame of the Gym Storage.
 - .7 Previously identified asbestos-containing gaskets observed in the Filter Room.

1.2 SECTIONS INCLUDE

- .1 Requirements and procedures for asbestos abatement of materials containing asbestos and trace amounts of asbestos.

1.3 REFERENCES

- .1 O. Reg. 278/05, Designated Substance - Asbestos on Construction Projects and in Buildings and Repair Operations.

- .2 A Guide to the Regulations respecting Asbestos on Construction Projects and in Buildings and Repair Operations released in November 2007, <http://www.labour.gov.on.ca/english/hs/asbestos/index.html>.
- .3 O. Reg. 490/09, Designated Substances.
- .4 O. Reg. 347/90, General - Waste Management
- .5 Dangerous Goods Transportation Act, R.S.O. 1990, c. D.1 (DGTA).

1.4 DEFINITIONS

- .1 Amended Water: water with nonionic surfactant wetting agent added to reduce water tension to allow thorough wetting of fibres.
 - .2 Asbestos-Containing Materials (ACMs): materials that contain 0.5 percent or more asbestos by dry weight and are identified under Existing Conditions including fallen materials and settled dust.
 - .3 Asbestos Work Area: area where work takes place which will, or may, disturb trace asbestos.
 - .4 Authorized Visitors: Building Owner or representatives, Owner or Consultant or designated representatives, and persons representing regulatory agencies.
 - .5 Experienced worker person: in relation to specific work, means a worker who:
 - .1 Is qualified because of understanding, training and experience to perform the work.
 - .2 Is familiar with the provincial and federal laws and with the provisions of the regulations that apply to the work.
 - .3 Has understanding of all potential or actual danger to health or safety in the work.
 - .6 Friable material: means material that:
 - .1 When dry, can be crumbled, pulverized or powdered by hand pressure, or is crumbled, pulverized or powdered.
 - .7 HEPA vacuum: High Efficiency Particulate Arrestance filtered vacuum equipment with filter system capable of collecting and retaining fibres greater than 0.3 microns in any direction at 99.97% efficiency.
 - .8 Non-Friable Material: material that when dry cannot be crumbled, pulverized or powdered by hand pressure.
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- .9 Occupied Area: any area of the building or work site that is outside Asbestos Work Area.
- .10 Polyethylene: polyethylene sheeting or rip-proof polyethylene sheeting with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide protection and isolation.
- .11 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must have appropriate capacity for work.

1.5 SUBMITTALS

- .1 Submittals in accordance with applicable Sections.
- .2 Submit proof satisfactory to Owner's Representative that suitable arrangements have been made to dispose of asbestos-containing waste in accordance with requirements of authority having jurisdiction.
- .3 Submit Ministry of Labour, Immigration, Training and Skills Development Notice of Project Form.
- .4 Submit to Owner Representative necessary permits for transportation and disposal of asbestos-containing waste and proof that asbestos-containing waste has been received and properly disposed.
- .5 Submit proof that all asbestos workers and/or supervisor have received appropriate training and education by an experienced person in the hazards of asbestos exposure, good personal hygiene and work practices while working in Asbestos Work Areas, and the use, cleaning and disposal of respirators and protective clothing.
- .6 Submit proof satisfactory to Owner Representative that employees have respirator fitting and testing. Workers must be fit tested with respirator that is personally issued.

1.6 QUALITY ASSURANCE

- .1 Regulatory Requirements: comply with Federal, Provincial, and local requirements pertaining to asbestos, provided that in case of conflict among these requirements or with these specifications, more stringent requirement applies. Comply with regulations in effect at time Work is performed.
- .2 Health and Safety:
 - .1 Perform construction occupational health and safety in accordance with applicable Sections.
 - .2 Safety Requirements: worker protection.
 - .3 Protective equipment and clothing provided to

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the workers while in Asbestos Work Area include:

- .1 Air purifying half-mask respirator with N-100, R-100 or P-100 particulate filter, personally issued to worker and marked as to efficiency and purpose, suitable for protection against asbestos and acceptable to the Ministry of Labour, Immigration, Training and Skills Development. The respirator to be fitted so that there is an effective seal between the respirator and the worker's face, unless the respirator is equipped with a hood or helmet. The respirator to be cleaned, disinfected and inspected after use on each shift, or more often if necessary, when issued for the exclusive use of one worker, or after each use when used by more than one worker. The respirator to have damaged or deteriorated parts replaced prior to being used by a worker; and, when not in use, to be stored in a convenient, clean and sanitary location. The employer to establish written procedures regarding the selection, use and care of respirators, and a copy of the procedures to be provided to and reviewed with each worker who is required to wear a respirator. A worker not to be assigned to an operation requiring the use of a respirator unless the worker is physically able to perform the operation while using the respirator.
 - .2 Disposable-type protective clothing that does not readily retain or permit penetration of asbestos fibres. Protective clothing to be provided by the employer and worn by every worker who enters the work area, and the protective clothing shall consist of a head covering and full body covering that fits snugly at the ankles, wrists and neck, in order to prevent asbestos fibres from reaching the garments and skin under the protective clothing to include suitable footwear, and to be repaired or replaced if torn.
 - .4 The following procedures are also to be followed:
 - .1 Eating, drinking, chewing, and smoking are not permitted in Asbestos Work Area.
 - .2 Before leaving Asbestos Work Area, the worker can decontaminate his or her
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protective clothing by using a vacuum equipped with a HEPA filter, or by damp wiping, before removing the protective clothing, or, if the protective clothing will not be reused, place it in a container for dust and waste. The container to be dust tight, suitable for asbestos waste, impervious to asbestos, identified as asbestos waste, cleaned with a damp cloth or a vacuum equipped with a HEPA filter immediately before removal from the work area, and removed from the work area frequently and at regular intervals.

- .3 Facilities for washing hands and face shall be provided within or close to the Asbestos Work Area.
- .4 Ensure workers wash hands and face when leaving Asbestos Work Area.
- .5 Ensure that no person required to enter an Asbestos Work Area has facial hair that affects seal between respirator and face.

1.7 EXISTING CONDITIONS

- .1 Information pertaining to asbestos materials to be handled, removed, or otherwise disturbed and disposed of during this project, including the report entitled "*Bulk Asbestos Sampling Report - Roof Assessment of Indoor Pool - Glenforest Secondary School, Mississauga, ON*" (Report issued by WSP dated February 12, 2024) and "*Hazardous Building Materials Assessment (Pre-construction) Glenforest secondary School Indoor Pool Demolition 3575 Fieldgate Drive, Mississauga, Ontario*" (Report issued by Pinchin dated August 1, 2023); is bound into this specification.
- .2 Notify Owner Representative of suspected asbestos-containing material discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material pending instructions from Owner Representative.

1.8 SCHEDULING

- .1 Hours of Work: perform work involving abatement as per agreement with Owner Representative.

1.9 OWNER'S INSTRUCTIONS

- .1 Before beginning Work, provide Owner Representative satisfactory proof that every worker has had instruction and training in hazards of asbestos exposure, in personal hygiene and work practices, and in use, cleaning, and disposal of respirators and protective clothing.
- .2 Instruction and training related to respirators includes, following minimum requirements:

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- .1 Fitting of equipment.
- .2 Inspection and maintenance of equipment.
- .3 Disinfecting of equipment.
- .4 Limitations of equipment.

- .3 Instruction and training must be provided by an experienced, qualified person.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Drop Sheets:
 - .1 Polyethylene: 0.15 mm thick.
 - .2 FR polyethylene: 0.15 mm thick woven fiber reinforced fabric bonded both sides with polyethylene.
- .2 Wetting Agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with water in a concentration to provide thorough wetting asbestos-containing material.
- .3 Waste Containers: contain waste in two separate containers.
 - .1 Inner container: 0.15 mm thick sealable polyethylene waste bag.
 - .2 Outer container: sealable metal or fiber type where there are sharp objects included in waste material; otherwise outer container may be sealable metal or fiber type or second 0.15 mm thick sealable polyethylene bag.
 - .3 Labelling requirements: affix pre-printed cautionary asbestos warning in both official languages that is visible when ready for removal to disposal site.
- .4 Slow-drying sealer: non-staining, clear, water-dispersible type that remains tacky on surface for at least 8 hours and designed for purpose of trapping residual asbestos fibers.
- .5 Tape: fiberglass-reinforced duct tape suitable for sealing polyethylene under both dry conditions and wet conditions using amended water.

PART 3 - EXECUTION

3.1 CLEANING

- .1 Do construction occupational health and safety in accordance with applicable Sections.
- .2 Before beginning Work, isolate Asbestos Work Area using, minimum, preprinted cautionary asbestos warning signs in both official languages that are visible at access routes to Asbestos Work Area.

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- .1 Remove visible dust from surfaces in the work area where dust is likely to be disturbed during course of work.
 - .2 Use HEPA vacuum or damp cloths where damp cleaning does not create a hazard and is otherwise appropriate.
 - .3 Do not use compressed air to clean up or remove dust from any surface.
- .3 Prevent spread of dust from Asbestos Work Area using measures appropriate to work to be done.
- .1 Use FR polyethylene drop sheets over ground surface in Asbestos Work Area where dust and contamination cannot otherwise be safely contained. Drop sheets are not to be reused.
- .4 Wet materials containing asbestos to be cut, ground, abraded, scraped, drilled, or otherwise disturbed unless wetting creates hazard or causes damage.
- .1 Use garden reservoir type low-velocity fine-mist sprayer.
 - .2 Perform Work to reduce dust creation to lowest levels practicable.
 - .3 Work will be subject to visual inspection and air monitoring.
 - .4 Contamination of surrounding areas indicated by visual inspection or air monitoring will require complete enclosure and clean-up of affected areas.
- .5 Frequently and at regular intervals during Work and immediately on completion of work:
- .1 Dust and waste to be cleaned up and removed using a vacuum equipped with a HEPA filter, or by damp mopping or wet sweeping, and placed in a waste container.
 - .2 Drop sheets to be wetted and placed in a waste container as soon as practicable.
- .6 Cleanup:
- .1 Place dust and asbestos-containing waste in sealed dust-tight waste bags. Treat drop sheets and disposable protective clothing as asbestos waste; wet and fold these items to contain dust, and then place in plastic bags.
 - .2 Clean exterior of each waste-filled bag using damp cloths or HEPA vacuum and place in second clean waste bag immediately prior to removal from Asbestos Work Area.
 - .3 Seal waste bags and remove from site. Dispose of in accordance with requirements of Provincial and Federal Authority having jurisdiction. Supervise dumping and ensure that dump operator is fully aware of hazardous nature of material to be dumped and

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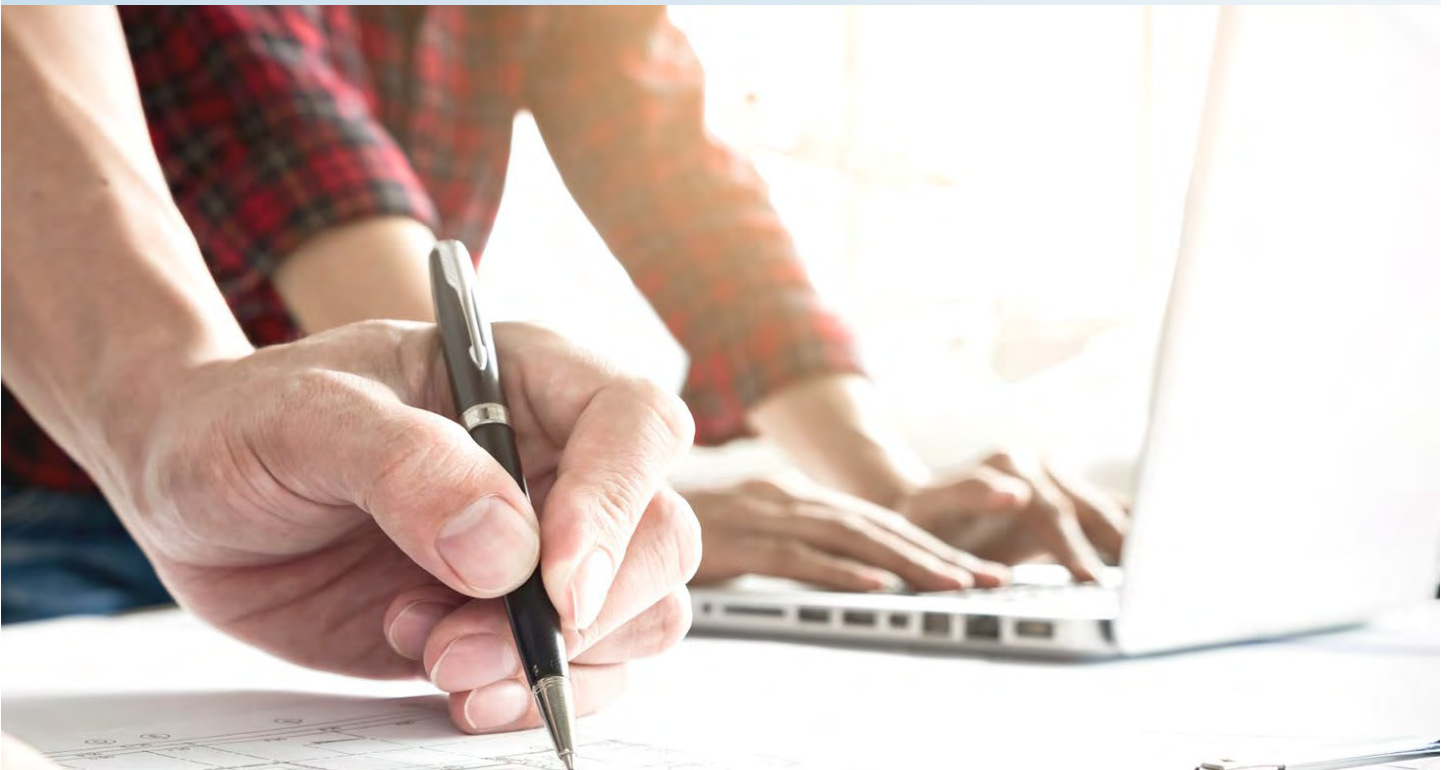
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- that the appropriate guidelines and regulations for asbestos disposal are followed.
- .4 Perform final thorough clean-up of Work areas and adjacent areas affected by Work using HEPA vacuum.

END OF SECTION

SECTION 02 82 00.02

**ASBESTOS ABATEMENT
[TYPE 2]**



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PART 1 - GENERAL1.1 SUMMARY

- .1 Comply with requirements of this Section when performing the following Work:
- .1 Removal of one square meter or more of previously identified drywall with asbestos-containing joint compound observed in the Lobby and Custodian Room.
 - .2 Removal of previously identified asbestos-containing parging cement insulation observed on piping on the Balcony, provided a proper seal is achieved using a glove bag.
 - .3 Removal and/or disturbance of the following asbestos-containing material provided that power tools are used with a HEPA filter attachment:
 - .1 Asbestos-containing black tar observed on the wall near Lower Roof 2.
 - .2 Previously identified asbestos-containing Transite piping in the Phys. Ed. Room and Gym storage.
 - .3 Previously identified asbestos-containing mortar observed on the exterior brick of the building.
 - .4 Previously identified asbestos-containing mortar observed on the block walls in the Gym Storage and Custodian Room.
 - .5 Previously identified asbestos-containing gaskets observed in the Filter Room.

1.2 SECTIONS INCLUDE

- .1 Requirements and procedures for asbestos abatement of asbestos containing materials of the type described within.

1.3 REFERENCES

- .1 O.Reg. 278/05, Designated Substance - Asbestos on Construction Projects and in Buildings and Repair Operations.
- .2 A Guide to the Regulations respecting Asbestos on Construction Projects and in Buildings and Repair Operations released in November 2007, <http://www.labour.gov.on.ca/english/hs/asbestos/index.html>.
- .3 O. Reg. 490/09, Designated Substances.
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.205- [94], Sealer for Application of Asbestos Fiber Releasing Materials.
- .5 Environmental Protection Act, R.S.O. 1990, c. E.19
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(EPA).

- .6 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .7 Dangerous Goods Transportation Act, R.S.O. 1990, c. D1 (DGTA).
- .8 Underwriters' Laboratories of Canada (ULC).

1.4 DEFINITIONS

- .1 Amended Water: water with non-ionic surfactant wetting agent added to reduce water tension to allow wetting of fibres.
 - .2 Asbestos-Containing Materials (ACMs): materials that contain 0.5 percent or more asbestos by dry weight and are identified under Existing Conditions including fallen materials and settled dust.
 - .3 Asbestos Work Area: area where work takes place which will or may disturb ACMs.
 - .4 Authorized Visitors: Building Owner or representatives, Owner or Consultant or designated representatives, and persons representing regulatory agencies.
 - .5 Experienced worker person: in relation to specific work, means a worker who:
 - .1 Is qualified because of understanding, training and experience to perform the work.
 - .2 Is familiar with the provincial and federal laws and with the provisions of the regulations that apply to the work.
 - .3 Has understanding of all potential or actual danger to health or safety in the work.
 - .6 Friable Materials: 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 vacuum: High Efficiency Particulate Arrestance filtered vacuum equipment with filter system capable of collecting and retaining fibres greater than 0.3 microns in any dimension at 99.97% efficiency.
 - .8 Negative pressure: system that extracts air directly from work area, filters such extracted air through High Efficiency Particulate Arrestance filtering system, and discharges this air directly outside work area to exterior of building.
 - .1 System to maintain minimum pressure differential of 5 Pa relative to adjacent
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areas outside of work areas, be equipped with alarm to warn of system breakdown, and be equipped with instrument to continuously monitor and automatically record pressure differences.

- .9 Non-Friable Material: material that when dry cannot be crumbled, pulverized or powdered by hand pressure.
- .10 Occupied Area: any area of building or work site that is outside Asbestos Work Area.
- .11 Polyethylene: polyethylene sheeting or rip-proof polyethylene sheeting with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide protection and isolation.
- .12 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must have appropriate capacity for scope of work.

1.5 SUBMITTALS

- .1 Submittals in accordance with applicable Sections.
 - .2 Submit proof satisfactory to Owner's Representative that suitable arrangements have been made to dispose of asbestos containing waste in accordance with requirements of authority having jurisdiction.
 - .3 Submit Ministry of Labour, Immigration, Training and Skills Development Notice of Project Form.
 - .4 Submit proof of Contractor's Asbestos Liability Insurance.
 - .5 Submit to Owner's Representative necessary permits for transportation and disposal of asbestos containing waste and proof that asbestos containing waste has been received and properly disposed.
 - .6 Submit proof satisfactory to Owner's Representative that all asbestos workers have received appropriate training and education by an experienced person in the hazards of asbestos exposure, good personal hygiene, entry and exit from Asbestos Work Area, aspects of work procedures and protective measures while working in Asbestos Work Areas, and the use, cleaning and disposal of respirators and protective clothing.
 - .7 Submit proof that supervisory personnel have attended asbestos abatement course, of not less than two days duration, approved by Owner's Representative. Minimum of one supervisor for every
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ten workers.

- .8 Submit Workplace Safety Insurance Board (WSIB) status and transcription of insurance.
- .9 Submit documentation including test results, fire and flammability data, and Safety Data Sheets (SDSs) for chemicals or materials including:
 - .1 Encapsulants.
 - .2 Amended water.
 - .3 Slow-drying sealer.
- .10 Submit proof satisfactory to Owner's Representative that employees have respirator fitting and testing. Workers must be fit tested with respirator that is personally issued.

1.6 QUALITY ASSURANCE

- .1 Regulatory Requirements: comply with Federal, Provincial and local requirements pertaining to asbestos, provided that in case of conflict among these requirements or with these specifications more stringent requirement applies. Comply with regulations in effect at the time work is performed.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with applicable Sections.
 - .2 Safety Requirements: worker and visitor protection.
 - .1 Protective equipment and clothing to be worn by workers while in Asbestos Work Area include:
 - .1 Air purifying half-mask respirator with N-100, R-100 or P-100 particulate filter, personally issued to worker and marked as to efficiency and purpose, suitable for protection against asbestos and acceptable to the Ministry of Labour, Immigration, Training and Skills Development having jurisdiction. The respirator to be fitted so that there is an effective seal between the respirator and the worker's face, unless the respirator is equipped with a hood or helmet. The respirator to be cleaned, disinfected and inspected after use on each shift, or more often if necessary, when issued for the exclusive use of one worker, or after each use when used by more than one worker. The respirator to have damaged or deteriorated

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parts replaced prior to being used by a worker; and, when not in use, to be stored in a convenient, clean and sanitary location. The employer to establish written procedures regarding the selection, use and care of respirators, and a copy of the procedures to be provided to and reviewed with each worker who is required to wear a respirator. A worker not to be assigned to an operation requiring the use of a respirator unless he or she is physically able to perform the operation while using the respirator.

- .2 Disposable type protective clothing that does not readily retain or permit penetration of asbestos fibres. Protective clothing to be provided by the employer and worn by every worker who enters the work area, and the protective clothing to consist of a head covering and full body covering that fits snugly at the ankles, wrists and neck, in order to prevent asbestos fibres from reaching the garments and skin under the protective clothing. It includes suitable footwear, and it to be repaired or replaced if torn.
 - .3 Eating, drinking, chewing, and smoking are not permitted in Asbestos Work Area.
 - .4 Before leaving Asbestos Work Area, the worker can decontaminate his or her protective clothing by using a vacuum equipped with a HEPA filter, or by damp wiping, before removing the protective clothing, or, if the protective clothing will not be reused, place it in a container for dust and waste. The container to be dust tight, suitable for asbestos waste, impervious to asbestos, identified as asbestos waste, cleaned with a damp cloth or a vacuum equipped with a HEPA filter immediately before removal from the work area, and removed from the work area frequently and at regular intervals.
 - .5 Ensure workers wash hands and face when leaving Asbestos Work Area.
 - .6 Ensure that no person required to enter an Asbestos Work Area has facial hair that affects seal between respirator and face.
 - .7 Visitor Protection:
 - .1 Provide protective clothing and
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approved respirators to Authorized Visitors to work areas.

.2 Instruct Authorized Visitors in the use of protective clothing, respirators and procedures.

.3 Instruct Authorized Visitors in proper procedures to be followed in entering into and exiting from Asbestos Work Area.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with applicable Sections.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Separate for reuse and recycling and place in designated containers in accordance with Waste Management Plan.

.5 Place materials defined as hazardous or toxic in designated containers.

.6 Handle and dispose of hazardous materials in accordance with the EPA, TDGTA, and Municipal regulations and by-laws.

.7 Fold up metal banding, flatten and place in designated area for recycling.

.8 Disposal of asbestos waste generated by removal activities must comply with Federal, Provincial and Municipal regulations. Dispose of asbestos waste in sealed double thickness 0.15 mm thick (6 mil) bags or leak proof drums. Label containers with appropriate warning labels.

.9 Provide manifests describing and listing waste created. Transport containers by approved means to licensed landfill for burial.

1.8 EXISTING CONDITIONS

.1 Information pertaining to ACM to be handled, removed, or otherwise disturbed and disposed of during this project, including the report entitled "Bulk Asbestos Sampling Report - Roof Assessment of Indoor Pool - Glenforest Secondary School, Mississauga, ON" (Report issued by WSP dated February 12, 2024) and "Hazardous Building Materials Assessment (Pre-construction) Glenforest secondary School Indoor Pool Demolition 3575 Fieldgate Drive, Mississauga, Ontario" (Report

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issued by Pinchin dated August 1, 2023); is bound into this specification.

- .2 Notify Owner's Representative of friable material discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material until instructed by Owner's Representative.

1.9 SCHEDULING

- .1 Hours of Work: perform work involving abatement as per agreement with Owner's Representative.

1.10 OWNER'S INSTRUCTIONS

- .1 Before beginning Work, provide Owner's Representative satisfactory proof that every worker has had instruction and training in hazards of asbestos exposure, in personal hygiene and work practices, in use of glove bag procedures, and in use, cleaning, and disposal of respirators and protective clothing.
- .2 Instruction and training related to respirators includes, at minimum:
 - .1 Fitting of equipment.
 - .2 Inspection and maintenance of equipment.
 - .3 Disinfecting of equipment.
 - .4 Limitations of equipment.
- .3 Instruction and training must be provided by experienced, qualified person.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Drop and Enclosure Sheets:
 - .1 Polyethylene: 0.15 mm thick.
 - .2 FR polyethylene: 0.15 mm thick woven fiber reinforced fabric bonded both sides with polyethylene.
- .2 Wetting Agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with water in concentration to provide thorough wetting of asbestos containing material.
- .3 Waste Containers: contain waste in two separate containers.
 - .1 Inner container: 0.15 mm thick sealable polyethylene bag, or where glove bag method is used, glove bag itself.
 - .2 Outer container: sealable metal or fiber type where there are sharp objects included in waste material; otherwise outer container may be sealable metal or fiber type or second 0.15 mm thick sealable polyethylene bag.
 - .3 Labelling requirements: affix preprinted cautionary asbestos warning, in both official

languages, that is visible when ready for removal to disposal site.

- .4 Tape: tape suitable for sealing polyethylene to surfaces under both dry and wet conditions using amended water.
- .5 Slow-drying sealer: non-staining, clear, water - dispersible type that remains tacky on surface for at least 8 hours and designed for purpose of trapping residual asbestos fibres.
 - .1 Sealer: flame spread and smoke developed rating less than 50 [and be compatible with new fireproofing].
- .6 Encapsulant: type conforming to CAN/CGSB-1.205.

PART 3 - EXECUTION

3.1 SUPERVISION

- .1 Minimum of one Supervisor for every ten workers is required.
- .2 Approved Supervisor must remain within Asbestos Work Area during disturbance, removal, or other handling of asbestos-containing materials.

3.2 PROCEDURES

- .1 Do construction occupational health and safety in accordance with applicable Sections.
- .2 Before beginning work, PDSB representative must be notified 24 hours in advance of any scheduled abatement work.
- .3 Before beginning Work, at each access to Asbestos Work Area, install warning signs in both official languages in upper case 'Helvetica Medium' letters reading as follows, where number in parentheses indicates font size to be used: 'CAUTION ASBESTOS HAZARD AREA (25 mm) / NO UNAUTHORIZED ENTRY (19 mm) / WEAR ASSIGNED PROTECTIVE EQUIPMENT (19 mm) / BREATHING ASBESTOS DUST MAY CAUSE SERIOUS BODILY HARM (7 mm)'.
 - .4 Before beginning Work remove visible dust from surfaces in work area where dust is likely to be disturbed during course of work.
 - .1 Use HEPA vacuum or damp cloths where damp cleaning does not create hazard and is otherwise appropriate.
 - .2 Do not use compressed air to clean up or remove dust from any surface.
 - .5 Prevent spread of dust from Asbestos Work Area using measures appropriate to work to be done.
 - .1 Use FR polyethylene drop sheets over ground

and under work area to contain dust or contamination.

- .6 Remove loose material by HEPA vacuum; thoroughly wet material containing asbestos to be removed or disturbed before and during Work unless wetting creates hazard or causes damage.
 - .1 Use garden reservoir type low-velocity sprayer or airless spray equipment capable of producing mist or fine spray.
 - .2 Perform Work in a manner to reduce dust creation to lowest levels practicable.
- .7 Work is subject to visual inspection and air monitoring. Contamination of surrounding areas indicated by visual inspection or air monitoring will require complete enclosure and clean-up of affected areas.
- .8 Cleanup:
 - .1 Frequently during Work and immediately after completion of work, clean up dust and asbestos containing waste using HEPA vacuum or by damp mopping.
 - .2 Place dust and asbestos-containing waste in sealed dust tight waste bags. Treat drop sheets and disposable protective clothing as asbestos waste and wet and fold to contain dust and then place in waste bags.
 - .3 Immediately before their removal from Asbestos Work Area and disposal, clean each filled waste bag using damp cloths or HEPA vacuum and place in second clean waste bag.
 - .4 Seal and remove double bagged waste from site. Dispose of in accordance with requirements of Provincial and Federal authority having jurisdiction. Supervise dumping and ensure that dump operator is fully aware of hazardous nature of material to be dumped and that guidelines and regulations for asbestos disposal are followed.
 - .5 After wire brushing and wet sponging to remove visible asbestos, and after encapsulating the edges of the asbestos containing material that is to remain, wet clean entire work area.
 - .6 Perform final thorough clean-up of Asbestos Work Areas and adjacent areas affected by Work using HEPA vacuum.

3.3 AIR MONITORING

- .1 From beginning of Work until completion of cleaning operations, Abatement Consultant may take air samples on daily basis outside of Asbestos Work Area in accordance with the Occupational Health and Safety Act and Regulations, and Owner's requirements.

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- .1 Contractor will be responsible for monitoring inside enclosure in accordance with O. Reg. 278/05..
- .2 If air monitoring shows that areas outside Asbestos Work Area are contaminated, enclose, maintain and clean these areas in same manner as that applicable to Asbestos Work Area.
- .3 Ensure that respiratory safety factors are not exceeded.
- .4 During the course of Work, Owner's Representative may measure fiber content of air outside Work areas by means of air samples analyzed by Phase Contrast Microscopy (PCM).
 - .1 Stop Work when PCM measurements exceed 0.05 f/cc and correct procedures.
- .5 Prior to any air monitoring, Peel District School Board Multi-Site Joint Health and Safety Committee (MJHSC) Representative is to be notified, 24 hours in advance, to allow them to be present if they so desire.

END OF SECTION

SECTION 02 82 00.03

**ASBESTOS ABATEMENT
[TYPE 3]**



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PART 1 - GENERAL

- 1.1 SUMMARY
- .1 Comply with requirements of this Section when performing following Work:
 - .2 Removal of previously identified asbestos-containing parging cement insulation observed on piping on the Balcony if a proper seal cannot be achieved using a glove bag.
 - .3 Removal and/or disturbance of the following asbestos-containing material if abatement is completed via power tools with no HEPA filter attachment:
 - .1 Asbestos-containing black tar observed on the wall near Lower Roof 2.
 - .2 Previously identified asbestos containing Transite piping in the Phys. Ed. Room and Gym storage.
 - .3 Previously identified asbestos containing mortar observed on the exterior brick of the building.
 - .4 Previously identified asbestos containing mortar observed on the block walls in the Gym Storage and Custodian Room.
 - .5 Previously identified asbestos containing gaskets observed in the Filter Room.
- 1.2 SECTION INCLUDES
- .1 Requirements and procedures for asbestos abatement of asbestos containing materials of the type described within.
- 1.3 REFERENCES
- .1 O. Reg. 278/05, Designated Substance - Asbestos on Construction Projects and in Buildings and Repair Operations.
 - .2 A Guide to the Regulations respecting Asbestos on Construction Projects and in Buildings and Repair Operations released in November 2007, <http://www.labour.gov.on.ca/english/hs/asbestos/index.html>.
 - .3 O. Reg. 490/09, Designated Substances.
 - .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.205-94, Sealer for Application to Asbestos-Fibre-Releasing Materials.
 - .5 Environmental Protection Act, R.S.O. 1990, c. E.19 (EPA).
 - .6 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
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- .1 Safety Data Sheets (SDSs).
- .7 Dangerous Goods Transportation Act, R.S.O. 1990, c. D.1 (DGTA).
- .8 Underwriters' Laboratories of Canada (ULC).
- .9 U.S. Department of Health and Human Services/Centers for Disease Control and Prevention (CDC)/National Institute for Occupational Safety and Health (NIOSH).
 - .1 NIOSH 94-113-[August 1994], NIOSH Manual of Analytical Methods (NMAM), 4th Edition.
- .10 U.S. Department of Labour - Occupational Safety and Health Administration - Toxic and Hazardous Substances.
 - .1 29 CFR 1910.1001-2001, Asbestos Regulations.

1.4 DEFINITIONS

- .1 Amended Water: water with a non-ionic surfactant wetting agent added to reduce water tension to allow wetting of fibres.
 - .2 Asbestos-Containing Materials (ACMs): materials that contain 0.5 per cent or more asbestos by dry weight and are identified under Existing Conditions including fallen materials and settled dust.
 - .3 Asbestos Work Areas: area where work takes place which will or may disturb ACMs.
 - .4 Authorized Visitors: Building Owner or representatives, Owner or Consultant or designated representatives, and persons representing regulatory agencies.
 - .5 Experienced worker person: in relation to specific work, means a worker who:
 - .1 Is qualified because of understanding, training and experience to perform the work.
 - .2 Is familiar with the provincial and federal laws and with the provisions of the regulations that apply to the work.
 - .3 Has understanding of all potential or actual danger to health or safety in the work.
 - .6 DOP/PAO Test: testing method used to determine integrity of Negative Pressure unit using dioctyl phthalate (DOP) or polyalpha olefin (PAO) HEPA-filter leak test.
 - .7 Friable Materials: material that when dry can be crumbled, pulverized or powdered by hand pressure and includes such material that is crumbled, pulverized or powdered.
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- .8 HEPA vacuum: High Efficiency Particulate Arrestance filtered vacuum equipment with a filter system capable of collecting and retaining fibres greater than 0.3 microns in any direction at 99.97% efficiency.
- .9 Non-Friable Materials: material that when dry cannot be crumbled, pulverized or powdered by hand pressure.
- .10 Occupied Areas: any area of building or work site that is outside Asbestos Work Area.
- .11 Polyethylene sheeting sealed with tape: polyethylene sheeting of type and thickness specified sealed with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide continuous polyethylene membrane to protect underlying surfaces from water damage or damage by sealants, and to prevent escape of asbestos fibres through sheeting into clean area.
- .12 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must be appropriate capacity for scope of work.

1.5 SUBMITTALS

- .1 Submittals in accordance with applicable Sections.
 - .2 Before beginning work:
 - .1 Obtain from appropriate agency and submit to Owner Representative necessary permits for transportation and disposal of asbestos waste. Ensure that dump operator is fully aware of hazardous nature of material being dumped, and proper methods of disposal. Submit proof satisfactory to Owner Representative that suitable arrangements have been made to receive and properly dispose of asbestos waste.
 - .2 Submit proof satisfactory to Owner Representative that all asbestos workers have received appropriate training and education by an experienced person on hazards of asbestos exposure, good personal hygiene, entry and exit from Asbestos Work Area, aspects of work procedures and protective measures while working in Asbestos Work Areas, and the use, cleaning and disposal of respirators and protective clothing. Submit proof of attendance in form of certificate.
 - .3 Ensure supervisory personnel have attended asbestos abatement course, of not less than two days duration, approved by Owner
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- Representative. Submit proof of attendance in form of certificate. Minimum of one Supervisor for every ten workers.
- .4 Submit layout of proposed enclosures and decontamination facilities to Owner Representative for review.
 - .5 Submit documentation including test results for sealer proposed for use.
 - .6 Submit Ministry of Labour, Immigration, Training and Skills Development Notice of Project form.
 - .7 Submit proof satisfactory to Owner Representative that employees have respirator fitting and testing. Workers must be fit tested with respirator that is personally issued.
 - .8 Submit documentation including test results, fire and flammability data, and Safety Data Sheets (SDSs) for chemicals or materials including but not limited to following:
 - .1 Encapsulants.
 - .2 Amended water.
 - .3 Slow-drying sealer.

1.6 QUALITY ASSURANCE

- .1 Regulatory Requirements: comply with Federal, Provincial and local requirements pertaining to asbestos, provided that in case of conflict among those requirements or with these specifications more stringent requirement applies. Comply with regulations in effect at time work is performed.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with applicable Sections.
 - .2 Safety Requirements: worker and visitor protection.
 - .1 Protective equipment and clothing to be worn by workers while in Asbestos Work Area includes:
 - .1 Air purifying full face-mask respirator, powered air purifying respirator (PAPR), or supplied air respirator with N-100, R-100 or P-100 particulate filter, personally issued to worker and marked as to efficiency and purpose, suitable for protection against asbestos and acceptable to the Ministry of Labour, Immigration, Training and Skills Development. The respirator to be fitted so that there is an effective seal between the respirator and the worker's face, unless the respirator is equipped with a hood or helmet. The

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respirator to be cleaned, disinfected and inspected after use on each shift, or more often if necessary, when issued for the exclusive use of one worker, or after each use when used by more than one worker. The respirator to have damaged or deteriorated parts replaced prior to being used by a worker; and, when not in use, to be stored in a convenient, clean and sanitary location. The employer to establish written procedures regarding the selection, use and care of respirators, and a copy of the procedures to be provided to and reviewed with each worker who is required to wear a respirator. A worker not to be assigned to an operation requiring the use of a respirator unless he or she is physically able to perform the operation while using the respirator.

.2 Disposable type protective clothing that does not readily retain or permit penetration of asbestos fibres. Protective clothing to be provided by the employer and worn by every worker who enters the work area, and the protective clothing to consist of a head covering and full body covering that fits snugly at the ankles, wrists and neck, in order to prevent asbestos fibres from reaching the garments and skin under the protective clothing. It includes suitable footwear, and it to be repaired or replaced if torn. Requirements for each worker:

.1 Remove street clothes in clean change room and put on respirator with new filters or reusable filters that have been tested as satisfactory, clean coveralls and head covers before entering Equipment and Access Rooms or Asbestos Work Area. Store street clothes, uncontaminated footwear, towels, and similar uncontaminated articles in

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- clean change room.
- .2 Remove gross contamination from clothing before leaving work area then proceed to Equipment and Access Room and remove clothing except respirators. Place contaminated work suits in receptacles for disposal with other asbestos - contaminated materials. Leave reusable items except respirator in Equipment and Access Room. Still wearing the respirator proceed naked to showers. Using soap and water wash body and hair thoroughly. Clean outside of respirator with soap and water while showering; remove respirator; remove filters and wet them and dispose of filters in container provided for purpose; and wash and rinse inside of respirator. When not in use in work area, store work footwear in Equipment and Access Room. Upon completion of asbestos abatement, dispose of footwear as contaminated waste or clean thoroughly inside and out using soap and water before removing from work area or from Equipment and Access Room.
- .3 After showering and drying off, proceed to clean change room and dress in street clothes at end of each day's work, or in clean coveralls before eating, smoking, or drinking. If re-entering work area, follow procedures outlined in paragraphs above.
- .4 Enter unloading room from outside dressed in clean coveralls to remove waste containers and equipment from Holding Room of Container and Equipment Decontamination Enclosure
-

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system. Workers must not use this system as means to leave or enter work area.

- .2 Eating, drinking, chewing, and smoking are not permitted in Asbestos Work Area.
- .3 Ensure workers are fully protected with respirators and protective clothing during preparation of system of enclosures prior to commencing actual asbestos abatement.
- .4 Provide and post in Clean Change Room and in Equipment and Access Room the procedures described in this Section, in both official languages.
- .5 Ensure that no person required to enter an Asbestos Work Area has facial hair that affects seal between respirator and face.
- .6 Visitor Protection:
 - .1 Provide protective clothing and approved respirators to Authorized Visitors to work areas.
 - .2 Instruct Authorized Visitors in the use of protective clothing, respirators and procedures.
 - .3 Instruct Authorized Visitors in proper procedures to be followed in entering into and exiting from Asbestos Work Area.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with applicable Sections.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Separate for reuse and recycling and place in designated containers in accordance with Waste Management Plan.
- .5 Place materials defined as hazardous or toxic in designated containers.
- .6 Handle and dispose of hazardous materials in accordance with the EPA, DGTA, Regional and Municipal regulations and by-laws.
- .7 Fold up metal banding, flatten and place in designated area for recycling.

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- .8 Disposal of asbestos waste generated by removal activities must comply with Federal, Provincial and Municipal regulations. Dispose of asbestos waste in sealed double thickness 0.152 mm thick (6 mil) bags or leak proof drums. Label containers with appropriate warning labels.
- .9 Provide manifests describing and listing waste created. Transport containers by approved means to licensed landfill for burial.

1.8 EXISTING CONDITIONS

- .1 Information pertaining to asbestos materials to be handled, removed, or otherwise disturbed and disposed of during this project, including the report entitled "*Bulk Asbestos Sampling Report - Roof Assessment of Indoor Pool - Glenforest Secondary School, Mississauga, ON*" (Report issued by WSP dated February 12, 2024) and "*Hazardous Building Materials Assessment (Pre-construction) Glenforest secondary School Indoor Pool Demolition 3575 Fieldgate Drive, Mississauga, Ontario*" (Report issued by Pinchin dated August 1, 2023) is bound into this specification.
- .2 Notify Owner Representative of suspect asbestos containing material discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material until instructed by Owner Representative.

1.9 SCHEDULING

- .1 Not later than ten (10) days before beginning Work on this Project notify following in writing:
 - .1 Ministry of Labour, Immigration, Training and Skills Development.
 - .2 Disposal Authority.
- .2 Inform sub-trades of presence of asbestos containing materials identified in Existing Conditions.
- .3 Submit to Owner Representative copy of notifications prior to start of Work.
- .4 Hours of Work: perform work involving abatement as per agreement with Owner Representative.

1.10 OWNER'S INSTRUCTIONS

- .1 Before beginning Work, provide to Owner Representative satisfactory proof that every worker has had instruction and training in hazards of asbestos exposure, in personal hygiene including dress and showers, in entry and exit from Asbestos Work Area, in aspects of work procedures including glove bag procedures, and in use, cleaning, and disposal of respirators and protective clothing.

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- .2 Instruction and training related to respirators includes, at minimum:
 - .1 Proper fitting of equipment.
 - .2 Inspection and maintenance of equipment.
 - .3 Disinfecting of equipment.
 - .4 Limitations of equipment.
- .3 Instruction and training must be provided by experienced, qualified person.
- .4 Supervisory personnel to complete required training.

PART 2 - PRODUCTS2.1 MATERIALS

- .1 Polyethylene: minimum 0.15 mm thick unless otherwise specified; in sheet size to minimize joints.
 - .2 FR polyethylene: minimum 0.15 mm thick, woven fibre reinforced fabric bonded both sides with polyethylene.
 - .3 Tape: fibreglass-reinforced duct tape suitable for sealing polyethylene under both dry conditions and wet conditions using amended water.
 - .4 Wetting agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether, or other material approved by Owner Representative, mixed with water in concentration to provide adequate penetration and wetting of asbestos-containing material.
 - .5 Waste Containers: contain waste in two separate containers.
 - .1 Inner container: 0.15 mm thick sealable polyethylene bag, or where glove bag method is used, glove bag itself.
 - .2 Outer container: sealable metal or fibre type where there are sharp objects included in waste material; otherwise outer container may be sealable metal or fibre type or second 0.15 mm thick sealable polyethylene bag.
 - .3 Labelling requirements: affix preprinted cautionary asbestos warning, in both official languages, that is visible when ready for removal to disposal site. Label containers in accordance with Ontario Regulation 278/05. Label in both official languages.
 - .6 Tape: tape suitable for sealing polyethylene to surfaces under both dry and wet conditions using amended water.
-

- .7 Slow-drying sealer: non-staining, clear, water-dispersible type that remains tacky on surface for at least 8 hours and designed for purpose of trapping residual asbestos fibres.
- .8 Sealer: flame spread and smoke developed rating less than 50.
- .9 Encapsulants: Type conforming to CAN/CGSB-1.205 and approved by the Ontario Fire Marshall.

PART 3 - EXECUTION

3.1 PREPARATION

- .1 Do construction occupational health and safety in accordance with applicable Sections.
- .2 Work Areas:
 - .1 Shut off and isolate air handling and ventilation systems to prevent fibre dispersal to other building areas during work phase. Conduct smoke tests to ensure that duct work is airtight. Seal and caulk joints and seams of active return air ducts within Asbestos Work Area.
 - .2 Clean proposed work areas using, where practicable, HEPA vacuum cleaning equipment. If not practicable, use wet cleaning method. Do not use methods that raise dust, such as dry sweeping, or vacuuming using other than HEPA vacuum equipment.
 - .3 For the work being carried out outdoors, access to the asbestos work area must be restricted via a physical hoarding area or barriers. Decontamination Facility must be located at the entrance and exit of the asbestos work area.
 - .4 Seal off openings such as doorways, windows, skylights, ducts, grilles, and diffusers, with polyethylene sheeting sealed with tape.
 - .5 The spread of dust from the work area to be prevented by:
 - .1 Utilizing appropriate dust suppressions methods i.e. use of water during removals etc.
 - .6 At each access to work areas install warning signs in both official languages in upper case "Helvetica Medium" letters reading as follows where number in parentheses indicates font size to be used: "CAUTION ASBESTOS HAZARD AREA (25 mm) NO UNAUTHORIZED ENTRY (19 mm) WEAR ASSIGNED PROTECTIVE EQUIPMENT (19 mm) BREATHING ASBESTOS DUST MAY CAUSE SERIOUS BODILY HARM (7 mm)".
 - .7 Maintain emergency and fire exits from work

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- areas, or establish alternative exits satisfactory to the Ontario Fire Marshall.
- .8 Where application of water is required for wetting asbestos containing materials, shut off electrical power, provide 24-volt safety lighting and ground fault interrupter circuits on power source for electrical tools, in accordance with applicable CSA Standard. Ensure safe installation of electrical lines and equipment.
 - .9 After preparation of work areas and Decontamination Trailer Systems, remove designated asbestos containing caulking within work areas progressively and carefully, clean using HEPA vacuum and damp sponge, wrap clean panels in 0.10 mm minimum thick polyethylene, and dispose of as contaminated waste.
- .3 Worker Decontamination Trailer System:
- .1 Worker Decontamination Trailer System includes Equipment and Access Room, Shower Room, and Clean Room, as follows:
 - .1 Equipment and Access Room: build Equipment and Access Room between Shower Room and work areas, with two curtained doorways, one to Shower Room and one to work areas. Install portable toilet, waste receptor, and storage facilities for workers' shoes and protective clothing to be reworn in work areas. Build Equipment and Access Room large enough to accommodate specified facilities, other equipment needed, and at least one worker allowing him /her sufficient space to undress comfortably.
 - .2 Shower Room: build Shower Room between Clean Room and Equipment and Access Room, with two curtained doorways, one to Clean Room and one to Equipment and Access Room. Provide one shower for every five workers. Provide constant supply of hot and cold or warm water. Provide piping and connect to water sources and drains. Pump wastewater through 5 micrometre filter system acceptable to Owner Representative before directing into drains. Provide soap, clean towels, and appropriate containers for disposal of used respirator filters.
 - .3 Clean Room: build Clean Room between Shower Room and clean areas outside of enclosures, with two curtained doorways, one to outside of enclosures and one to Shower Room. Provide lockers
-

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or hangers and hooks for workers' street clothes and personal belongings. Provide storage for clean protective clothing and respiratory equipment. Install mirror to permit workers to fit respiratory equipment properly.

- .4 Outdoor Decontamination Facilities:
 - .1 As the work area is located outdoors, a trailer containing a decontamination layout similar to the areas noted above is acceptable.
- .5 Separation of Work Areas from Occupied Areas:
 - .1 Separate parts of building required to remain in use from parts of building used for asbestos abatement by means of the following:
 - .1 Ensure all openings (i.e. vents) to the interior of the building are sealed utilizing polyethylene and tape;
 - .2 Ensure all windows and openings at street level are sealed off with polyethylene, tape, or other sufficient measures.
- .6 Maintenance of Work Areas:
 - .1 Maintain enclosures in tidy condition.
 - .2 Ensure that barriers and polyethylene linings are effectively sealed and taped. Repair damaged barriers and remedy defects immediately upon discovery.
 - .3 Visually inspect enclosures at beginning of each working period.
 - .4 Use smoke methods to test effectiveness of barriers when directed by Owner Representative.
- .7 Do not begin Asbestos Abatement work until:
 - .1 Arrangements have been made for disposal of waste.
 - .2 For wet stripping techniques, arrangements have been made for containing, filtering, and disposal of waste ater.
 - .3 Work areas and decontamination enclosures and parts of building required to remain in use are effectively segregated.
 - .4 Tools, equipment, and materials waste containers are on hand.
 - .5 Arrangements have been made for building security.
 - .6 Warning signs are displayed where access to contaminated areas is possible.
 - .7 Notifications have been completed and other preparatory steps have been taken.

3.2 SUPERVISION

- .1 Minimum of one Supervisor for every ten workers is required.
-

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- .2 Approved Supervisor must remain within Asbestos Work Area during disturbance, removal, or other handling of asbestos containing materials.

3.3 ASBESTOS REMOVAL

- .1 Before removing asbestos:
 - .1 Prepare site.
 - .2 Spray asbestos material with water containing specified wetting agent, using airless spray equipment capable of providing "mist" application to prevent release of fibres. Saturate asbestos material sufficiently to wet it to substrate without causing excess dripping. Spray asbestos material repeatedly during work process to maintain saturation and to minimize asbestos fibre dispersion.
 - .2 Remove saturated asbestos material in small sections. Do not allow saturated asbestos to dry out. As it is being removed pack material in sealable plastic bags 0.15 mm minimum thick and place in labelled containers for transport.
 - .3 Seal filled containers. Clean external surfaces thoroughly by wet sponging. Remove from immediate working area to Staging Area. Clean external surfaces thoroughly again by wet sponging before moving containers to decontamination Washroom. Wash containers thoroughly in decontamination Washroom, and store in Holding Room pending removal to Unloading Room and outside. Ensure that containers are removed from Holding Room by workers who have entered from uncontaminated areas dressed in clean coveralls.
 - .4 After completion of stripping work, wire brushed and wet sponged surfaces from which asbestos has been removed to remove visible material. During this work keep surfaces wet.
 - .5 Where Owner Representative decides complete removal of asbestos-containing material is impossible due to obstructions such as structural members or major service elements, and provides written direction, encapsulate material as follows:
 - .1 Apply surface film forming type sealer to provide dry film thickness over sprayed asbestos surfaces. Apply using airless spray equipment to avoid blowing off fibres. Apply penetrating type sealer to penetrate existing sprayed asbestos surfaces uniformly to substrate.
 - .6 After wire brushing and wet sponging to remove visible asbestos, and after encapsulating asbestos containing material impossible to remove, wet clean
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entire work area including Equipment and Access Room, and equipment used in process. After a 24-hour period to allow for dust settling, wet clean these areas and objects again. After a second 24-hour period under same conditions, clean these areas and objects again using HEPA vacuum followed by wet cleaning. After inspection by Owner Representative apply continuous coat of slow drying sealer to surfaces of work area.

.7 Work is subject to visual inspection. Contamination of surrounding areas indicated by visual inspection will require clean-up of affected areas.

.8 Cleanup:

.1 Frequently during Work and immediately after completion of work, clean up dust and asbestos containing waste using HEPA vacuum or by damp mopping.

.2 Place dust and asbestos containing waste in sealed dust tight waste bags. Treat drop sheets and disposable protective clothing as asbestos waste and wet and fold to contain dust and then place in waste bags.

.3 Immediately before their removal from Asbestos Work Area and disposal, clean each filled waste bag using damp cloths or HEPA vacuum and place in second clean waste bag.

.4 Seal and remove double bagged waste from site. Dispose of in accordance with requirements of Provincial and Federal authority having jurisdiction. Supervise dumping and ensure that dump operator is fully aware of hazardous nature of material to be dumped and that guidelines and regulations for asbestos disposal are followed.

.5 Perform final thorough clean-up of Asbestos Work Areas and adjacent areas affected by Work using HEPA vacuum.

3.4 FINAL CLEANUP

.1 If utilized, remove polyethylene sheet by rolling it away from walls to centre of work area. Vacuum visible asbestos-containing fibres observed during cleanup, immediately, using HEPA vacuum equipment.

.2 Place polyethylene seals, tape, cleaning material, clothing, and other contaminated waste in plastic bags and sealed labelled waste containers for transport.

.3 Include in clean-up Work areas, Equipment and Access Room, Washroom, Shower Room, and other contaminated enclosures.

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- .4 Include in clean-up sealed waste containers and equipment used in Work and remove from work areas, via Container and Equipment Decontamination Enclosure System, at appropriate time in cleaning sequence.
- .5 Conduct final check to ensure that no dust or debris remains on surfaces as result of dismantling operations. If requested by Owner Representative, conduct clearance air sampling within the work area.
- .6 As work progresses, and to prevent exceeding available storage capacity on site, remove sealed and labelled containers containing asbestos waste and dispose of to an authorized disposal area in accordance with requirements of disposal authority. Ensure that each shipment of containers transported to dump is accompanied by Contractor's representative to ensure that dumping is done in accordance with governing regulations.

3.5 RE-ESTABLISHMENT OF
OBJECTS AND SYSTEMS

- .1 When cleanup is complete:
 - .1 Re-establish objects and furniture moved to temporary locations in course of Work, in their proper positions.
 - .2 Re-secure mounted objects removed in course of Work in their former positions.
 - .3 Re-establish mechanical and electrical systems in proper working order. Install new filters.
 - .4 Repair or replace objects damaged in the course of Work, as directed by Owner Representative.

3.6 AIR MONITORING

- .1 From beginning of Work until completion of cleaning operations, Abatement Consultant may take air samples on daily basis outside of Asbestos Work Area in accordance with requirements prescribed under Ontario Regulation 278/05.
 - .1 Contractor will be responsible for monitoring inside enclosure in accordance with Ontario Regulation 278/05.
 - .2 If air monitoring shows that areas outside Asbestos Work Area are contaminated, enclose, maintain and clean these areas in same manner as that applicable to Asbestos Work Area.
 - .3 Ensure that respiratory safety factors are not exceeded.
 - .4 During the course of Work, Owner's Representative may measure fiber content of air outside Work areas by means of air samples analyzed by Phase Contrast
-

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Microscopy (PCM).

.1 Stop Work when PCM measurements exceed 0.05 f/cc and correct procedures.

.5 Prior to any air monitoring, Peel District School Board Multi-Site Joint Health and Safety Committee (MJHSC) Representative is to be notified, 24 hours in advance, to allow them to be present if they so desire.

3.7 INSPECTION

.1 Perform inspection of Asbestos Work Area to confirm compliance with specification and governing authority requirements. Deviations from these requirements that have not been approved in writing by Owner Representative may result in Work stoppage, at no cost to Owner.

.2 Owner Representative will inspect Work for:

.1 Adherence to specific procedures and materials.

.2 Final cleanliness and completion.

.3 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.

.3 When asbestos leakage from Asbestos Work Area has occurred or is likely to occur Owner Representative may order Work shutdown.

.1 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.

END OF SECTION

SECTION 02 8310

LEAD DISTURBANCE MINIMUM [CLASS 1] PRECAUTIONS



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PART 1 - GENERAL

1.1 SUMMARY

1. Comply with requirements of this Section when performing Work on the following lead-Containing paints:
 - Brown paint observed on the metal flashing throughout the roof.
 - Red paint observed on ladder on the roof.
 - Yellow paint observed on pipes (natural gas lines) throughout the lower roofs.
 - Previously identified grey paint on concrete floor in Fan Room.
 - Previously identified light grey paint on concrete floor in Filter Room.
 - Previously identified red paint on concrete floor in Filter Room.
 - Previously identified off-white paint on metal duct in Filter Room.
 - Previously identified off-white paint on masonry wall in Filter Room.
 - Previously identified yellow paint on concrete floor in Filter Room.
 - Previously identified white paint on concrete wall in Filter Room.
 - Previously identified off-white paint on block wall on Balcony.
 - Previously identified dark grey paint on concrete floor on Balcony.
 - Previously identified green paint on block wall underneath on Balcony.
 - Previously identified black paint on concrete wall in East Stairwell.
 - Previously identified dark grey paint on metal door on Balcony.
 - Previously identified beige paint on block wall in Men's Change Room.
 - Previously identified light grey paint on block wall in Supervisor Office.
 - Previously identified grey paint on metal door in Mechanical Room and Stairwell.
 - Previously identified blue paint on metal door in Pool Office.
 - Previously identified light beige paint on block wall in Indoor Pool.
 - Previously identified dark red paint on structural steel in Men's Washroom.
 - Previously identified beige paint on block wall in Gym Storage.
 - Previously identified blue paint on concrete

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floor in Gym Storage.

- Previously identified light teal paint on metal door in Phys. Ed. Room.
- Previously identified teal paint on concrete wall in Storeroom.
- Previously identified light yellow paint on drywall in Custodian.
- Previously identified light yellow paint on block wall in Custodian.
- Any paint observed to be visually similar to the above noted lead-containing paints.

2. Comply with requirements of this Section, in compliance with the Ontario Ministry of Labour, Immigration, Training and Skills Development Guideline - Lead on Construction Projects, revised April 2011, and the Environmental Abatement Council of Canada (EACC) Lead Guideline for Construction, Renovation, Maintenance or Repair, October 2014, when disturbing and/or removing lead-containing paints and materials providing that operations are limited to:

- Removal of lead-containing or lead-based paints and surface coatings with a chemical gel/stripper or paste.
- Removal of lead-containing paints or materials with non-powered hand tool, where the material remains chiefly intact and is not crumbled, pulverized or powdered.
- Removal of lead sheeting or flashing.
- Operating construction or demolition equipment during renovations where lead-containing paints or surface coatings are present on building materials and being disturbed.
- Removing lead-containing or lead-based paints or surface coatings with a heat gun
- Removing lead-containing and lead-based paints and surface coatings using a high-pressure water jet (e.g. pressure washer).

1.2 REFERENCES

- .1 Ontario Ministry of Labour, Immigration, Training and Skills Development Guideline Lead on Construction Projects, September 2004, Designated Substances Regulation (O. Reg. 490/09).
- .2 Environmental Abatement Council of Canada (EACC) - Lead Guideline for Construction, Renovation, Maintenance or Repair, October 2014.
- .3 Environmental Protection Act, R.S.O. 1990, c. E.19 (EPA).

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- .3 Health Canada
 - .1 Workplace Hazardous Materials Information System (WHMIS), Safety Data Sheets (SDSs).
- .4 Dangerous Goods Transportation Act, R.S.O. 1990, c. D.1 (DGTA).
- .5 U.S. Environmental Protection Agency (EPA)
 - .1 EPA 747-R-95-007- [1995], Sampling House Dust for Lead.
- .6 U.S. Department of Health and Human Services/Centers for Disease Control and Prevention/National Institute for Occupational Safety and Health (NIOSH)
 - .1 NIOSH 94-113 - NIOSH Manual of Analytical Methods (NMAM), 4th Edition (1994).
- .7 U.S. Department of Labour - Occupational Safety and Health Administration (OSHA) - Toxic and Hazardous Substances
 - .1 Lead in Construction Regulation - 29 CFR 1926.62-1993.

.8 Underwriters' Laboratories of Canada (ULC)

1.3 DEFINITIONS

- .1 Authorized Visitors: Owner Representative or designated representatives.
- .2 Polyethylene: polyethylene sheeting or rip-proof polyethylene sheeting with tape along edges, around penetrating objects over cuts and tears, and elsewhere as required to provide protection and isolation. For protection of underlying surfaces from damage and to prevent lead dust entering in clean area.
- .3 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must be appropriate capacity for scope of work.
- .4 Action level: employee exposure, without regard to use of respirators, to airborne concentration of lead of 50 micrograms per cubic meter of air (50 µg/m³) calculated as 8-hour time-weighted average (TWA). Minimum precautions for lead abatement are based on airborne lead concentrations less than 0.05 milligrams per cubic meter (0.05 mg/m³) of air for removal of lead Containing paint by methods noted in paragraph 1.1.
- .5 Experienced person: Owner Representative capable of

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identifying existing lead hazards in workplace taking corrective measures to eliminate them.

- .6 HEPA vacuum: High Efficiency Particulate Arrestance filtered vacuum equipment with a filter system capable of collecting and retaining fibres greater than 0.3 microns in any direction at 99.97% efficiency.
- .7 Lead dust: wipe sampling on vertical surfaces and/or horizontal surfaces, dust and debris is considered to be lead contaminated if it contains more than 40 micrograms of lead in dust per square foot.

1.4 SUBMITTALS

- .1 Provide submittals in accordance with applicable Sections.
- .2 Provide proof satisfactory to Owner Representative that suitable arrangements have been made to dispose of lead-Containing paint waste in accordance with requirements of Ontario regulation 347/90.
- .3 Quality Control:
 - .1 Provide Owner Representative necessary permits for transportation and disposal of lead-Containing paint waste and proof that lead-containing paint waste has been received and properly disposed.
 - .2 Provide proof satisfactory to Owner Representative that employees have had instruction on hazards of lead exposure, respirator use, dress, and aspects of work procedures and protective measures.

1.5 QUALITY ASSURANCE

- .1 Regulatory Requirements: comply with Federal, Provincial and local requirements pertaining to lead paint, provided that in case of conflict among those requirements or with these specifications more stringent requirement applies. Comply with regulations in effect at time work is performed.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with applicable Sections.
 - .2 Safety Requirements: worker and visitor protection.
 - .1 If requested by the worker, protective equipment and clothing to be worn by workers and visitors in work Area include:
 - .1 Respirator NIOSH approved and

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equipped with replaceable HEPA filter cartridges with an assigned protection factor of 10, acceptable to Authority having jurisdiction. Suitable for type of lead and level of lead dust exposure. Provide sufficient number of filters.

.2 Half mask respirator: half-mask particulate respirator with P-series filter, and 100% efficiency could be provided.

.2 Dust-impermeable gloves appropriate for the work being completed and disposable chemical resistant gloves for application of solvents, strippers and detergents shall be provided and worn by workers.

.3 Eating, drinking, chewing, and smoking are not permitted in work area.

.4 Ensure workers wash hands and face when leaving work area.

.5 Visitor Protection:

.1 Provide approved respirators to Authorized Visitors to work areas.

.3 Instruct Authorized Visitors procedures to be followed in entering and exiting work area.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with applicable Sections.

.2 Handle and dispose of hazardous materials in accordance with EPA, DGTA, Regional and Municipal regulations.

.3 Disposal of lead waste generated by removal activities must comply with Federal, Provincial and Municipal regulations. Dispose of lead waste in sealed double thickness 0.152 mm thick bags or leak proof drums. Label containers with appropriate warning labels.

.4 Provide manifests describing and listing waste created. Transport containers by approved means to licensed landfill for burial.

1.7 EXISTING CONDITIONS

.1 Information pertaining to lead-containing paints to be handled, removed, or otherwise disturbed and disposed of during this project, including the report entitled "*Bulk Asbestos Sampling Report - Roof Assessment of Indoor Pool - Glenforest Secondary School, Mississauga, ON*" (Report issued

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by WSP dated February 12, 2024) and "*Hazardous Building Materials Assessment (Pre-construction) Glenforest secondary School Indoor Pool Demolition 3575 Fieldgate Drive, Mississauga, Ontario*" (Report issued by Pinchin dated August 1, 2023); is bound into this specification.

- .2 Notify Owner Representative of lead-containing paint discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material until instructed by Owner Representative.

1.8 SCHEDULING

- .1 Not later than two days before beginning Work on this Project notify following in writing:
 - .1 Ministry of Labour, Immigration, training and Skills Development.
 - .2 Disposal Authority.
- .2 Inform sub trades of presence of lead-containing materials identified in Existing Conditions.
- .3 Provide Owner Representative copy of notifications prior to start of Work.

1.9 OWNER'S INSTRUCTIONS

- .1 Provide Owner Representative satisfactory proof that every worker has had instruction and training in hazards of lead exposure, in personal hygiene, in aspects of work procedures, and in use, cleaning, and disposal of respirators.
- .2 Instruction and training related to respirators includes, at minimum:
 - .1 Proper fitting of equipment.
 - .2 Inspection and maintenance of equipment.
 - .3 Disinfecting of equipment.
 - .4 Limitations of equipment.
- .3 Instruction and training must be provided by experienced, qualified person.
- .4 Supervisory personnel to complete required training.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Polyethylene 0.15 mm thick unless otherwise specified; in sheet size to minimize joints.
- .2 Tape: fiberglass-reinforced duct tape suitable for sealing polyethylene under dry conditions and wet conditions using amended water.

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- .3 Slow-drying sealer: non-staining, clear, water-dispersible type that remains tacky on surface for at least 8 hours and designed for purpose of trapping residual lead paint residue.
- .4 Lead waste containers: metal or fiber type acceptable to dump operator with tightly fitting covers and 0.15 mm thickness sealable polyethylene liners.
 - .1 Label containers with pre-printed bilingual cautionary Warning Lead clearly visible when ready for removal to disposal site.
- .5 Paint removal gel:
 - .1 Neutral pH.
 - .2 Flash point: > 93°C (200°F).
 - .3 Boiling point: > 315°C (600°F).
 - .4 Specific gravity: 0.99 g/ml.
 - .5 VOC: g/l < 4.41%.

PART 3 - EXECUTION

3.1 SUPERVISION

- .1 One Supervisor for every ten workers is required.
- .2 Supervisor must remain within work area during disturbance, removal, or handling of lead containing paints.

3.2 PREPARATION

- .1 Remove and store items to be salvaged or reused.
 - .1 Protect and wrap items and transport and store in area specified by Owner Representative.
- .2 Work Area:
 - .1 Pre-clean work area and equipment within work area, if applicable, using HEPA vacuum and cover and seal with polyethylene sheeting and tape.
 - .2 Clean work area using HEPA vacuum. If not practicable, use wet cleaning method. Do not raise dust.
 - .3 Seal off surrounding HVAC or air intake openings with polyethylene sheeting and seal with tape.
 - .4 Protect ground surfaces with polyethylene drop sheets.
 - .5 Maintain emergency fire exits or establish alternatives satisfactory to Authority having jurisdiction.
 - .6 Where water application is required for wetting lead-containing materials, provide temporary water supply appropriately sized

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for application of water as required.
.7 Provide electrical power and shut off for operation of powered tools and equipment. Provide 24-volt safety lighting and ground fault interrupter circuits on power source for electrical tools, in accordance with applicable CSA Standard. Ensure safe installation of electrical cables and equipment.

- .3 Do not start work until:
- .1 Arrangements have been made for disposal of waste.
 - .2 Tools, equipment, and materials waste containers are on site.
 - .3 Notifications have been completed and preparatory steps have been taken.

3.3 LEAD ABATEMENT

- .1 Removal of lead-containing coatings with a chemical gel or paste and fibrous laminated cloth wrap; or removal using power tools equipped with HEPA filters; or removal with non-powered hand tools, other than manual scraping and sanding.
 - .2 Remove lead-containing paint in small sections and pack as it is being removed in sealable 0.15 mm plastic bags and place in labelled containers for transport.
 - .3 Seal filled containers. Clean external surfaces thoroughly by wet sponging. Remove from immediate working area to staging area. Clean external surfaces thoroughly again by wet sponging. Wash containers thoroughly pending removal to outside. Ensure containers are removed by workers who have entered from uncontaminated areas dressed in clean coveralls.
 - .4 After completion of stripping work, wire brush and wet sponge surface from which lead-containing paint has been removed to remove visible material. During this work keep surfaces wet.
 - .5 After wire brushing and wet sponging to remove visible lead-containing paint, and after encapsulating lead-containing material impossible to remove, wet clean entire work area, and equipment used in process. After inspection by Owner Representative apply continuous coat of slow drying sealer to surfaces of work area.
-

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3.4 INSPECTION

- .1 A pre-contamination inspection must be completed by an experienced person to document that the prescribed measures are established and acceptable prior to the start of any work that will disturb lead.
- .2 Perform regular inspections to confirm compliance with specification and governing authority requirements.
- .3 A lead clearance assessment performed by an experienced person shall be conducted upon the completion of Class 1 Operations that will consist of a visual assessment and no visible lead containing dust or debris is observed. The presence of dust, debris or residue indicates that the cleaning was insufficient and additional cleaning shall be completed. Following additional cleaning, a follow-up inspection is required.

3.5 FINAL CLEANUP

- .1 Following cleaning and clearance is provided by a final visual assessment, proceed with final cleanup.
- .2 Remove polyethylene sheet by rolling it away from walls to center of work area. Vacuum visible lead-containing debris observed during cleanup, immediately, using HEPA vacuum.
- .3 Place polyethylene sheets, tape, cleaning material, clothing, and contaminated waste in plastic bags and sealed labelled waste containers for transport.
- .4 Conduct final check to ensure no dust or debris remains on surfaces as result of dismantling operations.

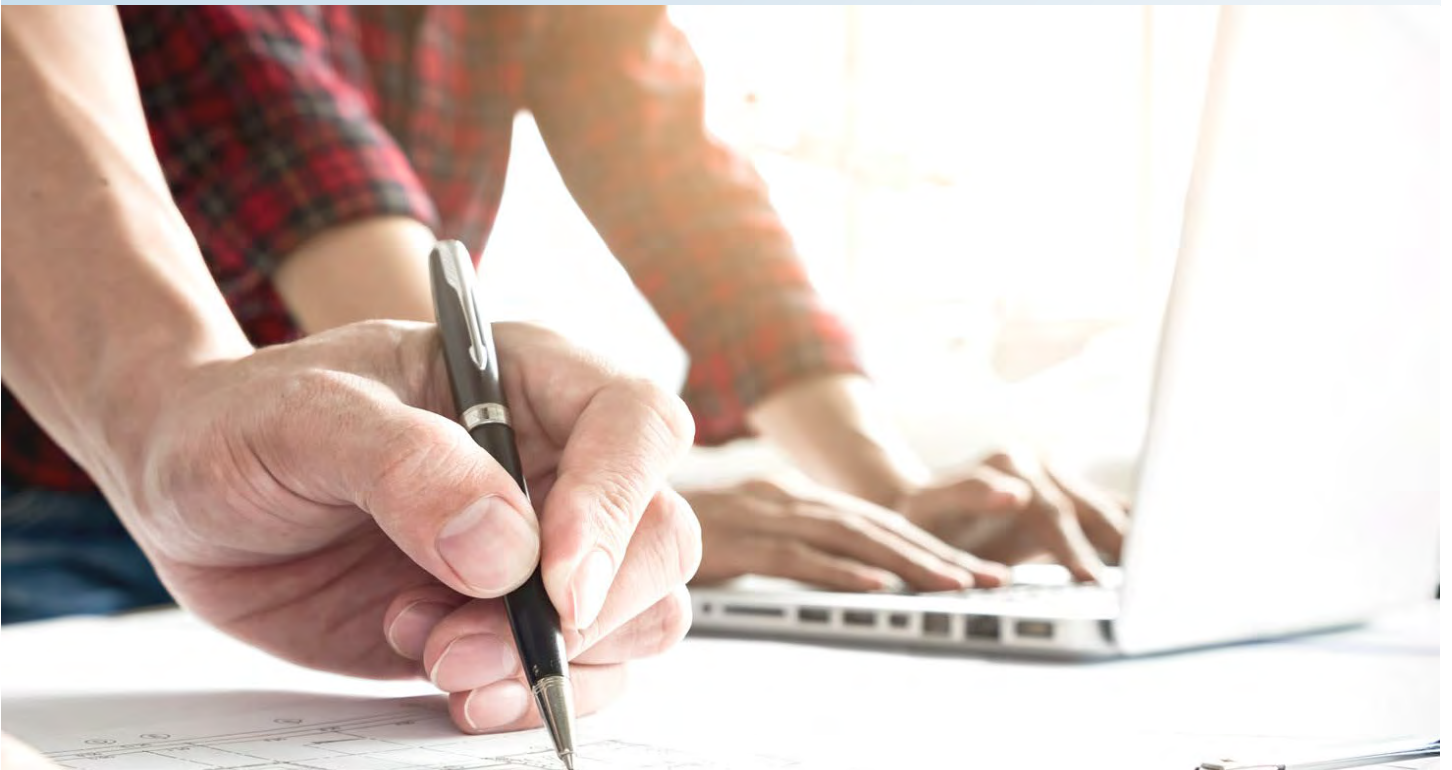
3.6 RE-ESTABLISHMENT OF
OBJECTS AND SYSTEMS

- .1 Repair or replace objects damaged in course of work to their original state or better, as directed by Owner Representative.

END OF SECTION

SECTION 02 8311

LEAD DISTURBANCE INTERMEDIATE [CLASS 2] PRECAUTIONS



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PART 1 - GENERAL

1.1 SUMMARY

1. Comply with requirements of this Section when performing Work on the following lead-containing paints:
 - Brown paint observed on the metal flashing throughout the roof.
 - Red paint observed on ladder on the roof.
 - Yellow paint observed on pipes (natural gas lines) throughout the lower roofs.
 - Previously identified grey paint on concrete floor in Fan Room.
 - Previously identified light grey paint on concrete floor in Filter Room.
 - Previously identified red paint on concrete floor in Filter Room.
 - Previously identified off-white paint on metal duct in Filter Room.
 - Previously identified off-white paint on masonry wall in Filter Room.
 - Previously identified yellow paint on concrete floor in Filter Room.
 - Previously identified white paint on concrete wall in Filter Room.
 - Previously identified off-white paint on block wall on Balcony.
 - Previously identified dark grey paint on concrete floor on Balcony.
 - Previously identified green paint on block wall underneath on Balcony.
 - Previously identified black paint on concrete wall in East Stairwell.
 - Previously identified dark grey paint on metal door on Balcony.
 - Previously identified beige paint on block wall in Men's Change Room.
 - Previously identified light grey paint on block wall in Supervisor Office.
 - Previously identified grey paint on metal door in Mechanical Room and Stairwell.
 - Previously identified blue paint on metal door in Pool Office.
 - Previously identified light beige paint on block wall in Indoor Pool.
 - Previously identified dark red paint on structural steel in Men's Washroom.
 - Previously identified beige paint on block wall in Gym Storage.
 - Previously identified blue paint on concrete floor in Gym Storage.
-

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- Previously identified light teal paint on metal door in Phys. Ed. Room.
- Previously identified teal paint on concrete wall in Storeroom.
- Previously identified light yellow paint on drywall in Custodian.
- Previously identified light yellow paint on block wall in Custodian.
- Any paint observed to be visually similar to the above noted lead-containing paints.

2. Comply with requirements of this Section, in compliance with the Ontario Ministry of Labour, Immigration, Training and Skills Development Guideline - Lead on Construction Projects, revised April 2011, and the Environmental Abatement Council of Canada (EACC) Lead Guideline for Construction, Renovation, Maintenance or Repair, October 2014, when disturbing and/or removing lead-containing paints and materials providing that operations are limited to:

- Removal of lead-containing paints and surface coating materials using a power tool that has an effective dust collection system.
- Welding, torching or high temperature cutting of lead-containing paints outdoors.
- Removing lead-containing paints and surface coatings by scraping or sanding (including wet sanding) using non-powered hand tools.
- Demolition of plaster or building components that crumble, pulverize or powder and are covered with lead-containing paints.
- Clean up and removal of a significant amount of lead-containing dust and debris using wet methods or HEPA vacuums.

1.2 REFERENCES

- .1 Ontario Ministry of Labour, Immigration, Training and Skills Development, Guideline Lead on Construction Projects, September 2004, Designated Substances Regulation (O. Reg. 490/09).
- .2 Environmental Abatement Council of Canada (EACC) - Lead Guideline for Construction, Renovation, Maintenance or Repair, October 2014.
- .3 Environmental Protection Act, R.S.O. 1990, c. E.19 (EPA).
- .4 Health Canada
 - .1 Workplace Hazardous Materials Information System (WHMIS), Safety Data Sheets (SDSs).

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- .5 Dangerous Goods Transportation Act, R.S.O. 1990, c. D.1 (DGTA).
- .6 U.S. Environmental Protection Agency (EPA)
 - .1 EPA 747-R-95-007-1995, Sampling House Dust for Lead.
- .7 U.S. Department of Health and Human Services/Centers for Disease Control and Prevention/National Institute for Occupational Safety and Health (NIOSH)
 - .1 NIOSH 94-113 - NIOSH Manual of Analytical Methods (NMAM), 4th Edition (1994).
- .8 U.S. Department of Labour - Occupational Safety and Health Administration (OSHA) - Toxic and Hazardous Substances
 - .1 Lead in Construction Regulation - 29 CFR 1926.62-1993.

.9 Underwriters' Laboratories of Canada (ULC)

1.3 DEFINITIONS

- .1 Authorized Visitors: Owner Representative or designated representatives and representatives of regulatory agencies.
- .2 Occupied Area: areas of building or work site that is outside Work Area.
- .3 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must be appropriate capacity for scope of work.
- .4 Airlock: ingress or egress system, without permitting air movement between contaminated area and uncontaminated area. Consisting of two curtained doorways at least 2 m apart.
- .5 Curtained doorway: arrangement of closures to allow ingress and egress from one room to another. Typically constructed as follows:
 - .1 Place two overlapping polyethylene sheets over existing or temporarily framed doorway, securing each along top of doorway, securing vertical edge of one sheet along one vertical side of doorway, and secure other sheet along opposite vertical side of doorway.
 - .2 Reinforce free edges of polyethylene with duct tape and add weight to bottom edge to ensure proper closing.
 - .3 Overlap each polyethylene sheet at openings 1.5 m on each side.

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- .6 Action level: employee exposure, without regard to usage of respirators, to an airborne concentration of lead of 50 micrograms per cubic meter of air calculated as 8-hour time-weighted average (TWA). Intermediate precautions for lead abatement are based on airborne lead concentrations greater than 0.05 milligrams per cubic meter of air within Work Area.
- .7 Experienced person: Owner Representative capable of identifying existing lead hazards in workplace and taking corrective measures to eliminate them.
- .8 HEPA vacuum: High Efficiency Particulate Arrestance filtered vacuum equipment with filter system capable of collecting and retaining fibres greater than 0.3 microns in any direction at 99.97% efficiency.
- .9 Lead in Dust: wipe sampling on vertical and/or horizontal surfaces, dust and debris is considered to be lead contaminated if it contains more than 40 micrograms of lead in dust per square foot.

1.4 SUBMITTALS

- .1 Provide submittals in accordance with applicable Sections.
- .2 Provide proof satisfactory to Owner Representative that suitable arrangements have been made to dispose of lead containing paint waste in accordance with Ontario Regulation 347/90.
- .3 Provide: Ministry of Labour, Immigration, Training and Skills Development Notice of Project Form.
- .4 Quality Control:
 - .1 Provide Owner Representative necessary permits for transportation and disposal of lead-containing paint waste and proof that it has been received and properly disposed.
 - .2 Provide proof satisfactory to Owner Representative that employees have had instruction on hazards of lead exposure, respirator use, dress, entry and exit from Work Area, and aspects of work procedures and protective measures.
 - .3 Provide proof that supervisory personnel have attended lead abatement course, of not less than two days duration, approved by Owner Representative. Minimum of one supervisor for every ten workers.
- .5 Product data:
 - .1 Provide documentation including test results,

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fire and flammability data, and Safety Data Sheets (SDSs) for chemicals or materials including:

- .1 Encapsulants.
- .2 Amended water.
- .3 Slow-drying sealer.

1.5 QUALITY ASSURANCE

.1 Regulatory Requirements: comply with Federal, Provincial and local requirements pertaining to lead paint, in case of conflict among those requirements or with these specifications more stringent requirement applies. Comply with regulations in effect at time work is performed.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with applicable Sections.

.2 Safety Requirements: worker and visitor protection.

.1 Protective equipment and clothing to be worn by workers and visitors in Work Area includes:

.1 Respirator NIOSH approved and equipped with filter cartridges with assigned protection factor of 50, acceptable to the Ministry of Labour, Immigration, Training and Skills Development. Suitable for type of lead and level of lead dust exposure in Lead Work Area. Provide sufficient filters so workers can install new filters following disposal of used filters and before re-entering contaminated areas.

.2 Disposable type protective clothing that does not readily retain or permit skin contamination, consisting of full body covering including head covering with snug fitting cuffs at wrists, ankles, and neck.

.3 Dust-impermeable gloves appropriate for the work being completed and disposable chemical resistant gloves for application of solvents, strippers and detergents shall be provided and worn by workers.

.2 Requirements for workers:

.1 Remove street clothes in clean changing area and put on respirator with new filters or reusable filters, clean coveralls and head covers before entering

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- Work Area. Store street clothes, uncontaminated footwear, towels, and similar uncontaminated articles in clean change room.
- .2 Remove gross contamination from clothing before leaving work area. Place contaminated work suits in receptacles for disposal with other lead - contaminated materials. When not in use in Work Area, store work footwear in Equipment Room. Upon completion of lead abatement, dispose of footwear as contaminated waste or clean thoroughly inside and out using soap and water before removing from Work Area.
 - .3 Washing facilities consisting of a wash basin, clean water, soap (consider the use of lead-specific soaps and hygiene indicators based on the scope of the Operation) and towels shall be provided. Workers shall use these washing facilities upon leaving the work area and before eating, drinking or smoking.
 - .4 Eating, drinking, chewing, and smoking are not permitted in Work Area.
 - .5 Ensure workers are fully protected with respirators and protective clothing during preparation of system of enclosures prior to commencing actual lead abatement.
 - .6 Ensure no person required to enter Work Area has facial hair that affects seal between respirator and face.
 - .7 Visitor Protection:
 - .1 Provide protective clothing and approved respirators to Authorized Visitors to Work Areas.
 - .2 Instruct Authorized Visitors in use of protective clothing, respirators and procedures.
 - .3 Instruct Authorized Visitors in proper procedures to be followed in entering into and exiting from Work Area.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with applicable Sections.
- .2 Handle and dispose of hazardous materials in accordance with EPA, DGTA, Regional and Municipal regulations and by-laws.

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- .3 Disposal of lead waste generated by removal activities must comply with Federal, Provincial, and Municipal regulations and by-laws. Dispose of lead waste in sealed double thickness 0.152 mm thick bags or leak proof drums. Label containers with appropriate warning labels.
- .4 Provide manifests describing and listing waste created. Transport containers by approved means to licensed landfill for burial.

1.7 EXISTING CONDITIONS

- .1 Information pertaining to lead-containing paints to be handled, removed, or otherwise disturbed and disposed of during this project, including the report entitled "*Bulk Asbestos Sampling Report - Roof Assessment of Indoor Pool - Glenforest Secondary School, Mississauga, ON*" (Report issued by WSP dated February 12, 2024) and "*Hazardous Building Materials Assessment (Pre-construction) Glenforest secondary School Indoor Pool Demolition 3575 Fieldgate Drive, Mississauga, Ontario*" (Report issued by Pinchin dated August 1, 2023); is bound into this specification.
- .2 Notify Owner Representative of lead-containing paint discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material until instructed by Owner Representative.

1.8 SCHEDULING

- .1 Not later than two days before beginning Work on this Project notify the following in writing, where appropriate:
 - .1 Ministry of Labour, Immigration, Training and Skills Development.
 - .2 Disposal Authority.
- .2 Inform sub trades of presence of lead-containing materials identified in Existing Conditions.
- .3 Provide Owner Representative copy of notifications prior to start of Work.

1.9 OWNER'S INSTRUCTIONS

- .1 Provide Owner Representative satisfactory proof that every worker has had instruction and training in hazards of lead exposure, in personal hygiene, in aspects of work procedures, and in use, cleaning, and disposal of respirators.
- .2 Instruction and training related to respirators includes, at minimum:
 - .1 Proper fitting of equipment.
 - .2 Inspection and maintenance of equipment.
 - .3 Disinfecting of equipment.

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- .4 Limitations of equipment.
- .3 Instruction and training must be provided by experienced, qualified person.
- .4 Supervisory personnel to complete required training.

PART 2- PRODUCTS

2.1 MATERIALS

- .1 Polyethylene: 0.15 mm unless otherwise specified; in sheet size to minimize joints.
- .2 FR polyethylene: 0.15 mm woven fiber reinforced fabric bonded both sides with polyethylene.
- .3 Tape: fiberglass-reinforced duct tape suitable for sealing polyethylene under dry conditions and wet conditions using amended water.
- .4 Slow-drying sealer: non-staining, clear, water-dispersible type that remains tacky on surface for at least 8 hours and designed for trapping residual lead paint residue.
- .5 Lead waste containers: metal or fiber type acceptable to dump operator with tightly fitting covers and 0.15 mm sealable polyethylene liners.
 - .1 Label containers with pre-printed bilingual cautionary Warning Lead clearly visible when ready for removal to disposal site.

PART 3 - EXECUTION

3.1 SUPERVISION

- .1 Approved Supervisor must remain within Lead Work Area during disturbance, removal, or other handling of lead containing paints.

3.2 PREPARATION

- 1 Remove and wrap items to be salvaged or reused, and transport and store in area specified by Owner Representative.
- .2 Work Area:
 - .1 If applicable, shut off and isolate air handling and ventilation systems to prevent lead dispersal to other building areas during work phase. Conduct smoke tests to ensure that duct work is airtight.
 - .2 Pre-clean fixed casework, and equipment within work areas, using HEPA vacuum and cover with polyethylene sheeting sealed with tape.
 - .3 Clean work areas using HEPA vacuum. If not

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practicable, use wet cleaning method. Do not use methods that raise dust, such as dry sweeping, or vacuuming using other than HEPA vacuum.

- .4 Seal off openings, corridors, doorways, windows, skylights, ducts, grilles, and diffusers, with polyethylene sheeting sealed with tape.
- .5 Cover ground surfaces in work area with FR polyethylene drop sheets to protect existing floor during removal.
- .6 Access to the Work Area must be delineated and restricted via barriers to control access.
- .7 At point of access to work areas install warning signs in both official languages in upper case "Helvetica Medium" letters reading as follows where number in parentheses indicates font size to be used:
 - .1 CAUTION LEAD HAZARD AREA (25 mm).
 - .2 NO UNAUTHORIZED ENTRY (19 mm).
 - .3 WEAR ASSIGNED PROTECTIVE EQUIPMENT AND RESPIRATOR (19 mm).
 - .4 BREATHING LEAD CONTAMINATED DUST CAUSES SERIOUS BODILY HARM (7 mm).
- .8 Maintain emergency and fire exits from work areas, or establish alternative exits satisfactory to Authority having jurisdiction.
- .9 Where water application is required for wetting lead-containing materials, provide temporary water supply by use of appropriately sized hoses for application of water as required.

3.3 LEAD-CONTAINING
ABATEMENT

- .1 Removal of lead-containing paint to be performed by scraping or sanding using non-powered hand tools, or manual demolition of lead-painted plaster walls or building components by striking a wall with sledgehammer or similar tool.
- .2 Remove lead-containing paint in small sections and pack as it is being removed in sealable 0.15 mm plastic bags and place in labelled containers for transport.
- .3 Seal filled containers. Clean external surfaces thoroughly by wet sponging. Remove from immediate working area to Staging Area. Clean external surfaces thoroughly again by wet sponging before moving containers to decontamination Washroom. Wash containers thoroughly in decontamination Washroom, and store in Holding Room pending removal to Unloading Room and outside. Ensure containers are removed from Holding Room by workers who have entered from uncontaminated areas dressed in clean

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coveralls.

- .4 After completion of stripping work, wire brush and wet sponge surface from which lead-containing paint has been removed to remove visible material. During this work keep surfaces wet.
- .5 After wire brushing and wet sponging to remove visible lead-containing paint, and after encapsulating any lead-containing material to remain, wet clean work area including equipment and access room, and equipment used in process. After inspection by Owner Representative, apply continuous coat of slow-drying sealer to surfaces.
- .6 After enclosing remaining lead painted surfaces, wet clean work area and equipment and access room. During settling period no entry, activity, or ventilation will be permitted.

3.4 INSPECTION

- .1 A pre-contamination inspection must be completed by an experienced person to document that the prescribed measures are established and acceptable prior to the start of any work that will disturb lead.
- .2 Perform regular inspections to confirm compliance with specification and governing authority requirements.
- .3 A lead clearance assessment performed by an experienced person shall be conducted upon the completion of Class 2 Operations that will consist of a visual assessment and no visible lead containing dust or debris is observed. The presence of dust, debris or residue indicates that the cleaning was insufficient and additional cleaning shall be completed. Following additional cleaning, a follow-up inspection is required.
- .4 Owner Representative will inspect work for:
 - .1 Adherence to specific procedures and materials.
 - .2 Final cleanliness and completion.
 - .3 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.
- .5 When lead dust leakage from Work Area occurs, Owner Representative may order Work shutdown.
 - .1 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.

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3.5 FINAL CLEANUP

- .1 Following cleaning and clearance is provided by a final visual assessment, proceed with final cleanup.
- .2 Remove polyethylene sheet by rolling it away from walls to center of work area. Vacuum visible lead-containing debris observed during cleanup, immediately, using HEPA vacuum equipment.
- .3 Place polyethylene seals, tape, cleaning material, clothing, and other contaminated waste in plastic bags and sealed labelled waste containers for transport.
- .4 Clean-up Work Areas, Equipment and Access Room, and other contaminated enclosures.
- .5 Clean-up sealed waste containers and equipment used in Work and remove from work areas, via Container and Equipment Decontamination Enclosure System, at appropriate time in cleaning sequence.
- .6 Conduct final check to ensure no dust or debris remains on surfaces as result of dismantling operations.

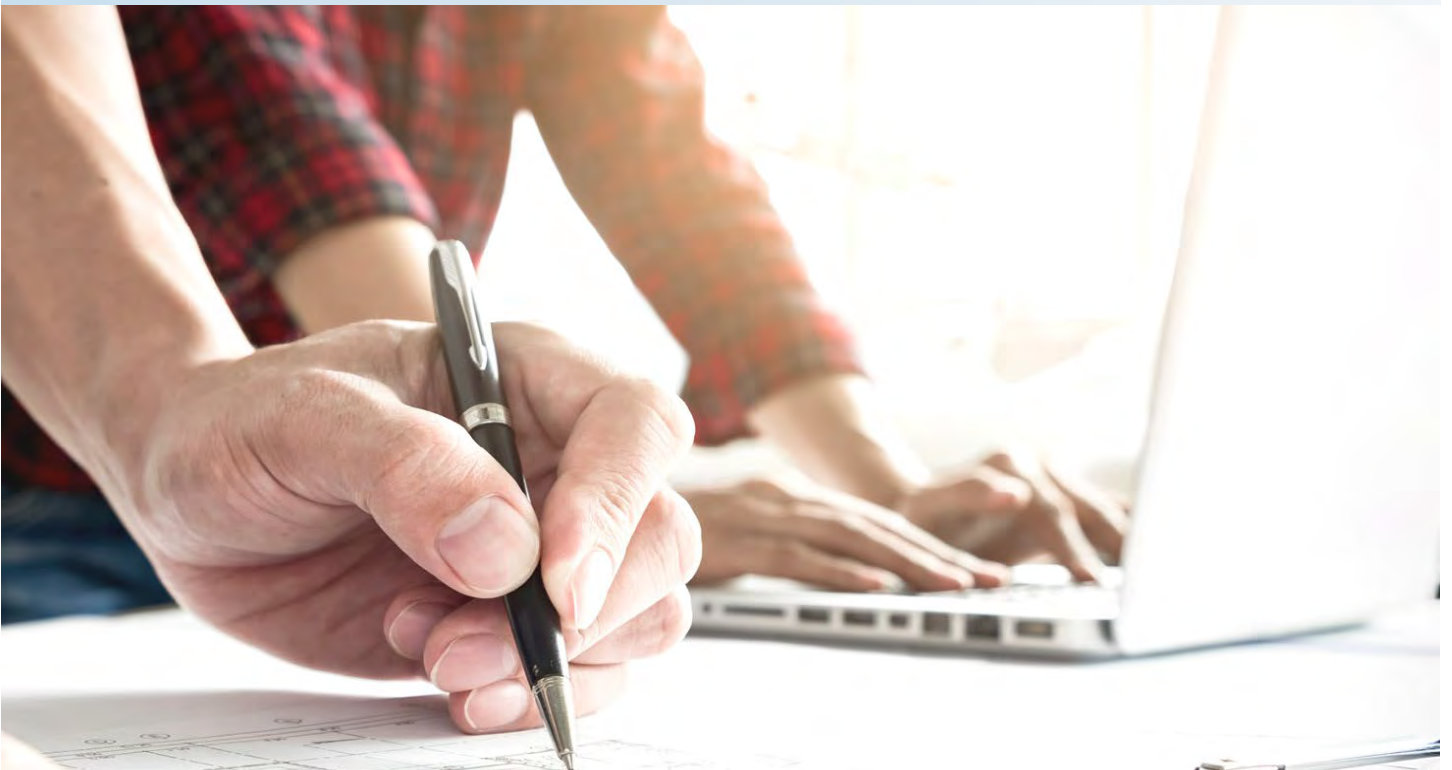
3.6 RE-ESTABLISHMENT OF
OBJECTS AND SYSTEMS

- .1 Repair or replace objects damaged in course of work to their original state or better, as directed by Owner Representative.

END OF SECTION

SECTION 02 8312

LEAD DISTURBANCE MAXIMUM [CLASS 3] PRECAUTIONS



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PART 1 - GENERAL

1.1 SUMMARY

1. Comply with requirements of this Section when performing Work on the following lead-containing paints:
 - Brown paint observed on the metal flashing throughout the roof.
 - Red paint observed on ladder on the roof.
 - Yellow paint observed on pipes (natural gas lines) throughout the lower roofs.
 - Previously identified grey paint on concrete floor in Fan Room.
 - Previously identified light grey paint on concrete floor in Filter Room.
 - Previously identified red paint on concrete floor in Filter Room.
 - Previously identified off-white paint on metal duct in Filter Room.
 - Previously identified off-white paint on masonry wall in Filter Room.
 - Previously identified yellow paint on concrete floor in Filter Room.
 - Previously identified white paint on concrete wall in Filter Room.
 - Previously identified off-white paint on block wall on Balcony.
 - Previously identified dark grey paint on concrete floor on Balcony.
 - Previously identified green paint on block wall underneath on Balcony.
 - Previously identified black paint on concrete wall in East Stairwell.
 - Previously identified dark grey paint on metal door on Balcony.
 - Previously identified beige paint on block wall in Men's Change Room.
 - Previously identified light grey paint on block wall in Supervisor Office.
 - Previously identified grey paint on metal door in Mechanical Room and Stairwell.
 - Previously identified blue paint on metal door in Pool Office.
 - Previously identified light beige paint on block wall in Indoor Pool.
 - Previously identified dark red paint on structural steel in Men's Washroom.
 - Previously identified beige paint on block wall in Gym Storage.
 - Previously identified blue paint on concrete floor in Gym Storage.
-

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- Previously identified light teal paint on metal door in Phys. Ed. Room.
- Previously identified teal paint on concrete wall in Storeroom.
- Previously identified light yellow paint on drywall in Custodian.
- Previously identified light yellow paint on block wall in Custodian.
- Any paint observed to be visually similar to the above noted lead-containing paints.

2. Comply with requirements of this Section, in compliance with the Ministry of Labour, Immigration, Training and Skills Development Guideline - Lead on Construction Projects, revised April 2011, and the Environmental Abatement Council of Canada (EACC) Lead Guideline for Construction, Renovation, Maintenance or Repair, October 2014, when disturbing and/or removing lead-containing paints and materials providing that operations are limited to:

- Removal of lead-containing paint using power tools without an effective dust collection system equipped with HEPA filter.
- Abrasive blasting of lead-containing paint (including wet, slurry and drive abrasive blasting and dry-ice blasting).
- Welding, torching or high temperature cutting of lead-containing materials indoors.

1.2 REFERENCES

- .1 Ontario Ministry of Labour, Immigration, Training and Skills Development, Guideline Lead on Construction Projects, September 2004, Designated Substances Regulation (O. Reg. 490/09).
- .2 Environmental Abatement Council of Canada (EACC) - Lead Guideline for Construction, Renovation, Maintenance or Repair, October 2014.
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-Z180.1-00(R2005), Compressed Breathing Air and Systems.
- .4 Environmental Protection Act, R.S.O. 1990, c. E.19 (EPA).
- .5 Workplace Hazardous Materials Information System (WHMIS), Safety Data Sheets (SDSs).
- .6 Dangerous Goods Transportation Act, R.S.O. 1990, c. D.1 (DGTA).

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- .7 U.S. Environmental Protection Agency (EPA)
 - .1 EPA 747-R-95-007-1995, Sampling House Dust for Lead.
- .8 U.S. Department of Health and Human Services/Centers for Disease Control and Prevention/National Institute for Occupational Safety and Health (NIOSH)
 - .1 NIOSH 94-113 - NIOSH Manual of Analytical Methods (NMAM), 4th Edition (1994).
- .9 U.S. Department of Labour - Occupational Safety and Health Administration (OSHA) - Toxic and Hazardous Substances
 - .1 Lead in Construction Regulation - 29 CFR 1926.62- [1993].
- .10 Underwriters' Laboratories of Canada (ULC).

1.3 DEFINITIONS

- .1 HEPA vacuum: High Efficiency Particulate Arrestance filtered vacuum equipment with a filter system capable of collecting and retaining fibres greater than 0.3 microns in any direction at 99.97% efficiency.
- .2 Authorized Visitors: Owner Representative or designated representatives of regulatory agencies.
- .3 Occupied Area: area of building or work site outside Work Area.
- .4 Dioctyl Phthalate (DOP)/ Polyalpha Olefin (PAO) Test: testing method used to evaluate particle penetration and air flow resistance properties of filtration materials - HEPA filter leak test.
- .5 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Appropriate capacity for scope of work.
- .6 Airlock: ingress or egress system without permitting air movement between contaminated area and uncontaminated area. Consisting of two curtained doorways at least 2 m apart.
- .7 Curtained doorway: arrangement of closures to allow ingress and egress from one room to another while permitting minimal air movement between rooms, typically constructed as follows:
 - .1 Place two overlapping sheets of polyethylene over existing or temporarily framed doorway, secure each along top of doorway, secure vertical edge of one sheet along one vertical side of doorway, and secure vertical edge of

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other sheet along opposite vertical side of doorway.

- .2 Reinforce free edges of polyethylene with duct tape and add weight to bottom edge to ensure proper closing.
- .3 Overlap each polyethylene sheet at openings 1.5 m on each side.

- .8 Action level: employee exposure, without regard to usage of respirators, to an airborne concentration of lead of 50 micrograms per cubic meter (50 $\mu\text{g}/\text{m}^3$) of air calculated as an 8-hour time-weighted average (TWA). Maximum precautions for lead abatement are containing on airborne lead concentrations greater than 1.25 milligrams per cubic meter of air within Work Area.

- .9 Experienced person: Owner Representative capable of identifying existing lead hazards in workplace and taking corrective measures to eliminate them.

- .10 HEPA vacuum: High Efficiency Particulate Arrestance filtered vacuum equipment with a filter system capable of collecting and retaining fibres greater than 0.3 microns in any direction at 99.97% efficiency.

- .11 Lead in Dust: wipe sampling on the vertical and/or horizontal surfaces, dust and debris is considered to be lead contaminated if it contains more than 40 micrograms of lead in dust per square foot.

- .12 Negative Air Pressure Machine: extracts air directly from work area and filters extracted air through a HEPA filter, discharge air to exterior of building.

- .13 Maintain pressure differential of 5 to 7 Pa relative to adjacent areas outside of work areas. Machine to be equipped with alarm to warn of system breakdown and equipped with instrument to continuously monitor and automatically record pressure differences.

1.4 SUBMITTALS

- .1 Provide submittals in accordance with applicable Sections.

 - .2 Provide proof satisfactory to Owner Representative that suitable arrangements have been made to dispose of lead-containing paint waste in accordance with requirements of Ontario Regulation 347/90.

 - .3 Provide: Ministry of Labour, Immigration, Training and Skills Development Notice of Project Form.
-

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- .4 Quality Control:
 - .1 Provide Owner Representative necessary permits for transportation and disposal of lead-containing paint waste and proof it has been received and properly disposed.
 - .2 Provide proof satisfactory to Owner Representative that employees had instruction on hazards of lead exposure, respirator use, dress, entry and exit from Work Area, and aspects of work procedures and protective measures.
 - .3 Provide proof that supervisory personnel have attended lead abatement course, of not less than two days duration, approved by Owner Representative. Minimum of one supervisor for every ten workers.

- .5 Product data:
 - .1 Provide documentation including test results, fire and flammability data, and Safety Data Sheets (SDSs) for chemicals or materials including:
 - .1 Encapsulants.
 - .2 Amended water.
 - .3 Slow-drying sealer

1.5 QUALITY ASSURANCE

- .1 Regulatory Requirements: comply with Federal, Provincial and local requirements pertaining to lead, in case of conflict among those requirements or with these specifications the more stringent requirement applies. Comply with regulations in effect at time work is performed.

- .2 Health and Safety:
 - .1 Require construction work to be in compliance with the occupational health and safety regulations.
 - .2 Safety Requirements: worker and visitor protection.
 - .1 Protective equipment and clothing to be worn by workers while in Lead Work Area includes:
 - .1 Lead removal using power tool: respirator NIOSH approved and equipped with filter cartridges with assigned protection factor of 50, acceptable to the Ministry of Labour, Immigration, Training and Skills Development. Suitable for type of lead and level of lead dust exposure in Lead Work Area. Provide sufficient filters so workers can install new filters following disposal of used filters and before re-

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- entering contaminated areas.
- .2 Abrasive blasting of lead paint:
NIOSH approved and equipped with filter cartridges with assigned protection factor of 1000, acceptable to Authority having jurisdiction. Suitable for type of lead and level of lead dust exposure in Lead Work Area. Respirator to be equivalent Type CE abrasive blast supplied air respirator operated in a pressure demand or positive pressure mode with a tight-fitting full-face-piece. Compressed air used to supply supplied air respirators to meet breathing air purity requirements of CAN/CSA-Z180.1. Where an oil-lubricated compressor is used to supply breathing air, a continuous carbon monoxide monitor/alarm to be provided.
- .3 Disposable protective clothing that does not readily retain or permit skin contamination, consisting of full body covering including head covering with snug fitting cuffs at wrists, ankles, and neck.
- .4 Dust-impermeable gloves appropriate for the work being completed and disposable chemical resistant gloves for application of solvents, strippers and detergents shall be provided and worn by workers.
- .2 Requirements for workers:
 - .1 Remove street clothes in clean change room and put on respirator with new filters or reusable filters, clean coveralls and head covers before entering Work Area. Store street clothes, uncontaminated footwear, towels, and similar uncontaminated articles in clean change room.
 - .2 Remove gross contamination from clothing before leaving work area. Place contaminated work suits in receptacles for disposal with other lead - contaminated materials. Leave reusable items except respirator in dirty change room. When not in use in Work Area, store work footwear in

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dirty change room. Upon completion of lead abatement, dispose of footwear as contaminated waste or clean thoroughly inside and out using soap and water before removing from Work Area.

- .3 Washing facilities consisting of a wash basin, clean water, soap (consider the use of lead-specific soaps and hygiene indicators based on the scope of the Operation) and towels shall be provided. Workers shall use these washing facilities upon leaving the work area and before eating, drinking or smoking.
- .4 Eating, drinking, chewing, and smoking are not permitted in Work Area.
- .5 Ensure workers are fully protected with respirators and protective clothing during preparation of system of enclosures prior to commencing actual lead abatement.
- .6 Ensure no person required to enter Work Area has facial hair that affects seal between respirator and face.
- .7 Visitor Protection:
 - .1 Provide protective clothing and approved respirators to Authorized Visitors to work areas.
 - .2 Instruct Authorized Visitors in use of protective clothing, respirators and procedures.
 - .3 Instruct Authorized Visitors in proper procedures to be followed in entering into and exiting from Work Area.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with applicable Sections.
- .2 Handle and dispose of hazardous materials in accordance with EPA, DGTA, Regional and Municipal regulations and by-laws.
- .3 Disposal of lead waste generated by removal activities must comply with Federal, Provincial, and Municipal regulations and by-laws. Dispose of lead waste in sealed double thickness 0.15 mm thick bags or leak proof drums. Label containers with appropriate warning labels.
- .4 Provide manifests describing and listing waste created. Transport containers by approved means to licensed landfill for burial.

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1.7 EXISTING CONDITIONS

- .1 Information pertaining to lead-containing paints to be handled, removed, or otherwise disturbed and disposed of during this project, including the report entitled "*Bulk Asbestos Sampling Report - Roof Assessment of Indoor Pool - Glenforest Secondary School, Mississauga, ON*" (Report issued by WSP dated February 12, 2024) and "*Hazardous Building Materials Assessment (Pre-construction) Glenforest secondary School Indoor Pool Demolition 3575 Fieldgate Drive, Mississauga, Ontario*" (Report issued by Pinchin dated August 1, 2023); is bound into this specification.
- .2 Notify Owner Representative of lead containing paint discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material until instructed by Owner Representative.

1.8 SCHEDULING

- .1 Not later than two days before beginning Work on this Project notify the following in writing; where appropriate.
 - .1 Ministry of Labour, Immigration, Training and Skills Development.
 - .2 Disposal Authority.
- .2 Inform sub trades of presence of lead-containing materials identified in Existing Conditions.
- .3 Provide Owner Representative copy of notifications prior to start of Work.

1.9 OWNER'S INSTRUCTIONS

- .1 Provide Owner Representative satisfactory proof that every worker has had instruction and training in hazards of lead exposure, in personal hygiene, in aspects of work procedures, and in use, cleaning, and disposal of respirators.
- .2 Instruction and training related to respirators includes, at minimum:
 - .1 Proper fitting of equipment.
 - .2 Inspection and maintenance of equipment.
 - .3 Disinfecting of equipment.
 - .4 Limitations of equipment.
- .3 Instruction and training must be provided by experienced, qualified person.
- .4 Supervisory personnel to complete required training.

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PART 2 - PRODUCTS

- 2.1 MATERIALS
- .1 Polyethylene 0.15 mm unless otherwise specified; in sheet size minimize joints.
 - .2 FR polyethylene: 0.15 mm woven fiber reinforced fabric bonded both sides with polyethylene.
 - .3 Tape: fiberglass-reinforced duct tape suitable for sealing polyethylene under dry conditions and wet conditions using amended water.
 - .4 Slow-drying sealer: non-staining, clear, water-dispersible type that remains tacky on surface for at least 8 hours and designed for trapping residual lead paint residue.
 - .5 Lead waste containers: metal or fiber type acceptable to dump operator with tightly fitting covers and 0.15 mm sealable polyethylene liners.
 - .1 Label containers with pre-printed bilingual cautionary Warning Lead clearly visible when ready for removal to disposal site.

PART 3 - EXECUTION

- 3.1 SUPERVISION
- .1 Approved Supervisor must remain within Work Area during disturbance, removal, or handling of lead-containing paints.
- 3.2 PREPARATION
- .1 Remove and wrap items to be salvaged or reused, and transport and store in area specified by Owner Representative.
 - .2 Work Area:
 - .1 Enclosures shall be used to separate the work area from other construction activities or work areas and to prevent lead exposure to persons not directly involved in the lead operation. Barriers should only be used where full and partial enclosures are not practicable.
 - .1 For Class 3a operations conducted indoors where work areas are not accessible to the public or anyone not included in the lead abatement activities, barriers, partial enclosures, or full enclosures may be used.
 - .2 For all other all other Class 3 operations conducted indoors full enclosures shall be used.

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- .3 For Class 3a and 3b operations conducted outdoors, barriers, partial enclosures, or full enclosures shall be provided.
 - .2 If applicable, shut off and isolate HVAC system to prevent lead dust and particulate dispersal into other building areas. Conduct smoke tests to ensure duct work is airtight.
 - .3 Clean work areas using HEPA vacuum. If not practicable, use wet cleaning method. Do not use methods that raise dust, such as dry sweeping, or vacuuming using other than HEPA vacuum.
 - .4 If full enclosure is used, install negative pressure machine system and operate continuously from installation of polyethylene sheeting until completion of final cleanup. Provide automatic continuous monitoring and recording instrument of pressure difference.
 - .5 Seal off openings, corridors, doorways, windows, skylights, ducts, grilles, and diffusers, with polyethylene sheeting sealed with tape.
 - .6 Cover ground surfaces in work area with FR polyethylene drop sheets to protect existing floor during removal.
 - .7 Build airlocks at entrances and exits from work areas to ensure work areas are always closed off by one curtained doorway when workers enter or exit.
 - .8 At point of access to work areas install warning signs in both official languages in upper case "Helvetica Medium" letters reading as follows where number in parentheses indicates font size to be used:
 - .1 CAUTION LEAD HAZARD AREA (25 mm).
 - .2 NO UNAUTHORIZED ENTRY (19 mm).
 - .3 WEAR ASSIGNED PROTECTIVE EQUIPMENT AND RESPIRATOR (19 mm).
 - .4 BREATHING LEAD CONTAMINATED DUST CAUSES SERIOUS BODILY HARM (7 mm).
 - .9 Maintain emergency and fire exits from work areas, or establish alternative exits satisfactory to Authority having jurisdiction.
 - .10 Where water application is required for wetting lead-containing materials, provide temporary water supply by use of appropriately sized hoses for application of water as required.
 - .3 Worker Decontamination Enclosure System:
 - .1 Worker Decontamination Enclosure System must be as close as practicable to the work area and shall consist of a Clean Room, Shower
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Room and Dirty Change Room:

- .1 Clean Room: build Clean Room between Shower Room and clean areas outside of enclosures, with two curtained doorways, one to outside of enclosures and one to Shower Room. Provide a suitable area for taking off contaminated protective clothing which can include lockers or hangers and hooks for workers' street clothes and personal belongings. Provide storage for clean protective clothing and respiratory equipment.
 - .2 Shower Room: build Shower Room between Clean Room and Dirty Change Room, with two curtained doorways, one to Clean Room and one to Dirty Change Room as an area for workers to decontaminate after exiting the work area and entering the clean area which includes:
 - .1 Hot and cold water with individual controls inside the room to regulate water flow and temperature, or
 - .2 Water of a constant temperature that is not less than 40° Celsius or more than 50° Celsius.
 - .3 Clean towels.
 - .4 Soap that is suitable for removing lead, and
 - .5 Hygiene indicators to visually confirm that lead has been removed from workers hands.
 - .3 Dirty Change Room: construct between Shower Room and work area, with two curtained doorways, one to Shower Room and one to work area. Install portable toilet, waste receptor, and storage facilities for workers' shoes and protective clothing to be reworn in work area. Build Dirty Change Room large enough to accommodate specified facilities, other equipment needed, and at least one worker allowing him /her sufficient space to undress comfortably.
 - .4 Construction of Decontamination Enclosures:
 - .1 Construct framing for enclosures or use existing rooms. Line enclosure with polyethylene sheeting and seal with tape, apply two layers of FR polyethylene on floor.
 - .2 Construct curtain doorways between enclosures so when people move through or waste containers and equipment are moved through doorway, one of two closure comprising
-

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- doorway always remains closed.
- .3 Before each shift in which a decontamination facility is being used, an experienced person should inspect the facility to ensure that there are no defects that would allow lead-containing dust to escape. Defects should be repaired before the facility is used. The decontamination facility should be maintained in a clean and sanitary condition.
- .4 Maintenance of Enclosures:
 - .1 Maintain enclosures in tidy condition.
 - .2 Ensure barriers and polyethylene linings are effectively sealed and taped. Repair damaged barriers and remedy defects immediately.
 - .3 Visually inspect enclosures at beginning of each working day.
 - .4 Use smoke test method to test effectiveness of barriers as directed by Owner Representative.
- .5 Do not begin lead disturbance work until:
 - .1 Arrangements have been made for disposal of waste.
 - .2 Work areas and decontamination enclosures and parts of building required to remain in use are effectively segregated.
 - .3 Tools, equipment, and materials waste containers are on hand.
 - .4 Arrangements have been made for building security.
 - .5 Warning signs are displayed where access to contaminated areas is possible.
 - .6 Notifications have been completed and other preparatory steps have been taken.

3.3 LEAD-CONTAINING PAINT ABATEMENT

- .1 Removal of lead-containing paint to be performed using power tools or abrasive blasting.
- .2 Remove lead-containing paint in small sections and pack as it is being removed in sealable 0.15 mm plastic bags and place in labelled containers for transport.
- .3 Wet method to be used to reduce dust generation. Examples of wet methods include wetting surfaces, wet scraping, and wet shoveling. Wet method not be used if it creates a hazard or cause damage to equipment or to project. Power tools to be equipped with a shroud, and to be kept flush with surface.
- .4 Seal filled containers. Clean external surfaces thoroughly by wet sponging. Remove immediate from working area to staging area. Clean external

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surfaces thoroughly again by wet sponging before moving containers to decontamination Washroom. Wash containers thoroughly in decontamination Washroom, and store in Holding Room pending removal to Unloading Room and outside. Ensure containers are removed from Holding Room by workers who have entered from uncontaminated areas dressed in clean coveralls.

- .5 After completion of removal work, wire brush and wet sponge surface to remove visible material, and encapsulate any lead-containing material to remain. During this work keep surfaces wet. After wire brushing and wet sponging, wet clean and HEPA vacuum entire work area including Equipment and Access Room. Compressed air or dry sweeping not be used to clean up lead-containing dust or waste. After inspection and approval by Owner Representative apply continuous coat of slow drying sealer to surfaces. Do not disturb work area for 8 hours, no entry, activity, or ventilation other than operation negative air machine during this period.
- .6 After enclosing remaining lead painted surfaces, wet clean work area and equipment and access room. During settling period no entry, activity, or ventilation will be permitted.

3.4 INSPECTION

- .1 A pre-contamination inspection must be completed by an experienced person to document that the prescribed measures are established and acceptable prior to the start of any work that will disturb lead.
- .2 Perform regular inspections to confirm compliance with specification and governing authority requirements.
- .3 Owner Representative will inspect work for:
 - .1 Adherence to specific procedures and materials.
 - .2 Final cleanliness and completion.
 - .3 No additional costs will be allowed for additional labour or materials required to provide specified performance level.
- .4 When lead dust leakage from Work Area occurs, Owner Representative will order Work shutdown.
 - .1 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.

3.5 LEAD SURFACE SAMPLING

- .1 After the work area has passed the clearance visual

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- WORK AREAS

assessment, clearance wipe sampling shall be conducted by an experienced person. The purpose of clearance testing is to verify that work areas have been cleaned sufficiently and to demonstrate that it is safe for workers and occupants.

- .2 Wipe samples may not be required if a physical barrier will be installed over cleaned surfaces in a manner that prevents access (to the cleaned surfaces) by building occupants.
- .3 When required, final lead surface sampling to be conducted as follows:
 - .1 After work area has passed a visual inspection for cleanliness approved and accepted by Owner Representative. Apply coat of lock-down agent to surfaces within enclosure, and appropriate setting period of a minimum of 8 hours has passed, Owner Representative will perform lead wipe sampling in Work Area.
 - .1 The minimum amount of clearance wipe samples will be collected in accordance with Table 4 - Minimum Number of Clearance Wipe Samples within Section 12.2 of the Environmental Abatement Council of Canada (EACC) Lead Guideline for Construction, Renovation, Maintenance or Repair, October 2014.
 - .2 Wipe sample collection will follow d follow NIOSH method 9100 "Lead in Surface Wipe Samples" or NIOSH method 9102 "Elements on Wipes".
 - .3 Samples will be analyzed in accordance with the EPA method SW-846 Test Method 7000B: Flame Atomic Absorption Spectrophotometry.
 - .4 Depending on the surface analyzed, clearance wipe samples will be compared Table 5 - Wipe Sampling Clearance Criteria within Section 12.2.1 of the Environmental Abatement Council of Canada (EACC) Lead Guideline for Construction, Renovation, Maintenance or Repair, October 2014.
 - .5 If wipe sampling results show levels of lead in excess of clearance criteria, re-clean work area at contractor's expense and apply another acceptable coat of lock-down agent to surfaces.
 - .6 Repeat as necessary until clearance criteria is met.

3.6 FINAL CLEANUP

- .1 Following specified cleaning procedures and when lead wipe sampling is below acceptable concentrations proceed with final cleanup.

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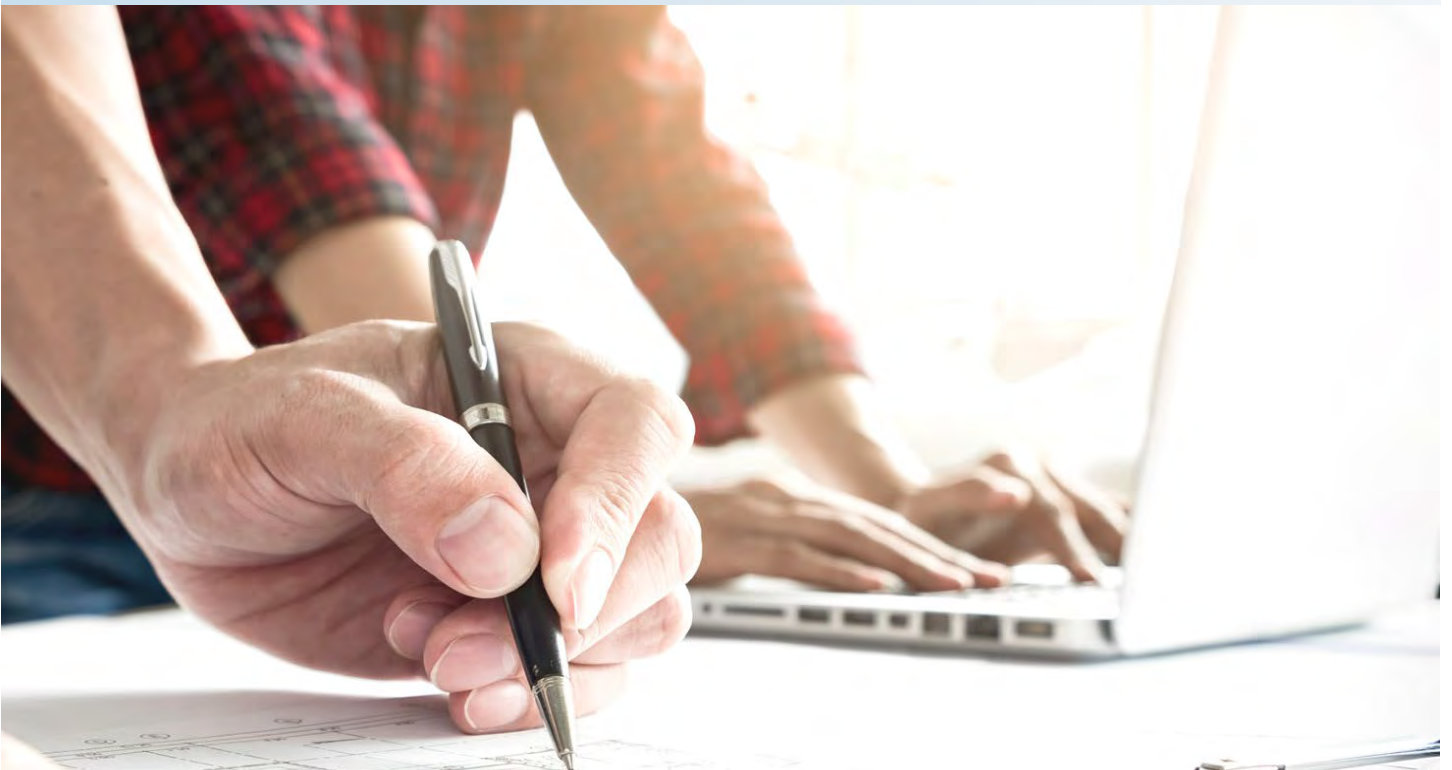
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- .2 Cleaning shall be completed in a top-to-bottom methodology (i.e. start in high locations and clean down towards floor level) and beginning at the farthest point of the work area from the entrance (i.e. clean towards the entrance to the work area).
 - .3 Remove polyethylene sheet by rolling it away from walls to centre of work area. Vacuum visible lead containing particles observed during cleanup, immediately, using HEPA vacuum.
 - .4 Place polyethylene sheets, tape, cleaning material, clothing, and contaminated waste in plastic bags and sealed labelled waste containers for transport.
 - .5 Clean up Work areas, Equipment and Access Room, and other contaminated enclosures.
 - .6 Remove sealed waste containers and equipment used in Work and remove from work areas at appropriate time in cleaning sequence.
 - .7 Conduct final check to ensure no dust or debris remain on surfaces as result of dismantling operations.
- 3.7 RE ESTABLISHMENT OF OBJECTS AND SYSTEMS
- .1 Repair or replace objects damaged in course of work to their original state or better, as directed by Owner Representative.

END OF SECTION

APPENDIX A

**“BULK ASBESTOS SAMPLING
REPORT, ROOF ASSESSMENT OF
INDOOR POOL, GLENFOREST
SECONDARY SCHOOL,
MISSISSAUGA, ON” (REPORT
ISSUED BY WSP DATED FEBRUARY
2024)**





FEBRUARY 16, 2024

Confidential

Peel District School Board
5650 Hurontario Street
Mississauga, Ontario
L5R 1C6

Attention: Michael Arruda, Project Manager

Subject: Bulk Asbestos Sampling Report – Roof Assessment of Indoor Pool – Glenforest Secondary School, Mississauga, ON

INTRODUCTION

WSP was retained by Peel District School Board (PDSB) to collect bulk samples of suspected asbestos and lead containing roofing materials found in Glenforest Secondary School, which is located at 3575 Fieldgate Drive in Mississauga, ON. Vanitha Mathur of WSP collected the samples on February 1st, 2024.

WSP reviewed the asbestos survey report pertaining to the work area entitled “Hazardous Materials Assessment (Pre-Construction), Glenforest Secondary School, Indoor Pool Demolition, 3575 Fieldgate Drive, Mississauga, Ontario” issued by Pinchin Ltd, dated August 1, 2023. The assessment was completed in preparation for the proposed demolition activities at Glenforest Secondary School. The assessment was limited to the roof above the indoor pool.

ASBESTOS SAMPLING AND ANALYSIS

At the request of Peel District School Board c/o Etude Architects Inc. and in accordance with the Asbestos on Construction Projects and in Buildings and Repair Operations Regulation (O. Reg. 278/05), WSP collected forty-eight (48) samples from sixteen (16) homogeneous building materials and submitted them to EMC Scientific (EMC) for analysis of asbestos content by polarized light microscopy (PLM) (analytical certificates are presented in **Appendix A**). EMC is accredited by NVLAP (NVLAP Code 200877-0) for bulk asbestos analysis by PLM. A summary of the analytical results is presented in Table 1 below.

Table 1 Summary of Asbestos Sampling Results

SAMPLE ID	LOCATION	SAMPLE DESCRIPTION	FRIABLE/NON-FRIABLE	ASBESTOS CONTENT (%)
AS01A	Lower Roof 2	Tar on wall	Non-Friable	2% <i>Chrysotile</i>
AS01B	Lower Roof 2	Tar on wall	Non-Friable	<i>Sample Not Analyzed</i>
AS01C	Lower Roof 2	Tar on wall	Non-Friable	<i>Sample Not Analyzed</i>
AS02A	Lower Roof 1	Brown Flashing Caulking	Non-Friable	None Detected
AS02B	Lower Roof 1	Brown Flashing Caulking	Non-Friable	None Detected
AS02C	Lower Roof 2	Brown Flashing Caulking	Non-Friable	None Detected
AS03A	Lower Roof 1	Grey Caulking on Concrete Wall	Non-Friable	None Detected
AS03B	Lower Roof 1	Grey Caulking on Concrete Wall	Non-Friable	None Detected
AS03C	Lower Roof 1	Grey Caulking on Concrete Wall	Non-Friable	None Detected



SAMPLE ID	LOCATION	SAMPLE DESCRIPTION	FRIABLE/NON-FRIABLE	ASBESTOS CONTENT (%)
AS04A	Lower Roof 1	Caulking on Conduit Pipes	Non-Friable	None Detected
AS04B	Lower Roof 1	Caulking on Conduit Pipes	Non-Friable	None Detected
AS04C	Lower Roof 1	Caulking on Conduit Pipes	Non-Friable	None Detected
AS05A	Lower Roof 1	Top Layer of Lower Roof 1	Non-Friable	None Detected
AS05B	Lower Roof 1	Top Layer of Lower Roof 1	Non-Friable	None Detected
AS05C	Lower Roof 1	Top Layer of Lower Roof 1	Non-Friable	None Detected
AS06A	Lower Roof 1	Middle Layer of Lower Roof 1	Non-Friable	None Detected
AS06B	Lower Roof 1	Middle Layer of Lower Roof 1	Non-Friable	None Detected
AS06C	Lower Roof 1	Middle Layer of Lower Roof 1	Non-Friable	None Detected
AS07A	Lower Roof 1	Vapour Retarder Layer in Lower Roof 1	Non-Friable	None Detected
AS07B	Lower Roof 1	Vapour Retarder Layer in Lower Roof 1	Non-Friable	None Detected
AS07C	Lower Roof 1	Vapour Retarder Layer in Lower Roof 1	Non-Friable	None Detected
AS08A	Lower Roof 1	Concrete Layer in Lower Roof 1	Non-Friable	None Detected
AS08B	Lower Roof 1	Concrete Layer in Lower Roof 1	Non-Friable	None Detected
AS08C	Lower Roof 1	Concrete Layer in Lower Roof 1	Non-Friable	None Detected
AS09A	Lower Roof 2	Top Layer of Lower Roof 2	Non-Friable	None Detected
AS09B	Lower Roof 2	Top Layer of Lower Roof 2	Non-Friable	None Detected
AS09C	Lower Roof 2	Top Layer of Lower Roof 2	Non-Friable	None Detected
AS10A	Lower Roof 2	Middle Layer 1 of Lower Roof 2	Non-Friable	None Detected
AS10B	Lower Roof 2	Middle Layer 1 of Lower Roof 2	Non-Friable	None Detected
AS10C	Lower Roof 2	Middle Layer 1 of Lower Roof 2	Non-Friable	None Detected
AS11A	Lower Roof 2	Middle Layer 2 of Lower Roof 2	Non-Friable	None Detected
AS11B	Lower Roof 2	Middle Layer 2 of Lower Roof 2	Non-Friable	None Detected
AS11C	Lower Roof 2	Middle Layer 2 of Lower Roof 2	Non-Friable	None Detected
AS12A	Lower Roof 2	Vapour Retarder Layer in Lower Roof 2	Non-Friable	None Detected
AS12B	Lower Roof 2	Vapour Retarder Layer in Lower Roof 2	Non-Friable	None Detected



SAMPLE ID	LOCATION	SAMPLE DESCRIPTION	FRIABLE/NON-FRIABLE	ASBESTOS CONTENT (%)
AS12C	Lower Roof 2	Vapour Retarder Layer in Lower Roof 2	Non-Friable	None Detected
AS13A	Lower Roof 2	Bottom Layer of Lower Roof 2	Non-Friable	None Detected
AS13B	Lower Roof 2	Bottom Layer of Lower Roof 2	Non-Friable	None Detected
AS13C	Lower Roof 2	Bottom Layer of Lower Roof 2	Non-Friable	None Detected
AS14A	Upper Roof	Top Layer of Upper Roof	Non-Friable	None Detected
AS14B	Upper Roof	Top Layer of Upper Roof	Non-Friable	None Detected
AS14C	Upper Roof	Top Layer of Upper Roof	Non-Friable	None Detected
AS15A	Upper Roof	Middle layer of Upper Roof	Non-Friable	None Detected
AS15B	Upper Roof	Middle layer of Upper Roof	Non-Friable	None Detected
AS15C	Upper Roof	Middle layer of Upper Roof	Non-Friable	None Detected
AS16A	Upper Roof	Bottom Layer of Upper Roof	Non-Friable	None Detected
AS16B	Upper Roof	Bottom Layer of Upper Roof	Non-Friable	None Detected
AS16C	Upper Roof	Bottom Layer of Upper Roof	Non-Friable	None Detected

1. Method detection limit (MDL) = 0.5%
2. Bolding indicates positive asbestos-containing material (I.e., $\geq 0.5\%$ asbestos by dry weight)
3. Description provided refers to colour and patterns observed on the surface of the material by the surveyors at the time of sampling, and should be used to identify the material in the work area. Laboratory colour descriptions on the Certificate of Analysis in some cases describe the cross-sectional colour of the material.
4. Sample not analyzed indicates these samples were not analyzed by the laboratory due to positive indientification of asbestos in the initial samplped analyzed (e.g., AS01B and AS01C are all considered to be asbestos-containing since AS01A tested positive for asbestos).

Based on the laboratory results, the black tar on the wall near Lower Roof 2 considered to be asbestos-containing as per O. Reg. 278/05.

Laboratory results (**Appendix A**) and representative photographs (**Appendix B**) have been attached.

LEAD SAMPLING AND ANALYSIS

At the request of Peel District School Board c/o Etude Architects Inc. and in accordance with the Ministry of Labour, Immigration, Training and Skills Development (MLITSD) Guideline-Lead on Construction Projects (O. Reg. 490/09 and 833/90), WSP collected three (3) samples of bulk paints and/or surface coating samples and submitted them to EMC Scientific (EMC) for analysis of lead content (analytical certificates are presented in **Appendix A**). A summary of the analytical results is presented in Table 2 below.



Table 2 Summary of Lead Sampling Results

SAMPLE ID	LOCATION	SAMPLE DESCRIPTION	LEAD CONTENT (%)	CLASSIFICATION
Pb01	Lower Roof 1	Brown Paint on Metal Flashing	0.0025%	Lead-containing
Pb02	Lower Roof 1	Red Paint on Roof Ladder	0.0046%	Lead-containing
Pb03	Lower Roof 1	Yellow Paint on Pipe	0.102%	Lead-containing

FINDINGS/RECOMMENDATIONS

Based on the laboratory results, the black tar observed on Lower Roof 2 was identified as asbestos-containing as per O. Reg. 278/05.

Asbestos-containing materials must be removed prior to conducting any work that may damage or disturb these materials. Removal can be conducted utilizing Type 1 asbestos abatement procedures, provided non-powered hand tools are utilized, as per O. Reg. 278/05. If powered tools are used to remove the identified asbestos-containing materials, Type 2 or Type 3 asbestos abatement procedures are to be used, depending on the removal methods utilized by the abatement contractor.

Any work that will disturb lead-containing materials should be conducted in accordance with the MLITSD Guideline – Lead on Construction Projects, which will ensure compliance with other relevant regulations made under the Occupational Health and Safety Act. The MLITSD Guideline classifies lead-based work in accordance with the following criteria:

CLASS 1 (OR TYPE 1):

Removal of lead-containing paints/surface coatings/materials with chemical gels/strippers or pastes.

Operating construction or demolition equipment (e.g., excavator, bulldozer) during building demolition where lead-containing surface coatings are present on building materials.

CLASS 2A (OR TYPE 2A):

Removal of lead-containing paints/surface coatings/materials using a power tool that has an effective dust collection system equipped with a HEPA filter.

Welding, torching or high temperature cutting of lead-containing materials indoors when using an effective fume collector or smoke eater that filter and exhausts lead fumes and expel them directly outdoors (away from occupants, entrances, walkways, rest areas, etc.).

Welding, torching or high temperature cutting of lead-containing paints/surface coatings/materials outdoors.

Removal of lead-containing paints/surface coatings/materials by scraping or sanding (including wet sanding) using non-powered hand tools.

Demolition of plaster or building components that crumble, pulverize or powder and are covered with lead-containing paints/surface coatings/materials.

CLASS 3A (OR TYPE 3A):

Removal of lead-containing paints/surface coatings/materials using a power tool without an effective dust collection system equipped with a HEPA filter.

Welding, torching or high temperature cutting of lead-containing materials indoors or in a confined space.

CLASS 3B (OR TYPE 3B):

Abrasive blasting of lead-containing paints/surface coatings/materials (including wet, slurry and dry abrasive blasting and dry-ice blasting).



The application of a physical barrier (e.g., an encapsulant or new coat of paint) to a stabilized lead-containing paint/surface coating/material, is not considered a “Lead Operation” regardless of the concentration of lead in the underlying material.

The type of work must be classified prior to any disturbance of these materials, and the corresponding precautions/safety measures must be followed. In addition, the disposal of any lead-containing materials must also comply with the requirements of the General – Waste Management Regulation (O. Reg. 347/90).

If any materials not mentioned within this report are identified throughout the course of the project, the materials are to be assumed to contain asbestos until proven otherwise.

LIMITATIONS

This report discusses the finding of the asbestos sampling investigation only. This report should be read in conjunction with any reports previously issued for this project.

This report is prepared for the sole use of the Corporation of Peel District School Board. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of the third party. The conclusions and recommendations contained in this letter report are based upon professional opinions with regard to the subject matter. These opinions are in accordance with currently accepted industry practices for asbestos surveys, regulatory requirements for sampling and identifying asbestos-containing materials and are subject to the following inherent limitations:

- 1 The data and findings presented in this report are valid as of the date(s) of the investigation only. The passage of time, manifestation of latent conditions or occurrence of future events may warrant further exploration of the Site, analysis of the data, and re-evaluation of the findings, observations, and conclusions expressed in this report.
- 2 The findings, observations, conclusions, and recommendations expressed by WSP in this report do not represent an opinion concerning compliance of any past or present owner or operator of the Site with any federal, provincial or local laws or regulations.
- 3 WSP’s assessment presents professional opinions and findings of a scientific and technical nature. While attempts were made to relate the data and findings to applicable environmental and occupational health & safety laws and regulations, the report shall not be construed to offer legal opinion or representations as to the requirements of, nor compliance with, environmental and occupational health and safety laws, rules, regulations or policies of federal, provincial, or local governmental agencies. WSP’s liability extends only to its client and not to other parties who may obtain this assessment report. Issues raised by the report should be reviewed by appropriate legal counsel.

We trust that the above is satisfactory for your purposes at this time. Please contact the undersigned should you have any questions or concerns.

Yours Truly,

Vanitha Mathur, B.Eng., EIT
Associate Environmental Technician – EHS Compliance

Shelby McCullough, EPT
Project Coordinator – EHS Compliance

Robert Stoyanoff, CIH.
Senior Industrial Hygienist –EHS Compliance

APPENDIX

LABORATORY RESULTS



To:

Vanitha Mathur
 WSP Canada Inc.
 2 International Boulevard, Suite 201
 Etobicoke, Ontario
 M9W 1A2

EMC LAB REPORT NUMBER: A100400
Job/Project Name: Glenforest SS
Analysis Method: Polarized Light Microscopy – EPA 600
Date Received: Feb 2/24 **Date Analyzed:** Feb 9/24
Analysts: John Paul Cantillon & Ameerah Ngai
Reviewed By: Malgorzata Sybydlo

Job No: CA0021623.7941
Number of Samples: 48
Date Reported: Feb 9/24

Client's Sample ID	Lab Sample No.	Description/Location	Sample Appearance	SAMPLE COMPONENTS (%)		
				Asbestos Fibres	Non-asbestos Fibres	Non-fibrous Material
AS01A	A100400-1	Lower Roof 2 /Tar on Wall	Black, tar	Chrysotile	2	98
AS01B	A100400-2	Lower Roof 2 /Tar on Wall	NA	NA		
AS01C	A100400-3	Lower Roof 2 /Tar on Wall	NA	NA		
AS02A	A100400-4	Lower Roof 1/Flashing Caulking	2 Phases: a) Dark brown, caulking b) Black, tar	ND ND	2	100 98
AS02B	A100400-5	Lower Roof 1/Flashing Caulking	2 Phases: a) Dark brown, caulking b) Black, tar	ND ND	2	100 98
AS02C	A100400-6	Lower Roof 2 /Flashing Caulking	2 Phases: a) Dark brown, caulking b) Black, tar	ND ND	2	100 98
AS03A	A100400-7	Lower Roof 1/Grey Caulking	Grey, caulking	ND		100
AS03B	A100400-8	Lower Roof 1/Grey Caulking	Grey, caulking	ND		100
AS03C	A100400-9	Lower Roof 1/Grey Caulking	Grey, caulking	ND		100
AS04A	A100400-10	Lower Roof 1/Conduit Caulking	Black, tar	ND	2	98
AS04B	A100400-11	Lower Roof 1/Conduit Caulking	Black, tar	ND	2	98
AS04C	A100400-12	Lower Roof 1/Conduit Caulking	Black, tar	ND	2	98

EMC LAB REPORT NUMBER: A100407

Client's Job/Project Name/No.: CA0021623.7941

Analysts: John Paul Cantillon / Ameerah Ngai

Client's Sample ID	Lab Sample No.	Description/Location	Sample Appearance	SAMPLE COMPONENTS (%)		
				Asbestos Fibres	Non-asbestos Fibres	Non-fibrous Material
AS05A	A100400-13	Lower Roof 1/Top Layer	3 Phases: a) Black, tar b) Black, tar with fibres c) Brown, paper with tar	ND ND ND	20 80	100 80 20
AS05B	A100400-14	Lower Roof 1/Top Layer	3 Phases: a) Black, tar b) Black, tar with fibres c) Brown, paper with tar	ND ND ND	20 80	100 80 20
AS05C	A100400-15	Lower Roof 1/Top Layer	3 Phases: a) Black, tar b) Black, tar with fibres c) Brown, paper with tar	ND ND ND	20 80	100 80 20
AS06A	A100400-16	Lower Roof 1/Middle Layer	Brown, paper with tar	ND	80	20
AS06B	A100400-17	Lower Roof 1/Middle Layer	Brown, paper with tar	ND	80	20
AS06C	A100400-18	Lower Roof 1/Middle Layer	Brown, paper with tar	ND	80	20
AS07A	A100400-19	Lower Roof 1/Vapour Retarder	2 Phases: a) Black, tar b) Brown, paper	ND ND	90	100 10
AS07B	A100400-20	Lower Roof 1/Vapour Retarder	2 Phases: a) Black, tar b) Brown, paper	ND ND	90	100 10
AS07C	A100400-21	Lower Roof 1/Vapour Retarder	2 Phases: a) Black, tar	ND		100

EMC LAB REPORT NUMBER: A100407

Client's Job/Project Name/No.: CA0021623.7941

Analysts: John Paul Cantillon / Ameerah Ngai

Client's Sample ID	Lab Sample No.	Description/Location	Sample Appearance	SAMPLE COMPONENTS (%)		
				Asbestos Fibres	Non-asbestos Fibres	Non-fibrous Material
			b) Brown, paper	ND	90	10
AS08A	A100400-22	Lower Roof 1/Concrete	Grey, cementitious material	ND		100
AS08B	A100400-23	Lower Roof 1/Concrete	Grey, cementitious material	ND		100
AS08C	A100400-24	Lower Roof 1/Concrete	Grey, cementitious material	ND		100
AS09A	A100400-25	Lower Roof 2 /Top Layer	2 Phases: a) Black, tar b) Black, tar with fibres	ND ND	2 20	98 80
AS09B	A100400-26	Lower Roof 2 /Top Layer	2 Phases: a) Black, tar b) Black, tar with fibres	ND ND	2 20	98 80
AS09C	A100400-27	Lower Roof 2 /Top Layer	2 Phases: a) Black, tar b) Black, tar with fibres	ND ND	2 20	98 80
AS10A	A100400-28	Lower Roof 2/Middle Layer 1	2 Phases: a) Black, tar b) Black, tar with fibres	ND ND	2 20	98 80
AS10B	A100400-29	Lower Roof 2/Middle Layer 1	2 Phases: a) Black, tar b) Black, tar with fibres	ND ND	2 20	98 80
AS10C	A100400-30	Lower Roof 2/Middle Layer 1	2 Phases: a) Black, tar b) Black, tar with fibres	ND ND	2 20	98 80

EMC LAB REPORT NUMBER: A100407

Client's Job/Project Name/No.: CA0021623.7941

Analysts: John Paul Cantillon / Ameerah Ngai

Client's Sample ID	Lab Sample No.	Description/Location	Sample Appearance	SAMPLE COMPONENTS (%)		
				Asbestos Fibres	Non-asbestos Fibres	Non-fibrous Material
AS11A	A100400-31	Lower Roof 2/Middle Layer 2	Black, tar	ND	2	98
AS11B	A100400-32	Lower Roof 2/Middle Layer 2	2 Phases: a) Black, tar b) Black, tar with fibres	ND ND	2 20	98 80
AS11C	A100400-33	Lower Roof 2/Middle Layer 2	2 Phases: a) Black, tar b) Black, tar with fibres	ND ND	2 20	98 80
AS12A	A100400-34	Lower Roof 2/Vapour Retarder	Brown, paper	ND	90	10
AS12B	A100400-35	Lower Roof 2/Vapour Retarder	2 Phases: a) Brown, paper b) Black, tar	ND ND	90	10 100
AS12C	A100400-36	Lower Roof 2/Vapour Retarder	2 Phases: a) Brown, paper b) Black, tar	ND ND	90	10 100
AS13A	A100400-37	Lower Roof 2/Bottom Layer	4 Phases: a) Black, tar b) Black, fibrous material with tar c) Black, tar d) Black, fibrous material with tar	ND ND ND ND	80	100 20 100 20
AS13B	A100400-38	Lower Roof 2/Bottom Layer	4 Phases: a) Black, tar b) Black, fibrous material with tar c) Black, tar d) Black, fibrous material with tar	ND ND ND ND	80	100 20 100 20

EMC LAB REPORT NUMBER: A100407

Client's Job/Project Name/No.: CA0021623.7941

Analysts: John Paul Cantillon / Ameerah Ngai

Client's Sample ID	Lab Sample No.	Description/Location	Sample Appearance	SAMPLE COMPONENTS (%)		
				Asbestos Fibres	Non-asbestos Fibres	Non-fibrous Material
AS13C	A100400-39	Lower Roof 2/Bottom Layer	4 Phases: a) Black, tar b) Black, fibrous material with tar c) Black, tar d) Black, fibrous material with tar	ND ND ND ND	80 80	100 20 100 20
AS14A	A100400-40	Upper Roof/Top Layer	2 Phases: a) Black, tar b) Black, tar with fibres	ND ND	20	100 80
AS14B	A100400-41	Upper Roof/Top Layer	2 Phases: a) Black, tar b) Black, tar with fibres	ND ND	20	100 80
AS14C	A100400-42	Upper Roof/Top Layer	2 Phases: a) Black, tar b) Black, tar with fibres	ND ND	20	100 80
AS15A	A100400-43	Upper Roof/Middle Layer	3 Phases: a) Black, tar b) Black, tar with fibres c) Grey, paper with tar	ND ND ND	20 80	100 80 20
AS15B	A100400-44	Upper Roof/Middle Layer	Brown, paper with tar	ND	80	20
AS15C	A100400-45	Upper Roof/Middle Layer	3 Phases: a) Black, tar b) Black, tar with fibres c) Grey, paper with tar	ND ND ND	20 80	100 80 20
AS16A	A100400-46	Upper Roof/Bottom Layer	3 Phases: a) Black, tar	ND		100

EMC LAB REPORT NUMBER: A100407
Client's Job/Project Name/No.: CA0021623.7941
Analysts: John Paul Cantillon / Ameerah Ngai

Client's Sample ID	Lab Sample No.	Description/Location	Sample Appearance	SAMPLE COMPONENTS (%)		
				Asbestos Fibres	Non-asbestos Fibres	Non-fibrous Material
			b) Black, tar with fibres c) Black, fibrous material with tar	ND ND	20 80	80 20
AS16B	A100400-47	Upper Roof/Bottom Layer	3 Phases: a) Black, tar b) Black, tar with fibres c) Black, fibrous material with tar	ND ND ND	20 80	100 80 20
AS16C	A100400-48	Upper Roof/Bottom Layer	3 Phases: a) Black, tar b) Black, tar with fibres c) Black, fibrous material with tar	ND ND ND	20 80	100 80 20

- Note:**
- Bulk samples are analyzed using Polarized Light Microscopy (PLM) and dispersion staining techniques. The analytical procedures are in accordance with EPA 600/R-93/116 method.
 - The results are only related to the samples analyzed. **ND** = None Detected (no asbestos fibres were observed), **NA** = Not Analyzed (analysis stopped due to a previous positive result).
 - This report may not be reproduced, except in full without the written approval of EMC Scientific Inc. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. Government.
 - The Ontario Regulatory Threshold for asbestos is 0.5%. The limit of quantification (LOQ) is 0.5%.

C.O.C.: -

REPORT No: 24-003248 - Rev. 0

Report To:

EMC Scientific Inc.
5800 Ambler Dr. #100
Mississauga, ON L4W 4J4

CADUCEON Environmental Laboratories

2378 Holly Lane
Ottawa, ON K1V 7P1

Attention: Alister Haddad

DATE RECEIVED: 2024-Feb-05
DATE REPORTED: 2024-Feb-06
SAMPLE MATRIX: Paint Chips

CUSTOMER PROJECT: Glenforest SS
P.O. NUMBER: CA0021623.7941

Analyses	Qty	Site Analyzed	Authorized	Date Analyzed	Lab Method	Reference Method
ICP/OES (Solid)	3	OTTAWA	NHOGAN	2024-Feb-06	D-ICP-02	EPA 6010

R.L. = Reporting Limit

NC = Not Calculated

Test methods may be modified from specified reference method unless indicated by an *

Client I.D.	Sample I.D.	Date Collected	Parameter	Units	R.L.
			Lead	%	0.0005
					-
Pb01 Brown metal flashing lwr rf 1	24-003248-1	2024-Feb-01			0.0025
Pb02 Red roof ladder lwr rf 1	24-003248-2	2024-Feb-01			0.0046
Pb03 Yellow pipe lwr rf 1	24-003248-3	2024-Feb-01			0.102



Michelle Dubien
Data Specialist

APPENDIX

SITE PHOTOGRAPHS





PHOTO NO.	MATERIAL DESCRIPTION & LOCATION	PHOTO
1	Representative view of Lower Roof 1.	 A wide-angle photograph of a flat roof. The surface is made of grey concrete with visible expansion joints. A brick wall runs along the back edge. A silver ladder is leaning against the wall on the left. In the center, there is a large grey HVAC unit. A yellow caution tape is stretched across the roof surface. A white bucket and some black equipment are on the ground.
2	Representative view of Lower Roof 2.	 A photograph of a roof section covered in dark grey gravel. In the foreground, there is a green metal vent or cap on a silver metal base. In the background, a brick wall is visible, and a grey HVAC unit is mounted on the roof. Yellow caution tape is also present.

PHOTO NO.	MATERIAL DESCRIPTION & LOCATION	PHOTO
<p><u>3</u></p>	<p>Representative view of the Upper Roof.</p>	
<p><u>4</u></p>	<p>Representative view of asbestos-containing tar on wall near the Lower Roof 2. <u>Sample ID:</u> AS01A-C (2% Chrysotile)</p>	



PHOTO NO.	MATERIAL DESCRIPTION & LOCATION	PHOTO
5	<p>Representative view of brown flashing caulking. This material is not considered asbestos-containing.</p> <p><u>Sample ID:</u> AS02A-C</p>	
6	<p>Representative view of grey caulking on concrete wall. This material is not considered asbestos-containing.</p> <p><u>Sample ID:</u> AS03A-C</p>	



PHOTO NO.	MATERIAL DESCRIPTION & LOCATION	PHOTO
7	<p>Representative view of caulking on conduit piping. This material is not considered asbestos-containing.</p> <p><u>Sample ID:</u> AS04A-C</p>	
8	<p>Representative view of the roofing layers on Lower Roof 1. These materials are not considered asbestos-containing.</p> <p><u>Sample ID:</u> AS05A-C, AS06A-C, AS07A-C, AS08A-C</p>	



PHOTO NO.	MATERIAL DESCRIPTION & LOCATION	PHOTO
<p><u>9</u></p>	<p>Representative view of roofing layers on Lower Roof 2. These materials are not considered asbestos-containing.</p> <p>Sample ID: AS09A-C, AS10A-C, AS11A-C, AS12A-C, AS13A-C</p>	
<p><u>10</u></p>	<p>Representative view of roofing materials on Upper Roof. These materials are not considered asbestos-containing.</p> <p>Sample ID: AS14A-C, AS15A-C, AS16A-C</p>	




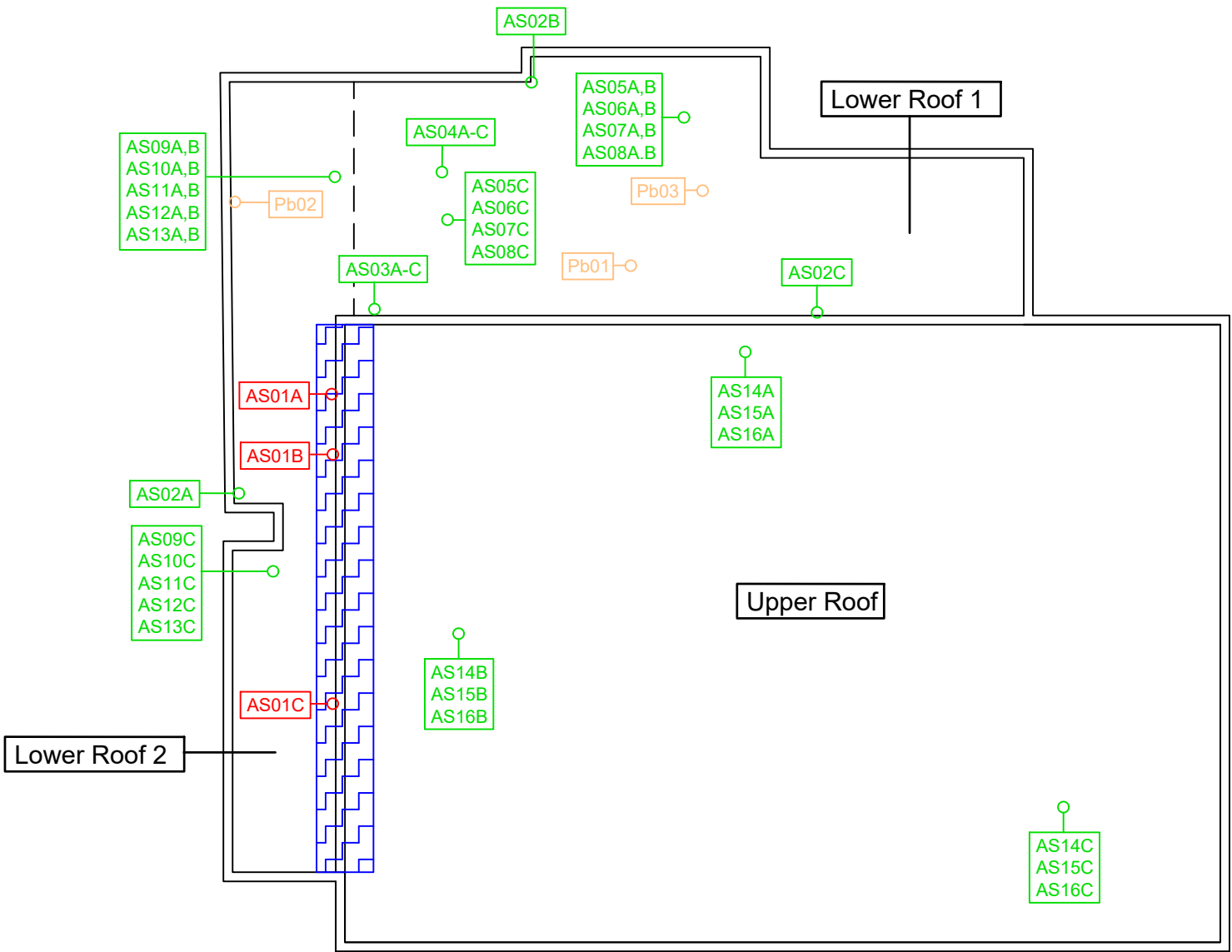
PHOTO NO.	MATERIAL DESCRIPTION & LOCATION	PHOTO
<p><u>11</u></p>	<p>Representative view of lead-containing brown paint on metal flashing observed throughout the roof.</p> <p>Sample ID: Pb01 (0.0025%)</p>	
<p><u>12</u></p>	<p>Representative view of lead-containing red paint observed on ladder on the roof.</p> <p>Sample ID: Pb02 (0.0046%)</p>	

PHOTO NO.	MATERIAL DESCRIPTION & LOCATION	PHOTO
<u>13</u>	Representative view of lead-containing yellow paint observed on pipes (natural gas lines) throughout the lower roofs. <u>Sample ID: Pb03 (0.102%)</u>	 A photograph showing a gravel-covered roof surface. In the background, a brick wall is visible. Several yellow-painted pipes (natural gas lines) are running across the roof. One horizontal pipe is in the foreground, supported by two black brackets. Another pipe runs vertically in the background. The roof surface is covered in grey gravel.

APPENDIX

DRAWINGS





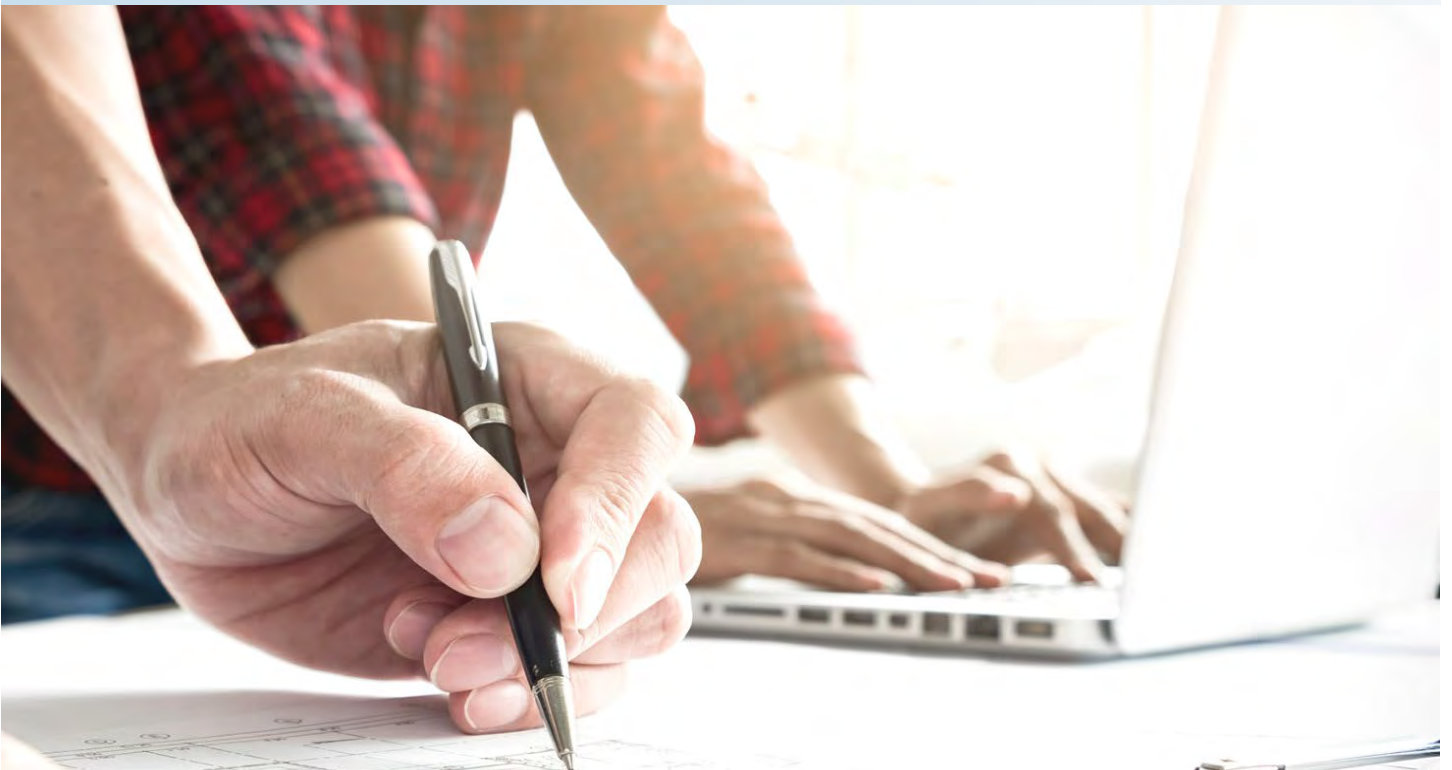
- Notes:
1. This drawing must be read in conjunction with associated report.
 2. Drawing based on observations made on site by WSP.
 3. Asbestos-containing materials may be present in inaccessible areas throughout the building (i.e. inside wall/ceiling cavities)
 4. Sample locations are approximate.
 5. Asbestos-containing tar is present on the wall on Lower Roof 2.

- Legend:
- Approximate Location of Asbestos-Containing Tar
 - Negative Asbestos Result
 - Positive Asbestos Result
 - Positive Lead Result

Client: Peel District School Board		Project No.: CA0021623.7941 Task 001	Drawing No.: 1
Drawn: SM	Approved: RS	Title: Roof - Sampling Locations	
Date: February 2024	Scale: NTS	Project: Bulk Asbestos Sampling Report – Roof Assessment of Indoor Pool – Glenforest Secondary School, Mississauga, ON	
Original Size: Letter	Rev: N/A		
		2 International Blvd, Suite 201 Toronto, Ontario M9W 1A2 T: 416-798-0065	

APPENDIX B

**“HAZARDOUS BUILDING MATERIALS
ASSESSMENT (PRE-
CONSTRUCTION) GLENFOREST
SECONDARY SCHOOL INDOOR
POOL DEMOLITION, 3575 FIELDGATE
DRIVE, MISSISSAUGA,
ONTARIO” (REPORT ISSUED BY
PINCHIN LTD. DATED AUGUST 2023)**





Hazardous Building Materials Assessment (Pre-construction)

Glenforest Secondary School
Indoor Pool Demolition
3575 Fieldgate Drive,
Mississauga, Ontario

Prepared for:

Etude Architect Inc.

30 Kern Road, Suite 106
Toronto, Ontario, M3B 1T1

August 1, 2023

Pinchin File: 323445.000



Issued to: Etude Architect Inc.
Issued on: August 1, 2023
Pinchin File: 323445.000
Issuing Office: Toronto, ON

Author:

Aman Sharma, B.Eng., CAPM
Senior Project Technologist
289.971.8207
asharma@pinchin.com

Reviewer:

Tanya Stanisic, B.Sc. Hons.
Operations Manager
647.502.6665
tstanisic@pinchin.com



EXECUTIVE SUMMARY

Etude Architect Inc. (Client) retained Pinchin Ltd. (Pinchin) to conduct a hazardous building materials assessment at Glenforest Secondary School located at 3575 Fieldgate Drive, Mississauga, Ontario. Pinchin performed the assessment from May 2, 2023 to May 4, 2023.

The objective of the assessment was to identify specified hazardous building materials in preparation for upcoming renovation and demolition activities. The proposed work as identified by the Client includes the complete demolition of the indoor pool and select renovations to adjacent areas of the school as per the information and project drawings provided by the Client (*Glenforest Pool, Glenforest Secondary School, Pool Demolition*, dated December 2022, Project No. 222113).

The assessed areas consisted of the interior and exterior pool area to be demolished and adjacent areas of the building to be impacted by the planned renovations. The results of this assessment are intended for use with a properly developed performance specifications and safe work procedures.

SUMMARY OF FINDINGS

The following is a summary of significant findings; refer to the body of the report for detailed findings:

Asbestos: The following asbestos-containing materials are present in the assessed areas and were observed in good condition:

- Drywall joint compound in the Lobby (Loc. 7) and Custodian Room (Loc. 29).
- Mortar on exterior brick of the building (Loc. 14).
- Grey caulking on control joints in the Pool Area (Loc. 13) and Exterior (Loc. 14).
- Black caulking between the wall and door frame of the Entrance Vestibule (Loc. 6).
- Parging cement insulation on piping in the Balcony (Loc. 4).
- Mortar on block walls in the Gym Storage (Loc. 25) and Custodian Room (Loc. 29).
- Beige caulking between the wall and door frame of the Gym Storage (Loc. 25).
- Transite piping in the Phys. Ed. Room (Loc. 24) and Gym Storage (Loc. 25).
- Gaskets in Filter Room (Loc. 2).
- Built-up roofing materials on the Upper and Lower Roof Sections (Loc. 18 and 17).

Lead: Lead is present in select sampled paints and coatings.

Silica: Crystalline silica is present in concrete, mortar, grout, masonry, drywall, ceiling tiles and plaster.

Mercury: Mercury vapour is present in lamp tubes and presumed to be present in the thermostat ampules.



Polychlorinated Biphenyls (PCBs): Based on the date of construction and presence of T12 by visual confirmation, PCBs may be present in light ballasts.

Mould and Water Damage: Visible mould was not observed. Water staining was observed on acoustic ceiling tiles in the Corridor (Loc. 27) and Hallway (Loc. 28).

SUMMARY OF RECOMMENDATIONS

The following is a summary of significant recommendations; refer to the body of the report for detailed recommendations.

1. Replace the water-stained ceiling tiles identified regardless of the planned renovations.
2. Conduct further investigation of the following items, which was not completed during this assessment:
 - a. Any items listed as exclusions in this report, prior to disturbance.
 - b. Once the area slated for demolition is vacant, complete destructive investigations to view concealed areas behind plaster walls and above plaster ceilings with the assistance of a qualified contractor.
 - c. Once the area slated for demolition is vacant, complete roofing core samples and arrange access to the upper elevated roof section to assess for hazardous materials that was not accessible at the time with a qualified contractor.
3. Prepare specifications and safe work procedures for the hazardous materials removal required for the planned work.
4. Do not disturb suspected hazardous building materials discovered during the planned work, which have not been identified in this report and arrange for further evaluation and testing.
5. Remove and properly dispose of asbestos-containing materials prior to demolition and renovation activities.
6. Remove and properly dispose of PCB ballasts when fixtures are decommissioned. All PCB lamp ballasts must be removed from service and properly disposed of by 12/31/25.
7. Recycle mercury-containing lamp tubes and liquid mercury from thermostats when removed from service.
8. Follow appropriate safe work procedures when handling or disturbing asbestos, lead, silica.

This Executive Summary is subject to the same standard limitations as contained in the report and must be read in conjunction with the entire report.



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APPENDICES

APPENDIX I	Drawings
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APPENDIX II-C	PCB Analytical Certificates
APPENDIX III	Methodology
APPENDIX IV	Additional Photographs



1.0 INTRODUCTION AND SCOPE

Etude Architect Inc. (Client) retained Pinchin Ltd. (Pinchin) to conduct a hazardous building materials assessment at Glenforest Secondary School located at 3575 Fieldgate Drive, Mississauga, Ontario.

Pinchin performed the assessment from May 2, 2023 to May 4, 2023. The surveyor was unaccompanied during the assessment. The assessed area was occupied at the time of the assessment.

The objective of the assessment was to identify specified hazardous building materials in preparation for demolition activities. The proposed work as identified by the Client includes the complete demolition of the indoor pool and select renovations to adjacent interior areas of the school as per the information and project drawings provided by the Client (*Glenforest Pool, Glenforest Secondary School, Pool Demolition*, dated December 2022, Project No. 222113). The assessed areas consisted of the interior and exterior pool area to be demolished and adjacent areas of the building to be impacted by the planned renovations.

The results of this assessment are intended for use with a properly developed performance specifications and safe work procedures.

1.1 Scope of Assessment

The **assessed area** is limited to the portions of the building to be demolished and renovated, as described by the Client, and identified in the drawings in Appendix I.

The assessment was performed to establish the type of specified hazardous building materials, locations and approximate quantities incorporated in the structures and its finishes.

For the purpose of the assessment and this report, hazardous building materials are defined as follows:

- Asbestos
- Lead
- Silica
- Mercury
- Polychlorinated Biphenyls (PCBs)
- Mould
- Ozone Depleting Substances (ODS)

The following Designated Substances are not typically found in building materials in a composition/state that is hazardous and were not included in this assessment:

- Arsenic
- Acrylonitrile



- Benzene
- Coke oven emissions
- Ethylene oxide
- Isocyanates
- Vinyl chloride monomer

2.0 METHODOLOGY

Pinchin conducted a room-by-room assessment to identify the hazardous building materials as defined in the scope.

The assessment included limited demolition of wall and ceiling finishes to view concealed conditions at representative areas as permitted by the current building use. Limited destructive testing of flooring was conducted where possible (under ceramic tiles, carpets, or multiple layers of flooring). Demolition of exterior building finishes, masonry walls (chases, shafts etc.), and structural surrounds was not conducted.

Limited demolition of masonry block walls (core holes) was conducted to investigate for loose fill vermiculite insulation. Sampling of roofing materials was conducted.

For further details on the methodology including test methods, refer to Appendix III.

3.0 BACKGROUND INFORMATION

3.1 Assessed Area Description

Description Item	Details
Use	Recreational (Pool) & Secondary School
Number of Floors	2 storeys plus 1 level(s) below grade
Total Area	Approximately 20,000 square feet
Year of Construction	The building was constructed in 1963
Structure	Concrete, steel
Exterior Cladding	Brick, masonry
HVAC	Forced air
Roof	Built-up roofing system
Flooring	Vinyl floor tiles, ceramic tiles, concrete, terrazzo, wood
Interior Walls	Drywall, masonry, concrete, ceramic tiles
Ceilings	Ceiling tiles, plaster



3.2 Existing Reports

Pinchin reviewed the report entitled *Annual Asbestos-Containing Materials Inspection, Glenforest Secondary School*, prepared by S2S Environmental Inc., Project No. 10015.03, dated August 26, 2021, as part of this assessment.

3.3 Inaccessible Locations

The following rooms or areas were not accessible and are therefore not included in the report.

Area or Room	Reason
Upper Pool Roof	No Interior or Exterior Safe Access

4.0 FINDINGS

The following section summarizes the findings of the assessment and provides a general description of the hazardous building materials identified. For details on approximate quantities, condition, friability, accessibility, and locations of hazardous building materials; refer to the Hazardous Material Summary / Sample Log and All Data Report in Appendices V and VI.

Any quantities listed in this report or data tables are estimated based on visual approximations only and are subject to variation.

4.1 Asbestos

4.1.1 Pipe Insulation

Parging cement, containing **chrysotile asbestos**, is present on pipe fittings (elbows) on rainwater leader systems in the Balcony on the 2nd Floor (Loc. 4, samples S0026A-C).

Remaining pipes in the assessed areas are either uninsulated or insulated with non-asbestos fibreglass or other non-asbestos insulation such as mineral fibre or elastomeric foam insulation.

Pipes insulated with asbestos-containing insulations may be present in inaccessible spaces such as above solid ceilings, in chases, in column enclosures and within shafts.



Photo 1: Non-asbestos fiberglass insulated pipe present in the Fan Room (Loc.1)



Photo 2: Uninsulated piping present in the Tunnel Area (Loc. 3).



Photo 3: Asbestos containing parging cement insulated pipe present in the Balcony (Loc.4).



Photo 4: Asbestos containing parging cement insulated pipe present in the Balcony (Loc.4).

4.1.2 Duct Insulation and Mastic

Ducts are either uninsulated or insulated with non-asbestos fiberglass (foil-faced).

Grey duct mastic, present at seams / joints on the exterior of ducts, does not contain asbestos (samples S0023A-C).



Photo 5: Non-asbestos fiberglass(foil-faced) insulated duct present in the Fan Room (Loc.1).



Photo 6: Uninsulated duct present in the Filter Room (Loc. 2).



Photo 7: Non-asbestos grey duct mastic present in the Mechanical Room and Stairwell (Loc. 21).

4.1.3 Mechanical Equipment Insulation

Fan units present in the assessed area are non-insulated insulated.

Mechanical equipment (e.g., air handling unit, filters, pumps, unit heater, compressor, hot water tank) are either uninsulated or insulated with non-asbestos fibreglass (covered in metal).



Photo 8: Fibreglass insulated air handling unit present in the Fan Room (Loc. 1).

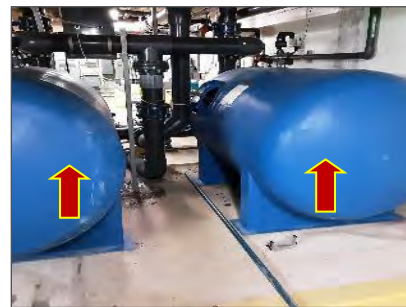


Photo 9: Uninsulated filter tanks present in the Filter Room (Loc. 2).



Photo 10: Uninsulated compressor present in the Lower Roof (Loc.17).



Photo 11: Uninsulated fan unit present in the Mechanical Room and Stairwell (Loc. 21).

4.1.4 Vermiculite

Destructive testing was conducted of a representative selection of masonry brick and block walls. The locations of destructive testing have been indicated on the drawings in Appendix I.

Loose fill vermiculite was not observed within the cavities.





Photo 12: Vermiculite drill hole made on block wall present in Indoor Pool (Loc. 13).



Photo 13: Vermiculite drill hole made on brick wall present in Exterior (Loc. 14).

4.1.5 Acoustic Ceiling Tiles

The following is a summary of acoustic ceiling tiles present, for a complete list of locations, refer to Appendix V.

Description	Sample Location	Sample Number, Date Code	Asbestos	Photo
48"x24", lay-in, small fissures and pinholes	Corridor (Loc. 27)	S0031A-C	No	
48"x24", lay-in, small fissures and pinholes	Various Locations	*Date stamp 04/15/11	No	

*Ceiling tiles are presumed to be non-asbestos based on the date of manufacture determined from the date stamp applied to the top of the tiles. The tiles were manufactured after asbestos stopped being used in acoustic ceiling tiles.

4.1.6 Plaster

Plaster present in the Men's and Women's Change Room (Loc. 9 and 12), and Men's and Women's Washrooms (Loc. 22 and 23) does not contain asbestos (samples S0018A-C, layer 2 and 3).



Photo 14: Non-asbestos plaster in the Men's Change Room (Loc. 9).



Photo 15: Non-asbestos plaster in the Men's Washroom (Loc. 22).

4.1.7 Drywall Joint Compound

Drywall joint compound, present underneath the stairwell located in the Lobby (Loc. 7) and on wall finishes present in the Custodian Room (Loc. 29) contains **chrysotile asbestos** (samples S0008A-C).



Photo 16: Asbestos-containing drywall joint compound underneath the stairwell present in the Lobby (Loc. 7).



Photo 17: Asbestos-containing drywall joint compound on wall finishes present in the Custodian (Loc. 29).

4.1.8 Asbestos Cement Products

Cement pipe (Transite), presumed to **contain asbestos** based on visual observation, is present as sanitary drains / rainwater leaders in the Phys. Ed. Room (Loc. 24) and in Gym storage (Loc. 25).




Photo 18: Presumed asbestos cement pipe (Transite) present in the Phys. Ed. Room (Loc. 24).



Photo 19: Presumed asbestos cement pipe (Transite) present in the Gym storage (Loc. 25).

4.1.9 Vinyl Floor Tiles, Baseboard, and Stair Flooring

The following is a summary of vinyl floor tiles sampled, for a complete list of locations, refer to Appendix V

Description	Sample Location (Location #)	Sample Number	Asbestos (Tile / Adhesive)	Photo
12"x12" white with light brown specks	East Stairwell (Loc. 5)	S0005A-C	No / No	
12"x12" sky blue with light blue specks	Supervisor Office (Loc. 15)	S0019A-C	No / No	
12"x12" blue with light blue specks	Equipment Storage (Loc. 16)	S0020A-C	No / No	

Description	Sample Location (Location #)	Sample Number	Asbestos (Tile / Adhesive)	Photo
12"x12" light teal with teal specks	Phys. Ed. Room (Loc. 24)	S0030A-C	No / No	
12"x12" light beige with brown specks	Hallway (Loc. 28)	S0032A-C	No / No	
4" black rubber baseboard	East Stairwell (Loc. 5)	S0006A-C	No / No	
Terrazzo on stair flooring	Lobby (Loc. 7)	S0007A-C	No	

4.1.10 Firestopping

Firestopping present at pipe and conduit penetrations in Filter Room (Loc. 2) and Tunnel Area (Loc. 3) does not contain asbestos (samples S002A-C).

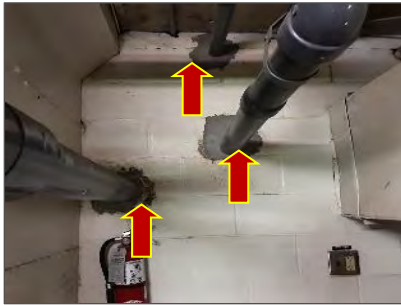





Photo 20: Non-asbestos firestopping (cementitious) present in Filter Room (Loc. 2).




Photo 21: Non-asbestos firestopping (cementitious) present in Tunnel Area (Loc. 3).

4.1.11 Caulking

The following is a summary of sealants, caulking, and putties sampled, for a complete list of locations, refer to Appendix V.



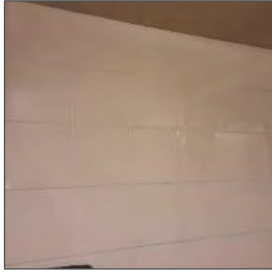
Material, Description and Application	Sample Location (Location #)	Sample Number	Asbestos	Photo
Caulking, off white on walls as expansion joint	Balcony (Loc. 4)	S0003A-C	No	
Caulking, beige on walls as expansion joint	Balcony (Loc. 4)	S0004A-C	No	
Caulking, light red on walls as expansion joint	Exterior (Loc. 14)	S0011A-C	No	

Material, Description and Application	Sample Location (Location #)	Sample Number	Asbestos	Photo
Caulking, grey on window and door frame	Exterior (Loc. 14)	S0013A-C	Yes	
Caulking, light grey on window frame and around duct	Exterior (Loc. 14)	S0015A-C	No	
Caulking, black between wall and door frame	Entrance Vestibule (Loc 6)	S0016A-C	Yes	
Caulking, black between door frame and glass	Entrance Vestibule (Loc 6)	S0017A-C	No	
Caulking, grey between duct	Lower Roof (Loc 17)	S0021A-C	No	

Material, Description and Application	Sample Location (Location #)	Sample Number	Asbestos	Photo
Caulking, beige between wall and door frame	Gym Storage (Loc 25)	S0029A-C	Yes	

4.1.12 Other Building Materials

The following is a summary of other materials sampled, for a complete list of locations, refer to Appendix V.

Description	Sample Location (Location #)	Sample Number	Asbestos	Photo
Mortar on block walls	Fan Room (Loc. 1)	S0001A-E	No	
Thin set under ceramic floor tiles	Men's Change Room (Loc. 9)	S0009A-C	No	
Yellow mastic under ceramic wall tiles	Men's Change Room (Loc. 9)	S0010A-C	No	


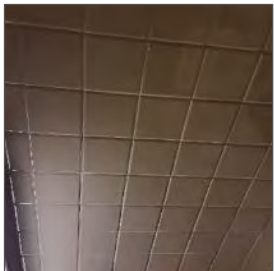
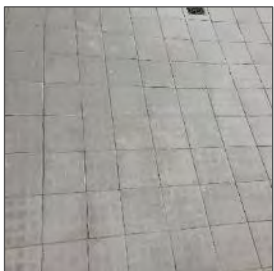


Hazardous Building Materials Assessment (Pre-construction)

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Etude Architect Inc.

August 1, 2023

Pinchin File: 323445.000

Description	Sample Location (Location #)	Sample Number	Asbestos	Photo
Mortar on brick walls	Exterior (Loc. 14)	S0012A-C	Yes	
Cementitious material with aggregates	Exterior (Loc. 14)	S0014A-C	No	
Mastic under ceramic wall tiles	Men's Change Room (Loc. 9)	S0018A-C, layer 1	No	
Thin set under ceramic floor tiles	Indoor Pool (Loc. 13)	S0022A-C	No	
Thin set under ceramic floor tiles	Indoor Pool (Loc. 13)	S0024A-C	No	

Description	Sample Location (Location #)	Sample Number	Asbestos	Photo
Thin set under ceramic floor tiles	Indoor Pool (Loc. 13)	S0025A-C	No	
Mortar under ceramic wall tiles	Lobby (Loc. 7)	S0027A-C	No	
Mortar on block walls	Gym Storage (Loc. 25)	S0028A-C	*Yes	

*Asbestos-containing mortar is limited to walls inside the school only, and not within the Pool Area slated for demolition.

Gaskets are present in the Filter Room (Loc. 2) and were not accessible to sample at the time of the assessment. Gaskets are presumed to contain asbestos.

4.1.13 Excluded Materials

The following is a list of materials which may contain asbestos and was excluded from the assessment.





These materials are presumed to contain asbestos until otherwise proven by sampling and analysis:

- Roofing felts and tar, mastics
- Electrical components
- Mechanical packing, ropes, and gaskets
- Fire resistant doors
- Vibration dampers on HVAC equipment
- Ropes and gaskets in cast-iron bell and spigot joints
- Sealants on pipe threads



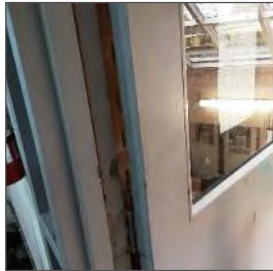
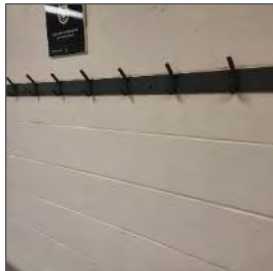
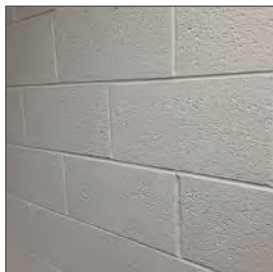
4.2 Lead

4.2.1 Paints and Surface Coatings

The following table summarizes the analytical results of paints sampled.

Sample Number	Colour, Substrate Description	Sample Location	Lead (%)	Photo
L0001	Grey on concrete floor	Fan Room (Loc. 1)	0.034	
L0002	Light grey on concrete floor	Filter Room (Loc. 2)	0.075	
L0003	Red on concrete floor	Filter Room (Loc. 2)	2.3	
L0004	Off-white on metal duct	Filter Room (Loc. 2)	0.057	

Sample Number	Colour, Substrate Description	Sample Location	Lead (%)	Photo
L0005	Off-white on masonry wall	Filter Room (Loc. 2)	0.050	
L0006	Yellow on concrete floor	Filter Room (Loc. 2)	0.80	
L0007	White on concrete wall	Filter Room (Loc. 2)	0.13	
L0008	Off-white on block wall	Balcony (Loc. 4)	0.057	
L0009	Dark grey on concrete floor	Balcony (Loc. 4)	0.0058	

Sample Number	Colour, Substrate Description	Sample Location	Lead (%)	Photo
L0010	Green on block wall underneath	Balcony (Loc. 4)	0.12	
L0011	Black on concrete wall	East Stairwell (Loc.5)	0.56	
L0012	Dark grey on metal door	Balcony (Loc. 4)	0.15	
L0013	Beige on block wall	Men's Change Room (Loc. 9)	0.027	
L0014	Light grey on block wall	Supervisor Office (Loc. 15)	0.00067	



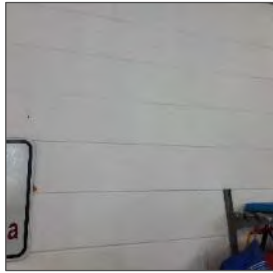



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Sample Number	Colour, Substrate Description	Sample Location	Lead (%)	Photo
L0015	Grey on metal door	Mechanical Room and Stairwell (Loc. 21)	0.020	
L0016	Blue on metal door	Pool office (Loc. 8)	0.24	
L0017	Light beige on block wall	Indoor Pool (Loc. 13)	0.040	
L0018	Dark red on structural steel	Men's Washroom (Loc.22)	Presumed*	N/A
L0019	Beige on block wall	Gym Storage (Loc. 25)	0.040	





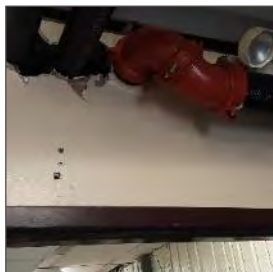


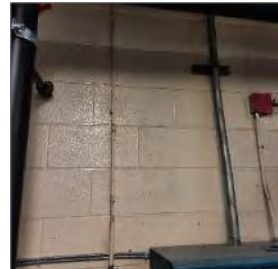
Hazardous Building Materials Assessment (Pre-construction)

Glenforest Secondary School Indoor Pool Demolition, 3575 Fieldgate Drive, Mississauga, Ontario
Etude Architect Inc.

August 1, 2023

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Sample Number	Colour, Substrate Description	Sample Location	Lead (%)	Photo
L0020	Blue on concrete floor	Gym Storage (Loc. 25)	0.0070	
L0021	Light teal on metal door	Phys. Ed. Room (Loc. 24)	0.00026	
L0022	Teal on concrete wall	Storeroom (Loc. 26)	0.041	
L0023	Dark teal on metal door	Phys. Ed. Room (Loc. 24)	<0.00060	
L0024	Light yellow on drywall	Custodian (Loc. 29)	0.00074	

Sample Number	Colour, Substrate Description	Sample Location	Lead (%)	Photo
L0025	Light yellow on block wall	Custodian (Loc. 29)	0.033	

*Sample L0018 was not analyzed as it was lost during the digestion step in the analysis process as advised by Bureau Veritas (external laboratory). L0018 is presumed to be lead-based.

Results above 0.1% (1,000 mg/kg) are considered lead-containing, and over 0.5% (5,000 mg/kg) are considered lead-based.

Results less than or equal to 0.1% (1,000 mg/kg), but equal to or greater than 0.009% (90 mg/kg), are considered low-level lead paints or surface coatings in accordance with the EACC guideline.

Paint containing less than 0.009% (90 mg/kg) lead is assumed to be insignificant.

4.2.2 Excluded Lead Materials

Lead is known to be present in several materials which were not assessed or sampled. The following materials, where found, should be presumed to contain lead.

- Electrical components, including wiring connectors, grounding conductors, and solder.
- Solder on pipe connections
- Glazing on ceramic tiles

4.3 Silica

Crystalline silica is assumed to be a component of the following materials where present in the building.

- Concrete
- Masonry and mortar
- Ceramic tiles and grout
- Plaster
- Drywall
- Ceiling tiles
- Asphalt

4.4 Mercury

4.4.1 Lamps

Mercury vapour is present in fluorescent lamp tubes.

4.4.2 Mercury-Containing Devices

Mercury is presumed to be present as a liquid in thermostats ampules.

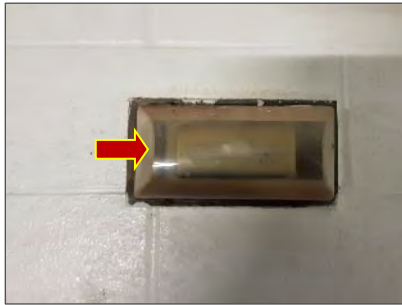


Photo 22: View of presumed mercury containing thermostat present in the East Stairwell (Loc. 5).

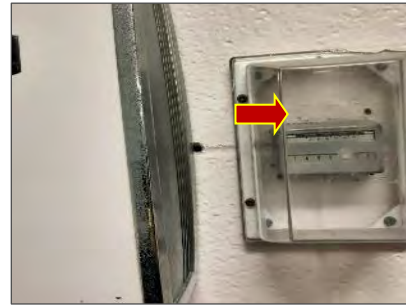








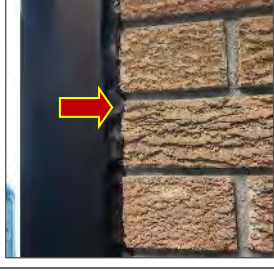
Photo 23: View of presumed mercury containing thermostat present in the Men's Change Room (Loc. 9).



4.5 Polychlorinated Biphenyls

4.5.1 Caulking and Sealants

The following table presents a summary of caulking sampled:

Material, Colour, Application	Sample Location (Location #)	Sample Number	PCB (mg/kg)	Photo
Caulking, beige on walls as expansion joint	Balcony (Loc. 4)	P0001	<30	
Caulking, off white on walls as expansion joint	Balcony (Loc. 4)	P0002	<0.5	

Material, Colour, Application	Sample Location (Location #)	Sample Number	PCB (mg/kg)	Photo
Caulking, grey on window and door frame	Exterior (Loc. 14)	P0003	<1	
Caulking, light red on walls as expansion joint	Exterior (Loc. 14)	P0004	0.2	
Caulking, light grey on window frame and around duct and expansion joint	Exterior (Loc. 14)	P0005	<0.2	
Caulking, black between wall and door frame	Entrance Vestibule (Loc. 6)	P0006	0.6	
Caulking, dark grey (Black) between wall and door frame	Entrance Vestibule (Loc. 6)	P0007	1.1	

Material, Colour, Application	Sample Location (Location #)	Sample Number	PCB (mg/kg)	Photo
Caulking, grey between duct	Lower Roof (Loc. 17)	P0008	<0.1	
Caulking, beige between wall and door frame	Gym Storage (Loc. 25)	P0009	3.2	

All caulking is considered non-PCB solids based on the threshold (50 mg/kg).

4.5.2 Lighting Ballasts

The building has not been comprehensively re-lamped with energy efficient light fixtures (evidence of T-12 fixtures, and as such, a percentage of light ballasts may be manufactured prior to 1980 and may contain PCBs.

4.5.3 Transformers

Transformers were not found during the assessment.

4.5.4 Excluded PCB Materials

PCBs are known to be present in several materials and equipment which were not assessed or sampled. The following materials, where found, should be presumed to contain PCBs until sampling proves otherwise.

- Capacitors within or associated with electrical equipment
- Oil impregnated cables
- High voltage electrical terminals (potheads) and bushings
- Voltage regulators and capacitors
- Hydraulic fluids
- Paints
- Lubricants

4.6 Mould and Water Damage

Visible mould was not observed. Water staining was observed on acoustic ceiling tiles present in the Corridor (Loc. 27) and Hallway (Loc. 28).



Photo 24: View of water-stained acoustic ceiling tiles present in the Corridor (Loc. 27).

5.0 RECOMMENDATIONS

5.1 General

1. Replace the water-stained ceiling tiles regardless of the planned work.
2. Prepare performance specifications for hazardous material removal required for the planned work. The specifications should include safe work practices, personal protective equipment, respiratory protection, and disposal of waste materials.
3. If suspected hazardous building materials are discovered during the planned work, which are not identified in this report, do not disturb, and arrange for further testing and evaluation.
4. Conduct further investigation of the following items, which was not completed during this assessment:
 - a. Any items listed as exclusions in this report, prior to disturbance.
 - b. Once the area slated for demolition is vacant, complete destructive investigations to view concealed areas behind plaster walls and above plaster ceilings with the assistance of a qualified contractor.
 - c. Once the area slated for demolition is vacant, complete roofing core samples and arrange access to the upper elevated roof section to assess for hazardous materials that was not accessible at the time with a qualified contractor.
5. Provide this report and the detailed plans and specifications to the contractor prior to bidding or commencing work.



6. Retain a qualified consultant to specify, observe and document the successful removal of hazardous materials.
7. Update the asbestos inventory upon completion of the abatement and removal of asbestos-containing materials and any other relevant findings.

5.2 Building Renovation Work & Demolition Work

The following recommendations are made regarding renovation and demolition involving the hazardous materials identified.

5.2.1 Asbestos

Remove all asbestos-containing materials (ACM) prior to demolition work following safe work procedures. If the identified ACM will not be removed prior to commencement of the work, any potential disturbance of ACM must follow asbestos precautions appropriate for the type of work being performed.

Asbestos-containing materials must be disposed of at a landfill approved to accept asbestos waste.

5.2.2 Lead

For lead-containing or lead-based paints (i.e., greater than the EACC guideline of 0.1% (1,000 mg/kg) for lead-containing paints, and 0.5% (5,000 mg/kg) for lead-based), construction disturbance may result in over-exposure to lead dust or fumes. The need for work procedures, engineering controls and personal protective equipment should be assessed on a site-specific basis to comply with Ministry of Labour, Training and Skills Development regulations and guidelines.

For paints identified as having low levels of lead (i.e., equal to or above 0.009% (90 mg/kg) but less than or equal to the EACC guideline of 0.1% (1,000 mg/kg) for lead-containing paints) special precautions are not recommended unless aggressive disturbance (grinding, blasting, torching) is planned. Exposure from construction disturbance of paints containing lead less than 0.009% (90 mg/kg) is assumed to be insignificant.

Items painted with paints containing elevated levels of lead may be a hazardous waste. Test lead-painted materials for leachable lead and other metals prior to disposal. Metallic components coated with lead paint do not require leachate testing and can be disposed of as non-hazardous construction and demolition (C&D) waste.



5.2.3 Silica

Construction disturbance of silica-containing products may result in excessive exposures to airborne silica, especially if performed indoors and dry. Cutting, grinding, drilling or demolition of materials containing silica should be completed only with proper respiratory protection and other worker safety precautions that comply with applicable regulations and guidelines.

5.2.4 Mercury

Do not break lamps or separate liquid mercury from components. Recycle and reclaim mercury from fluorescent lamps and thermostats when taken out of service. Mercury is classified as a hazardous waste and must be disposed of in accordance with applicable regulations.

5.2.5 PCBs

Prior to demolition, remove light fixtures and examine light ballasts for PCB content. If ballasts are not clearly labelled as “non-PCB” or are suspected to contain PCBs, package, and ship ballasts for destruction at a federally permitted facility.

6.0 TERMS AND LIMITATIONS

This work was performed subject to the Terms and Limitations presented or referenced in the proposal for this project.

Information provided by Pinchin is intended for Client use only. Pinchin will not provide results or information to any party unless disclosure by Pinchin is required by law. Any use by a third party of reports or documents authored by Pinchin or any reliance by a third party on or decisions made by a third party based on the findings described in said documents, is the sole responsibility of such third parties. Pinchin accepts no responsibility for damages suffered by any third party as a result of decisions made or actions conducted. No other warranties are implied or expressed.

7.0 REFERENCES

The following legislation and documents were referenced in completing the assessment and this report:

1. Asbestos on Construction Projects and in Buildings and Repair Operations, Ontario Regulation 278/05.
2. Designated Substances, Ontario Regulation 490/09.
3. Lead on Construction Projects, Ministry of Labour Guidance Document.
4. The Environmental Abatement Council of Canada (EACC) Lead Guideline for Construction, Renovation, Maintenance or Repair.



Hazardous Building Materials Assessment (Pre-construction)

Glenforest Secondary School Indoor Pool Demolition, 3575 Fieldgate Drive, Mississauga,
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Etude Architect Inc.

August 1, 2023

Pinchin File: 323445.000








5. Ministry of the Environment Regulation, R.R.O. 1990 Reg. 347 as amended.
6. Ministry of the Environment Regulation, R.R.O. 1990 Reg. 362 as amended.
7. Silica on Construction Projects, Ministry of Labour Guidance Document.
8. Alert – Mould in Workplace Buildings, Ontario Ministry of Labour.
9. PCB Regulations, SOR/2008-273, Canadian Environmental Protection Act.
10. Surface Coating Materials Regulations, SOR/2016-193, Canada Consumer Product Safety Act.
11. Consolidated Transportation of Dangerous Goods Regulations, including Amendment SOR/2019-101, Transportation of Dangerous Goods Act.
12. Canada Occupational Health and Safety Regulation, SOR/86-304.

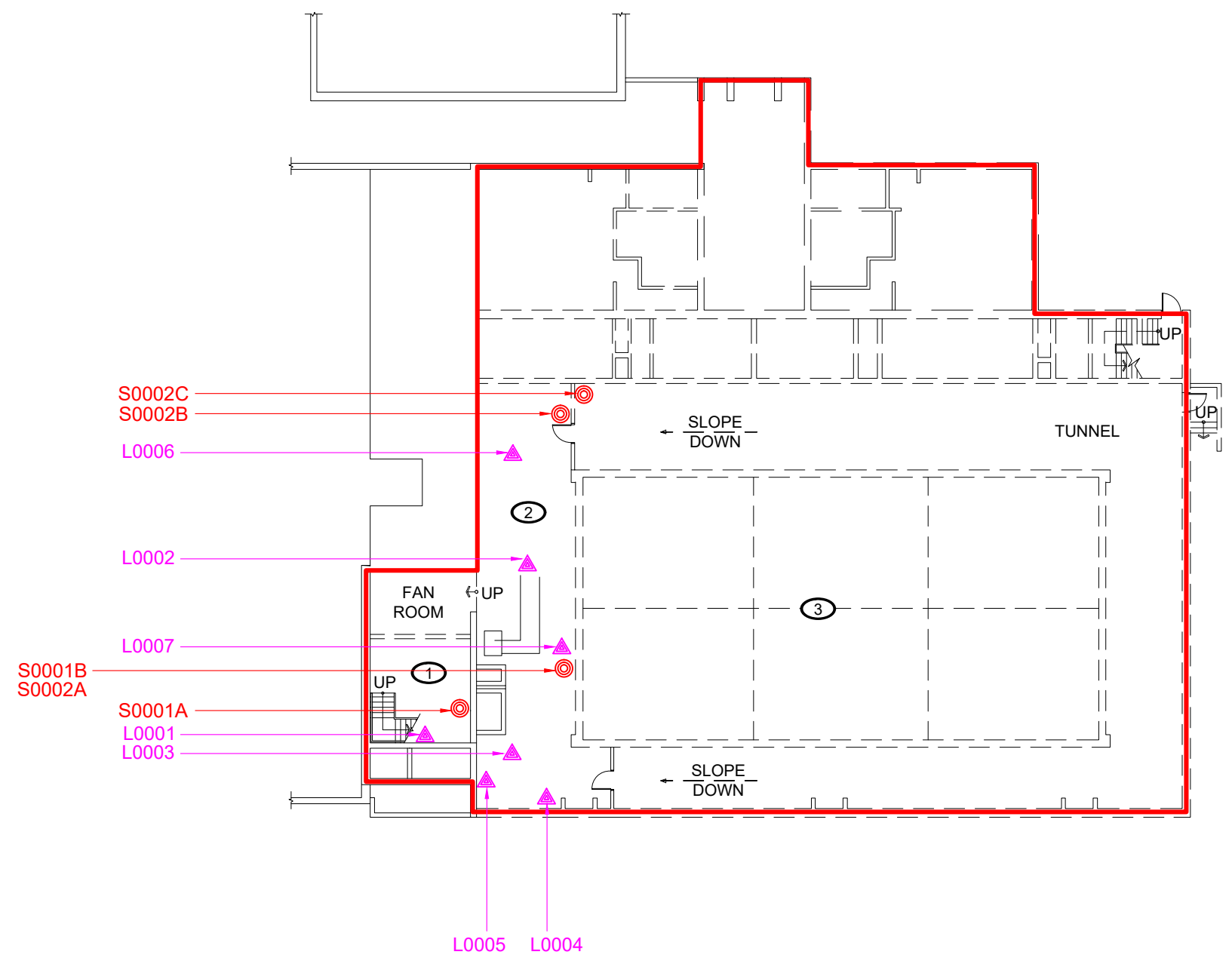
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Template: Master Report for Hazardous Materials Assessment (Pre-Construction), HAZ, October 31, 2022

APPENDIX I
Drawings



- LEGEND**
-  PINCHIN LOCATION NUMBER
 -  SURVEY BOUNDARY/ASSESSED AREA
 -  OUTSIDE ASSESSMENT SCOPE
 -  ASBESTOS BULK SAMPLE
 -  LEAD BULK SAMPLE
 -  PCB BULK SAMPLE
 -  VERMICULITE DRILLHOLE



NOT ALL KNOWN OR SUSPECTED HAZARDOUS BUILDING MATERIALS MAY BE DEPICTED ON THE DRAWING. REFER TO THE HAZARDOUS BUILDING MATERIALS ASSESSMENT REPORT FOR A COMPLETE LIST OF KNOWN AND SUSPECTED HAZARDOUS BUILDING MATERIALS.

LEGEND IS COLOUR DEPENDENT. NON-COLOUR COPIES MAY ALTER INTERPRETATION.

BASE PLAN PROVIDED BY CLIENT.



PROJECT NAME:
HAZARDOUS BUILDING MATERIALS ASSESSMENT (PRE-CONSTRUCTION)

CLIENT NAME:
ETUDE ARCHITECT INC.








PROJECT LOCATION:
**GLENFOREST SECONDARY SCHOOL INDOOR POOL
3575 FIELDGATE DRIVE
MISSISSAUGA, ONTARIO**

FIGURE NAME:
BASEMENT

PROJECT NUMBER: 323445.000	SCALE: NOT TO SCALE
DRAWN BY: DP	REVIEWED BY: AS
DATE: AUGUST 2023	FIGURE NUMBER: 1 OF 4



LEGEND

-  PINCHIN LOCATION NUMBER
-  SURVEY BOUNDARY/ASSESSED AREA
-  OUTSIDE ASSESSMENT SCOPE
-  ASBESTOS BULK SAMPLE
-  LEAD BULK SAMPLE
-  PCB BULK SAMPLE
-  VERMICULITE DRILLHOLE

NOT ALL KNOWN OR SUSPECTED HAZARDOUS BUILDING MATERIALS MAY BE DEPICTED ON THE DRAWING. REFER TO THE HAZARDOUS BUILDING MATERIALS ASSESSMENT REPORT FOR A COMPLETE LIST OF KNOWN AND SUSPECTED HAZARDOUS BUILDING MATERIALS.

LEGEND IS COLOUR DEPENDENT. NON-COLOUR COPIES MAY ALTER INTERPRETATION.

BASE PLAN PROVIDED BY CLIENT.



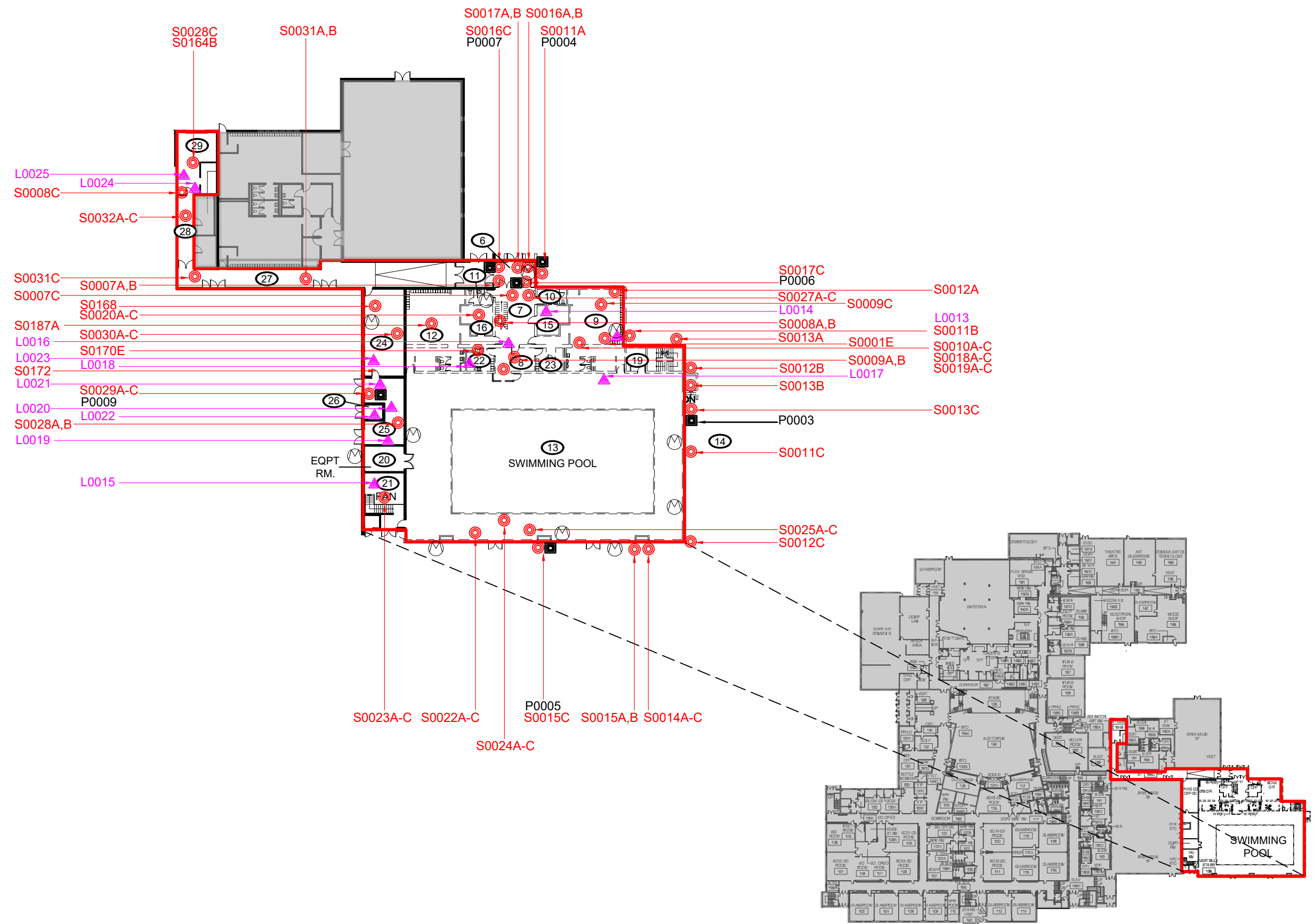
PROJECT NAME:
HAZARDOUS BUILDING MATERIALS ASSESSMENT (PRE-CONSTRUCTION)

CLIENT NAME:
ETUDE ARCHITECT INC.

PROJECT LOCATION:
**GLENFOREST SECONDARY SCHOOL INDOOR POOL
3575 FIELDGATE DRIVE
MISSISSAUGA, ONTARIO**








FIGURE NAME:
GROUND FLOOR

PROJECT NUMBER: 323445.000	SCALE: NOT TO SCALE
DRAWN BY: DP	REVIEWED BY: AS
DATE: AUGUST 2023	FIGURE NUMBER: 2 OF 4





LEGEND

-  PINCHIN LOCATION NUMBER
-  SURVEY BOUNDARY/ASSESSED AREA
-  OUTSIDE ASSESSMENT SCOPE
-  ASBESTOS BULK SAMPLE
-  LEAD BULK SAMPLE
-  PCB BULK SAMPLE
-  VERMICULITE DRILLHOLE

NOT ALL KNOWN OR SUSPECTED HAZARDOUS BUILDING MATERIALS MAY BE DEPICTED ON THE DRAWING. REFER TO THE HAZARDOUS BUILDING MATERIALS ASSESSMENT REPORT FOR A COMPLETE LIST OF KNOWN AND SUSPECTED HAZARDOUS BUILDING MATERIALS.

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BASE PLAN PROVIDED BY CLIENT.



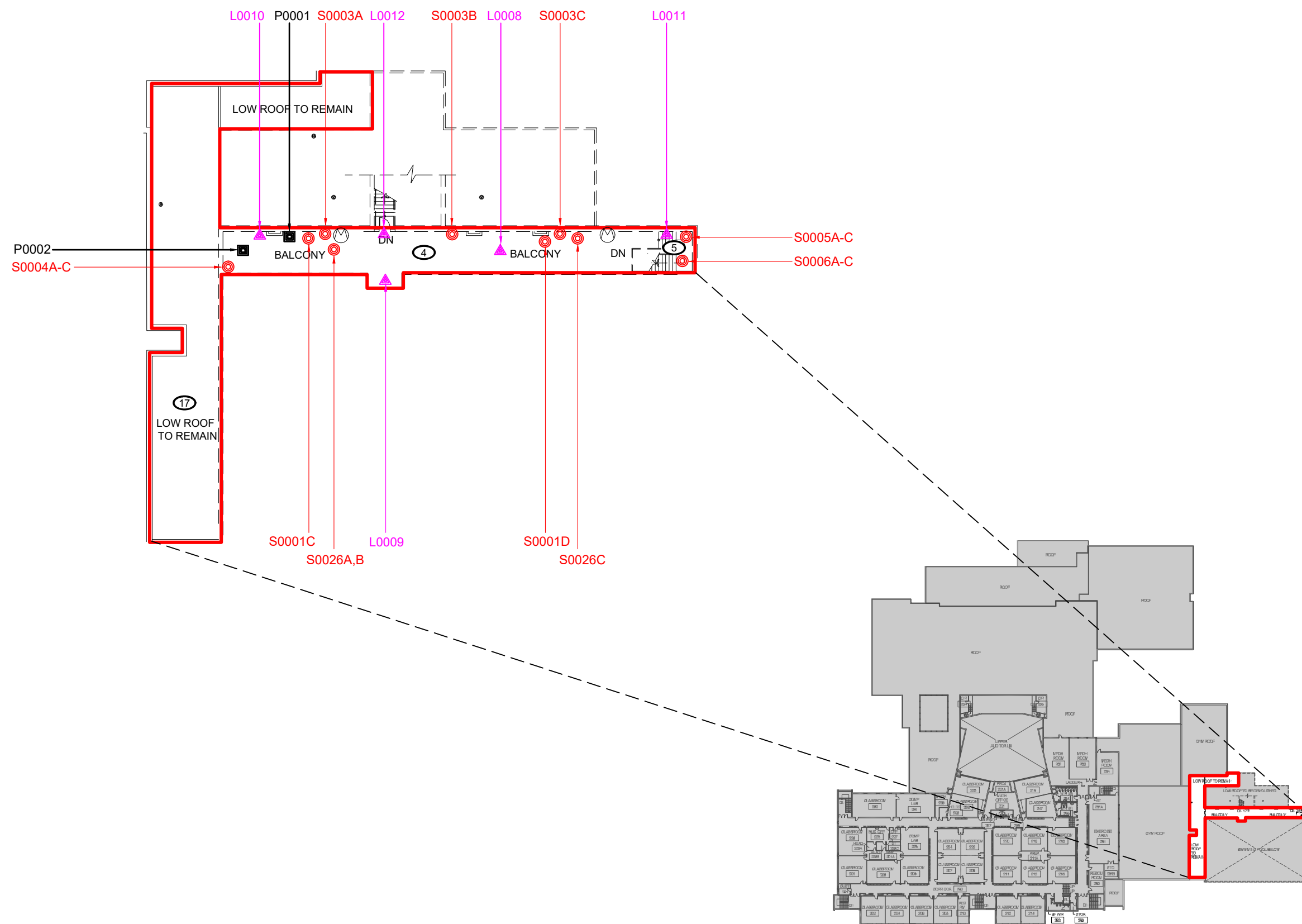
PROJECT NAME:
HAZARDOUS BUILDING MATERIALS ASSESSMENT (PRE-CONSTRUCTION)

CLIENT NAME:
ETUDE ARCHITECT INC.

PROJECT LOCATION:
**GLENFORD SECONDARY SCHOOL INDOOR POOL
3575 FIELDGATE DRIVE
MISSISSAUGA, ONTARIO**








FIGURE NAME:
SECOND FLOOR

PROJECT NUMBER: 323445.000	SCALE: NOT TO SCALE
DRAWN BY: DP	REVIEWED BY: AS
DATE: AUGUST 2023	FIGURE NUMBER: 3 OF 4





LEGEND

-  PINCHIN LOCATION NUMBER
-  SURVEY BOUNDARY/ASSESSED AREA
-  OUTSIDE ASSESSMENT SCOPE
-  ASBESTOS BULK SAMPLE
-  LEAD BULK SAMPLE
-  PCB BULK SAMPLE
-  VERMICULITE DRILLHOLE

NOT ALL KNOWN OR SUSPECTED HAZARDOUS BUILDING MATERIALS MAY BE DEPICTED ON THE DRAWING. REFER TO THE HAZARDOUS BUILDING MATERIALS ASSESSMENT REPORT FOR A COMPLETE LIST OF KNOWN AND SUSPECTED HAZARDOUS BUILDING MATERIALS.

LEGEND IS COLOUR DEPENDENT. NON-COLOUR COPIES MAY ALTER INTERPRETATION.

BASE PLAN PROVIDED BY CLIENT.



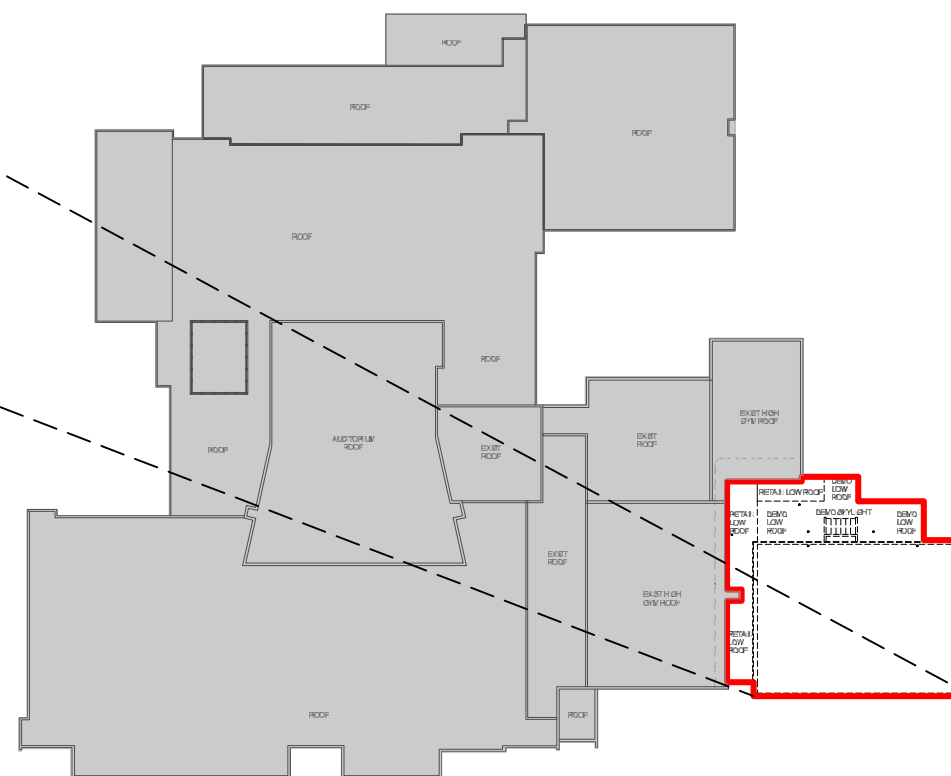
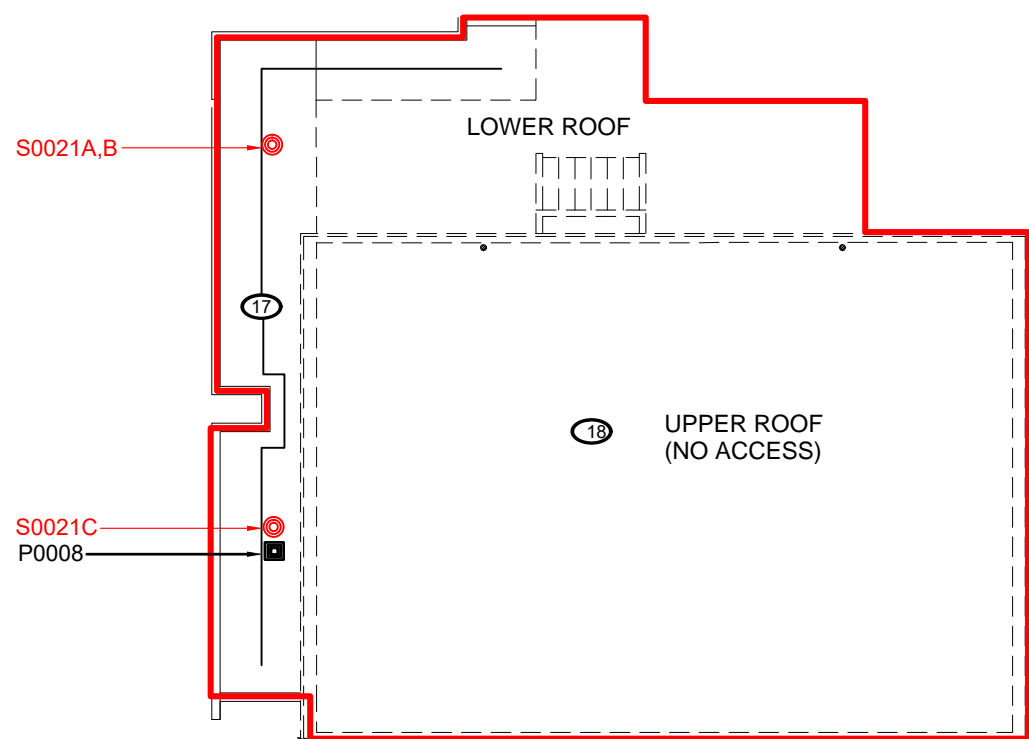
PROJECT NAME:
HAZARDOUS BUILDING MATERIALS ASSESSMENT (PRE-CONSTRUCTION)

CLIENT NAME:
ETUDE ARCHITECT INC.

PROJECT LOCATION:
**GLENFOREST SECONDARY SCHOOL INDOOR POOL
3575 FIELDGATE DRIVE
MISSISSAUGA, ONTARIO**

FIGURE NAME:
ROOF

PROJECT NUMBER: 323445.000	SCALE: NOT TO SCALE
DRAWN BY: DP	REVIEWED BY: AS
DATE: AUGUST 2023	FIGURE NUMBER: 4 OF 4



APPENDIX II-A
Asbestos Analytical Certificates



Your Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Your C.O.C. #: na

Attention: Tanya Stanisic

Pinchin Ltd
 2360 Meadowpine Blvd
 Unit # 2
 Mississauga, ON
 CANADA L5N 6S2

Report Date: 2023/07/13
 Report #: R7712921
 Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3K2006

Received: 2023/07/10, 09:19

Sample Matrix: Solid
 #Samples Received: 98

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Asbestos by PLM - 0.5 RDL (1)	98	N/A	2023/07/13	COR3SOP-00002	EPA 600R-93/116

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCCFP, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Bureau Veritas' Asbestos Laboratory is accredited by NVLAP for bulk asbestos analysis by polarized light microscopy, NVLAP Code 600136-0.

This report may not be reproduced, except in full, without the written approval of Bureau Veritas. This report may not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any other agency of the U.S. Government.

Bureau Veritas' scope of accreditation includes EPA -- 40 CFR Appendix E to Subpart E of Part 763, "Interim Method for the Determination of Asbestos in Bulk Insulation Samples" and EPA-600/R-93/116: "Method for the Determination of Asbestos in Bulk Building Materials".

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) P.O.B. - Percent of Bulk



Your Project #: 323445
Site Location: 3575 FIELDGATE DR
Your C.O.C. #: na

Attention: Tanya Stanisic

Pinchin Ltd
2360 Meadowpine Blvd
Unit # 2
Mississauga, ON
CANADA L5N 6S2

Report Date: 2023/07/13
Report #: R7712921
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3K2006

Received: 2023/07/10, 09:19

When Asbestos data is reported with other data, this report contains data that are not covered by the NVLAP accreditation.

Encryption Key



Bureau Veritas
13 Jul 2023 09:39:18

Please direct all questions regarding this Certificate of Analysis to:

Nilushi Mahathantila, Project Manager
Email: Nilushi.Mahathantila@bureauveritas.com
Phone# (905) 817-5700

=====
This report has been generated and distributed using a secure automated process.

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental Laboratory operations.



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0001A WALL,MORTAR,LOC:1,FAN ROOM					
Bureau Veritas ID:	WII112			Date Analyzed:	2023/07/12
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey mortar	Not Detected		Non-Fibrous

S0001B WALL,MORTAR,LOC:2,FILTER ROOM					
Bureau Veritas ID:	WII113			Date Analyzed:	2023/07/12
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey mortar	Not Detected		Non-Fibrous

S0001C WALL,ALL,MORTAR,LOC:4,BALCONY					
Bureau Veritas ID:	WII114			Date Analyzed:	2023/07/12
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey mortar	Not Detected		Non-Fibrous

S0001D WALL,ALL,MORTAR,LOC:4,BALCONY					
Bureau Veritas ID:	WII115			Date Analyzed:	2023/07/12
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey mortar	Not Detected		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0001E WALL,ALL,MORTAR,LOC:9,MEN'S CHANGE ROOM					
Bureau Veritas ID: WII116		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey mortar	Not Detected		Non-Fibrous

S0002A WALL,FIRE STOP,CEMENT PRODUCT,LOC:2,FILTER ROOM					
Bureau Veritas ID: WII117		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey cementitious material	Not Detected		Non-Fibrous

S0002B WALL,FIRE STOP,CEMENT PRODUCT,LOC:2,FILTER ROOM					
Bureau Veritas ID: WII118		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey cementitious material	Not Detected		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0002C WALL,FIRE STOP,CEMENT PRODUCT,LOC:3,TUNNEL AREA					
Bureau Veritas ID: WII119		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey cementitious material	Not Detected		Non-Fibrous

S0003A WALL,EXPANSION JOINT,CAULKING,LOC:4,BALCONY					
Bureau Veritas ID: WII120		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous beige caulking	Not Detected		Non-Fibrous

S0003B WALL,EXPANSION JOINT,CAULKING,LOC:4,BALCONY					
Bureau Veritas ID: WII121		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous beige caulking	Not Detected		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0003C WALL,EXPANSION JOINT,CAULKING,LOC:4,BALCONY					
Bureau Veritas ID:		WII122	Date Analyzed:		2023/07/12
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous beige caulking	Not Detected		Non-Fibrous

S0004A WALL,EXPANSION JOINT,CAULKING,LOC:4,BALCONY					
Bureau Veritas ID:		WII123	Date Analyzed:		2023/07/12
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey caulking	Not Detected		Non-Fibrous

S0004B WALL,EXPANSION JOINT,CAULKING,LOC:4,BALCONY					
Bureau Veritas ID:		WII124	Date Analyzed:		2023/07/12
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey caulking	Not Detected		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0004C WALL,EXPANSION JOINT,CAULKING,LOC:4,BALCONY					
Bureau Veritas ID: WII125		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey caulking	Not Detected		Non-Fibrous

S0005A FLOOR,ALL,VINYL FLOOR TILE AND MASTIC, 12X12 WHITE WITH LIGHT BROWN SPECKS,LOC:5,EAST STAIRWELL					
Bureau Veritas ID: WII126		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	95	Homogeneous off-white vinyl floor tile	Not Detected		Non-Fibrous
Layer 2	5	Homogeneous black/brown mastic	Not Detected		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0005B FLOOR,ALL,VINYL FLOOR TILE AND MASTIC, 12X12 WHITE WITH LIGHT BROWN SPECKS, LOC:5,EAST STAIRWELL					
Bureau Veritas ID: W1127		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	95	Homogeneous off-white vinyl floor tile	Not Detected		Non-Fibrous
Layer 2	5	Homogeneous black/brown mastic	Not Detected		Non-Fibrous

S0005C FLOOR,ALL,VINYL FLOOR TILE AND MASTIC, 12X12 WHITE WITH LIGHT BROWN SPECKS, LOC:5,EAST STAIRWELL					
Bureau Veritas ID: W1128		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	95	Homogeneous off-white vinyl floor tile	Not Detected		Non-Fibrous
Layer 2	5	Homogeneous black/brown mastic	Not Detected		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0006A FLOOR,BASE,MASTIC, YELLOW,LOC:5,EAST STAIRWELL					
Bureau Veritas ID:	WII129			Date Analyzed:	2023/07/12
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous brown mastic	Not Detected		Non-Fibrous

S0006B FLOOR,BASE,MASTIC, YELLOW,LOC:5,EAST STAIRWELL					
Bureau Veritas ID:	WII130			Date Analyzed:	2023/07/12
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous brown mastic	Not Detected		Non-Fibrous

S0006C FLOOR,BASE,MASTIC, YELLOW,LOC:5,EAST STAIRWELL					
Bureau Veritas ID:	WII131			Date Analyzed:	2023/07/12
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous brown mastic	Not Detected		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0007A FLOOR,ALL,TERRAZZO,LOC:6,ENTRANCE VESTIBULE					
Bureau Veritas ID: WII132		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous white/grey terrazzo flooring/cementitious material	Not Detected		Non-Fibrous

S0007B FLOOR,ALL,TERRAZZO,LOC:6,ENTRANCE VESTIBULE					
Bureau Veritas ID: WII133		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous white/grey terrazzo flooring/cementitious material	Not Detected		Non-Fibrous

S0007C FLOOR,ALL,TERRAZZO,LOC:7,LOB BY					
Bureau Veritas ID: WII134		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous white/grey terrazzo flooring/cementitious material	Not Detected		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0008A STAIRS, DRYWALL COMPOUND, LOC:7, LOBBY					
Bureau Veritas ID: WII135		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey drywall joint compound	Chrysotile 1%		Non-Fibrous

S0008B STAIRS, DRYWALL COMPOUND, LOC:7, LOBBY					
Bureau Veritas ID: WII136		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1			N/A		
Comment: Not Analyzed - Positive Stop					

S0008C WALL, DRYWALL AND JOINT COMPOUND, LOC:29, CUSTODIAN					
Bureau Veritas ID: WII137		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1			N/A		
Comment: Not Analyzed - Positive Stop					

S0009A FLOOR, ALL, MORTAR, SMALL GREY SQUARES, LOC:8, POOL OFFICE					
Bureau Veritas ID: WII138		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey mortar	Not Detected		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0009B FLOOR,ALL,MORTAR,SMALL GREY SQUARES,LOC:8,POOL OFFICE					
Bureau Veritas ID: WII139		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey mortar	Not Detected		Non-Fibrous

S0009C FLOOR,ALL,MORTAR,SMALL GREY SQUARES,LOC:9,MEN'S CHANGE ROOM					
Bureau Veritas ID: WII140		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey mortar	Not Detected		Non-Fibrous

S0010A WALL,MASTIC,12X12 LIGHT BEIGE SQUARES,LOC:9,MEN'S CHANGE ROOM					
Bureau Veritas ID: WII141		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous brown mastic	Not Detected		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0010B WALL,MASTIC,12X12 LIGHT BEIGE SQUARES,LOC:9,MEN'S CHANGE ROOM					
Bureau Veritas ID: WII142		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous brown mastic	Not Detected		Non-Fibrous

S0010C WALL,MASTIC,12X12 LIGHT BEIGE SQUARES,LOC:9,MEN'S CHANGE ROOM					
Bureau Veritas ID: WII143		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous brown mastic	Not Detected		Non-Fibrous

S0011A WALL,EXPANSION JOINT,CAULKING,LOC:14,EXTERIOR					
Bureau Veritas ID: WII144		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous brown caulking	Not Detected		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0011B WALL,EXPANSION JOINT,CAULKING,LOC:14,EXTERIOR					
Bureau Veritas ID: WII145		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous brown caulking	Not Detected		Non-Fibrous

S0011C WALL,EXPANSION JOINT,CAULKING,LOC:14,EXTERIOR					
Bureau Veritas ID: WII146		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous brown caulking	Not Detected		Non-Fibrous

S0012A WALL,MORTAR,LOC:14,EXTERIOR					
Bureau Veritas ID: WII147		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey mortar	Chrysotile 0.5%		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0012B WALL,MORTAR,LOC:14,EXTERIOR					
Bureau Veritas ID: WII148		Date Analyzed: 2023/07/12			
<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>	
Layer 1		N/A			
Comment: Not Analyzed - Positive Stop					

S0012C WALL,MORTAR,LOC:14,EXTERIOR					
Bureau Veritas ID: WII149		Date Analyzed: 2023/07/12			
<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>	
Layer 1		N/A			
Comment: Not Analyzed - Positive Stop					

S0013A DOOR,CAULKING,LOC:14,EXTERIOR					
Bureau Veritas ID: WII150		Date Analyzed: 2023/07/12			
<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>	
Layer 1	100	Homogeneous grey caulking	Chrysotile 1%		Non-Fibrous

S0013B DOOR,CAULKING,LOC:14,EXTERIOR					
Bureau Veritas ID: WII151		Date Analyzed: 2023/07/12			
<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>	
Layer 1		N/A			
Comment: Not Analyzed - Positive Stop					

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0013C WALL,EXPANSION JOINT,CAULKING,LOC:14,EXTERIOR					
Bureau Veritas ID: WII152		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1			N/A		
Comment: Not Analyzed - Positive Stop					

S0014A WALL,UNIDENTIFIED MATERIAL,LOC:14,EXTERIOR					
Bureau Veritas ID: WII153		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey cementitious material	Not Detected		Non-Fibrous

S0014B WALL,UNIDENTIFIED MATERIAL,LOC:14,EXTERIOR					
Bureau Veritas ID: WII154		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey cementitious material	Not Detected		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0014C WALL, UNIDENTIFIED MATERIAL, LOC:14, EXTERIOR					
Bureau Veritas ID: W1155		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey cementitious material	Not Detected		Non-Fibrous

S0015A WINDOW, CAULKING, LOC:14, EXTERIOR					
Bureau Veritas ID: W1156		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey caulking	Not Detected		Non-Fibrous

S0015B WINDOW, CAULKING, LOC:14, EXTERIOR					
Bureau Veritas ID: W1157		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey caulking	Not Detected		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0015C WINDOW,CAULKING,LOC:14,EXTERIOR					
Bureau Veritas ID: WII158		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey caulking	Not Detected		Non-Fibrous

S0016A DOOR,CAULKING,LOC:6,ENTRANCE VESTIBULE					
Bureau Veritas ID: WII159		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous black caulking	Chrysotile 1%		Non-Fibrous

S0016B DOOR,CAULKING,LOC:6,ENTRANCE VESTIBULE					
Bureau Veritas ID: WII160		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1			N/A		
	Comment: Not Analyzed - Positive Stop				

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0016C DOOR,CAULKING,LOC:6,ENTRANCE VESTIBULE					
Bureau Veritas ID:	WII161			Date Analyzed:	2023/07/12
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1			N/A		
	Comment: Not Analyzed - Positive Stop				

S0017A DOOR,CAULKING,LOC:6,ENTRANCE VESTIBULE					
Bureau Veritas ID:	WII162			Date Analyzed:	2023/07/12
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous black caulking	Not Detected		Non-Fibrous

S0017B DOOR,CAULKING,LOC:6,ENTRANCE VESTIBULE					
Bureau Veritas ID:	WII163			Date Analyzed:	2023/07/12
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous black caulking	Not Detected		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0017C DOOR,CAULKING,LOC:6,ENTRANCE VESTIBULE					
Bureau Veritas ID: WII164		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous black caulking	Not Detected		Non-Fibrous

S0018A CEILING,MASTIC,6"X6" LIGHT BEIGE SQUARES,LOC9,MEN'S CHANGE ROOM					
Bureau Veritas ID: WII165		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	5	Homogeneous cream mastic	Not Detected		Non-Fibrous
Layer 2	45	Homogeneous off-white cementitious material	Not Detected		Non-Fibrous
Layer 3	50	Homogeneous grey cementitious material	Not Detected		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0018B CEILING,MASTIC,6"X6" LIGHT BEIGE SQUARES,LOC:9,MEN'S CHANGE ROOM					
Bureau Veritas ID: W11166		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	5	Homogeneous cream mastic	Not Detected		Non-Fibrous
Layer 2	45	Homogeneous off-white cementitious material	Not Detected		Non-Fibrous
Layer 3	50	Homogeneous grey cementitious material	Not Detected		Non-Fibrous

S0018C CEILING,MASTIC,6"X6" LIGHT BEIGE SQUARES,LOC:9,MEN'S CHANGE ROOM					
Bureau Veritas ID: W11167		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	5	Homogeneous cream mastic	Not Detected		Non-Fibrous
Layer 2	45	Homogeneous off-white cementitious material	Not Detected		Non-Fibrous
Layer 3	50	Homogeneous grey cementitious material	Not Detected		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0019A FLOOR,VINYL FLOOR TILE AND MASTIC, 12X12 SKY BLUE WITH LIGHT BLUE SPECKS, LOC:15,SUPERVISOR OFFICE					
Bureau Veritas ID: W11168		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	95	Homogeneous blue vinyl floor tile	Not Detected		Non-Fibrous
Layer 2	5	Homogeneous black mastic	Not Detected		Non-Fibrous

S0019B FLOOR,VINYL FLOOR TILE AND MASTIC, 12X12 SKY BLUE WITH LIGHT BLUE SPECKS, LOC:15,SUPERVISOR OFFICE					
Bureau Veritas ID: W11169		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	95	Homogeneous blue vinyl floor tile	Not Detected		Non-Fibrous
Layer 2	5	Homogeneous black mastic	Not Detected		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0019C FLOOR,VINYL FLOOR TILE AND MASTIC, 12X12 SKY BLUE WITH LIGHT BLUE SPECKS, LOC:15,SUPERVISOR OFFICE					
Bureau Veritas ID: WII170		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	95	Homogeneous blue vinyl floor tile	Not Detected		Non-Fibrous
Layer 2	5	Homogeneous black mastic	Not Detected		Non-Fibrous

S0020A FLOOR,VINYL FLOOR TILE AND MASTIC, 12X12 BLUE WITH LIGHT BLUE SPECKS, LOC:16,EQUIPMENT STORAGE					
Bureau Veritas ID: WII171		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	95	Homogeneous blue vinyl floor tile	Not Detected		Non-Fibrous
Layer 2	5	Homogeneous yellow mastic	Not Detected		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0020B FLOOR,VINYL FLOOR TILE AND MASTIC, 12X12 BLUE WITH LIGHT BLUE SPECKS, LOC:16,EQUIPMENT STORAGE					
Bureau Veritas ID: WII172		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	95	Homogeneous blue vinyl floor tile	Not Detected		Non-Fibrous
Layer 2	5	Homogeneous yellow mastic	Not Detected		Non-Fibrous

S0020C FLOOR,VINYL FLOOR TILE AND MASTIC, 12X12 BLUE WITH LIGHT BLUE SPECKS, LOC:16,EQUIPMENT STORAGE					
Bureau Veritas ID: WII173		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	95	Homogeneous blue vinyl floor tile	Not Detected		Non-Fibrous
Layer 2	5	Homogeneous yellow mastic	Not Detected		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0021A DUCT, CAULKING, LOC:17, LOWER ROOF					
Bureau Veritas ID: WII174		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey caulking	Not Detected		Non-Fibrous

S0021B DUCT, CAULKING, LOC:17, LOWER ROOF					
Bureau Veritas ID: WII175		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey caulking	Not Detected		Non-Fibrous

S0021C DUCT, CAULKING, LOC:17, LOWER ROOF					
Bureau Veritas ID: WII176		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey caulking	Not Detected		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0022A FLOOR,ALL,MORTAR,7.5"X7.5" LIGHT GREY SQUARES,LOC:13,INDOOR POOL					
Bureau Veritas ID:		WII177	Date Analyzed:		2023/07/12
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey mortar	Not Detected		Non-Fibrous

S0022B FLOOR,ALL,MORTAR,7.5"X7.5" LIGHT GREY SQUARES,LOC:13,INDOOR POOL					
Bureau Veritas ID:		WII178	Date Analyzed:		2023/07/12
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey mortar	Not Detected		Non-Fibrous

S0022C FLOOR,ALL,MORTAR,7.5"X7.5" LIGHT GREY SQUARES,LOC:13,INDOOR POOL					
Bureau Veritas ID:		WII179	Date Analyzed:		2023/07/12
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey mortar	Not Detected		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0023A DUCT,MASTIC,LOC:21,MECHANICAL ROOM AND STAIRWELL					
Bureau Veritas ID: WII180		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous dark grey caulking	Not Detected		Non-Fibrous

S0023B DUCT,MASTIC,LOC:21,MECHANICAL ROOM AND STAIRWELL					
Bureau Veritas ID: WII181		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	50	Homogeneous dark grey caulking	Not Detected		Non-Fibrous
Layer 2	50	Homogeneous grey caulking	Not Detected		Non-Fibrous

S0023C DUCT,MASTIC,LOC:21,MECHANICAL ROOM AND STAIRWELL					
Bureau Veritas ID: WII182		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	50	Homogeneous dark grey caulking	Not Detected		Non-Fibrous
Layer 2	50	Homogeneous grey caulking	Not Detected		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0024A FLOOR,MORTAR,SMALL SKY BLUE SQUARES,LOC:13,INDOOR POOL					
Bureau Veritas ID: W1183		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	45	Homogeneous grey grout	Not Detected		Non-Fibrous
Layer 2	45	Homogeneous grey mortar	Not Detected		Non-Fibrous
Layer 3	10	Homogeneous beige adhesive	Not Detected		Non-Fibrous

S0024B FLOOR,MORTAR,SMALL SKY BLUE SQUARES,LOC:13,INDOOR POOL					
Bureau Veritas ID: W1184		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	45	Homogeneous grey grout	Not Detected		Non-Fibrous
Layer 2	45	Homogeneous grey mortar	Not Detected		Non-Fibrous
Layer 3	10	Homogeneous beige adhesive	Not Detected		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0024C FLOOR,MORTAR,SMALL SKY BLUE SQUARES,LOC:13,INDOOR POOL					
Bureau Veritas ID: WII185		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	45	Homogeneous grey grout	Not Detected		Non-Fibrous
Layer 2	45	Homogeneous grey mortar	Not Detected		Non-Fibrous
Layer 3	10	Homogeneous beige adhesive	Not Detected		Non-Fibrous

S0025A FLOOR,ALL,MORTAR,7.5"X7.5" DARK GREY SQUARES,LOC:13,INDOOR POOL					
Bureau Veritas ID: WII186		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey mortar	Not Detected		Non-Fibrous

S0025B FLOOR,ALL,MORTAR,7.5"X7.5" DARK GREY SQUARES,LOC:13,INDOOR POOL					
Bureau Veritas ID: WII187		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey mortar	Not Detected		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0025C FLOOR,ALL,MORTAR,7.5"X7.5" DARK GREY SQUARES,LOC:13,INDOOR POOL					
Bureau Veritas ID: WII188		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey mortar	Not Detected		Non-Fibrous

S0026A PIPING,PARGING CEMENT,LOC:4,BALCONY					
Bureau Veritas ID: WII189		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey parging cement	Chrysotile 45%		Non-Fibrous

S0026B PIPING,PARGING CEMENT,LOC:4,BALCONY					
Bureau Veritas ID: WII190		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1			N/A		
Comment: Not Analyzed - Positive Stop					

S0026C PIPING,PARGING CEMENT,LOC:4,BALCONY					
Bureau Veritas ID: WII191		Date Analyzed: 2023/07/12			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1			N/A		
Comment: Not Analyzed - Positive Stop					

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0027A WALL,MORTAR,MULTI COLOR SQUARES,LOC:7,LOBBY					
Bureau Veritas ID:		WII192	Date Analyzed:		2023/07/12
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous off-white thinset	Not Detected		Non-Fibrous

S0027B WALL,MORTAR,MULTI COLOR SQUARES,LOC:7,LOBBY					
Bureau Veritas ID:		WII193	Date Analyzed:		2023/07/12
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous off-white thinset	Not Detected		Non-Fibrous

S0027C WALL,MORTAR,MULTI COLOR SQUARES,LOC:7,LOBBY					
Bureau Veritas ID:		WII194	Date Analyzed:		2023/07/12
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous off-white thinset	Not Detected		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0028A WALL,MORTAR,LOC:25,GYM STORAGE						
Bureau Veritas ID: WII195		Date Analyzed: 2023/07/12				
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>		<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous grey mortar	Chrysotile	0.5%		Non-Fibrous

S0028B WALL,MORTAR,LOC:25,GYM STORAGE						
Bureau Veritas ID: WII196		Date Analyzed: 2023/07/13				
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>		<u>Other Fibres</u>	<u>Particulate</u>
Layer 1			N/A			
Comment: Not Analyzed - Positive Stop						

S0028C WALL,ALL,MORTAR,LOC:29,CUSTODIAN						
Bureau Veritas ID: WII197		Date Analyzed: 2023/07/13				
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>		<u>Other Fibres</u>	<u>Particulate</u>
Layer 1			N/A			
Comment: Not Analyzed - Positive Stop						

S0029A WALL,CAULKING,BEIGE,LOC:25,GYM STORAGE						
Bureau Veritas ID: WII198		Date Analyzed: 2023/07/12				
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>		<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	100	Homogeneous beige caulking	Chrysotile	2%		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0029B WALL,CAULKING ,BEIGE,LOC:25,GYM STORAGE					
Bureau Veritas ID:	WII199			Date Analyzed:	2023/07/13
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1			N/A		
	Comment: Not Analyzed - Positive Stop				

S0029C WALL,CAULKING, BEIGE,LOC:25,GYM STORAGE					
Bureau Veritas ID:	WII200			Date Analyzed:	2023/07/13
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1			N/A		
	Comment: Not Analyzed - Positive Stop				

S0030A FLOOR,ALL,VINYL FLOOR TILE AND MASTIC, 12X12 LIGHT TEAL WITH TEAL SPECKS,LOC:24,PHYS. ED. ROOM					
Bureau Veritas ID:	WII201			Date Analyzed:	2023/07/13
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	95	Homogeneous green vinyl floor tile	Not Detected		Non-Fibrous
Layer 2	5	Homogeneous red/ brown mastic	Not Detected		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0030B FLOOR,ALL,VINYL FLOOR TILE AND MASTIC, 12X12 LIGHT TEAL WITH TEAL SPECKS,LOC:24,PHYS. ED. ROOM					
Bureau Veritas ID: WII202		Date Analyzed: 2023/07/13			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	95	Homogeneous green vinyl floor tile	Not Detected		Non-Fibrous
Layer 2	5	Homogeneous red/ brown mastic	Not Detected		Non-Fibrous

S0030C FLOOR,ALL,VINYL FLOOR TILE AND MASTIC, 12X12 LIGHT TEAL WITH TEAL SPECKS,LOC:24,PHYS. ED. ROOM					
Bureau Veritas ID: WII203		Date Analyzed: 2023/07/13			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	95	Homogeneous green vinyl floor tile	Not Detected		Non-Fibrous
Layer 2	5	Homogeneous red/ brown mastic	Not Detected		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0031A CEILING, ALL, CEILING TILES (LAY-IN), 48X24 SMALL FISSURES AND PINHOLES, LOC:27, CORRIDOR						
Bureau Veritas ID: WII204		Date Analyzed: 2023/07/13				
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>		<u>Particulate</u>
Layer 1	100	Homogeneous grey ceiling tile	Not Detected	Cellulose	35%	Non-Fibrous
				Fibrous Glass	45%	

S0031B CEILING, ALL, CEILING TILES (LAY-IN), 48X24 SMALL FISSURES AND PINHOLES, LOC:27, CORRIDOR						
Bureau Veritas ID: WII205		Date Analyzed: 2023/07/13				
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>		<u>Particulate</u>
Layer 1	100	Homogeneous grey ceiling tile	Not Detected	Cellulose	35%	Non-Fibrous
				Fibrous Glass	45%	

S0031C CEILING, ALL, CEILING TILES (LAY-IN), 48X24 SMALL FISSURES AND PINHOLES, LOC:27, CORRIDOR						
Bureau Veritas ID: WII206		Date Analyzed: 2023/07/13				
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>		<u>Particulate</u>
Layer 1	100	Homogeneous grey ceiling tile	Not Detected	Cellulose	35%	Non-Fibrous
				Fibrous Glass	45%	

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0032A FLOOR,ALL,VINYL FLOOR TILE AND MASTIC, 12X12 LIGHT BEIGE WITH BROWN SPECKS, LOC:28,HALLWAY					
Bureau Veritas ID: W11207		Date Analyzed: 2023/07/13			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	95	Homogeneous grey vinyl floor tile	Not Detected		Non-Fibrous
Layer 2	5	Homogeneous yellow/brown mastic	Not Detected		Non-Fibrous

S0032B FLOOR,ALL,VINYL FLOOR TILE AND MASTIC, 12X12 LIGHT BEIGE WITH BROWN SPECKS, LOC:28,HALLWAY					
Bureau Veritas ID: W11208		Date Analyzed: 2023/07/13			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	95	Homogeneous grey vinyl floor tile	Not Detected		Non-Fibrous
Layer 2	5	Homogeneous yellow/brown mastic	Not Detected		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0032C FLOOR,ALL,VINYL FLOOR TILE AND MASTIC, 12X12 LIGHT BEIGE WITH BROWN SPECKS, LOC:28,HALLWAY					
Bureau Veritas ID: W11209		Date Analyzed: 2023/07/13			
	<u>P.O.B</u>	<u>Sample Morphology</u>	<u>Asbestos</u>	<u>Other Fibres</u>	<u>Particulate</u>
Layer 1	95	Homogeneous grey vinyl floor tile	Not Detected		Non-Fibrous
Layer 2	5	Homogeneous yellow/brown mastic	Not Detected		Non-Fibrous

The limit of quantitation is 0.50%, although asbestos may be qualitatively detected at concentrations less than 0.50%. Samples for which asbestos is detected at <0.50% are reported as trace, "<0.50%". "Not Detected" indicates that no asbestos fibres were observed.

Calibrated Visual Estimate (%)
 Date Format : yyyy/mm/dd



Bureau Veritas Job #: C3K2006
Report Date: 2023/07/13

Pinchin Ltd
Client Project #: 323445
Site Location: 3575 FIELDGATE DR
Sampler Initials: AS

TEST SUMMARY

Bureau Veritas ID: WII112
Sample ID: S0001A WALL,MORTAR,LOC:1,FAN ROOM
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII113
Sample ID: S0001B WALL,MORTAR,LOC:2,FILTER ROOM
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII114
Sample ID: S0001C WALL,ALL,MORTAR,LOC:4,BALCONY
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII115
Sample ID: S0001D WALL,ALL,MORTAR,LOC:4,BALCONY
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII116
Sample ID: S0001E WALL,ALL,MORTAR,LOC:9,MEN'S CHANGE ROOM
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII116 Dup
Sample ID: S0001E WALL,ALL,MORTAR,LOC:9,MEN'S CHANGE ROOM
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII117
Sample ID: S0002A WALL,FIRE STOP,CEMENT PRODUCT,LOC:2,FILTER ROOM
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

TEST SUMMARY

Bureau Veritas ID: WII118
Sample ID: S0002B WALL,FIRE STOP,CEMENT PRODUCT,LOC:2,FILTER ROOM
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII119
Sample ID: S0002C WALL,FIRE STOP,CEMENT PRODUCT,LOC:3,TUNNEL AREA
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII120
Sample ID: S0003A WALL,EXPANSION JOINT,CAULKING,LOC:4,BALCONY
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII121
Sample ID: S0003B WALL,EXPANSION JOINT,CAULKING,LOC:4,BALCONY
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII122
Sample ID: S0003C WALL,EXPANSION JOINT,CAULKING,LOC:4,BALCONY
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII123
Sample ID: S0004A WALL,EXPANSION JOINT,CAULKING,LOC:4,BALCONY
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII124
Sample ID: S0004B WALL,EXPANSION JOINT,CAULKING,LOC:4,BALCONY
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos



Bureau Veritas Job #: C3K2006
Report Date: 2023/07/13

Pinchin Ltd
Client Project #: 323445
Site Location: 3575 FIELDGATE DR
Sampler Initials: AS

TEST SUMMARY

Bureau Veritas ID: WII125
Sample ID: S0004C WALL, EXPANSION JOINT, CAULKING, LOC:4, BALCONY
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII126
Sample ID: S0005A FLOOR, ALL, VINYL FLOOR TILE AND MASTIC, 12X12 WHITE WITH LIGHT BROWN SPECIFIED, EAST STAIRWELL
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII126 Dup
Sample ID: S0005A FLOOR, ALL, VINYL FLOOR TILE AND MASTIC, 12X12 WHITE WITH LIGHT BROWN SPECIFIED, EAST STAIRWELL
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII127
Sample ID: S0005B FLOOR, ALL, VINYL FLOOR TILE AND MASTIC, 12X12 WHITE WITH LIGHT BROWN SPECIFIED, EAST STAIRWELL
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII128
Sample ID: S0005C FLOOR, ALL, VINYL FLOOR TILE AND MASTIC, 12X12 WHITE WITH LIGHT BROWN SPECIFIED, EAST STAIRWELL
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII129
Sample ID: S0006A FLOOR, BASE, MASTIC, YELLOW, LOC:5, EAST STAIRWELL
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII130
Sample ID: S0006B FLOOR, BASE, MASTIC, YELLOW, LOC:5, EAST STAIRWELL
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

TEST SUMMARY

Bureau Veritas ID: WII131
Sample ID: S0006C FLOOR,BASE,MASTIC, YELLOW,LOC:5,EAST STAIRWELL
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII132
Sample ID: S0007A FLOOR,ALL,TERRAZZO,LOC:6,ENTRANCE VESTIBULE
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII133
Sample ID: S0007B FLOOR,ALL,TERRAZZO,LOC:6,ENTRANCE VESTIBULE
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII134
Sample ID: S0007C FLOOR,ALL,TERRAZZO,LOC:7,LOBBY
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII135
Sample ID: S0008A STAIRS,DRYWALL COMPOUND,LOC:7,LOBBY
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII135 Dup
Sample ID: S0008A STAIRS,DRYWALL COMPOUND,LOC:7,LOBBY
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII136
Sample ID: S0008B STAIRS,DRYWALL COMPOUND,LOC:7,LOBBY
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos



Bureau Veritas Job #: C3K2006
Report Date: 2023/07/13

Pinchin Ltd
Client Project #: 323445
Site Location: 3575 FIELDGATE DR
Sampler Initials: AS

TEST SUMMARY

Bureau Veritas ID: WII137
Sample ID: S0008C WALL, DRYWALL AND JOINT COMPOUND, LOC:29, CUSTODIAN
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII138
Sample ID: S0009A FLOOR, ALL, MORTAR, SMALL GREY SQUARES, LOC:8, POOL OFFICE
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII139
Sample ID: S0009B FLOOR, ALL, MORTAR, SMALL GREY SQUARES, LOC:8, POOL OFFICE
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII140
Sample ID: S0009C FLOOR, ALL, MORTAR, SMALL GREY SQUARES, LOC:9, MEN'S CHANGE ROOM
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII141
Sample ID: S0010A WALL, MASTIC, 12X12 LIGHT BEIGE SQUARES, LOC:9, MEN'S CHANGE ROOM
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII142
Sample ID: S0010B WALL, MASTIC, 12X12 LIGHT BEIGE SQUARES, LOC:9, MEN'S CHANGE ROOM
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII143
Sample ID: S0010C WALL, MASTIC, 12X12 LIGHT BEIGE SQUARES, LOC:9, MEN'S CHANGE ROOM
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos



TEST SUMMARY

Bureau Veritas ID: WII144
Sample ID: S0011A WALL,EXPANSION JOINT,CAULKING,LOC:14,EXTERIOR
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII145
Sample ID: S0011B WALL,EXPANSION JOINT,CAULKING,LOC:14,EXTERIOR
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII146
Sample ID: S0011C WALL,EXPANSION JOINT,CAULKING,LOC:14,EXTERIOR
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII146 Dup
Sample ID: S0011C WALL,EXPANSION JOINT,CAULKING,LOC:14,EXTERIOR
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII147
Sample ID: S0012A WALL,MORTAR,LOC:14,EXTERIOR
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII148
Sample ID: S0012B WALL,MORTAR,LOC:14,EXTERIOR
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII149
Sample ID: S0012C WALL,MORTAR,LOC:14,EXTERIOR
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos



TEST SUMMARY

Bureau Veritas ID: WII150
Sample ID: S0013A DOOR, CAULKING, LOC:14, EXTERIOR
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII151
Sample ID: S0013B DOOR, CAULKING, LOC:14, EXTERIOR
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII152
Sample ID: S0013C WALL, EXPANSION JOINT, CAULKING, LOC:14, EXTERIOR
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII153
Sample ID: S0014A WALL, UNIDENTIFIED MATERIAL, LOC:14, EXTERIOR
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII154
Sample ID: S0014B WALL, UNIDENTIFIED MATERIAL, LOC:14, EXTERIOR
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII155
Sample ID: S0014C WALL, UNIDENTIFIED MATERIAL, LOC:14, EXTERIOR
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781439	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII156
Sample ID: S0015A WINDOW, CAULKING, LOC:14, EXTERIOR
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos



TEST SUMMARY

Bureau Veritas ID: WII156 Dup
Sample ID: S0015A WINDOW,CAULKING,LOC:14,EXTERIOR
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII157
Sample ID: S0015B WINDOW,CAULKING,LOC:14,EXTERIOR
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII158
Sample ID: S0015C WINDOW,CAULKING,LOC:14,EXTERIOR
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII159
Sample ID: S0016A DOOR,CAULKING,LOC:6,ENTRANCE VESTIBULE
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII160
Sample ID: S0016B DOOR,CAULKING,LOC:6,ENTRANCE VESTIBULE
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII161
Sample ID: S0016C DOOR,CAULKING,LOC:6,ENTRANCE VESTIBULE
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII162
Sample ID: S0017A DOOR,CAULKING,LOC:6,ENTRANCE VESTIBULE
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos



TEST SUMMARY

Bureau Veritas ID: WII163
Sample ID: S0017B DOOR,CAULKING,LOC:6,ENTRANCE VESTIBULE
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII164
Sample ID: S0017C DOOR,CAULKING,LOC:6,ENTRANCE VESTIBULE
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII164 Dup
Sample ID: S0017C DOOR,CAULKING,LOC:6,ENTRANCE VESTIBULE
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII165
Sample ID: S0018A CEILING,MASTIC,6"X6" LIGHT BEIGE SQUARES,LOC:9,MEN'S CHANGE ROOM
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII166
Sample ID: S0018B CEILING,MASTIC,6"X6" LIGHT BEIGE SQUARES,LOC:9,MEN'S CHANGE ROOM
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII167
Sample ID: S0018C CEILING,MASTIC,6"X6" LIGHT BEIGE SQUARES,LOC:9,MEN'S CHANGE ROOM
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII168
Sample ID: S0019A FLOOR,VINYL FLOOR TILE AND MASTIC,12X12 SKY BLUE WITH LIGHT BLUE SPECKLES, SUPERVISOR OFFICE
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

TEST SUMMARY

Bureau Veritas ID: WII169
Sample ID: S0019B FLOOR,VINYL FLOOR TILE AND MASTIC,12X12 SKY BLUE WITH LIGHT BLUE SPECKS,LOC:15,OFFICE SUPERVISOR OFFICE
Matrix: Solid
Collected: 2023/05/04
Shipped: 2023/07/10
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII170
Sample ID: S0019C FLOOR,VINYL FLOOR TILE AND MASTIC,12X12 SKY BLUE WITH LIGHT BLUE SPECKS,LOC:15,OFFICE SUPERVISOR OFFICE
Matrix: Solid
Collected: 2023/05/04
Shipped: 2023/07/10
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII171
Sample ID: S0020A FLOOR,VINYL FLOOR TILE AND MASTIC,12X12 BLUE WITH LIGHT BLUE SPECKS,LOC:15,OFFICE SUPERVISOR OFFICE
Matrix: Solid
Collected: 2023/05/04
Shipped: 2023/07/10
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII172
Sample ID: S0020B FLOOR,VINYL FLOOR TILE AND MASTIC,12X12 BLUE WITH LIGHT BLUE SPECKS,LOC:15,OFFICE SUPERVISOR OFFICE
Matrix: Solid
Collected: 2023/05/04
Shipped: 2023/07/10
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII173
Sample ID: S0020C FLOOR,VINYL FLOOR TILE AND MASTIC,12X12 BLUE WITH LIGHT BLUE SPECKS,LOC:15,OFFICE SUPERVISOR OFFICE
Matrix: Solid
Collected: 2023/05/04
Shipped: 2023/07/10
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII174
Sample ID: S0021A DUCT,CAULKING,LOC:17,LOWER ROOF
Matrix: Solid
Collected: 2023/05/04
Shipped: 2023/07/10
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII175
Sample ID: S0021B DUCT,CAULKING,LOC:17,LOWER ROOF
Matrix: Solid
Collected: 2023/05/04
Shipped: 2023/07/10
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos



TEST SUMMARY

Bureau Veritas ID: WII176
Sample ID: S0021C DUCT,CAULKING,LOC:17,LOWER ROOF
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII176 Dup
Sample ID: S0021C DUCT,CAULKING,LOC:17,LOWER ROOF
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII177
Sample ID: S0022A FLOOR,ALL,MORTAR,7.5"X7.5" LIGHT GREY SQUARES,LOC:13,INDOOR POOL
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII178
Sample ID: S0022B FLOOR,ALL,MORTAR,7.5"X7.5" LIGHT GREYSQUARES,LOC:13,INDOOR POOL
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII179
Sample ID: S0022C FLOOR,ALL,MORTAR,7.5"X7.5" LIGHT GREY SQUARES,LOC:13,INDOOR POOL
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII180
Sample ID: S0023A DUCT,MASTIC,LOC:21,MECHANICAL ROOM AND STAIRWELL
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII181
Sample ID: S0023B DUCT,MASTIC,LOC:21,MECHANICAL ROOM AND STAIRWELL
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

TEST SUMMARY

Bureau Veritas ID: WII182
Sample ID: S0023C DUCT,MASTIC,LOC:21, MECHANICAL ROOM AND STAIRWELL
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII183
Sample ID: S0024A FLOOR,MORTAR,SMALL SKY BLUE SQUARES,LOC:13,INDOOR POOL
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII184
Sample ID: S0024B FLOOR,MORTAR,SMALL SKY BLUE SQUARES,LOC:13,INDOOR POOL
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII185
Sample ID: S0024C FLOOR,MORTAR,SMALL SKY BLUE SQUARES,LOC:13,INDOOR POOL
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII186
Sample ID: S0025A FLOOR,ALL,MORTAR,7.5"X7.5" DARK GREY SQUARES,LOC:13,INDOOR POOL
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII186 Dup
Sample ID: S0025A FLOOR,ALL,MORTAR,7.5"X7.5" DARK GREY SQUARES,LOC:13,INDOOR POOL
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII187
Sample ID: S0025B FLOOR,ALL,MORTAR,7.5"X7.5" DARK GREY SQUARES,LOC:13,INDOOR POOL
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

TEST SUMMARY

Bureau Veritas ID: WII188
Sample ID: S0025C FLOOR,ALL,MORTAR,7.5'X7.5" DARK GREY SQUARES,LOC:13,INDOOR POOL
Matrix: Solid
Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII189
Sample ID: S0026A PIPING,PARGING CEMENT,LOC:4,BALCONY
Matrix: Solid
Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII190
Sample ID: S0026B PIPING,PARGING CEMENT,LOC:4,BALCONY
Matrix: Solid
Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII191
Sample ID: S0026C PIPING,PARGING CEMENT,LOC:4,BALCONY
Matrix: Solid
Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII192
Sample ID: S0027A WALL,MORTAR,MULTI COLOR SQUARES,LOC:7,LOBBY
Matrix: Solid
Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII193
Sample ID: S0027B WALL,MORTAR,MULTI COLOR SQUARES,LOC:7,LOBBY
Matrix: Solid
Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII194
Sample ID: S0027C WALL,MORTAR,MULTI COLOR SQUARES,LOC:7,LOBBY
Matrix: Solid
Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos



Bureau Veritas Job #: C3K2006
Report Date: 2023/07/13

Pinchin Ltd
Client Project #: 323445
Site Location: 3575 FIELDGATE DR
Sampler Initials: AS

TEST SUMMARY

Bureau Veritas ID: WII195
Sample ID: S0028A WALL,MORTAR,LOC:25,GYM STORAGE
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII196
Sample ID: S0028B WALL,MORTAR,LOC:25,GYM STORAGE
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII197
Sample ID: S0028C WALL,ALL,MORTAR,LOC:29,CUSTODIAN
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII198
Sample ID: S0029A WALL,CAULKING,BEIGE,LOC:25,GYM STORAGE
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII198 Dup
Sample ID: S0029A WALL,CAULKING,BEIGE,LOC:25,GYM STORAGE
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781440	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII199
Sample ID: S0029B WALL,CAULKING,BEIGE,LOC:25,GYM STORAGE
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781441	N/A	2023/07/13	Jon Delos Santos

Bureau Veritas ID: WII200
Sample ID: S0029C WALL,CAULKING,BEIGE,LOC:25,GYM STORAGE
Matrix: Solid

Collected: 2023/05/04
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781441	N/A	2023/07/13	Jon Delos Santos



Bureau Veritas Job #: C3K2006
Report Date: 2023/07/13

Pinchin Ltd
Client Project #: 323445
Site Location: 3575 FIELDGATE DR
Sampler Initials: AS

TEST SUMMARY

Bureau Veritas ID: WII201
Sample ID: S0030A FLOOR,ALL,VINYL FLOOR TILE AND MASTIC,12X12 LIGHT TEAL WITH TEAL SPECKS,LOC:27,SHIPPER
Matrix: Solid
Collected: 2023/05/04
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781441	N/A		Jon Delos Santos

Bureau Veritas ID: WII202
Sample ID: S0030B FLOOR,ALL,VINYL FLOOR TILE AND MASTIC,12X12 LIGHT TEAL WITH TEAL SPECKS,LOC:27,SHIPPER
Matrix: Solid
Collected: 2023/05/04
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781441	N/A		Jon Delos Santos

Bureau Veritas ID: WII203
Sample ID: S0030C FLOOR,ALL,VINYL FLOOR TILE AND MASTIC,12X12 LIGHT TEAL WITH TEAL SPECKS,LOC:27,SHIPPER
Matrix: Solid
Collected: 2023/05/04
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781441	N/A		Jon Delos Santos

Bureau Veritas ID: WII204
Sample ID: S0031A CEILING,ALL,CEILING TILES (LAY-IN),48X24 SMALL FISSURES AND PINHOLES,LOC:27,SHIPPER
Matrix: Solid
Collected: 2023/05/04
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781441	N/A		Jon Delos Santos

Bureau Veritas ID: WII205
Sample ID: S0031B CEILING,ALL,CEILING TILES (LAY-IN),48X24 SMALL FISSURES AND PINHOLES,LOC:27,SHIPPER
Matrix: Solid
Collected: 2023/05/04
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781441	N/A		Jon Delos Santos

Bureau Veritas ID: WII206
Sample ID: S0031C CEILING,ALL,CEILING TILES (LAY-IN),48X24 SMALL FISSURES AND PINHOLES,LOC:27,SHIPPER
Matrix: Solid
Collected: 2023/05/04
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781441	N/A		Jon Delos Santos

Bureau Veritas ID: WII206 Dup
Sample ID: S0031C CEILING,ALL,CEILING TILES (LAY-IN),48X24 SMALL FISSURES AND PINHOLES,LOC:27,SHIPPER
Matrix: Solid
Collected: 2023/05/04
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781441	N/A		Jon Delos Santos



Bureau Veritas Job #: C3K2006
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Site Location: 3575 FIELDGATE DR
 Sampler Initials: AS

TEST SUMMARY

Bureau Veritas ID: WII207
Sample ID: S0032A FLOOR,ALL,VINYL FLOOR TILE AND MASTIC,12X12 LIGHT BEIGE WITH BROWN SPECIFIED,
Matrix: Solid
Collected: 2023/05/04
Shipped: 2023/06/28
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781441	N/A		Jon Delos Santos

Bureau Veritas ID: WII208
Sample ID: S0032B FLOOR,ALL,VINYL FLOOR TILE AND MASTIC,12X12 LIGHT BEIGE WITH BROWN SPECIFIED,
Matrix: Solid
Collected: 2023/05/04
Shipped: 2023/06/28
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781441	N/A		Jon Delos Santos

Bureau Veritas ID: WII209
Sample ID: S0032C FLOOR,ALL,VINYL FLOOR TILE AND MASTIC,12X12 LIGHT BEIGE WITH BROWN SPECIFIED,
Matrix: Solid
Collected: 2023/05/04
Shipped: 2023/06/28
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Asbestos by PLM - 0.5 RDL	MIC	8781441	N/A		Jon Delos Santos



Bureau Veritas Job #: C3K2006
Report Date: 2023/07/13

Pinchin Ltd
Client Project #: 323445
Site Location: 3575 FIELDGATE DR
Sampler Initials: AS

GENERAL COMMENTS

Vinyl floor tile can contain very fine asbestos fibres that are below the resolution limits of the PLM. Transmission Electron Microscopy (TEM) is recommended for confirmation of None Detected results.

Results relate only to the items tested.



Bureau Veritas Job #: C3K2006
Report Date: 2023/07/13

Pinchin Ltd
Client Project #: 323445
Site Location: 3575 FIELDGATE DR
Sampler Initials: AS

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Dina Yousof, Analyst 2

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by {0}, {1} responsible for {2} {3} laboratory operations.

10-Jul-23 09:19

Antonella Brasil



C3K2006

J.L ENV-111

Printed by: _____

Scanned by: _____

Report Date by: _____

RUSH!

Pinchin Ltd. - Asbestos Laboratory
Internal Asbestos Bulk Sample Chain of Custody

Client Name:	POSB	Project Address:	3575 Fieldgate Dr
Portfolio/Building No:		Pinchin File:	323445
Submitted by:	Aman Sharma	Email:	asharma@pinchin.com
CC Results to:	Tanya Stanisk	CC Email:	tstanisk@pinchin.com
Date Submitted:	May 04 2023	Required by:	Month Day 2020
# of Samples:	08	Priority:	3 Day Turnaround
Year of Building Construction (Mandatory, Years ONLY):	1968		
Do NOT Stop on Positive (Sample Numbers):			
Pinchin Group Company (Mandatory Field):	Pinchin		
HMIS2 Building Reference #:	119684/20234261752304		

To be Completed by Lab Personnel Only.

Lab Reference #:		Time:	24 hour clock
Received by:	MAY 10 th / 23 ST	Date:	Month Day Year
Name(s) of Analyst(s):			

Sample Prefix	Sample No.	Sample Suffix	Sample Description/Location (Mandatory)
S	0001	A	Wall, Mortar, Loc:1, Fan Room
S	0001	B	Wall, Mortar, Loc:2, Filter Room
S	0001	C	Wall, All, Mortar, Loc:4, Balcony
S	0001	D	Wall, All, Mortar, Loc:4, Balcony
S	0001	E	Wall, All, Mortar, Loc:9, Men's Change Room
S	0002	A	Wall, Fire Stop, Cement Product, Loc:2, Filter Room
S	0002	B	Wall, Fire Stop, Cement Product, Loc:2, Filter Room
S	0002	C	Wall, Fire Stop, Cement Product, Loc:3, Tunnel Area
S	0003	A	Wall, Expansion Joint, Caulking, Loc:4, Balcony
S	0003	B	Wall, Expansion Joint, Caulking, Loc:4, Balcony
S	0003	C	Wall, Expansion Joint, Caulking, Loc:4, Balcony
S	0004	A	Wall, Expansion Joint, Caulking, Loc:4, Balcony
S	0004	B	Wall, Expansion Joint, Caulking, Loc:4, Balcony

*MAMM M...
 10/31/23 0919*

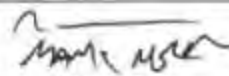
Sample Prefix	Sample No.	Sample Suffix	Sample Description/Location (Mandatory)
S	0004	C	Wall,Expansion Joint,Caulking,Loc:4,Balcony
S	0005	A	Floor,All,Vinyl Floor Tile And Mastic,12x12 White With Light Brown Specks,Loc:5,East Stairwell
S	0005	B	Floor,All,Vinyl Floor Tile And Mastic,12x12 White With Light Brown Specks,Loc:5,East Stairwell
S	0005	B	Floor,All,Vinyl Floor Tile And Mastic,12x12 White With Light Brown Specks,Loc:5,East Stairwell
S	0006	A	Floor,Base,Mastic, Yellow,Loc:5,East Stairwell
S	0006	B	Floor,Base,Mastic, Yellow,Loc:5,East Stairwell
S	0006	C	Floor,Base,Mastic, Yellow,Loc:5,East Stairwell
S	0007	A	Floor,All,Terrazzo,Loc:6,Entrance Vestibule
S	0007	B	Floor,All,Terrazzo,Loc:6,Entrance Vestibule
S	0007	C	Floor,All,Terrazzo,Loc:7,Lobby
S	0008	A	Stairs,Drywall Compound,Loc:7,Lobby
S	0008	B	Stairs,Drywall Compound,Loc:7,Lobby
S	0008	C	Wall,Drywall And Joint Compound,Loc:29,Custodian
S	0009	A	Floor,All,Mortar,Small Grey Squares,Loc:8,Pool Office
S	0009	B	Floor,All,Mortar,Small Grey Squares,Loc:8,Pool Office
S	0009	C	Floor,All,Mortar,Small Grey Squares,Loc:9,Men's Change Room
S	0010	A	Wall,Mastic,12x12 Light Beige Squares,Loc:9,Men's Change Room
S	0010	B	Wall,Mastic,12x12 Light Beige Squares,Loc:9,Men's Change Room
S	0010	C	Wall,Mastic,12x12 Light Beige Squares,Loc:9,Men's Change Room
S	0011	A	Wall,Expansion Joint,Caulking,Loc:14,Exterior
S	0011	B	Wall,Expansion Joint,Caulking,Loc:14,Exterior

M. MORE
 03/07/10 0919

Sample Prefix	Sample No.	Sample Suffix	Sample Description/Location (Mandatory)
S	0011	C	Wall,Expansion Joint,Caulking,Loc:14,Exterior
S	0012	A	Wall,Mortar,Loc:14,Exterior
S	0012	B	Wall,Mortar,Loc:14,Exterior
S	0012	C	Wall,Mortar,Loc:14,Exterior
S	0013	A	Door,Caulking,Loc:14,Exterior
S	0013	B	Door,Caulking,Loc:14,Exterior
S	0013	C	Wall,Expansion Joint,Caulking,Loc:14,Exterior
S	0014	A	Wall,Unidentified Material,Loc:14,Exterior
S	0014	B	Wall,Unidentified Material,Loc:14,Exterior
S	0014	C	Wall,Unidentified Material,Loc:14,Exterior
S	0015	A	Window,Caulking,Loc:14,Exterior
S	0015	B	Window,Caulking,Loc:14,Exterior
S	0015	C	Window,Caulking,Loc:14,Exterior
S	0016	A	Door,Caulking,Loc:6,Entrance Vestibule
S	0016	B	Door,Caulking,Loc:6,Entrance Vestibule
S	0016	C	Door,Caulking,Loc:6,Entrance Vestibule
S	0017	A	Door,Caulking,Loc:6,Entrance Vestibule
S	0017	B	Door,Caulking,Loc:6,Entrance Vestibule
S	0017	C	Door,Caulking,Loc:6,Entrance Vestibule
S	0018	A	Ceiling,Mastic,6"x6" Light Beige Squares,Loc:9,Men's Change Room
S	0018	B	Ceiling,Mastic,6"x6" Light Beige Squares,Loc:9,Men's Change Room

Mark Mason
6/20/10 v99

Sample Prefix	Sample No.	Sample Suffix	Sample Description/Location (Mandatory)
S	0018	C	Ceiling, Mastic, 6"x6" Light Beige Squares, Loc: 9, Men's Change Room
S	0019	A	Floor, Vinyl Floor Tile And Mastic, 12x12 Sky Blue With Light Blue Specks, Loc: 15, Supervisor Office
S	0019	B	Floor, Vinyl Floor Tile And Mastic, 12x12 Sky Blue With Light Blue Specks, Loc: 15, Supervisor Office
S	0019	C	Floor, Vinyl Floor Tile And Mastic, 12x12 Sky Blue With Light Blue Specks, Loc: 15, Supervisor Office
S	0020	A	Floor, Vinyl Floor Tile And Mastic, 12x12 Blue With Light Blue Specks, Loc: 16, Equipment Storage
S	0020	B	Floor, Vinyl Floor Tile And Mastic, 12x12 Blue With Light Blue Specks, Loc: 16, Equipment Storage
S	0020	C	Floor, Vinyl Floor Tile And Mastic, 12x12 Blue With Light Blue Specks, Loc: 16, Equipment Storage
S	0021	A	Duct, Caulking, Loc: 17, Lower Roof
S	0021	B	Duct, Caulking, Loc: 17, Lower Roof
S	0021	C	Duct, Caulking, Loc: 17, Lower Roof
S	0022	A	Floor, All, Mortar, 7.5"x7.5" Light Grey Squares, Loc: 13, Indoor Pool
S	0022	B	Floor, All, Mortar, 7.5"x7.5" Light Grey Squares, Loc: 13, Indoor Pool
S	0022	C	Floor, All, Mortar, 7.5"x7.5" Light Grey Squares, Loc: 13, Indoor Pool
S	0023	A	Duct, Mastic, Loc: 21, Mechanical Room And Stairwell
S	0023	B	Duct, Mastic, Loc: 21, Mechanical Room And Stairwell
S	0023	C	Duct, Mastic, Loc: 21, Mechanical Room And Stairwell
S	0024	A	Floor, Mortar, Small Sky Blue Squares, Loc: 13, Indoor Pool
S	0024	B	Floor, Mortar, Small Sky Blue Squares, Loc: 13, Indoor Pool
S	0024	C	Floor, Mortar, Small Sky Blue Squares, Loc: 13, Indoor Pool
S	0025	A	Floor, All, Mortar, 7.5"x7.5" Dark Grey Squares, Loc: 13, Indoor Pool
S	0025	B	Floor, All, Mortar, 7.5"x7.5" Dark Grey Squares, Loc: 13, Indoor Pool


 09/11/10 09/19
 Page 4 of 6

Sample Prefix	Sample No.	Sample Suffix	Sample Description/Location (Mandatory)
S	0025	C	Floor, All Mortar, 7.5"x7.5" Dark Grey Squares, Loc:13, Indoor Pool
S	0026	A	Piping, Parging Cement, Loc:4, Balcony
S	0026	B	Piping, Parging Cement, Loc:4, Balcony
S	0026	C	Piping, Parging Cement, Loc:4, Balcony
S	0027	A	Wall, Mortar, Multi Color Squares, Loc:7, Lobby
S	0027	B	Wall, Mortar, Multi Color Squares, Loc:7, Lobby
S	0027	C	Wall, Mortar, Multi Color Squares, Loc:7, Lobby
S	0028	A	Wall, Mortar, Loc:25, Gym Storage
S	0028	B	Wall, Mortar, Loc:25, Gym Storage
S	0028	C	Wall, All Mortar, Loc:29, Custodian
S	0029	A	Wall, Caulking, Beige, Loc:25, Gym Storage
S	0029	B	Wall, Caulking, Beige, Loc:25, Gym Storage
S	0029	C	Wall, Caulking, Beige, Loc:25, Gym Storage
S	0030	A	Floor, All, Vinyl Floor Tile And Mastic, 12x12 Light Teal With Teal Specks, Loc:24, Phys. Ed. Room
S	0030	B	Floor, All, Vinyl Floor Tile And Mastic, 12x12 Light Teal With Teal Specks, Loc:24, Phys. Ed. Room
S	0030	C	Floor, All, Vinyl Floor Tile And Mastic, 12x12 Light Teal With Teal Specks, Loc:24, Phys. Ed. Room
S	0031	A	Ceiling, All, Ceiling Tiles (lay-in), 48x24 Small Fissures And Pinholes, Loc:27, Corridor
S	0031	B	Ceiling, All, Ceiling Tiles (lay-in), 48x24 Small Fissures And Pinholes, Loc:27, Corridor
S	0031	C	Ceiling, All, Ceiling Tiles (lay-in), 48x24 Small Fissures And Pinholes, Loc:27, Corridor
S	0032	A	Floor, All, Vinyl Floor Tile And Mastic, 12x12 Light Beige With Brown Specks, Loc:28, Hallway
S	0032	B	Floor, All, Vinyl Floor Tile And Mastic, 12x12 Light Beige With Brown Specks, Loc:28, Hallway

Handwritten signature and date:
 04/10/10 09/4

Sample Prefix	Sample No.	Sample Suffix	Sample Description/Location (Mandatory)
S	0032	C	Floor, All Vinyl Floor Tile And Mastic, 12x12 Light Beige With Brown Specks, Loc: 28, Hallway

[Handwritten signature]

09/19/10

APPENDIX II-B
Lead Analytical Certificates



Your Project #: 323445
 Site Location: HBMA
 Your C.O.C. #: n/a

Attention: Aman Sharma

Pinchin Ltd
 2360 Meadowpine Blvd
 Unit # 2
 Mississauga, ON
 CANADA L5N 6S2

Report Date: 2023/07/12
 Report #: R7711767
 Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3K2240

Received: 2023/07/10, 09:19

Sample Matrix: Solid
 #Samples Received: 24

Analyses	Quantity	Date	Date	Laboratory Method	Analytical Method
		Extracted	Analyzed		
Metals in Paint	24	2023/07/11	2023/07/11	CAM SOP-00408	EPA 6010D m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCCFP, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.



Your Project #: 323445
Site Location: HBMA
Your C.O.C. #: n/a

Attention: Aman Sharma

Pinchin Ltd
2360 Meadowpine Blvd
Unit # 2
Mississauga, ON
CANADA L5N 6S2

Report Date: 2023/07/12
Report #: R7711767
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3K2240

Received: 2023/07/10, 09:19

Encryption Key



Bureau Veritas
12 Jul 2023 16:35:46

Please direct all questions regarding this Certificate of Analysis to:
Nilushi Mahathantila, Project Manager
Email: Nilushi.Mahathantila@bureauveritas.com
Phone# (905) 817-5700

=====
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For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental Laboratory operations.



ELEMENTS BY ATOMIC SPECTROSCOPY (SOLID)

Bureau Veritas ID		WIJ340	WIJ340		WIJ341			
Sampling Date		2023/05/05	2023/05/05		2023/05/05			
COC Number		n/a	n/a		n/a			
	UNITS	L0001 FLOOR, CONCRETE (POURED), GREY, LOC:1, FAN ROOM	L0001 FLOOR, CONCRETE (POURED), GREY, LOC:1, FAN ROOM Lab-Dup	QC Batch	L0002 FLOOR, CONCRETE (POURED), LIGHT GREY, LOC:2, FILTER ROOM	RDL	MDL	QC Batch

Metals								
Lead (Pb)	%	0.034	0.033	8781782	0.075	0.00010	0.000030	8782191

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Bureau Veritas ID		WIJ342			WIJ343			
Sampling Date		2023/05/05			2023/05/05			
COC Number		n/a			n/a			
	UNITS	L0003 FLOOR, CONCRETE (POURED), RED, LOC:2, FILTER ROOM	RDL	MDL	L0004 DUCT, METAL, OFF WHITE, LOC:2, FILTER ROOM	RDL	MDL	QC Batch

Metals								
Lead (Pb)	%	2.3	0.0024	0.00072	0.057	0.00012	0.000036	8782191

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Bureau Veritas ID		WIJ344			WIJ345			
Sampling Date		2023/05/05			2023/05/05			
COC Number		n/a			n/a			
	UNITS	L0005 WALL, MASONRY, OFF WHITE, LOC:2, FILTER ROOM	RDL	MDL	L0006 FLOOR, CONCRETE (POURED), YELLOW, LOC:2, FILTER ROOM	RDL	MDL	QC Batch

Metals								
Lead (Pb)	%	0.050	0.00010	0.000030	0.80	0.0010	0.00030	8782191

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch



ELEMENTS BY ATOMIC SPECTROSCOPY (SOLID)

Bureau Veritas ID		WIJ346			WIJ347			
Sampling Date		2023/05/05			2023/05/05			
COC Number		n/a			n/a			
	UNITS	L0007 WALL, CONCRETE (POURED), WHITE, LOC: 2, FILTER ROOM	RDL	MDL	L0008 WALL, MASONRY, OFF WHITE, LOC:4, BALCON Y	RDL	MDL	QC Batch

Metals								
Lead (Pb)	%	0.13	0.00019	0.000057	0.057	0.00010	0.000030	8782191
RDL = Reportable Detection Limit QC Batch = Quality Control Batch								

Bureau Veritas ID		WIJ348			WIJ349			
Sampling Date		2023/05/05			2023/05/05			
COC Number		n/a			n/a			
	UNITS	L0009 FLOOR, CONCRETE (POURED), DARK GREY, LOC:4, BALCONY	RDL	MDL	L0010 WALL, MASONRY, GREE N, LOC:4, BALCONY	RDL	MDL	QC Batch

Metals								
Lead (Pb)	%	0.0058	0.00010	0.000030	0.12	0.0010	0.00030	8782191
RDL = Reportable Detection Limit QC Batch = Quality Control Batch								

Bureau Veritas ID		WIJ350			WIJ351			
Sampling Date		2023/05/05			2023/05/05			
COC Number		n/a			n/a			
	UNITS	L0011 WALL, CONCRETE (POURED), BLACK, LOC: 5, EAST STAIRWELL	RDL	MDL	L0012 OTHER, METAL, DARK GREY, LOC:4, BALCONY	RDL	MDL	QC Batch

Metals								
Lead (Pb)	%	0.56	0.0027	0.00081	0.15	0.00020	0.000060	8782191
RDL = Reportable Detection Limit QC Batch = Quality Control Batch								



ELEMENTS BY ATOMIC SPECTROSCOPY (SOLID)

Bureau Veritas ID		WIJ352				WIJ353			
Sampling Date		2023/05/05				2023/05/05			
COC Number		n/a				n/a			
	UNITS	L0013 WALL, MASONRY, LIGHT T BEIGE, LOC: 9, MEN'S CHANGE ROOM	RDL	MDL		L0014 WALL, MASONRY, LIGHT T GREY, LOC: 15, SUPERVISOR OFFICE	RDL	MDL	QC Batch

Metals									
Lead (Pb)	%	0.027	0.00010	0.000030		0.00067	0.00013	0.000039	8782191
RDL = Reportable Detection Limit QC Batch = Quality Control Batch									

Bureau Veritas ID		WIJ354				WIJ355			
Sampling Date		2023/05/05				2023/05/05			
COC Number		n/a				n/a			
	UNITS	L0015 OTHER, METAL, GREY, LOC: 21, MECHANICAL ROOM AND STAIRWELL	RDL	MDL	QC Batch	L0016 OTHER, METAL, BLUE, LOC: 8, POOL OFFICE	RDL	MDL	QC Batch

Metals									
Lead (Pb)	%	0.020	0.00010	0.000030	8782191	0.24	0.0010	0.00030	8781782
RDL = Reportable Detection Limit QC Batch = Quality Control Batch									

Bureau Veritas ID		WIJ356		WIJ358				
Sampling Date		2023/05/05		2023/05/05				
COC Number		n/a		n/a				
	UNITS	L0017 WALL, MASONRY, LIGHT T BEIGE, LOC: 13, INDOOR POOL		L0019 WALL, MASONRY, BEIGE, LOC: 25, GYM STORAGE	RDL	MDL	QC Batch	

Metals								
Lead (Pb)	%	0.040		0.040	0.00010	0.000030		8781782
RDL = Reportable Detection Limit QC Batch = Quality Control Batch								



ELEMENTS BY ATOMIC SPECTROSCOPY (SOLID)

Bureau Veritas ID		WIJ359			WIJ360			
Sampling Date		2023/05/05			2023/05/05			
COC Number		n/a			n/a			
	UNITS	L0020 FLOOR, CONCRETE (POURED), BLUE, LOC:2 5, GYM STORAGE	RDL	MDL	L0021 OTHER, METAL, LIGHT TEAL, LOC:24, PHYS. ED. ROOM	RDL	MDL	QC Batch

Metals								
Lead (Pb)	%	0.0070	0.00028	0.000084	0.00026	0.00021	0.000063	8781782
RDL = Reportable Detection Limit QC Batch = Quality Control Batch								

Bureau Veritas ID		WIJ361			WIJ362			
Sampling Date		2023/05/05			2023/05/05			
COC Number		n/a			n/a			
	UNITS	L0022 WALL, CONCRETE (POURED), TEAL, LOC:2 6, STORE ROOM	RDL	MDL	L0023 OTHER, METAL, DARK TEAL, LOC:24, PHY. ED. ROOM	RDL	MDL	QC Batch

Metals								
Lead (Pb)	%	0.041	0.00010	0.000030	<0.00060	0.00060	0.00018	8781782
RDL = Reportable Detection Limit QC Batch = Quality Control Batch								

Bureau Veritas ID		WIJ363	WIJ364			
Sampling Date		2023/05/05	2023/05/05			
COC Number		n/a	n/a			
	UNITS	L0024 WALL, DRYWALL AND JOINT COMPOUND, LIGHT YELLOW, LOC:29, CUST ODIAN	L0025 WALL, MASONRY, LIGHT YELLOW, LOC:29, CUST ODIAN	RDL	MDL	QC Batch

Metals						
Lead (Pb)	%	0.00074	0.033	0.00010	0.000030	8781782
RDL = Reportable Detection Limit QC Batch = Quality Control Batch						



TEST SUMMARY

Bureau Veritas ID: WIJ340
Sample ID: L0001 FLOOR, CONCRETE (POURED), GREY, LOC:1, FAN ROOM
Matrix: Solid

Collected: 2023/05/05
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	8781782	2023/07/11	2023/07/11	Jaswinder Kaur

Bureau Veritas ID: WIJ340 Dup
Sample ID: L0001 FLOOR, CONCRETE (POURED), GREY, LOC:1, FAN ROOM
Matrix: Solid

Collected: 2023/05/05
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	8781782	2023/07/11	2023/07/11	Jaswinder Kaur

Bureau Veritas ID: WIJ341
Sample ID: L0002 FLOOR, CONCRETE (POURED), LIGHT GREY, LOC:2, FILTER ROOM
Matrix: Solid

Collected: 2023/05/05
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	8782191	2023/07/11	2023/07/11	Jaswinder Kaur

Bureau Veritas ID: WIJ342
Sample ID: L0003 FLOOR, CONCRETE (POURED), RED, LOC:2, FILTER ROOM
Matrix: Solid

Collected: 2023/05/05
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	8782191	2023/07/11	2023/07/11	Jaswinder Kaur

Bureau Veritas ID: WIJ343
Sample ID: L0004 DUCT, METAL, OFF WHITE, LOC:2, FILTER ROOM
Matrix: Solid

Collected: 2023/05/05
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	8782191	2023/07/11	2023/07/11	Jaswinder Kaur

Bureau Veritas ID: WIJ344
Sample ID: L0005 WALL, MASONRY, OFF WHITE, LOC:2, FILTER ROOM
Matrix: Solid

Collected: 2023/05/05
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	8782191	2023/07/11	2023/07/11	Jaswinder Kaur

Bureau Veritas ID: WIJ345
Sample ID: L0006 FLOOR, CONCRETE (POURED), YELLOW, LOC:2, FILTER ROOM
Matrix: Solid

Collected: 2023/05/05
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	8782191	2023/07/11	2023/07/11	Jaswinder Kaur



TEST SUMMARY

Bureau Veritas ID: WIJ346
Sample ID: L0007 WALL, CONCRETE (POURED), WHITE, LOC:2, FILTER ROOM
Matrix: Solid

Collected: 2023/05/05
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	8782191	2023/07/11	2023/07/11	Jaswinder Kaur

Bureau Veritas ID: WIJ347
Sample ID: L0008 WALL, MASONRY, OFF WHITE, LOC:4, BALCONY
Matrix: Solid

Collected: 2023/05/05
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	8782191	2023/07/11	2023/07/11	Jaswinder Kaur

Bureau Veritas ID: WIJ348
Sample ID: L0009 FLOOR, CONCRETE (POURED), DARK GREY, LOC:4, BALCONY
Matrix: Solid

Collected: 2023/05/05
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	8782191	2023/07/11	2023/07/11	Jaswinder Kaur

Bureau Veritas ID: WIJ349
Sample ID: L0010 WALL, MASONRY, GREEN, LOC:4, BALCONY
Matrix: Solid

Collected: 2023/05/05
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	8782191	2023/07/11	2023/07/11	Jaswinder Kaur

Bureau Veritas ID: WIJ350
Sample ID: L0011 WALL, CONCRETE (POURED), BLACK, LOC:5, EAST STAIRWELL
Matrix: Solid

Collected: 2023/05/05
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	8782191	2023/07/11	2023/07/11	Jaswinder Kaur

Bureau Veritas ID: WIJ351
Sample ID: L0012 OTHER, METAL, DARK GREY, LOC:4, BALCONY
Matrix: Solid

Collected: 2023/05/05
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	8782191	2023/07/11	2023/07/11	Jaswinder Kaur

Bureau Veritas ID: WIJ352
Sample ID: L0013 WALL, MASONRY, LIGHT BEIGE, LOC:9, MEN'S CHANGE ROOM
Matrix: Solid

Collected: 2023/05/05
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	8782191	2023/07/11	2023/07/11	Jaswinder Kaur



TEST SUMMARY

Bureau Veritas ID: WIJ353
Sample ID: L0014 WALL,MASONRY,LIGHT GREY,LOC:15,SUPERVISOR OFFICE
Matrix: Solid

Collected: 2023/05/05
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	8782191	2023/07/11	2023/07/11	Jaswinder Kaur

Bureau Veritas ID: WIJ354
Sample ID: L0015 OTHER,METAL,GREY,LOC:21,MECHANICAL ROOM AND STAIRWELL
Matrix: Solid

Collected: 2023/05/05
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	8782191	2023/07/11	2023/07/11	Jaswinder Kaur

Bureau Veritas ID: WIJ355
Sample ID: L0016 OTHER,METAL,BLUE,LOC:8,POOL OFFICE
Matrix: Solid

Collected: 2023/05/05
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	8781782	2023/07/11	2023/07/11	Jaswinder Kaur

Bureau Veritas ID: WIJ356
Sample ID: L0017 WALL,MASONRY,LIGHT BEIGE,LOC:13,INDOOR POOL
Matrix: Solid

Collected: 2023/05/05
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	8781782	2023/07/11	2023/07/11	Jaswinder Kaur

Bureau Veritas ID: WIJ358
Sample ID: L0019 WALL,MASONRY,BEIGE,LOC:25,GYM STORAGE
Matrix: Solid

Collected: 2023/05/05
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	8781782	2023/07/11	2023/07/11	Jaswinder Kaur

Bureau Veritas ID: WIJ359
Sample ID: L0020 FLOOR,CONCRETE (POURED),BLUE,LOC:25,GTYM STORAGE
Matrix: Solid

Collected: 2023/05/05
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	8781782	2023/07/11	2023/07/11	Jaswinder Kaur

Bureau Veritas ID: WIJ360
Sample ID: L0021 OTHER,METAL,LIGHT TEAL,LOC:24,PHYS. ED. ROOM
Matrix: Solid

Collected: 2023/05/05
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	8781782	2023/07/11	2023/07/11	Jaswinder Kaur



Bureau Veritas Job #: C3K2240
 Report Date: 2023/07/12

Pinchin Ltd
 Client Project #: 323445
 Site Location: HBMA
 Sampler Initials: TS

TEST SUMMARY

Bureau Veritas ID: WIJ361
Sample ID: L002.2 WALL, CONCRETE (POURED), TEAL, LOC:26, STORE ROOM
Matrix: Solid

Collected: 2023/05/05
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	8781782	2023/07/11	2023/07/11	Jaswinder Kaur

Bureau Veritas ID: WIJ362
Sample ID: L002.3 OTHER, METAL, DARK TEAL, LOC:24, PHY. ED. ROOM
Matrix: Solid

Collected: 2023/05/05
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	8781782	2023/07/11	2023/07/11	Jaswinder Kaur

Bureau Veritas ID: WIJ363
Sample ID: L002.4 WALL, DRYWALL AND JOINT COMPOUND, LIGHT YELLOW, LOC:29, CUSTODIAN
Matrix: Solid

Collected: 2023/05/05
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	8781782	2023/07/11	2023/07/11	Jaswinder Kaur

Bureau Veritas ID: WIJ364
Sample ID: L002.5 WALL, MASONRY, LIGHT YELLOW, LOC:29, CUSTODIAN
Matrix: Solid

Collected: 2023/05/05
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Metals in Paint	ICP	8781782	2023/07/11	2023/07/11	Jaswinder Kaur



GENERAL COMMENTS

Sample WIJ342 [L0003 FLOOR, CONCRETE (POURED), RED, LOC:2, FILTER ROOM] : Metals Analysis: Due to limited amount of sample available for analysis, a smaller than usual portion of the sample was used. Detection limits were adjusted accordingly.

Sample WIJ343 [L0004 DUCT, METAL, OFF WHITE, LOC:2, FILTER ROOM] : Metals Analysis: Due to limited amount of sample available for analysis, a smaller than usual portion of the sample was used. Detection limits were adjusted accordingly.

Sample WIJ346 [L0007 WALL, CONCRETE (POURED), WHITE, LOC:2, FILTER ROOM] : Metals Analysis: Due to limited amount of sample available for analysis, a smaller than usual portion of the sample was used. Detection limits were adjusted accordingly.

Sample WIJ350 [L0011 WALL, CONCRETE (POURED), BLACK, LOC:5, EAST STAIRWELL] : Metals Analysis: Due to limited amount of sample available for analysis, a smaller than usual portion of the sample was used. Detection limits were adjusted accordingly.

Sample WIJ351 [L0012 OTHER, METAL, DARK GREY, LOC:4, BALCONY] : Metals Analysis: Due to limited amount of sample available for analysis, a smaller than usual portion of the sample was used. Detection limits were adjusted accordingly.

Sample WIJ353 [L0014 WALL, MASONRY, LIGHT GREY, LOC:15, SUPERVISOR OFFICE] : Metals Analysis: Due to limited amount of sample available for analysis, a smaller than usual portion of the sample was used. Detection limits were adjusted accordingly.

Sample WIJ359 [L0020 FLOOR, CONCRETE (POURED), BLUE, LOC:25, GYM STORAGE] : Metals Analysis: Due to limited amount of sample available for analysis, a smaller than usual portion of the sample was used. Detection limits were adjusted accordingly.

Sample WIJ360 [L0021 OTHER, METAL, LIGHT TEAL, LOC:24, PHYS. ED. ROOM] : Metals Analysis: Due to limited amount of sample available for analysis, a smaller than usual portion of the sample was used. Detection limits were adjusted accordingly.

Sample WIJ362 [L0023 OTHER, METAL, DARK TEAL, LOC:24, PHYS. ED. ROOM] : Metals Analysis: Due to limited amount of sample available for analysis, a smaller than usual portion of the sample was used. Detection limits were adjusted accordingly.

Results relate only to the items tested.



QUALITY ASSURANCE REPORT

Pinchin Ltd
 Client Project #: 323445
 Site Location: HBMA
 Sampler Initials: TS

QC Batch	Parameter	Date	Matrix Spike		Method Blank		RPD		QC Standard	
			% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits	% Recovery	QC Limits
8781782	Lead (Pb)	2023/07/11	117	75 - 125	<0.00010	%	1.6	35	97	75 - 125
8782191	Lead (Pb)	2023/07/11	92	75 - 125	<0.00010	%	6.7	35	101	75 - 125

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

QC Standard: A sample of known concentration prepared by an external agency under stringent conditions. Used as an independent check of method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.



Bureau Veritas Job #: C3K2240
Report Date: 2023/07/12

Pinchin Ltd
Client Project #: 323445
Site Location: HBMA
Sampler Initials: TS

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Cristina Carriere

Cristina Carriere, Senior Scientific Specialist

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by {0}, {1} responsible for {2} {3} laboratory operations.

RUSH!

Version 1-15-2012

Client: Pinchin Ltd.
Contact: Aman Sharma, Tanya Stanisic
Address: 2360 Meadowpine Blvd Unit 2, Mississauga, ON L5N 6S2
Phone: (905) 363-0678
Fax:
Email: asharma@pinchin.com, tstanisic@pinchin.com

Instructions:
 Use Column "B" for your contact info
 To See an Example Click the bottom Example Tab

Project: HBMA
Client Notes:
P.O. #: 323445
Date Submitted: 05-05-2023
Analysis: Paint Chips Flame AA
TurnAroundTime: 3 Days

25
Begin Samples with a "<<" above the first sample and end with a ">>" below the last sample. Only Enter your data on the first sheet "Sheet1"

Note: Data 1 and Data 2 are optional fields that do not show up on the official report, however they will be included in the electronic data returned to you to facilitate your reintegration of the report data.

Scientific Analytical Institute



4604 Dundas Dr.
 Greensboro, NC 27407
 Phone: 336.292.3888
 Fax: 336.292.3313
 Email: lab@sailab.com

Sample Number	Data 1 (Lab use only)	Sample Description	Data 2 (Lab use only)
<<			
L0001		Floor, Concrete (poured), Grey,Loc:1,Fan Room	
L0002		Floor, Concrete (poured), Light Grey,Loc:2,Filter Room	
L0003		Floor, Concrete (poured), Red,Loc:2,Filter Room	
L0004		Duct, Metal, Off White,Loc:2,Filter Room	
L0005		Wall, Masonry, Off White,Loc:2,Filter Room	
L0006		Floor, Concrete (poured), Yellow,Loc:2,Filter Room	
L0007		Wall, Concrete (poured), White,Loc:2,Filter Room	
L0008		Wall, Masonry, Off White,Loc:4,Balcony	
L0009		Floor, Concrete (poured), Dark Grey,Loc:4,Balcony	
L0010		Wall, Masonry, Green,Loc:4,Balcony	
L0011		Wall, Concrete (poured), Black,Loc:5,East Stairwell	
L0012		Other, Metal, Dark Grey,Loc:4,Balcony	
L0013		Wall, Masonry, Light Beige,Loc:9,Men's Change Room	
L0014		Wall, Masonry, Light Grey,Loc:15,Supervisor Office	
L0015		Other, Metal, Grey,Loc:21,Mechanical Room And Stairwell	
L0016		Other, Metal, Blue,Loc:8,Pool Office	

10-Jul-23 09:19
 Nilushi Mahathantila

C3K2240
 RPK ENV-1177

Handwritten notes:
 07/10 09:19

L0017	Wall, Masonry, Light Beige, Loc:13, Indoor Pool
L0018	Struct, Metal, Dark Red, Loc:22, Men's Washroom
L0019	Wall, Masonry, Beige, Loc:25, Gym Storage
L0020	Floor, Concrete (poured), Blue, Loc:25, Gym Storage
L0021	Other, Metal, Light Teal, Loc:24, Phys. Ed. Room
L0022	Wall, Concrete (poured), Teal, Loc:26, Store Room
L0023	Other, Metal, Dark Teal, Loc:24, Phys. Ed. Room
L0024	Wall, Drywall And Joint Compound, Light Yellow, Loc:29, Custodian
L0025	Wall, Masonry, Light Yellow, Loc:29, Custodian
>>	

Handwritten notes:
✓ 9-7-03 2/23/07/10
09-19

APPENDIX II-C
PCB Analytical Certificates



Your Project #: 323445
 Your C.O.C. #: n/a

Attention: Aman Sharma

Pinchin Ltd
 2360 Meadowpine Blvd
 Unit # 2
 Mississauga, ON
 CANADA L5N 6S2

Report Date: 2023/07/13
 Report #: R7713701
 Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C3K2247

Received: 2023/07/10, 09:19

Sample Matrix: Solid
 #Samples Received: 9

Analyses	Quantity	Date	Date	Laboratory Method	Analytical Method
		Extracted	Analyzed		
Polychlorinated Biphenyl in Solids (1)	9	2023/07/11	2023/07/12	CAM SOP-00309	EPA 8082A m

Remarks:

Bureau Veritas is accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Bureau Veritas are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCCFP, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Bureau Veritas' profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Bureau Veritas in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

Bureau Veritas liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Bureau Veritas has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Bureau Veritas, unless otherwise agreed in writing. Bureau Veritas is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.

Results relate to samples tested. When sampling is not conducted by Bureau Veritas, results relate to the supplied samples tested.

This Certificate shall not be reproduced except in full, without the written approval of the laboratory.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.

* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

(1) Analysis was conducted according to Bureau Veritas method CAM SOP-00309 and modified where applicable based on the sample matrix. This test is not Standards Council of Canada accredited for this matrix.



Your Project #: 323445
Your C.O.C. #: n/a

Attention: Aman Sharma

Pinchin Ltd
2360 Meadowpine Blvd
Unit # 2
Mississauga, ON
CANADA L5N 6S2

Report Date: 2023/07/13
Report #: R7713701
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB#: C3K2247
Received: 2023/07/10, 09:19

Encryption Key

Archana Gothoskar
Project Manager
13 Jul 2023 16:08:16

Please direct all questions regarding this Certificate of Analysis to:
Nilushi Mahathantila, Project Manager
Email: Nilushi.Mahathantila@bureauveritas.com
Phone# (905) 817-5700

=====

This report has been generated and distributed using a secure automated process.

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by Rodney Major, General Manager responsible for Ontario Environmental Laboratory operations.



POLYCHLORINATED BIPHENYLS BY GC-ECD (SOLID)

Bureau Veritas ID		WIJ376			WIJ377			WIJ378				
Sampling Date												
COC Number		n/a			n/a			n/a				
	UNITS	P0001, BEIGE, LOC:4, BALCONY	RDL	MDL	P0002, OFF WHITE, LOC:4, BALCONY	RDL	MDL	P0003, GREY, LOC:14, EXTERIOR	RDL	MDL	QC Batch	
PCBs												
Aroclor 1262	ug/g	<30	30	30	<0.5	0.5	0.5	<1	1	1	8780364	
Aroclor 1016	ug/g	<30	30	30	<0.5	0.5	0.5	<1	1	1	8780364	
Aroclor 1221	ug/g	<30	30	30	<0.5	0.5	0.5	<1	1	1	8780364	
Aroclor 1232	ug/g	<30	30	30	<0.5	0.5	0.5	<1	1	1	8780364	
Aroclor 1242	ug/g	<30	30	30	<0.5	0.5	0.5	<1	1	1	8780364	
Aroclor 1248	ug/g	<30	30	30	<0.5	0.5	0.5	<1	1	1	8780364	
Aroclor 1254	ug/g	<30	30	30	<0.5	0.5	0.5	<1	1	1	8780364	
Aroclor 1260	ug/g	<30	30	30	<0.5	0.5	0.5	<1	1	1	8780364	
Aroclor 1268	ug/g	<30	30	30	<0.5	0.5	0.5	<1	1	1	8780364	
Total PCB	ug/g	<30	30	30	<0.5	0.5	0.5	<1	1	1	8780364	
Surrogate Recovery (%)												
Decachlorobiphenyl	%	101			80			33			8780364	
RDL = Reportable Detection Limit QC Batch = Quality Control Batch												



POLYCHLORINATED BIPHENYLS BY GC-ECD (SOLID)

Bureau Veritas ID		WIJ379			WIJ380	WIJ381			
Sampling Date									
COC Number		n/a			n/a	n/a			
	UNITS	P0004, LIGHT RED, LOC:14, EXTERIOR	RDL	MDL	P0005, LIGHT GREY, LOC:14, EXTERIOR	P0006, BLACK, LOC:6, ENTRANCE VESTIBULE	RDL	MDL	QC Batch
PCBs									
Aroclor 1262	ug/g	<0.1	0.1	0.1	<0.2	<0.2	0.2	0.2	8780364
Aroclor 1016	ug/g	<0.1	0.1	0.1	<0.2	<0.2	0.2	0.2	8780364
Aroclor 1221	ug/g	<0.1	0.1	0.1	<0.2	<0.2	0.2	0.2	8780364
Aroclor 1232	ug/g	<0.1	0.1	0.1	<0.2	<0.2	0.2	0.2	8780364
Aroclor 1242	ug/g	<0.1	0.1	0.1	<0.2	<0.2	0.2	0.2	8780364
Aroclor 1248	ug/g	<0.1	0.1	0.1	<0.2	<0.2	0.2	0.2	8780364
Aroclor 1254	ug/g	0.2	0.1	0.1	<0.2	0.6	0.2	0.2	8780364
Aroclor 1260	ug/g	<0.1	0.1	0.1	<0.2	<0.2	0.2	0.2	8780364
Aroclor 1268	ug/g	<0.1	0.1	0.1	<0.2	<0.2	0.2	0.2	8780364
Total PCB	ug/g	0.2	0.1	0.1	<0.2	0.6	0.2	0.2	8780364
Surrogate Recovery (%)									
Decachlorobiphenyl	%	56			87	82			8780364
RDL = Reportable Detection Limit QC Batch = Quality Control Batch									



POLYCHLORINATED BIPHENYLS BY GC-ECD (SOLID)

Bureau Veritas ID		WIJ 382	WIJ 383	WIJ 384			
Sampling Date							
COC Number		n/a	n/a	n/a			
	UNITS	P0007, DARK GREY, LOC:6, ENTRANCE VESTIBULE	P0008, GREY, LOC:17, LOWER ROOF	P0009, BEIGE, LOC:25, GYM STORAGE	RDL	MDL	QC Batch
PCBs							
Aroclor 1262	ug/g	<0.1	<0.1	<0.1	0.1	0.1	8780364
Aroclor 1016	ug/g	<0.1	<0.1	<0.1	0.1	0.1	8780364
Aroclor 1221	ug/g	<0.1	<0.1	<0.1	0.1	0.1	8780364
Aroclor 1232	ug/g	<0.1	<0.1	<0.1	0.1	0.1	8780364
Aroclor 1242	ug/g	0.1	<0.1	0.6	0.1	0.1	8780364
Aroclor 1248	ug/g	<0.1	<0.1	<0.1	0.1	0.1	8780364
Aroclor 1254	ug/g	0.9	<0.1	2.1	0.1	0.1	8780364
Aroclor 1260	ug/g	0.1	<0.1	0.5	0.1	0.1	8780364
Aroclor 1268	ug/g	<0.1	<0.1	<0.1	0.1	0.1	8780364
Total PCB	ug/g	1.1	<0.1	3.2	0.1	0.1	8780364
Surrogate Recovery (%)							
Decachlorobiphenyl	%	81	81	89			8780364
RDL = Reportable Detection Limit QC Batch = Quality Control Batch							



TEST SUMMARY

Bureau Veritas ID: WIJ376
Sample ID: P0001, BEIGE,LOC:4,BALCONY
Matrix: Solid

Collected:
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Polychlorinated Biphenyl in Solids	GC/ECD	8780364	2023/07/11	2023/07/12	Svitlana Shaula

Bureau Veritas ID: WIJ377
Sample ID: P0002, OFF WHITE,LOC:4,BALCONY
Matrix: Solid

Collected:
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Polychlorinated Biphenyl in Solids	GC/ECD	8780364	2023/07/11	2023/07/12	Svitlana Shaula

Bureau Veritas ID: WIJ378
Sample ID: P0003, GREY,LOC:14,EXTERIOR
Matrix: Solid

Collected:
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Polychlorinated Biphenyl in Solids	GC/ECD	8780364	2023/07/11	2023/07/12	Svitlana Shaula

Bureau Veritas ID: WIJ379
Sample ID: P0004, LIGHT RED,LOC:14,EXTERIOR
Matrix: Solid

Collected:
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Polychlorinated Biphenyl in Solids	GC/ECD	8780364	2023/07/11	2023/07/12	Svitlana Shaula

Bureau Veritas ID: WIJ380
Sample ID: P0005, LIGHT GREY,LOC:14,EXTERIOR
Matrix: Solid

Collected:
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Polychlorinated Biphenyl in Solids	GC/ECD	8780364	2023/07/11	2023/07/12	Svitlana Shaula

Bureau Veritas ID: WIJ381
Sample ID: P0006, BLACK,LOC:6,ENTRANCE VESTIBULE
Matrix: Solid

Collected:
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Polychlorinated Biphenyl in Solids	GC/ECD	8780364	2023/07/11	2023/07/12	Svitlana Shaula

Bureau Veritas ID: WIJ382
Sample ID: P0007, DARK GREY,LOC:6,ENTRANCE VESTIBULE
Matrix: Solid

Collected:
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Polychlorinated Biphenyl in Solids	GC/ECD	8780364	2023/07/11	2023/07/12	Svitlana Shaula



Bureau Veritas Job #: C3K2247
 Report Date: 2023/07/13

Pinchin Ltd
 Client Project #: 323445
 Sampler Initials: AS

TEST SUMMARY

Bureau Veritas ID: WIJ383
Sample ID: P0008, GREY,LOC:17,LOWER ROOF
Matrix: Solid

Collected:
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Polychlorinated Biphenyl in Solids	GC/ECD	8780364	2023/07/11	2023/07/12	Svitlana Shaula

Bureau Veritas ID: WIJ384
Sample ID: P0009, BEIGE,LOC:25,GYM STORAGE
Matrix: Solid

Collected:
Shipped:
Received: 2023/07/10

Test Description	Instrumentation	Batch	Extracted	Date Analyzed	Analyst
Polychlorinated Biphenyl in Solids	GC/ECD	8780364	2023/07/11	2023/07/12	Svitlana Shaula



Bureau Veritas Job #: C3K2247
Report Date: 2023/07/13

Pinchin Ltd
Client Project #: 323445
Sampler Initials: AS

GENERAL COMMENTS

PCB analysis: Values were calculated on a wet weight basis.

Results relate only to the items tested.



QUALITY ASSURANCE REPORT

QC Batch	Parameter	Date	Matrix Spike		SPIKED BLANK		Method Blank		RPD	
			% Recovery	QC Limits	% Recovery	QC Limits	Value	UNITS	Value (%)	QC Limits
8780364	Decachlorobiphenyl	2023/07/11	66	30 - 130	93	30 - 130	84	%		
8780364	Aroclor 1016	2023/07/11					<0.1	ug/g		
8780364	Aroclor 1221	2023/07/11					<0.1	ug/g		
8780364	Aroclor 1232	2023/07/11					<0.1	ug/g		
8780364	Aroclor 1242	2023/07/11					<0.1	ug/g		
8780364	Aroclor 1248	2023/07/11					<0.1	ug/g		
8780364	Aroclor 1254	2023/07/11					<0.1	ug/g		
8780364	Aroclor 1260	2023/07/11	110	30 - 130	120	30 - 130	<0.1	ug/g	12	50
8780364	Aroclor 1262	2023/07/11					<0.1	ug/g		
8780364	Aroclor 1268	2023/07/11					<0.1	ug/g		
8780364	Total PCB	2023/07/11	110	30 - 130	120	30 - 130	<0.1	ug/g	12	50

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Surrogate: A pure or isotopically labeled compound whose behavior mirrors the analytes of interest. Used to evaluate extraction efficiency.



Bureau Veritas Job #: C3K2247
Report Date: 2023/07/13

Pinchin Ltd
Client Project #: 323445
Sampler Initials: AS

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Anastasia Hamanov, Scientific Specialist

Bureau Veritas has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation, please refer to the Validation Signatures page if included, otherwise available by request. For Department specific Analyst/Supervisor validation names, please refer to the Test Summary section if included, otherwise available by request. This report is authorized by {0}, {1} responsible for {2}{3} laboratory operations.



RUSH!

6740 Campbell Rd, Mississauga, Ontario L5N 2L8
 Phone: 905-817-5700 Fax: 905-817-5779 Toll Free: 800-563-6266
 CAM FCD-01191/5

CHAIN OF CUSTODY RECORD

Page ___ of ___

Invoice Information		Report Information (if differs from invoice)		Project Information (where applicable)		Turnaround Time (TAT) Required									
Company Name: <u>Pinchin Ltd.</u>		Company Name: _____		Question #: _____		<input type="checkbox"/> Regular TAT (5-7 days) Most analyses PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS									
Contact Name: <u>Aman Sharma</u>		Contact Name: _____		P.O. #/AF#: _____		Rush TAT (Surcharges will be applied) <input type="checkbox"/> 1 Day <input type="checkbox"/> 2 Days <input checked="" type="checkbox"/> 3-4 Days									
Address: <u>2360 Meadowpine Blvd Unit 2,</u>		Address: _____		Project #: <u>22445</u>											
<u>Mississauga, ON L5N 6S2</u>				Site Location: _____											
Phone: (905) 363-0678 Fax: _____		Phone: _____ Fax: _____		Site #: _____		Date Required: _____									
Email: <u>asharma@pinchin.com</u>		Email: _____		Site Location Province: <u>ON</u>		Rush Confirmation #: _____									
NOTE: REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BUREAU VERITAS DRINKING WATER CHAIN OF CUSTODY															
Regulation 153 <input type="checkbox"/> Table 1 <input type="checkbox"/> Res/Park <input type="checkbox"/> Med/ Fine <input type="checkbox"/> Table 2 <input type="checkbox"/> Ind/Comm <input type="checkbox"/> Coarse <input type="checkbox"/> Table 3 <input type="checkbox"/> Agr/ Other <input type="checkbox"/> Table _____ FOR RSC (PLEASE CIRCLE) Y / N		Other Regulations <input type="checkbox"/> CCME <input type="checkbox"/> Sanitary Sewer Bylaw <input type="checkbox"/> MISA <input type="checkbox"/> Storm Sewer Bylaw <input type="checkbox"/> PWOO Region _____ <input type="checkbox"/> Other (Specify) _____ <input type="checkbox"/> REG 55R (MIN. 3 DAY TAT REQUIRED) <input type="checkbox"/> REG 406 Table _____		Analysis Requested <input type="checkbox"/> # OF CONTAINERS SUBMITTED <input type="checkbox"/> PHED FILTERS (CIRCLE: Meras / Mg / Cu) <input type="checkbox"/> BTEX/PHC/FI <input type="checkbox"/> PHOX/2-TN <input type="checkbox"/> AOCX <input type="checkbox"/> REG 153 METALS & INORGANICS <input type="checkbox"/> REG 153 METALS <input type="checkbox"/> REG 153 METALS (Hg, Cr VI, ICNMS Meras, HPO4 - Bi) <input type="checkbox"/> Lead (Pb) in Plastic <input type="checkbox"/> PCB <input type="checkbox"/> HOLD-DO NOT ANALYZE				LABORATORY USE ONLY CUSTODY SEAL Y / N Present Intact COOLING MEDIA PRESENT: Y / N							
Include Criteria on Certificate of Analysis: Y / N SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS															
SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	PHED FILTERS (CIRCLE: Meras / Mg / Cu)	BTEX/PHC/FI	PHOX/2-TN	AOCX	REG 153 METALS & INORGANICS	REG 153 METALS	REG 153 METALS (Hg, Cr VI, ICNMS Meras, HPO4 - Bi)	Lead (Pb) in Plastic	PCB	HOLD-DO NOT ANALYZE	COMMENTS
P0001, Beige, Loc:4, Balcony			BULK												
P0002, Off White, Loc:4, Balcony			BULK												
P0003, Grey, Loc:14, Exterior			BULK												
P0004, Light Red, Loc:14, Exterior			BULK												
P0005, Light Grey, Loc:14, Exterior			BULK												
P0006, Black, Loc:6, Entrance Vestibule			BULK												
P0007, Dark Grey, Loc:6, Entrance Vestibule			BULK												
P0008, Grey, Loc:17, Lower Roof			BULK												

10-Jul-23 09:19
 Nilushi Mahathani
 C3K2247
 RPK ENV-1177

APPENDIX III
Methodology



1.0 GENERAL

An inspection was conducted to identify the type of Hazardous Building Materials incorporated in the structure and its finishes.

Information regarding the location and condition of hazardous building materials encountered and visually estimated quantities were recorded. The locations of any samples collected were recorded on small-scale plans. As-built drawings and previous reports were referenced where provided.

Sample collection was conducted in accordance with our Standard Operating Procedures.

1.1 Asbestos

The inspection for asbestos included friable and non-friable asbestos-containing materials (ACM). A friable material is a material that when dry can be crumbled, pulverized, or powdered by hand pressure.

A separate set of samples was collected of each type of homogenous material suspected to contain asbestos. A homogenous material is defined by the US EPA as material that is uniform in texture and appearance, was installed at one time, and is unlikely to consist of more than one type or formulation of material. The homogeneous materials were determined by visual examination and available information on the phases of construction and prior renovations.

Samples were collected at a rate that is in compliance with the requirements of local regulations and guidelines. The sampling strategy was also based on known ban dates and phase out dates of the use of asbestos; sampling of certain building materials is not conducted after specific construction dates. In addition, to be conservative, several years past these dates are added to account for some uncertainty in the exact start / finish date of construction and associated usage of ACM. In some cases, manufactured products such as asbestos cement pipe were visually identified without sample confirmation.

The asbestos analysis was completed using a stop-positive approach. Only one result meeting the regulated criteria was required to determine that a material is asbestos containing, but all samples must be analyzed to conclusively determine that a material is non-asbestos. The laboratory stopped analyzing samples from a homogeneous material once a result equal to or greater than the regulated criteria is detected in any of the samples of that material. All samples of a homogeneous material were analyzed if no asbestos is detected. In some cases, all samples were analyzed in the sample set regardless of result.

The analysis was performed in accordance with Test Method EPA/600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials, July 1993.

Analytical results were compared to the following criteria.



Jurisdiction*	Friable	Non-Friable
Ontario	0.5%	0.5%
Federal	1%	1%

* If there is a conflict between federal and provincial criteria, the more stringent will apply.

Where building materials are described in the report as “non-asbestos” or “does not contain asbestos,” this means that either no asbestos was detected by the analytical method utilized in any of the multiple samples or, if detected, it is below the lower limit of an asbestos-containing material in the applicable regulation. Additionally, these terms are used for materials which historically are known to not include asbestos in their manufacturing.

1.2 Lead

Samples of distinctive paint finishes, and surface coatings present in more than a limited application, where removal of the paint is possible was collected. The samples were collected by scraping the painted finish to include base and covering applications.

Analysis for lead in paints or surface coatings was performed in accordance with EPA Method No. 3050B/Method No. 7420; flame atomic absorption.

Analytical results were compared to the following criteria.

Jurisdiction*	Units (%)	Units (ppm) / (mg/kg)
Ontario	0.1	1000
Federal	0.009	90

* If there is a conflict between federal and provincial criteria, the more stringent will apply.

Other lead building products (e.g. batteries, lead sheeting, flashing) were identified by visual observation only.

1.3 Silica

Building materials known to contain crystalline silica (e.g. concrete, cement, tile, brick, masonry, mortar) were identified by visual inspection only. Pinchin did not perform sampling of these materials for laboratory analysis of crystalline silica content.

1.4 Mercury

Building materials, products, or equipment (e.g. thermostats, barometers, pressure gauges, lamp tubes), suspected to contain mercury was identified by visually inspection only. Dismantling of equipment suspected of containing mercury was not performed. Sampling of these materials for laboratory analysis of mercury content was not performed.

1.5 Polychlorinated Biphenyls

The potential for light ballast and oil filled transformers to contain PCBs was based on the age of the building, a review of maintenance records and examination of labels or nameplates on equipment, where present and accessible. The information was compared to known ban dates of PCBs and Environment Canada publications.

Dry type transformers were presumed to be free of dielectric fluids and hence non-PCB.

Fluids (mineral oil, hydraulic, Aroclor or Askarel) in transformers or other equipment were not sampled for PCB content.

Caulking, sealants, or paints were sampled and submitted for PCB analysis following EPA 3550C/8082A.

Sample results are compared to the criteria of 50 mg/kg for solids as stated in the PCB Regulation, SOR/2008-273.

1.6 Visible Mould

The presence of mould or water damage was determined by visual inspection of exposed building surfaces. If any mould growth or water damage was concealed within building cavities it was not addressed in this assessment.

1.7 ODS Ozone Depleting Substances (ODS)

The potential for ODS (chlorofluorocarbon, hydrochlorofluorocarbon, hydrofluorocarbon, halon, etc.) in air conditioning units, chillers, commercial coolers, and fire suppression systems was determined by visual inspection of manufactures' labels or plates, maintenance records, or logbooks, etc.

Domestic type equipment such as window mounted and small central air conditioners, refrigerators, and freezers were not evaluated for the presence of ODS.

Template: Methodology for Hazardous Building Materials Assessment, HAZ, January 26, 2023

APPENDIX IV
Additional Photographs



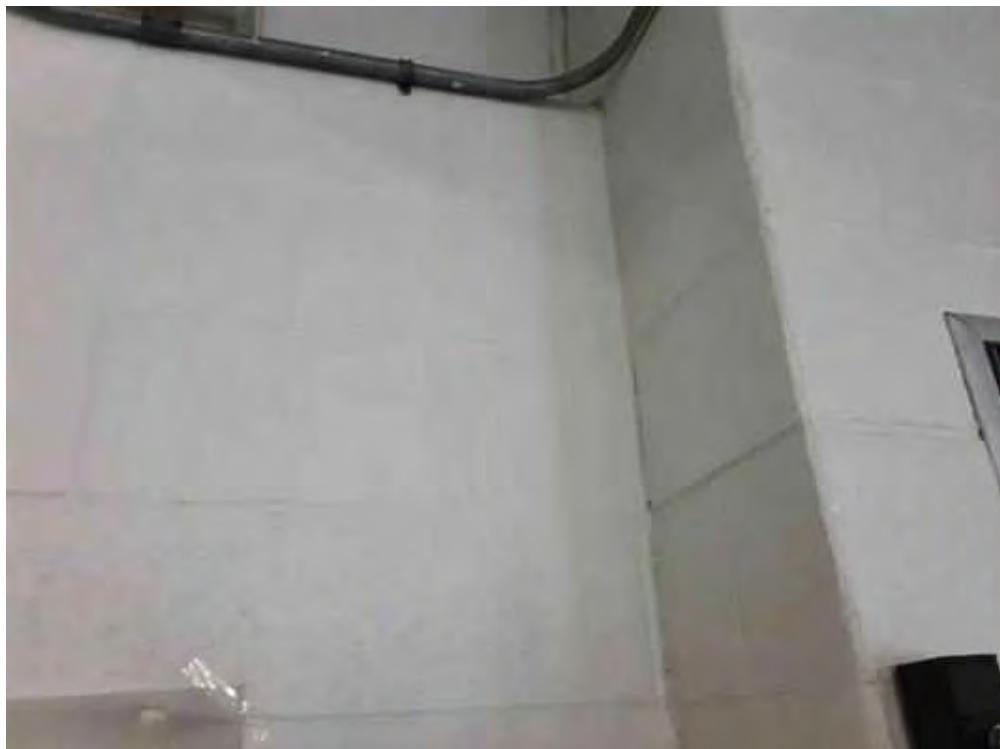
S0001A (None), Wall, Mortar, Fan Room (Location #: 1)
Block wall



S0001B (None), Wall, Mortar, Filter Room (Location #: 2)
Block wall



S0001C (None), Wall, All, Mortar, Balcony (Location #: 4)
Block wall



S0001C (None), Wall, All, Mortar, Balcony (Location #: 4)
Block wall



S0001D (None), Wall, All, Mortar, Balcony (Location #: 4)
Block wall



S0001E (None), Wall, All, Mortar, Men's Change Room (Location #: 9)
Block wall



S0002A (None), Wall, Fire Stop, Cement Product, Filter Room (Location #: 2)



S0002B (None), Wall, Fire Stop, Cement Product, Filter Room (Location #: 2)



S0002C (None), Wall, Fire Stop, Cement Product, Tunnel Area (Location #: 3)



S0002C (None), Wall, Fire Stop, Cement Product, Tunnel Area (Location #: 3)



V0003 (None), Structure, Expansion Joint, Caulking, Indoor Pool (Location #: 13)
Beige



S0003A (None), Wall, Expansion Joint, Caulking, Balcony (Location #: 4)
Beige



S0003C (None), Wall, Expansion Joint, Caulking, Balcony (Location #: 4)
Beige



S0003C (None), Wall, Expansion Joint, Caulking, Balcony (Location #: 4)
Beige



S0004A (None), Wall, Expansion Joint, Caulking, Balcony (Location #: 4)
Off white, some underneath beige caulking



S0004C (None), Wall, Expansion Joint, Caulking, Balcony (Location #: 4)
Off white, underneath beige caulking



S0005A (None), Floor, All, Vinyl Floor Tile and Mastic, East Stairwell (Location #: 5)



S0006A (None), Wall, Base, Mastic, Yellow, East Stairwell (Location #: 5)



V0007 (None), Floor, All, Terrazzo, Corridor (Location #: 27)



S0007A (None), Floor, All, Terrazzo, Entrance Vestibule (Location #: 6)



S0007C (None), Floor, All, Terrazzo, Lobby (Location #: 7)



S0008C (Confirmed Asbestos), Wall, Drywall and joint compound, Custodian (Location #: 29)



S0008C (Confirmed Asbestos), Wall, Drywall and joint compound, Custodian (Location #: 29)



S0008A (Confirmed Asbestos), Other, Stairs, Drywall Compound, Lobby (Location #: 7)
Underneath the stairwell



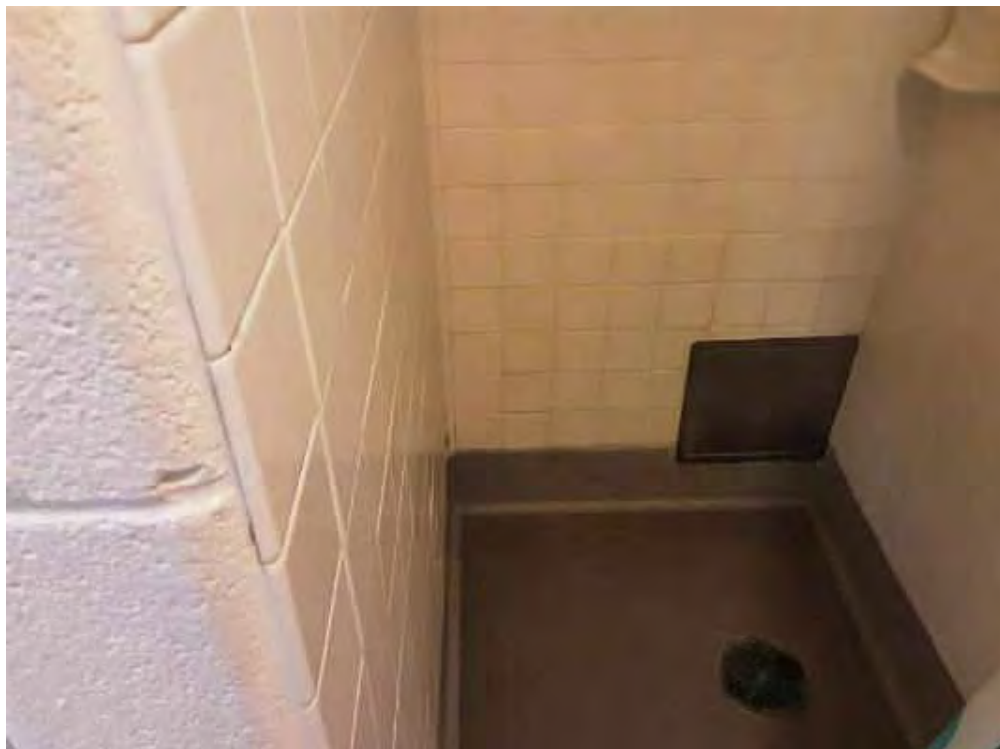
S0009A (None), Floor, All, Mortar, Pool Office (Location #: 8)



S0009B (None), Floor, All, Mortar, Pool Office (Location #: 8)



S0009C (None), Floor, All, Mortar, Men's Change Room (Location #: 9)



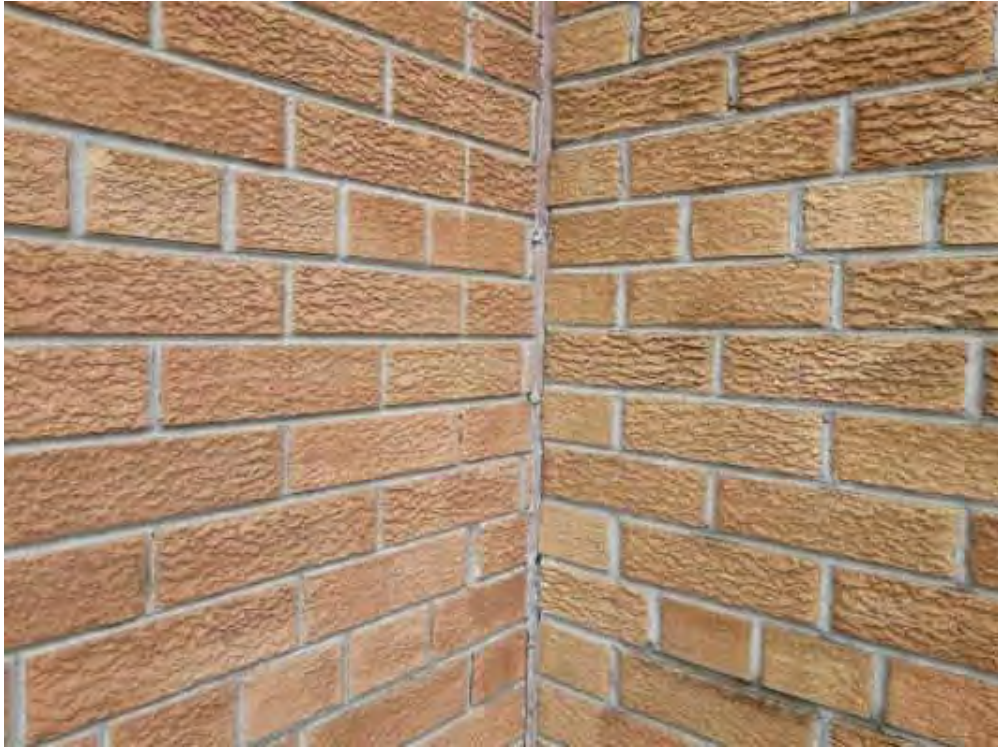
V0010 (None), Wall, Ceramic Tiles, Women's Washroom (Location #: 23)
ceramic tiles are covered over Block wall



S0010A (None), Wall, Mastic, Men's Change Room (Location #: 9)
Light green, ceramic tiles are covered over Block wall



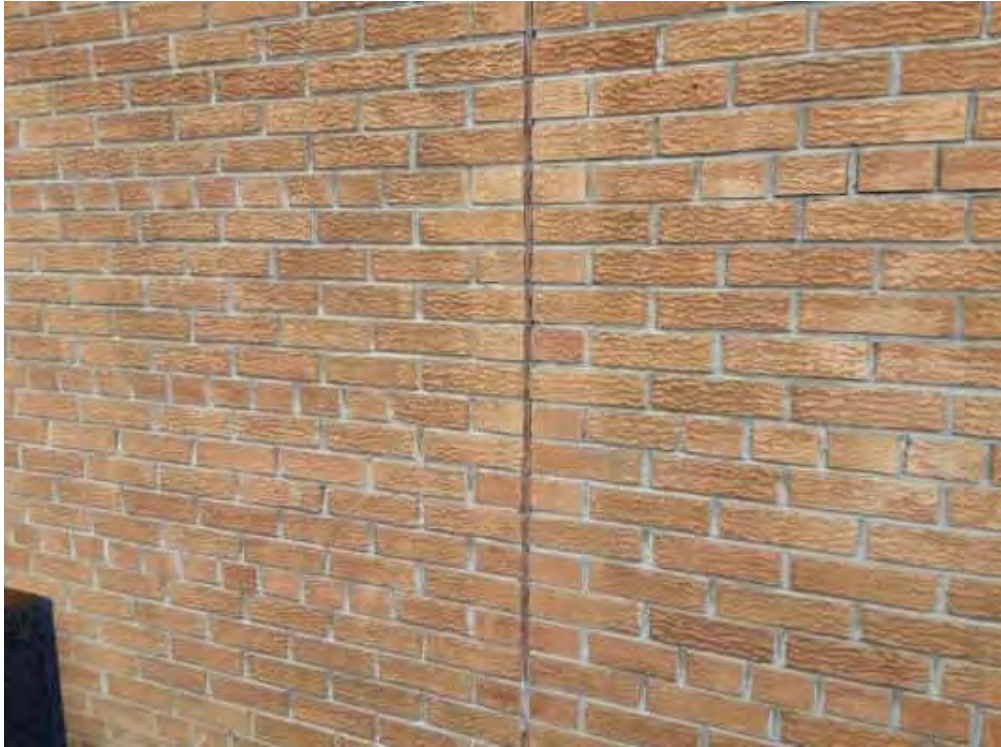
S0010B (None), Wall, Mastic, Men's Change Room (Location #: 9)
Light green



S0011A (None), Wall, Expansion Joint, Caulking, Exterior (Location #: 14)
Light red



S0011A (None), Wall, Expansion Joint, Caulking, Exterior (Location #: 14)
Light red



S0011B (None), Wall, Expansion Joint, Caulking, Exterior (Location #: 14)
Light red



S0011C (None), Wall, Expansion Joint, Caulking, Exterior (Location #: 14)
Light red, S wall



S0012A (Confirmed Asbestos), Wall, Mortar, Exterior (Location #: 14)
Brick



S0012B (Confirmed Asbestos), Wall, Mortar, Exterior (Location #: 14)
Brick



S0012C (Confirmed Asbestos), Wall, Mortar, Exterior (Location #: 14)
Brick



V0013 (Confirmed Asbestos), Other, Door, Caulking, In door Pool (Location #: 13)
Grey, S wall, between wall and door frame



V0013 (Confirmed Asbestos), Other, Door, Caulking, In door Pool (Location #: 13)
Grey, S wall, between wall and door frame



S0013A (Confirmed Asbestos), Other, Door, Caulking, Exterior (Location #: 14)
Grey



S0013B (Confirmed Asbestos), Other, Door, Caulking, Exterior (Location #: 14)
Grey, back door NE wall



S0013C (Confirmed Asbestos), Wall, Expansion Joint, Caulking, Exterior (Location #: 14)
Grey, NE wall



V0013 (Confirmed Asbestos), Other, Door, Caulking, Exterior (Location #: 14)
Grey, S wall



V0013 (Confirmed Asbestos), Other, Window, Caulking, Exterior (Location #: 14)
Grey, S wall



V0013 (Confirmed Asbestos), Other, Door, Caulking, Exterior (Location #: 14)
Grey, S wall



V0013 (Confirmed Asbestos), Other, Door, Caulking, Exterior (Location #: 14)
Grey, S wall



V0013 (Confirmed Asbestos), Other, Door, Caulking, Exterior (Location #: 14)
Grey, N wall, main entrance



S0014A (None), Wall, Unidentified Material, Exterior (Location #: 14)



S0014B (None), Wall, Unidentified Material, Exterior (Location #: 14)
Gravel stuck on top of coat



S0014C (None), Wall, Unidentified Material, Exterior (Location #: 14)



V0015 (None), Duct, Caulking, Exterior (Location #: 14)
Lightgrey, S wall



S0015A (None), Other, Window, Caulking, Exterior (Location #: 14)
Light Grey, S wall



S0015B (None), Other, Window, Caulking, Exterior (Location #: 14)
Light Grey, S wall



S0015C (None), Other, Window, Caulking, Exterior (Location #: 14)
Light Grey, S wall



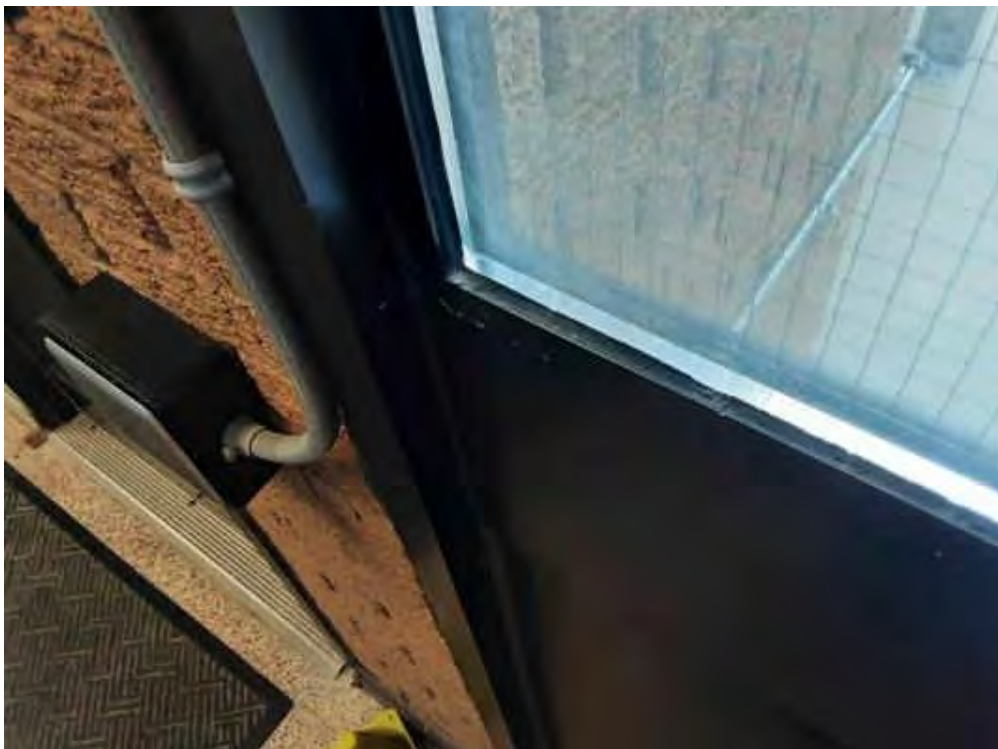
S0016A (Confirmed Asbestos), Other, Door, Caulking, Entrance Vestibule (Location #: 6)
Black, between wall and door frame



S0016B (Confirmed Asbestos), Other, Door, Caulking, Entrance Vestibule (Location #: 6)
Black, between wall and door frame



S0017A (None), Other, Door, Caulking, Entrance Vestibule (Location #: 6)
Black, between door frame and glass



S0017B (None), Other, Door, Caulking, Entrance Vestibule (Location #: 6)
Black, between door frame and glass



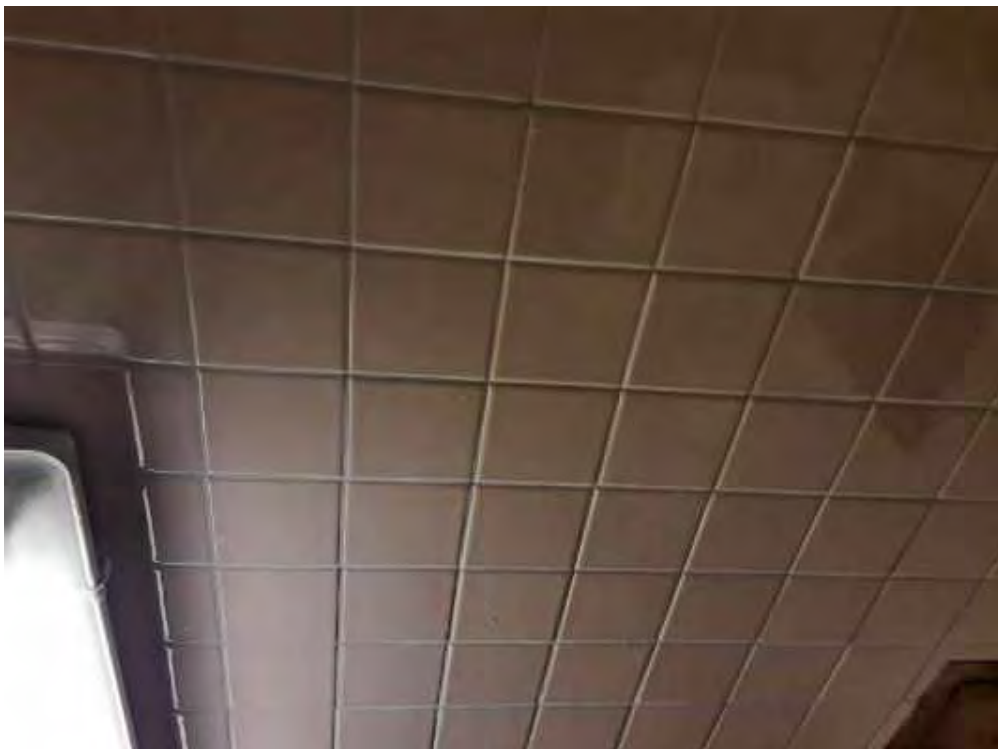
V0018 (None), Ceiling, Plaster, Men's Washroom (Location #: 22)
Same as men's change room



S0018A (None), Ceiling, Mastic, Men's Change Room (Location #: 9)
Multiple layers of plaster underneath



S0018B (None), Ceiling, Mastic, Men's Change Room (Location #: 9)
Multiple layers of plaster underneath



S0018C (None), Ceiling, Mastic, Men's Change Room (Location #: 9)
Multiple layers of plaster underneath



S0019A (None), Floor, Vinyl Floor Tile and Mastic, Supervisor Office (Location #: 15)
Black mastic



S0019B (None), Floor, Vinyl Floor Tile and Mastic, Supervisor Office (Location #: 15)
Black mastic



S0020A (None), Floor, Vinyl Floor Tile and Mastic, Equipment Storage (Location #: 16)
Yellow mastic



S0020B (None), Floor, Vinyl Floor Tile and Mastic, Equipment Storage (Location #: 16)
Yellow mastic



S0020C (None), Floor, Vinyl Floor Tile and Mastic, Equipment Storage (Location #: 16)
Yellow mastic



S0021A (None), Duct, Caulking, Lower Roof (Location #: 17)
Grey



S0021A (None), Duct, Caulking, Lower Roof (Location #: 17)
Grey



S0021C (None), Duct, Caulking, Lower Roof (Location #: 17)
Grey



S0022A (None), Floor, All, Mortar, Indoor Pool (Location #: 13)



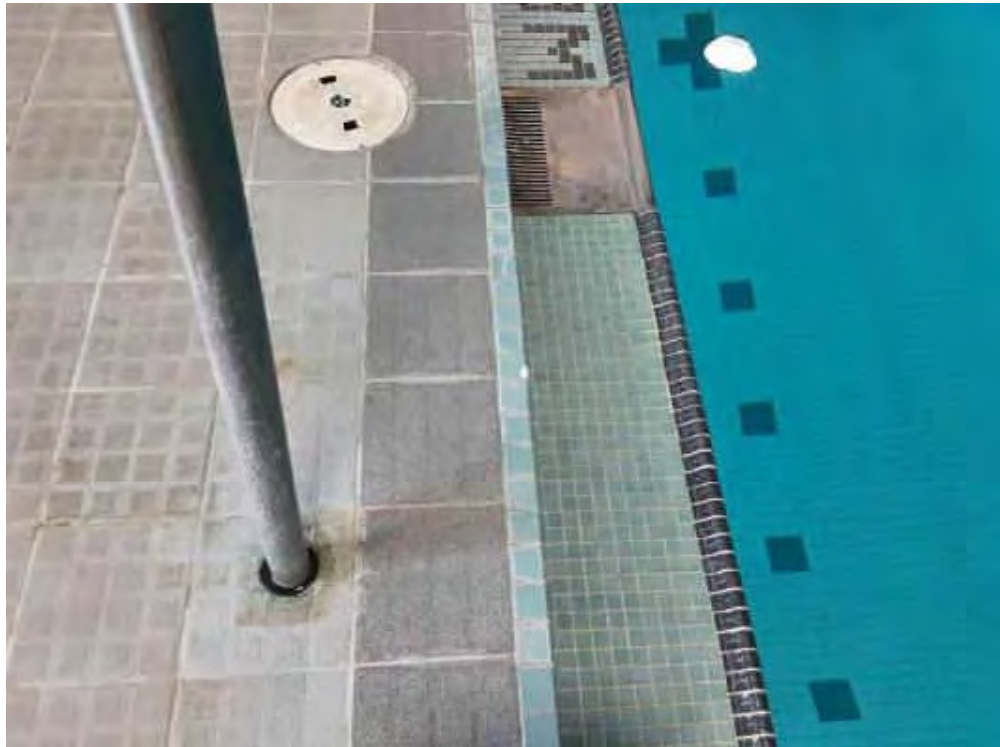
S0022B (None), Floor, All, Mortar, Indoor Pool (Location #: 13)



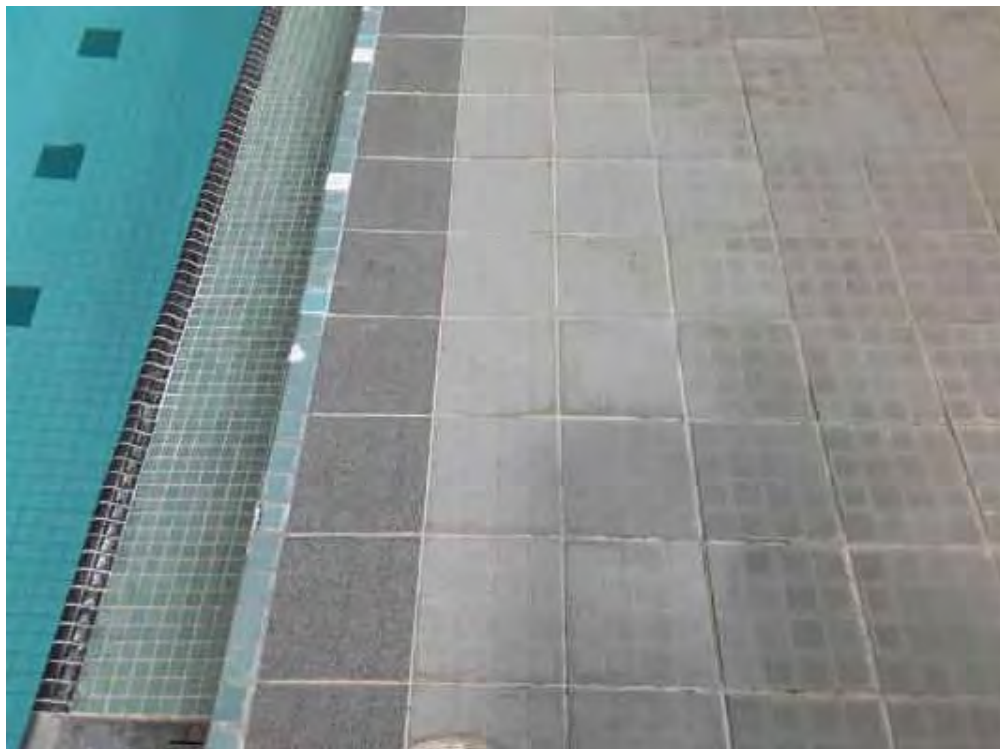
V0022 (None), Floor, All, Mortar, Men's Washroom (Location #: 22)



S0023A (None), Duct, Mastic, Mechanical Room And Stairwell (Location #: 21)
Grey, 4 connectors



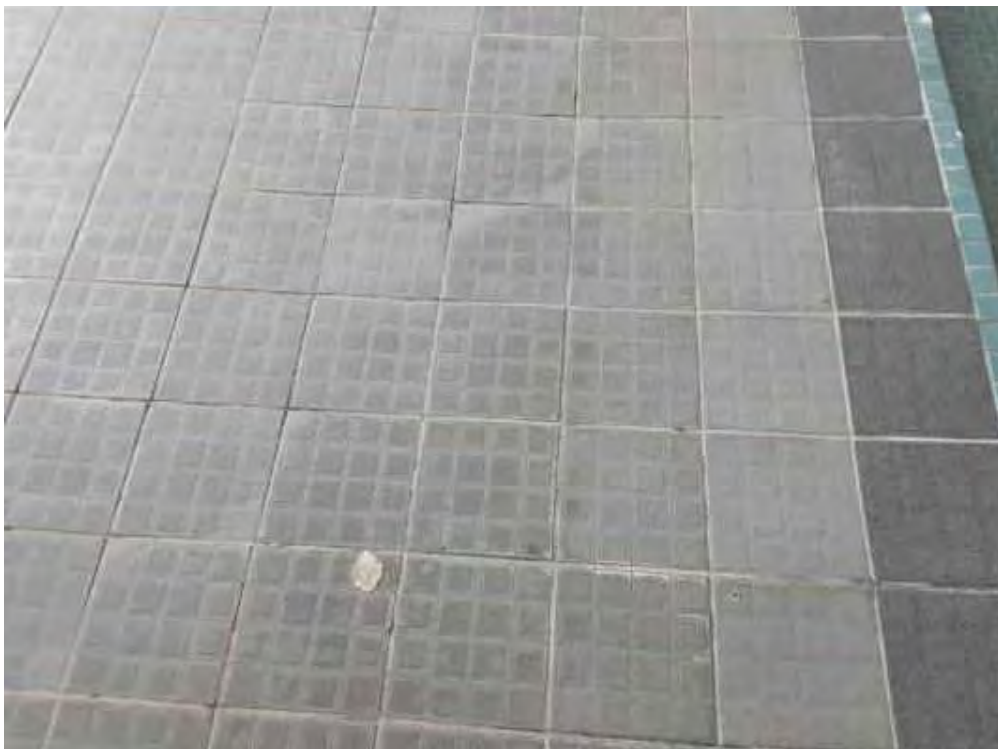
S0024A (None), Floor, Mortar, Indoor Pool (Location #: 13)



S0025A (None), Floor, All, Mortar, Indoor Pool (Location #: 13)



S0025B (None), Floor, All, Mortar, Indoor Pool (Location #: 13)



S0025C (None), Floor, All, Mortar, Indoor Pool (Location #: 13)



S0026A (Confirmed Asbestos), Piping, Parging Cement, Balcony (Location #: 4)



S0026B (Confirmed Asbestos), Piping, Parging Cement, Balcony (Location #: 4)



S0027A (None), Wall, Mortar, Lobby (Location #: 7)



S0028A (Con firmed Asbestos), Wall, Mortar, Gym Storage (Location #: 25)
Block wall



S0028C (Confirmed Asbestos), Wall, All, Mortar, Custodian (Location #: 29)
Block wall



S0029A (Confirmed Asbestos), Wall, Door, Caulking, Gym Storage (Location #: 25)
Between wall and door frame



S0030A (None), Floor, All, Vinyl Floor Tile and Mastic, Phys. Ed. Room (Location #: 24)
Red mastic



S0031A (None), Ceiling, All, Ceiling Tiles (lay-in), Corridor (Location #: 27)
Water staining observed



S0031A (None), Ceiling, All, Ceiling Tiles (lay-in), Corridor (Location #: 27)
Water staining observed



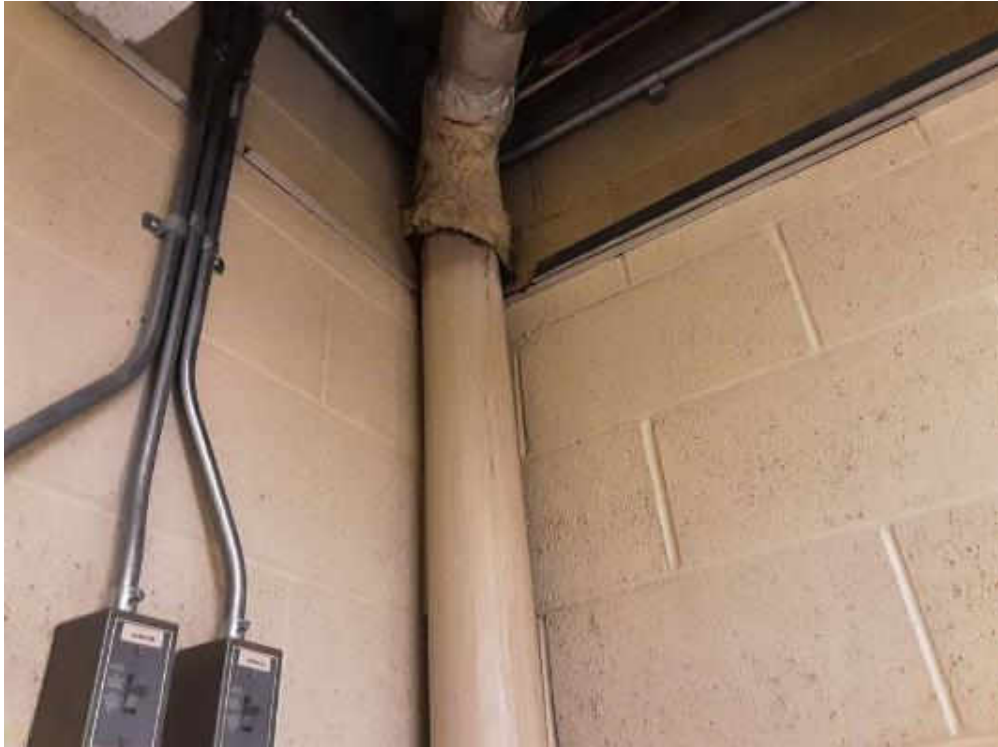
S0032A (None), Floor, All, Vinyl Floor Tile and Mastic, Hallway (Location #: 28)



V9000 (Confirmed Asbestos), Piping, All, Cement Product, Phys. Ed. Room (Location #: 24)
Transit3



V9000 (Confirmed Asbestos), Piping, Rain Water Leader, Cement Product, Gym Storage (Location #: 25)
Transite



V9000 (Confirmed Asbestos), Piping, Rain Water Leader, Cement Product, Gym Storage (Location #: 25)
Transite



V9500 (Presumed Asbestos), Mechanical Equipment, Gasket, Filter Room (Location #: 2)



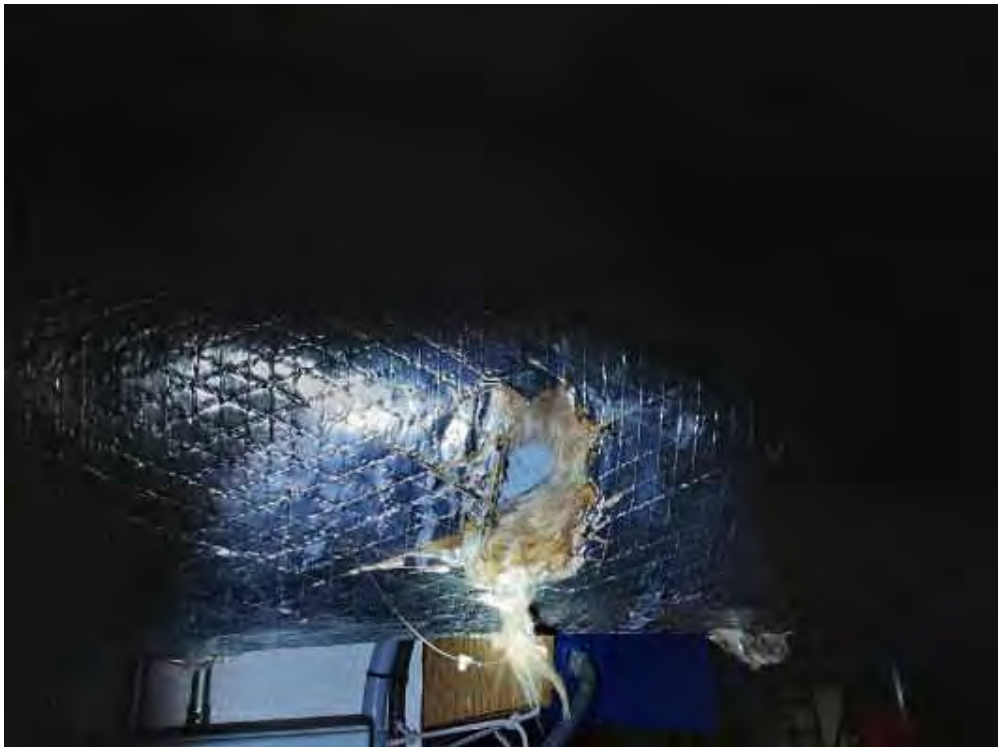
V9500 (Presumed Asbestos), Mechanical Equipment, Gasket, Filter Room (Location #: 2)



V0000 (No ne), Mechanical Equipment, Air Handling Unit, Not Insulated, Fan Room (Location #: 1)



V0000 (None), Duct, All, Fibreglass, Fan Room (Location #: 1)



V0000 (None), Duct, All, Fibreglass, Fan Room (Location #: 1)



V0000 (None), Piping, All, Fibreglass, Fan Room (Location #: 1)



V0000 (None), Piping, All, Fibreglass, Fan Room (Location #: 1)



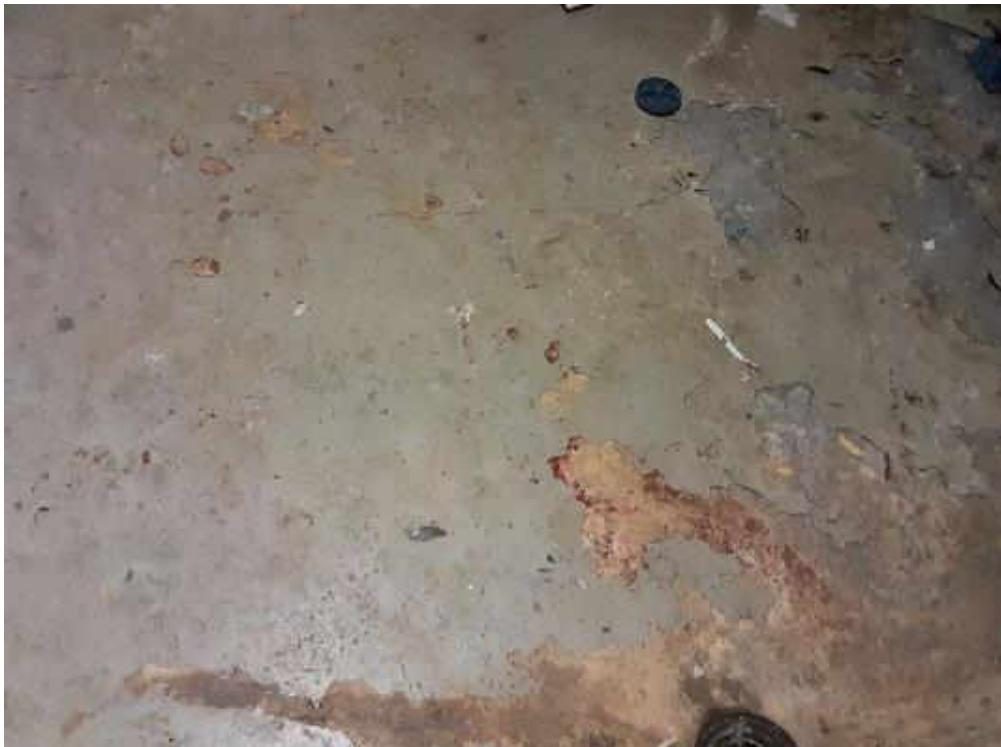
V0000 (None), Structure, All, Concrete (poured), Fan Room (Location #: 1)



V0000 (None), Wall, All, Concrete (poured), Fan Room (Location #: 1)



V0000 (None), Wall, All, Concrete (poured), Fan Room (Location #: 1)



V0000 (None), Floor, All, Concrete (poured), Fan Room (Location #: 1)



V0000 (None), Wall, Masonry, Fan Room (Location #: 1)
Block wall



V0000 (None), Piping, Not Insulated, Fan Room (Location #: 1)



V0000 (None), Piping, Not Insulated, Fan Room (Location #: 1)



V0000 (None), Other, Electrical Panel, Not Insulated, Fan Room (Location #: 1)



V0000 (None), Other, Electrical Panel, Not Insulated, Fan Room (Location #: 1)



V0000 (None), Mechanical Equipment, Air Handling Unit, Fibreglass, Fan Room (Location #: 1)



V0000 (None), Duct, All, Not Insulated, Fan Room (Location #: 1)



V0000 (None), Mechanical Equipment, Unit Heater, Not Insulated, Men's Washroom (Location #: 10)



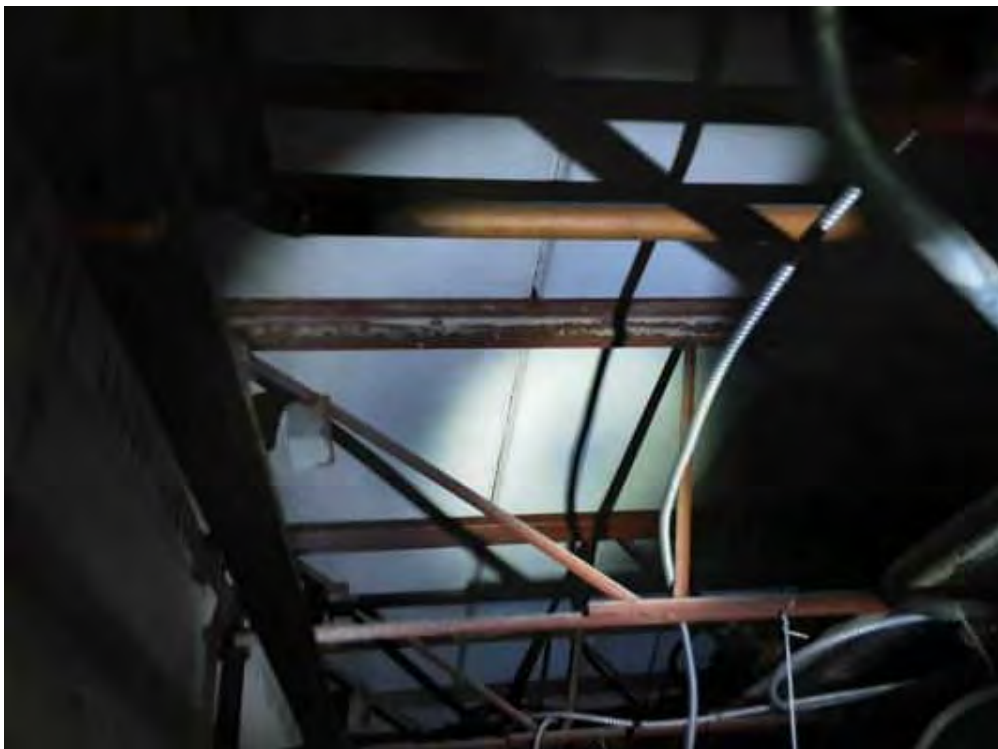
V0000 (None), Duct, All, Not Insulated, Men's Washroom (Location #: 10)



V0000 (None), Piping, All, Fibreglass, Men's Wash room (Location #: 10)



V0000 (None), Piping, Not Insulated, Men's Washroom (Location #: 10)



V0000 (None), Structure, All, Concrete (precast), Men's Washroom (Location #: 10)



V0000 (None), Duct, All, Not Insulated, Women's Change Room (Location #: 12)



V0000 (None), Ceiling, All, Ceiling Tiles (lay-in), Women's Change Room (Location #: 12)
Date stamp- 04/15/11



V0000 (None), Structure, All, Concrete (precast), Women's Change Room (Location #: 12)



V0000 (None), Structure, Beam, Metal, Women's Change Room (Location #: 12)



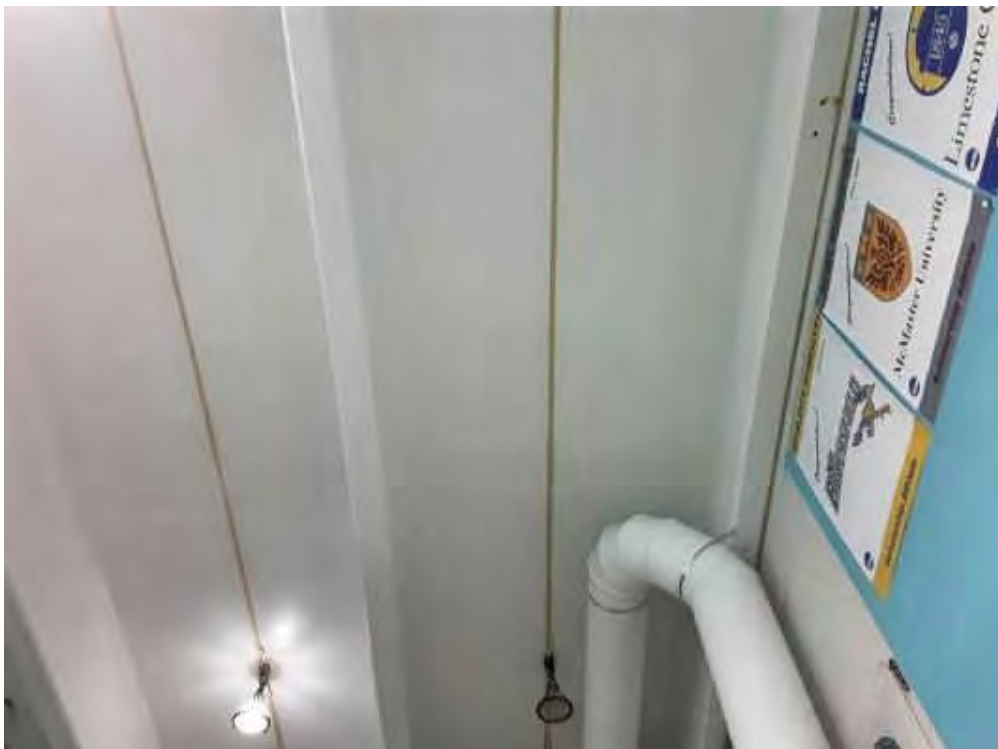
V0000 (None), Piping, All, Fibreglass, Women's Change Room (Location #: 12)



V0000 (None), Duct, All, Not Insulated, Indoor Pool (Location #: 13)



V0000 (None), Duct, All, Not Insulated, Indoor Pool (Location #: 13)



V0000 (None), Structure, All, Concrete (poured), Indoor Pool (Location #: 13)



V0000 (None), Wall, All, Masonry, Indoor Pool (Location #: 13)
Block wall



V0000 (None), Floor, All, Ceramic Tiles, Indoor Pool (Location #: 13)



V0000 (None), Wall, Vermiculite/concrete block walls, In do or Pool (Location #: 13)
4 Drill holes, no vermiculite, N wall, E wall, W wall, S wall



V0000 (None), Wall, Vermiculite/concrete block walls, In do or Pool (Location #: 13)
4 Drill holes, no vermiculite, N wall, E wall, W wall, S wall



V0000 (None), Wall, Vermiculite/concrete block walls, In do or Pool (Location #: 13)
4 Drill holes, no vermiculite, N wall, E wall, W wall, S wall



V0000 (None), Wall, Vermiculite/concrete block walls, In do or Pool (Location #: 13)
4 Drill holes, no vermiculite, N wall, E wall, W wall, S wall



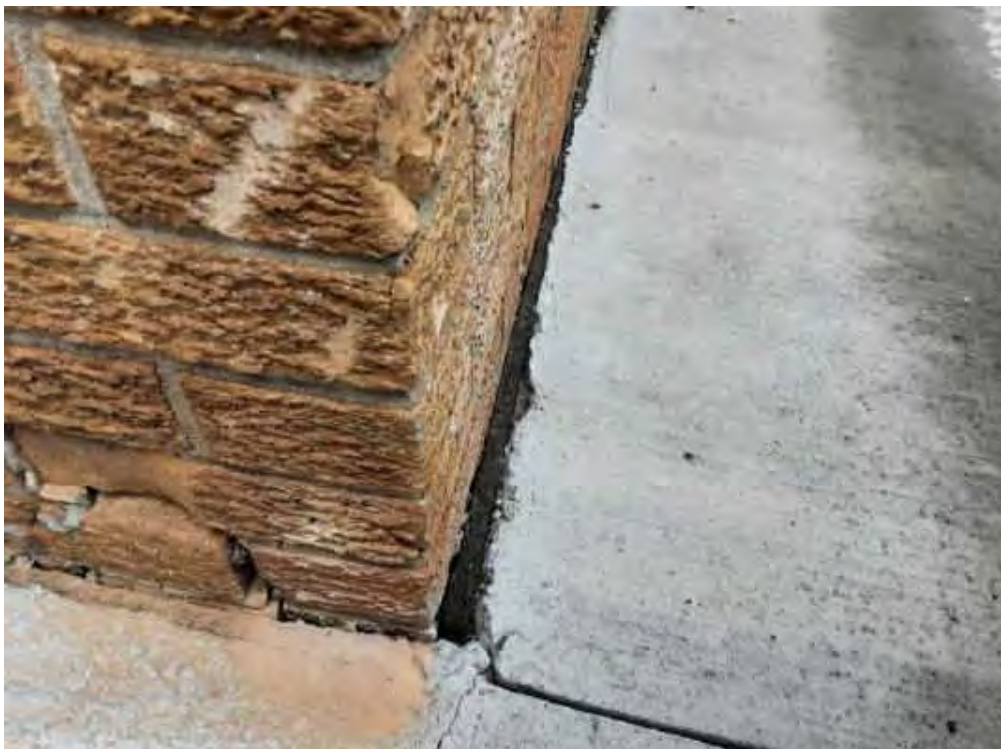
V0000 (None), Floor, Ceramic Tiles, Indoor Pool (Location # 13)



V0000 (None), Wall, Vermiculite, Exterior (Location #: 14)
5 Drill holes, no vermiculite, N wall, NE wall, S wall, SW wall, brick wall



V0000 (None), Wall, Vermiculite, Exterior (Location #: 14)
5 Drill holes, no vermiculite, N wall, NE wall, S wall, SW wall, brick wall



V0000 (None), Wall, Vermiculite, Exterior (Location #: 14)
5 Drill holes, no vermiculite, N wall, NE wall, S wall, SW wall, brick wall



V0000 (None), Wall, Vermiculite, Exterior (Location #: 14)
5 Drill holes, no vermiculite, N wall, NE wall, S wall, SW wall, brick wall



V0000 (None), Wall, Vermiculite, Exterior (Location #: 14)
5 Drill holes, no vermiculite, N wall, NE wall, S wall, SW wall, brick wall



V0000 (None), Duct, Not Insulated, Exterior (Location #: 14)



V0000 (None), Duct, All, Not Insulated, Supervisor Office (Location #: 15)



V0000 (None), Piping, Fibreglass, Supervisor Office (Location #: 15)



V0000 (None), Ceiling, All, Ceiling Tiles (lay-in), Supervisor Office (Location #: 15)
Date stamp- 04/15/11



V0000 (None), Piping, Fibreglass, Supervisor Office (Location #: 15)



V0000 (None), Other, Roof, Lower Roof (Location #: 17)
Built up,



V0000 (None), Other, Roof, Lower Roof (Location #: 17)
Built up,



V0000 (None), Other, Roof, Lower Roof (Location #: 17)
Built up,



V0000 (None), Mechanical Equipment, Air Handling Unit, Not Insulated, Lower Roof (Location #: 17)



V0000 (None), Mechanical Equipment, Air Handling Unit, Not Insulated, Lower Roof (Location #: 17)



V0000 (None), Mechanical Equipment, Air Handling Unit, Not Insulated, Lower Roof (Location #: 17)



V0000 (None), Mechanical Equipment, Air Handling Unit, Not Insulated, Lower Roof (Location #: 17)



V0000 (None), Mechanical Equipment, Air Handling Unit, Not Insulated, Lower Roof (Location #: 17)



V0000 (None), Mechanical Equipment, Roof Hopper (Drain), Not Insulated, Lower Roof (Location #: 17)



V0000 (None), Mechanical Equipment, Roof Hopper (Drain), Not Insulated, Lower Roof (Location #: 17)



V0000 (None), Mechanical Equipment, Fan Unit, Not Insulated, Lower Roof (Location #: 17)
Ventilator



V0000 (None), Mechanical Equipment, Fan Unit, Not Insulated, Lower Roof (Location #: 17)
Ventilator



V0000 (None), Mechanical Equipment, Fan Unit, Not Insulated, Lower Roof (Location #: 17)
Ventilator



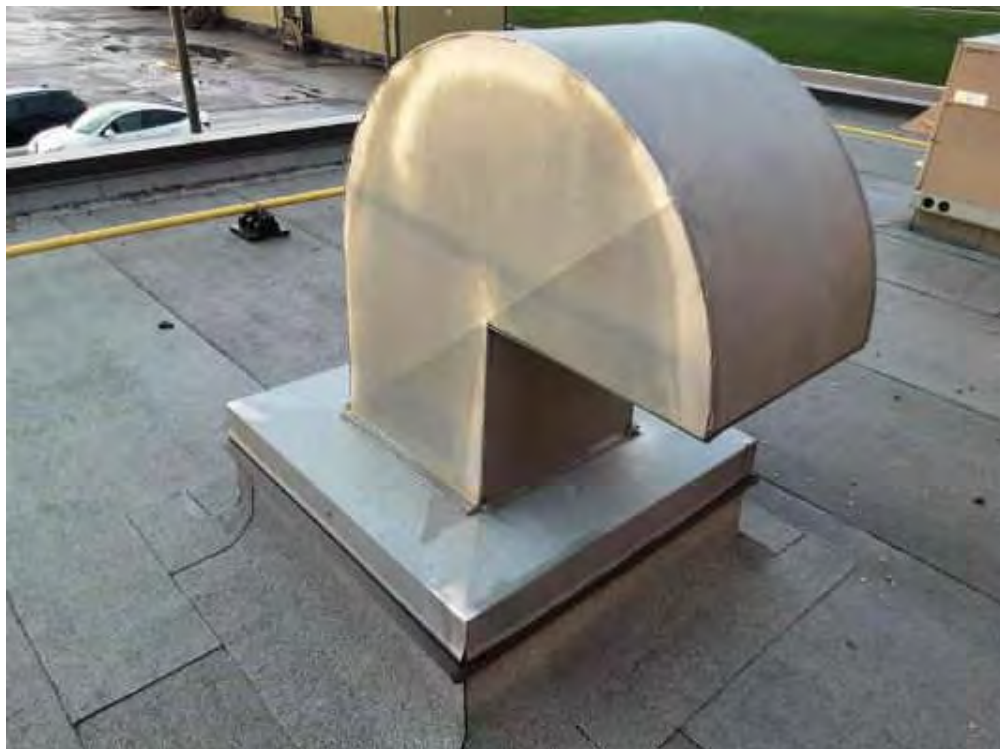
V0000 (None), Other, Skylight, Aluminum, Lower Roof (Location #: 17)
 Glass



V0000 (None), Mechanical Equipment, Compressor, Not Insulated, Lower Roof (Location #: 17)
 Fan unit



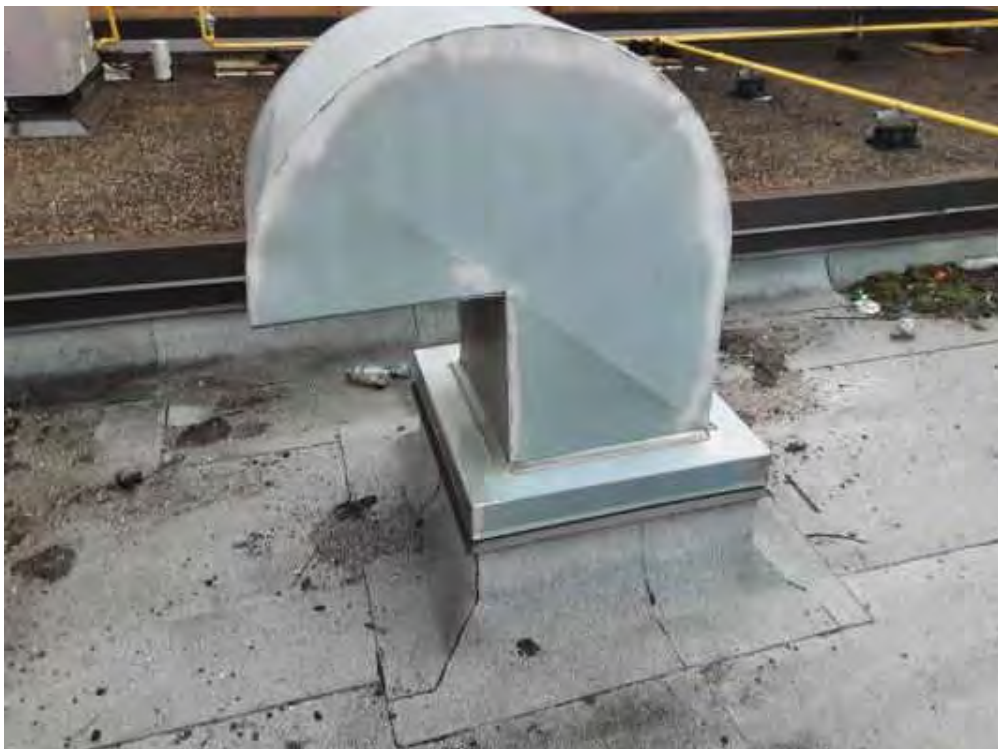
V0000 (None), Mechanical Equipment, Compressor, Not Insulated, Lower Roof (Location # 17)
Fan unit



V0000 (None), Duct, Exhaust, Not Insulated, Lower Roof (Location # 17)



V0000 (None), Duct, Exhaust, Not Insulated, Lower Roof (Location #: 17)



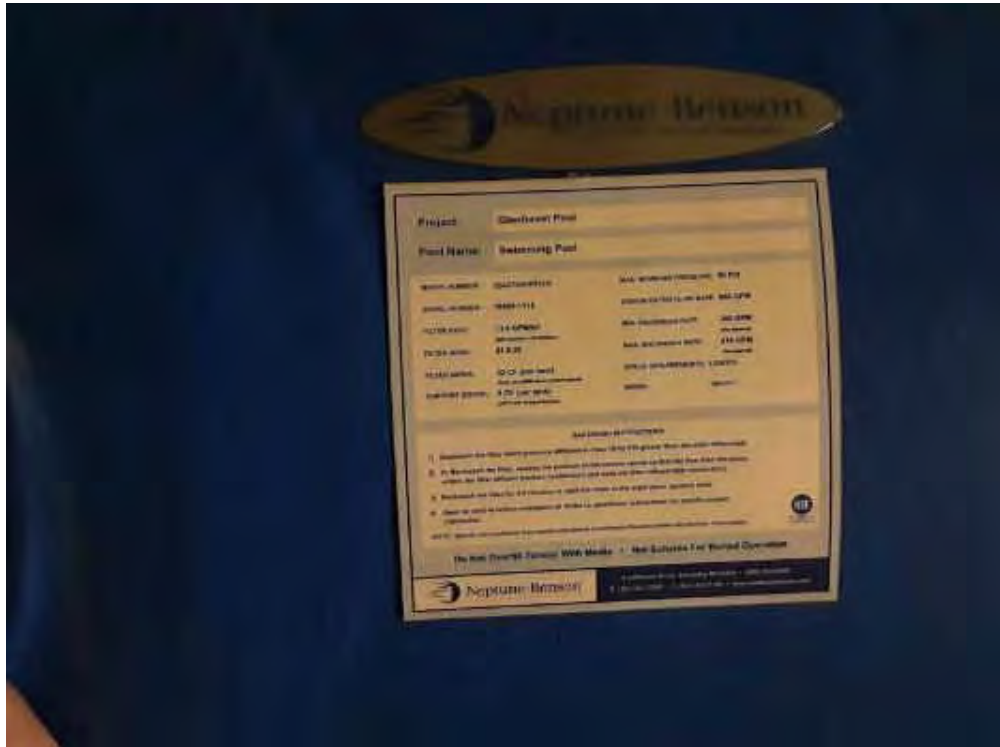
V0000 (None), Duct, Exhaust, Not Insulated, Lower Roof (Location #: 17)



V0000 (None), Mechanical Equipment, Filters, Not Insulated, Filter Room (Location #: 2)



V0000 (None), Mechanical Equipment, Filters, Not Insulated, Filter Room (Location #: 2)



V0000 (None), Mechanical Equipment, Filters, Not Insulated, Filter Room (Location #: 2)



V0000 (None), Duct, All, Fibreglass, Filter Room (Location #: 2)



V0000 (None), Duct, All, Fibreglass, Filter Room (Location #: 2)



V0000 (None), Piping, All, Fibreglass, Filter Room (Location #: 2)



V0000 (None), Piping, All, Fibreglass, Filter Room (Location #: 2)



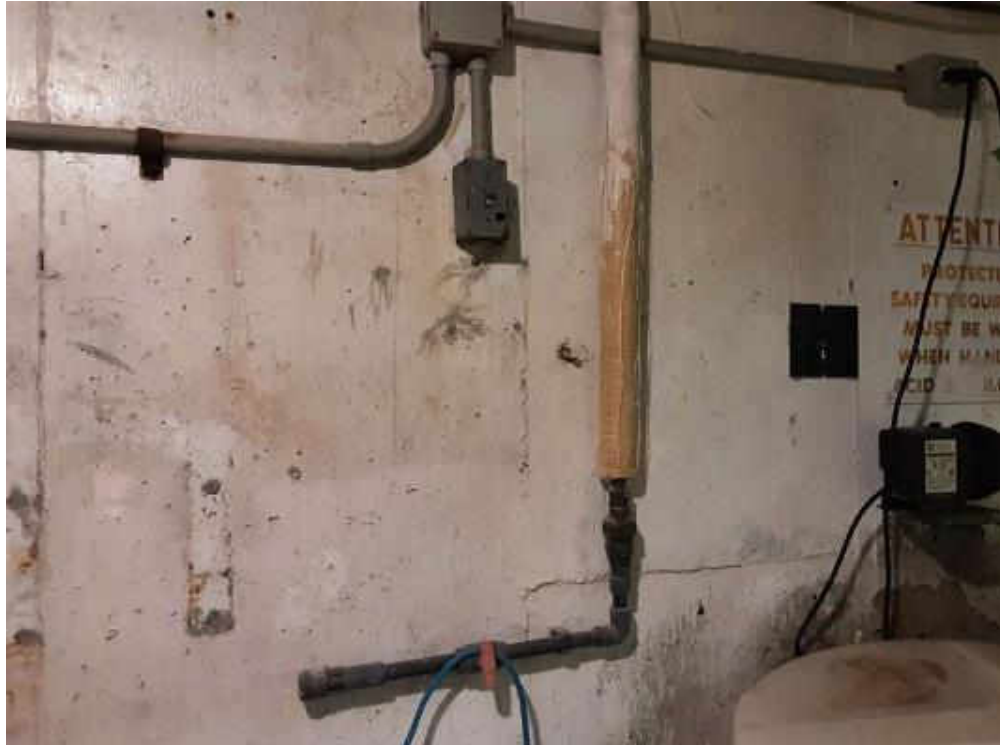
V0000 (None), Piping, All, Fibreglass, Filter Room (Location #: 2)



V0000 (None), Piping, All, Fibreglass, Filter Room (Location #: 2)



V0000 (None), Wall, All, Concrete (poured), Filter Room (Location #: 2)



V0000 (None), Wall, All, Concrete (poured), Filter Room (Location #: 2)



V0000 (None), Wall, Masonry, Filter Room (Location #: 2)
Block wall



V0000 (None), Piping, Polyvinyl chloride (PVC), Filter Room (Location #: 2)
Inlet, discharge, vacuum, skimmer, waste



V0000 (None), Piping, Polyvinyl chloride (PVC), Filter Room (Location #: 2)
Inlet, discharge, vacuum, skimmer, waste



V0000 (None), Piping, Polyvinyl chloride (PVC), Filter Room (Location #: 2)
Inlet, discharge, vacuum, skimmer, waste



V0000 (None), Piping, Polyvinyl chloride (PVC), Filter Room (Location #: 2)
Inlet, discharge, vacuum, skimmer, waste



V0000 (None), Other, Electrical Panel, Not Insulated, Filter Room (Location #: 2)



V0000 (None), Duct, All, Not Insulated, Filter Room (Location #: 2)



V0000 (None), Duct, All, Not Insulated, Filter Room (Location #: 2)



V0000 (None), Piping, Not Insulated, Filter Room (Location #: 2)



V0000 (None), Piping, Not Insulated, Filter Room (Location #: 2)



V0000 (None), Mechanical Equipment, Rubber, Filter Room (Location #: 2)



V0000 (None), Mechanical Equipment, Rubber, Filter Room (Location #: 2)



V0000 (None), Mechanical Equipment, Pump, Not Insulated, Filter Room (Location #: 2)



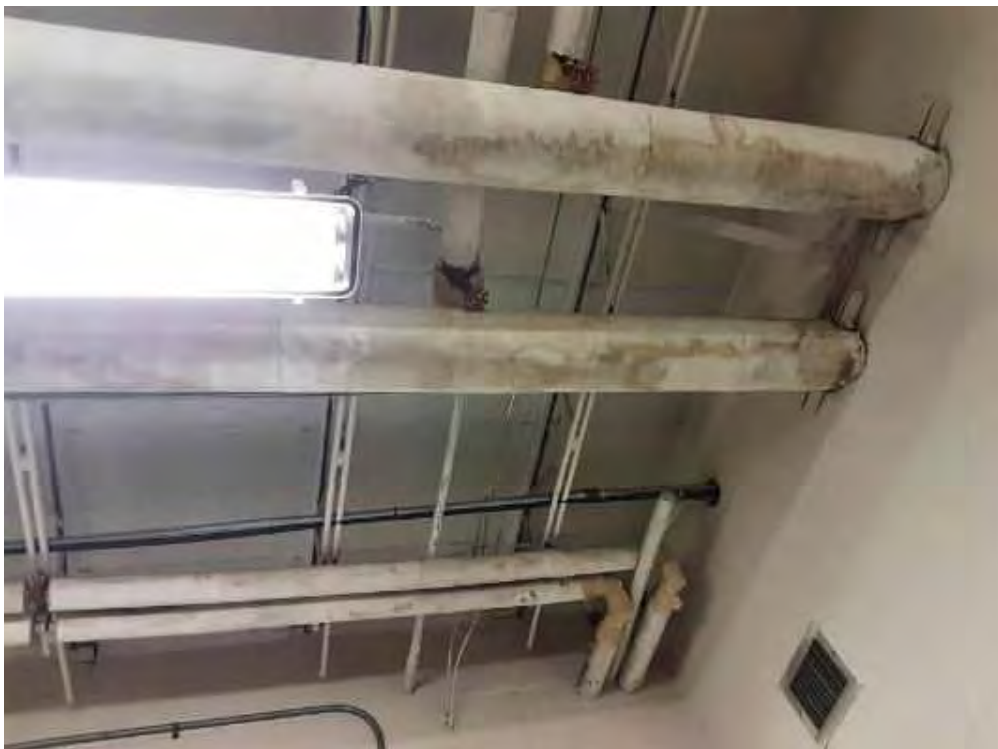
V0000 (None), Wall, Filter Room (Location #: 2)
No vermiculite



V0000 (None), Wall, Filter Room (Location #: 2)
No vermiculite



V0000 (None), Mechanical Equipment, Unit Heater, Not Insulated, Equipment Room 2 (Location #: 20)



V0000 (None), Piping, All, Fibreglass, Equipment Room 2 (Location #: 20)



V0000 (None), Piping, All, Fibreglass, Equipment Room 2 (Location #: 20)



V0000 (None), Structure, All, Concrete (precast), Equipment Room 2 (Location #: 20)



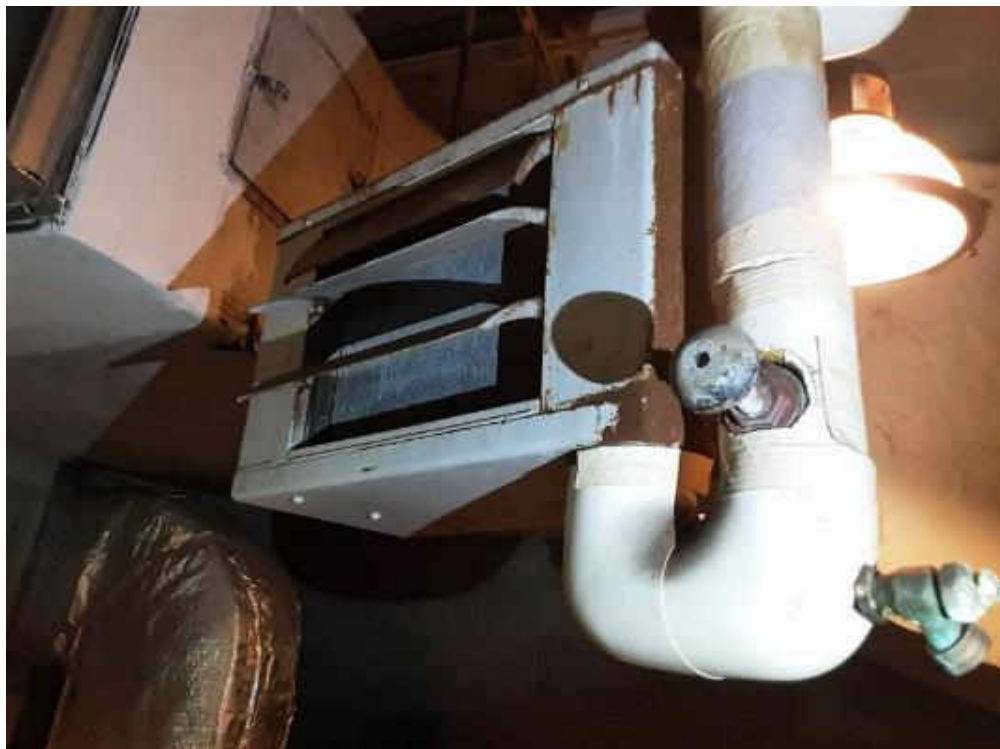
V0000 (None), Wall, All, Masonry, Equipment Room 2 (Location #: 20)
Block wall



V0000 (None), Floor, All, Concrete (poured), Equipment Room 2 (Location #: 20)



V0000 (None), Mechanical Equipment, Fan Unit, Not Insulated, Mechanical Room And Stairwell (Location #: 21)



V0000 (None), Mechanical Equipment, Fan Unit, Not Insulated, Mechanical Room And Stairwell (Location #: 21)



V0000 (None), Mechanical Equipment, Fan Unit, Not Insulated, Mechanical Room And Stairwell (Location #: 21)



V0000 (None), Duct, All, Fibreglass, Mechanical Room And Stairwell (Location #: 21)



V0000 (None), Duct, All, Fibreglass, Mechanical Room And Stairwell (Location #: 21)



V0000 (None), Piping, All, Fibreglass, Mechanical Room And Stairwell (Location #: 21)



V0000 (None), Piping, All, Fibreglass, Mechanical Room And Stairwell (Location #: 21)



V0000 (None), Structure, All, Concrete (precast), Mechanical Room And Stairwell (Location #: 21)



V0000 (None), Duct, Not Insulated, Mechanical Room And Stairwell (Location #: 21)



V0000 (None), Duct, All, Fibreglass, Mechanical Room And Stairwell (Location #: 21)



V0000 (None), Other, Stairs, Metal, Mechanical Room And Stairwell (Location #: 21)



V0000 (None), Duct, All, Not Insulated, Men's Washroom (Location #: 22)



V0000 (Non e), Piping, Not Insulated, Men's Washroom (Location # 22)



V0000 (Non e), Structure, Deck, Metal, Men's Washroom (Location # 22)



V0000 (None), Floor, All, Ceramic Tiles, Men's Washroom (Location #: 22)



V0000 (None), Ceiling, All, Ceiling Tiles (lay-in), Phys. Ed. Room (Location #: 24)



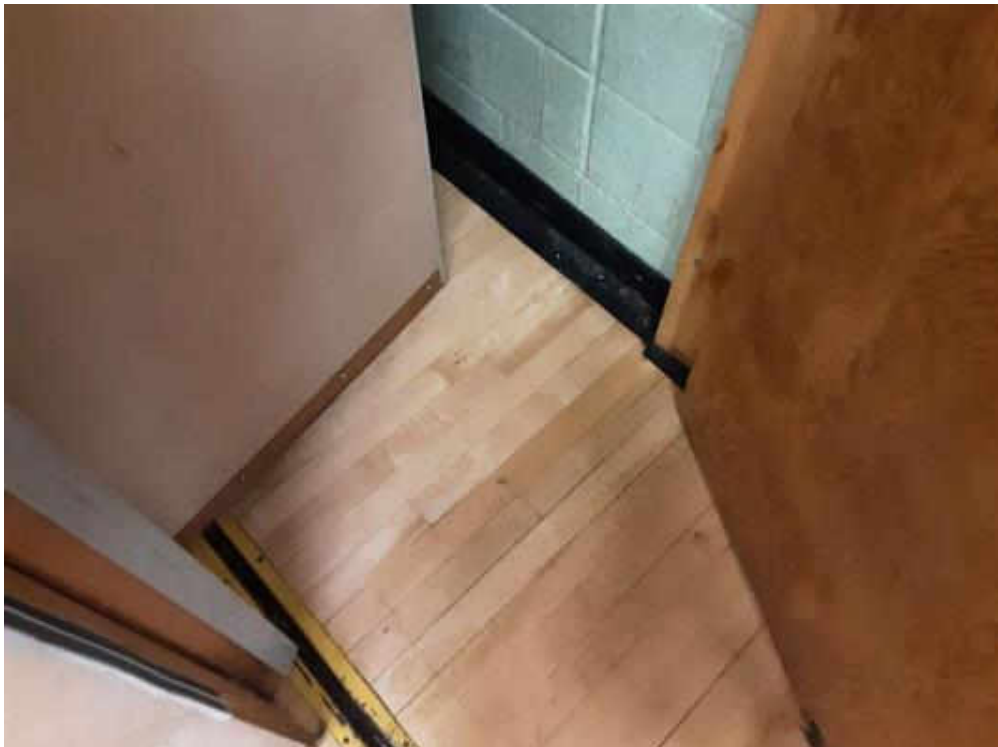
V0000 (None), Ceiling, All, Ceiling Tiles (lay-in), Gym Storage (Location #: 25)
Date stamp-02/17/16



V0000 (None), Floor, All, Concrete (poured), Gym Storage (Location #: 25)



V0000 (None), Piping, Fibreglass, Gym Storage (Location #: 25)



V0000 (None), Floor, All, Wood, Store Room (Location #: 26)



V0000 (None), Duct, All, Not Insulated, Corridor (Location #: 27)



V0000 (None), Duct, All, Not Insulated, Corridor (Location #: 27)



V0000 (None), Duct, All, Not Insulated, Corridor (Location #: 27)



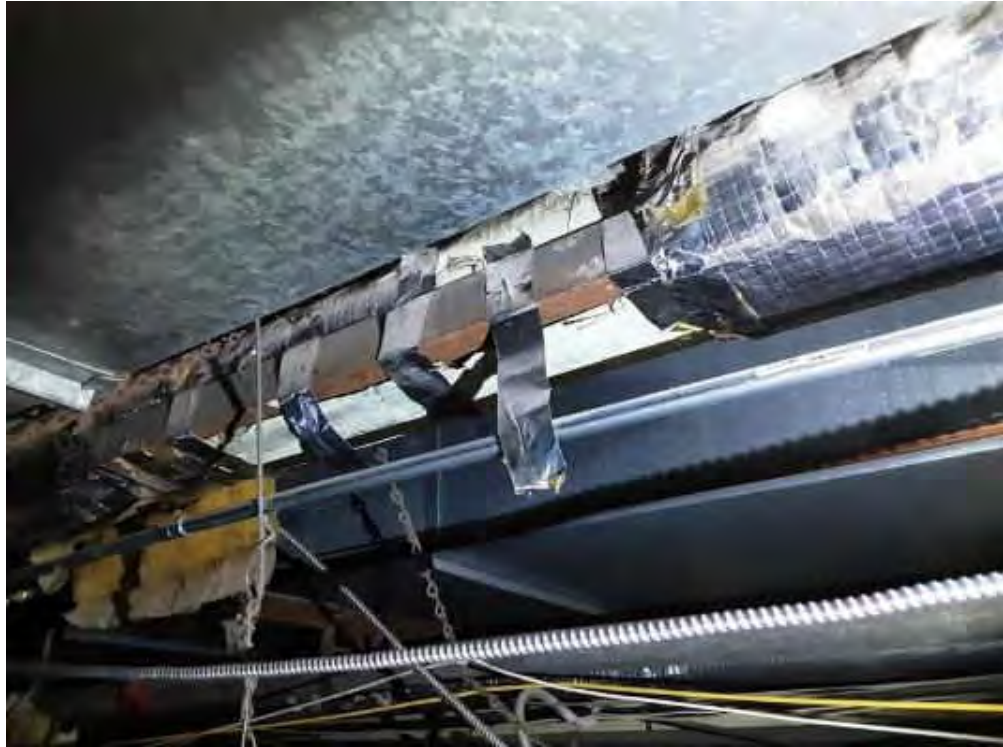
V0000 (None), Piping, All, Not Insulated, Corridor (Location #: 27)



V0000 (None), Piping, All, Not Insulated, Corridor (Location #: 27)



V0000 (None), Wall, All, Masonry, Corridor (Location #: 27)
Block wall



V0000 (None), Piping, Fibreglass, Corridor (Location #: 27)



V0000 (None), Piping, Fibreglass, Corridor (Location #: 27)



V0000 (None), Piping, Fibreglass, Corridor (Location #: 27)



V0000 (None), Piping, Fibreglass, Corridor (Location #: 27)



V0000 (None), Ceiling, All, Ceiling Tiles (lay-in), Corridor (Location #: 27)
Water staining observed, date stamp -03/14/15



V0000 (None), Duct, All, Not Insulated, Hallway (Location #: 28)



V0000 (None), Piping, Fibreglass, Hallway (Location #: 28)



V0000 (None), Mechanical Equipment, Fan Unit, Not Insulated, Custodian (Location #: 29)



V0000 (None), Duct, All, Not Insulated, Custodian (Location #: 29)



V0000 (None), Piping, All, Not Insulated, Custodian (Location #: 29)



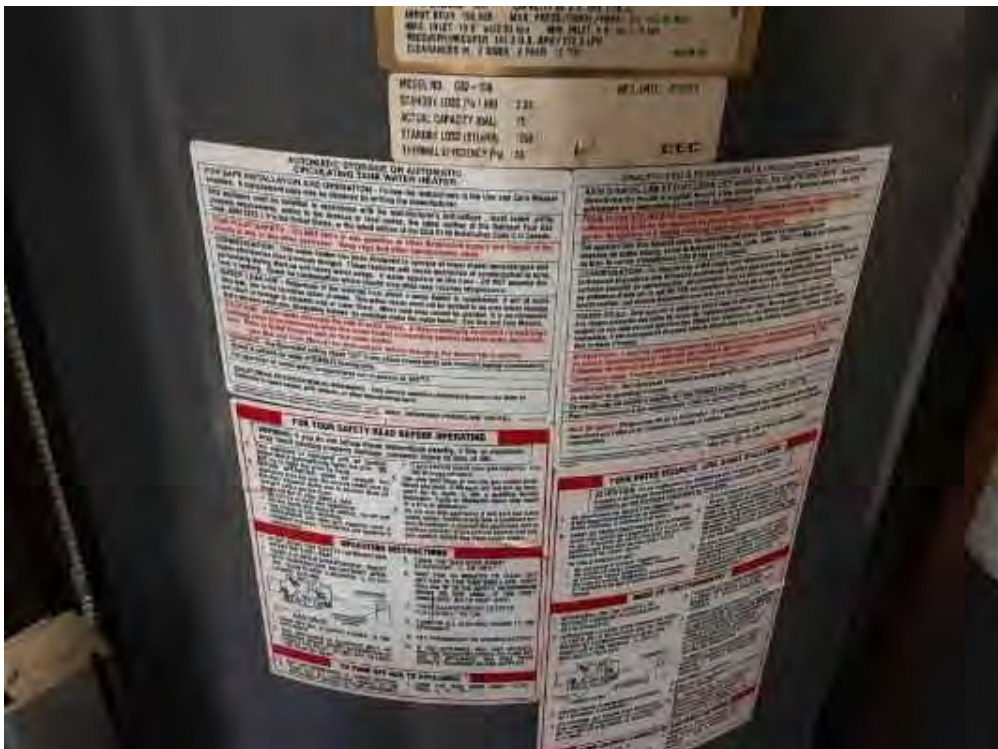
V0000 (None), Piping, Fibreglass, Custodian (Location #: 29)



V0000 (None), Piping, Fibreglass, Custodian (Location #: 29)



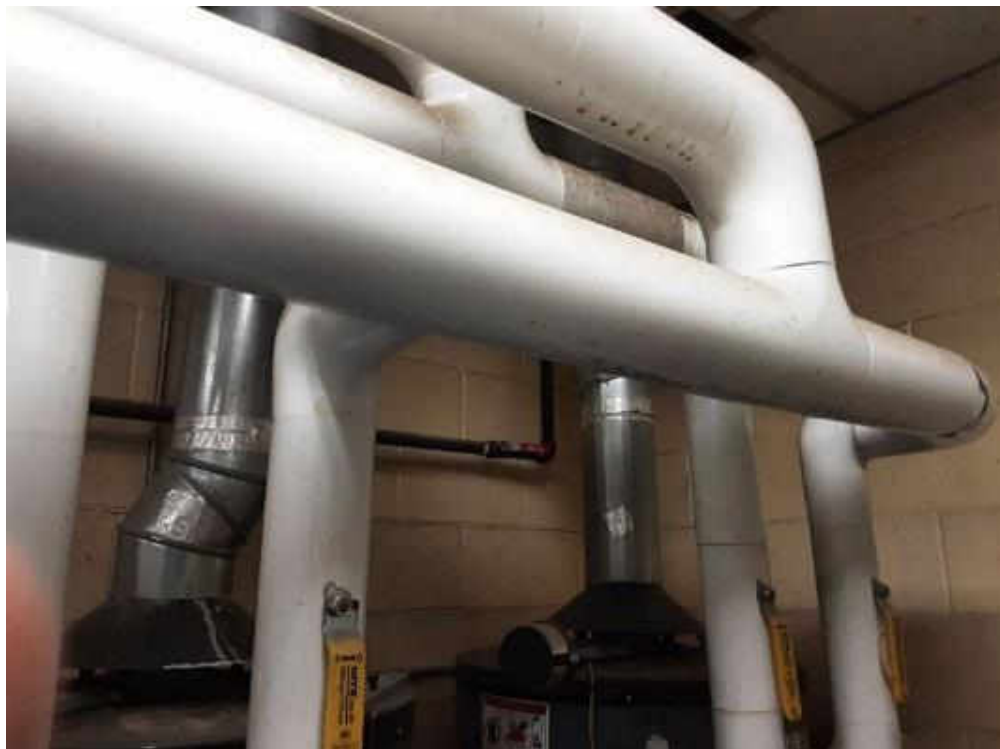
V0000 (None), Piping, Fibreglass, Custodian (Location #: 29)



V0000 (None), Mechanical Equipment, Heating Water Tank, Not Insulated, Custodian (Location #: 29)



V0000 (None), Piping, Fibreglass, Custodian (Location #: 29)



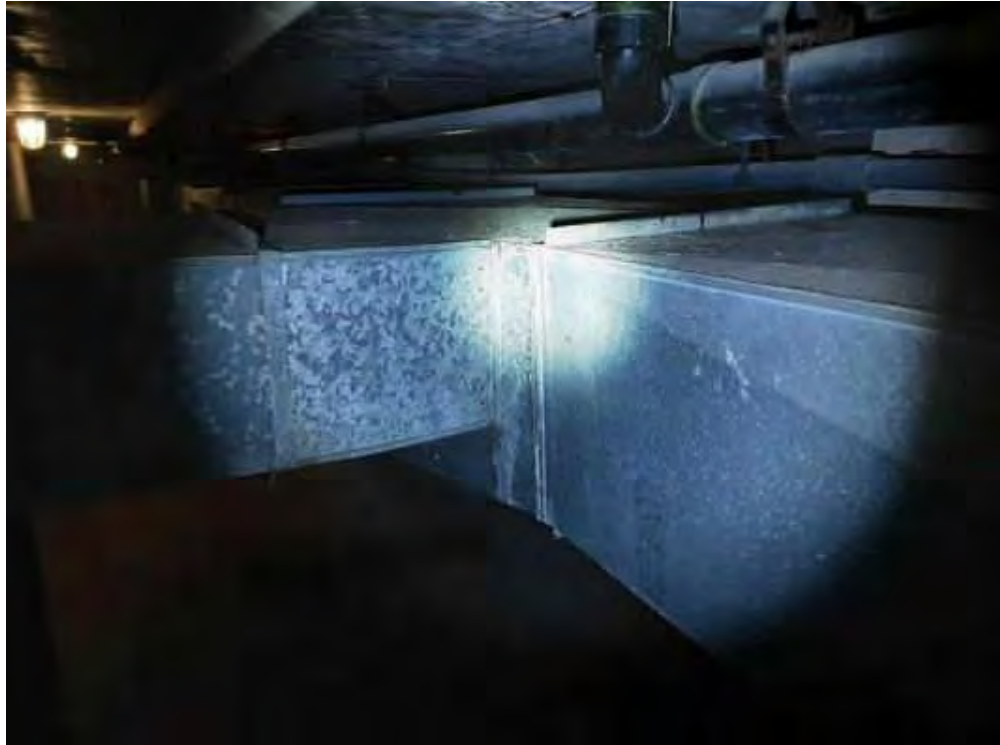
V0000 (None), Piping, Fibreglass, Custodian (Location #: 29)



V0000 (None), Duct, All, Not Insulated, Tunnel Area (Location #: 3)



V0000 (None), Duct, All, Not Insulated, Tunnel Area (Location #: 3)



V0000 (None), Duct, All, Not Insulated, Tunnel Area (Location #: 3)



V0000 (None), Duct, All, Not Insulated, Tunnel Area (Location #: 3)



V0000 (None), Piping, All, Fibreglass, Tunnel Area (Location #: 3)



V0000 (None), Piping, All, Fibreglass, Tunnel Area (Location #: 3)



V0000 (None), Structure, All, Concrete (poured), Tunnel Area (Location #: 3)



V0000 (None), Structure, All, Concrete (poured), Tunnel Area (Location #: 3)



V0000 (None), Wall, All, Concrete (poured), Tunnel Area (Location #: 3)



V0000 (None), Floor, All, Concrete (poured), Tunnel Area (Location #: 3)



V0000 (None), Piping, Polyvinyl chloride (PVC), Tunnel Area (Location # 3)



V0000 (None), Piping, Polyvinyl chloride (PVC), Tunnel Area (Location # 3)



V0000 (None), Piping, All, Fibreglass, Tunnel Area (Location #: 3)



V0000 (None), Piping, All, Fibreglass, Tunnel Area (Location #: 3)



V0000 (None), Piping, All, Fibreglass, Tunnel Area (Location #: 3)



V0000 (None), Piping, Rain Water Leader, Polyvinyl chloride (PVC), Balcony (Location #: 4)



V0000 (None), Piping, Rain Water Leader, Polyvinyl chloride (PVC), Balcony (Location #: 4)



V0000 (None), Structure, All, Concrete (poured), Balcony (Location #: 4)



V0000 (None), Wall, All, Masonry, Balcony (Location #: 4)
Block wall



V0000 (None), Floor, All, Concrete (poured), Balcony (Location #: 4)



V0000 (Non e), Wall, Vermiculite/concrete block walls, Balcony (Location #: 4)
2 Drill holes, no vermiculite



V0000 (Non e), Wall, Vermiculite/concrete block walls, Balcony (Location #: 4)
2 Drill holes, no vermiculite



V0000 (None), Wall, Vermiculite/concrete block walls, Balcony (Location #: 4)
2 Drill holes, no vermiculite



V0000 (None), Mechanical Equipment, Unit Heater, Not Insulated, East Stairwell (Location #: 5)
At the exit level



V0000 (None), Duct, All, Not Insulated, East Stairwell (Location #: 5)



V0000 (None), Floor, Base, Rubber, East Stairwell (Location #: 5)



V0000 (None), Mechanical Equipment, Unit Heater, Not Insulated, Entrance Vestibule (Location #: 6)



V0000 (None), Piping, All, Fibreglass, Entrance Vestibule (Location #: 6)



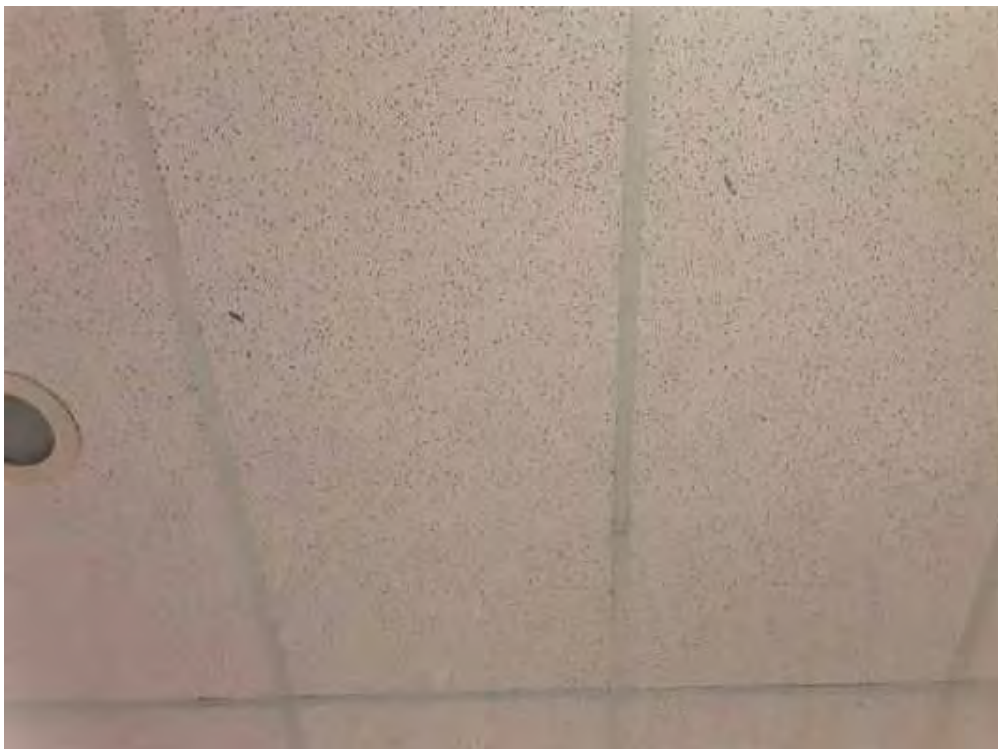
V0000 (None), Structure, All, Concrete (precast), Entrance Vestibule (Location #: 6)



V0000 (None), Wall, All, Masonry, Entrance Vestibule (Location #: 6)
Brick wall



V0000 (None), Wall, All, Masonry, Entrance Vestibule (Location #: 6)
Brick wall



V0000 (None), Ceiling, All, Ceiling Tiles (lay-in), Entrance Vestibule (Location #: 6)
Date stamp- 04/15/11



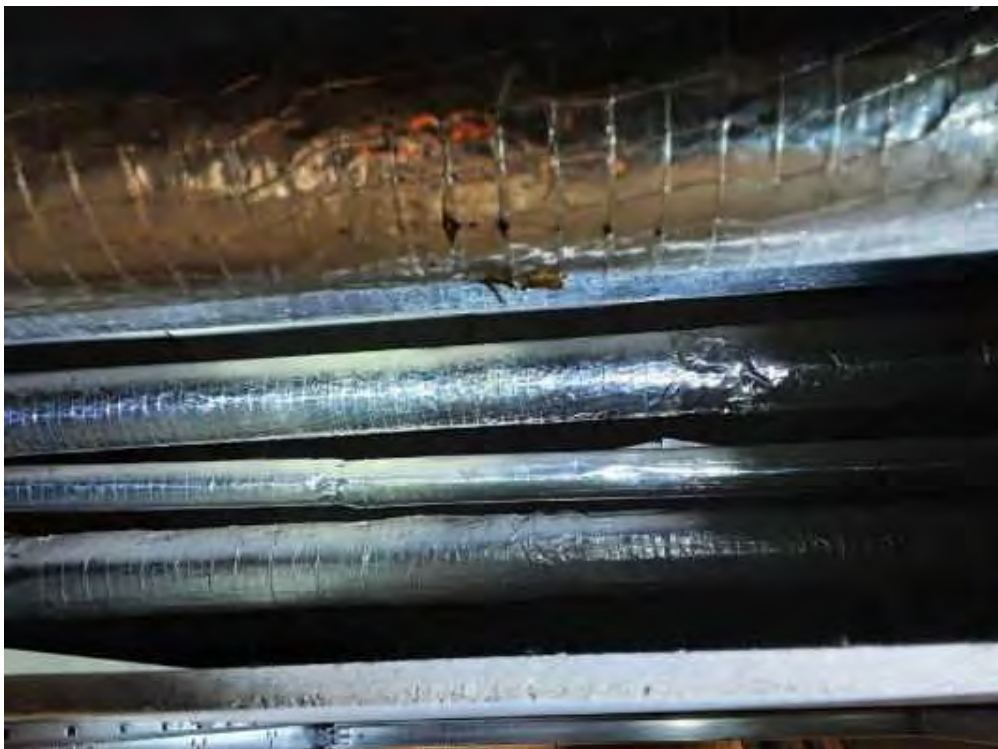
V0000 (None), Ceiling, All, Ceiling Tiles (lay-in), Entrance Vestibule (Location #: 6)
Date stamp- 04/15/11



V0000 (None), Structure, Beam, Metal, Entrance Vestibule (Location #: 6)



V0000 (None), Wall, Base, Vermiculite, Entrance Vestibule (Location #: 6)
1 drill hole, no vermiculite, NE wall, brick wall



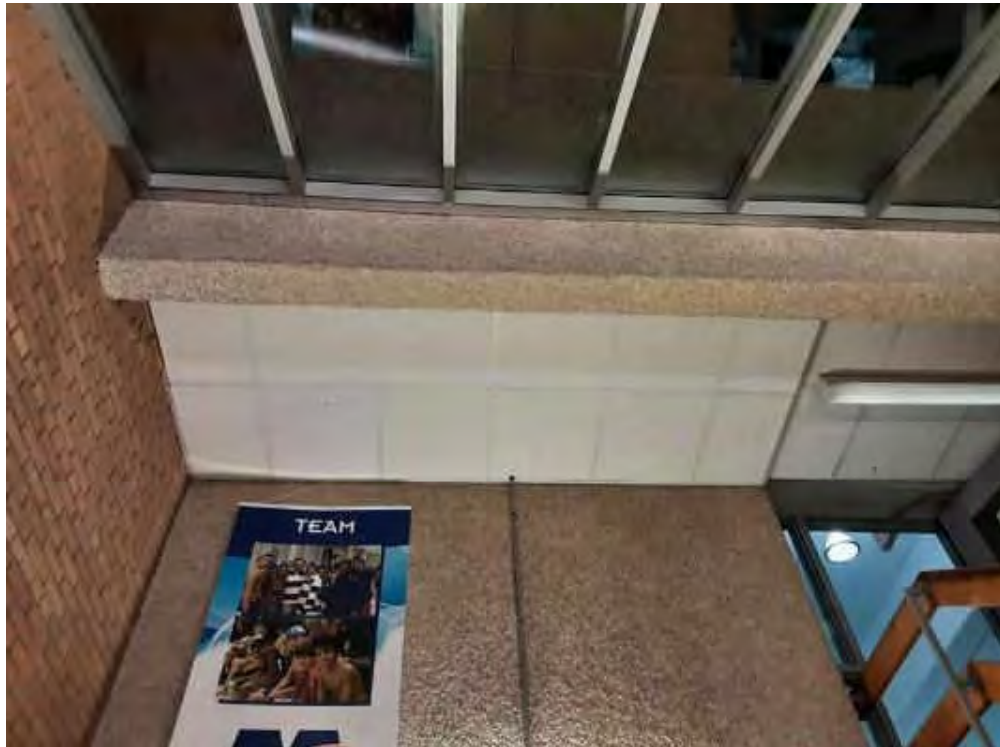
V0000 (None), Piping, All, Fibreglass, Lobby (Location #: 7)



V0000 (None), Structure, All, Con crete (precast), Lobby (Location #: 7)



V0000 (None), Ceiling, All, Ceiling Tiles (lay-in), Lobby (Location #: 7)
Date stamp- 04/15/11



V0000 (None), Ceiling, All, Ceiling Tiles (lay-in), Lobby (Location #: 7)
Date stamp- 04/15/11



V0000 (None), Ceiling, All, Ceiling Tiles (lay-in), Lobby (Location #: 7)
Date stamp- 04/15/11



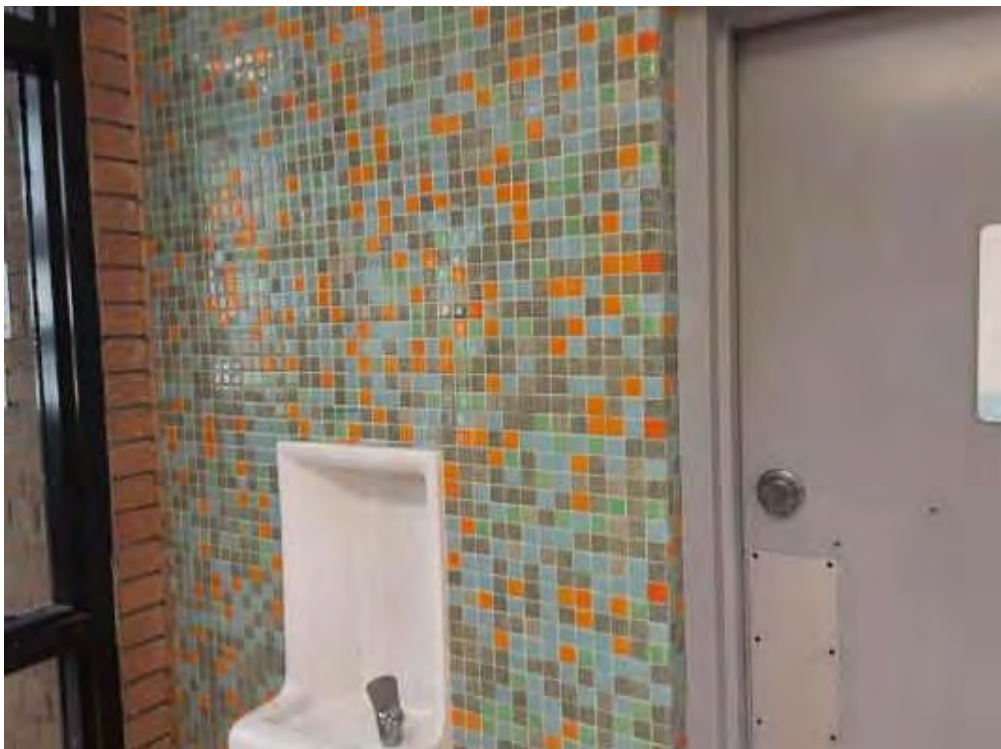
V0000 (None), Structure, Beam, Metal, Lobby (Location #: 7)



V0000 (None), Other, Skylight, Aluminum, Lobby (Location #: 7)
Glass windows



V0000 (None), Wall, Base, Vermiculite, Lobby (Location #: 7)
1 drill hole, no vermiculite, NW wall beside stairwell, brick



V0000 (None), Wall, Ceramic Tiles, Lobby (Location #: 7)



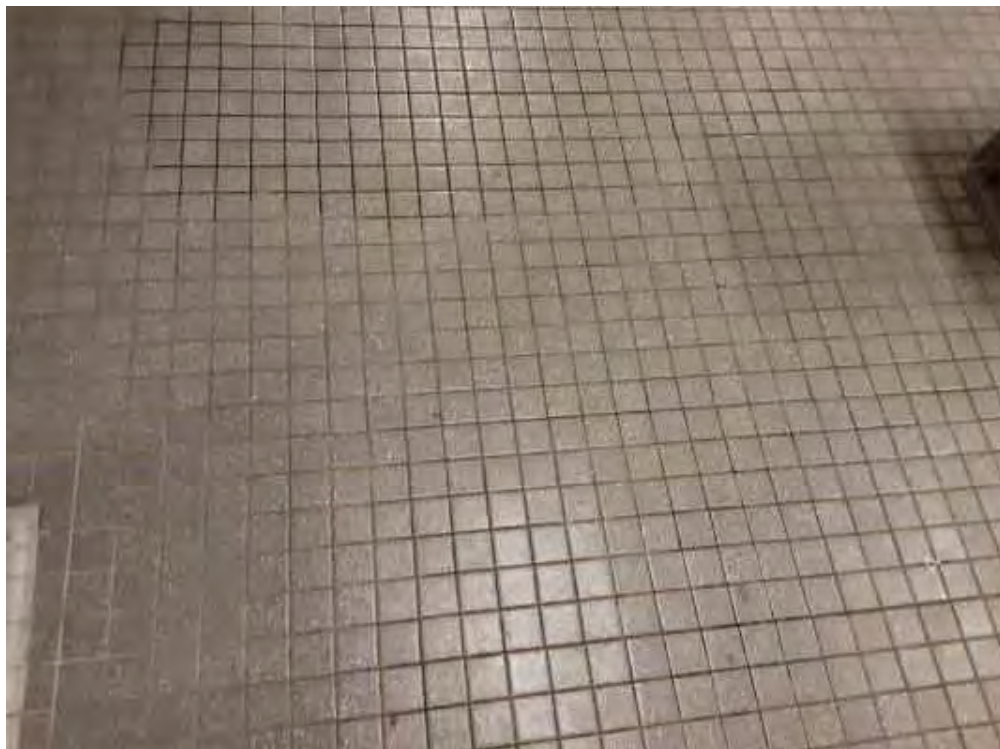
V0000 (None), Floor, All, Ceramic Tiles, Pool Office (Location #: 8)



V0000 (None), Piping, Rain Water Leader, Polyvinyl chloride (PVC), Men's Change Room (Location #: 9)



V0000 (None), Wall, All, Masonry, Men's Change Room (Location #: 9)
Block wall



V0000 (None), Floor, All, Ceramic Tiles, Men's Change Room (Location #: 9)



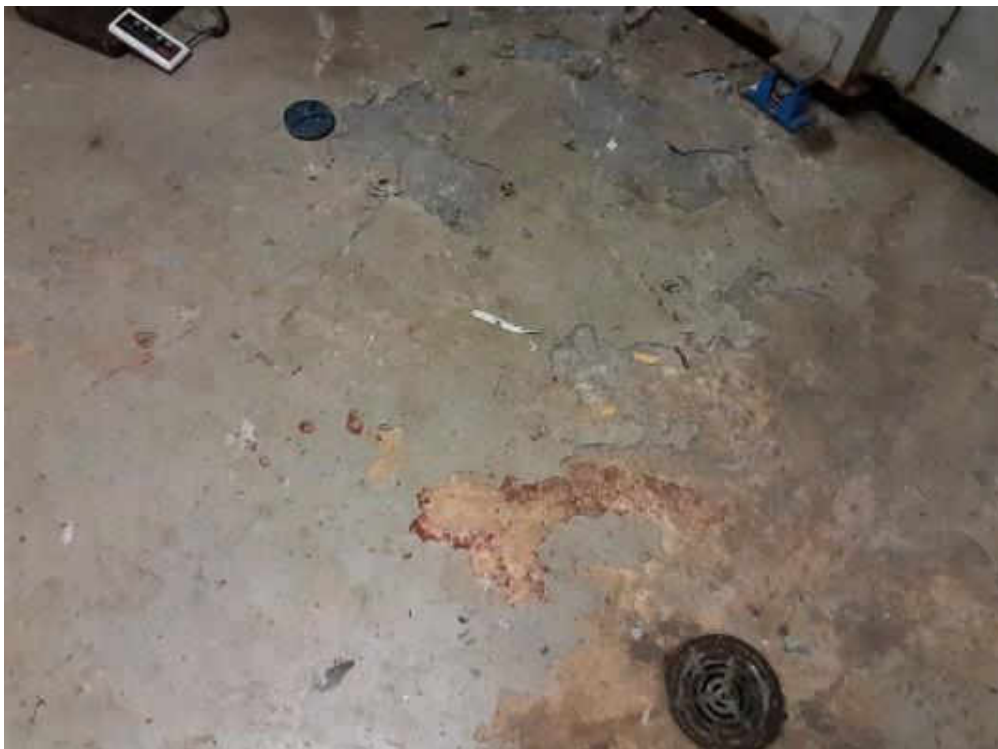
V0000 (None), Ceiling, Ceramic Tiles, Men's Change Room (Location #: 9)



Ceiling, Ceramic Tiles, Women's Change Room (Location #: 12)



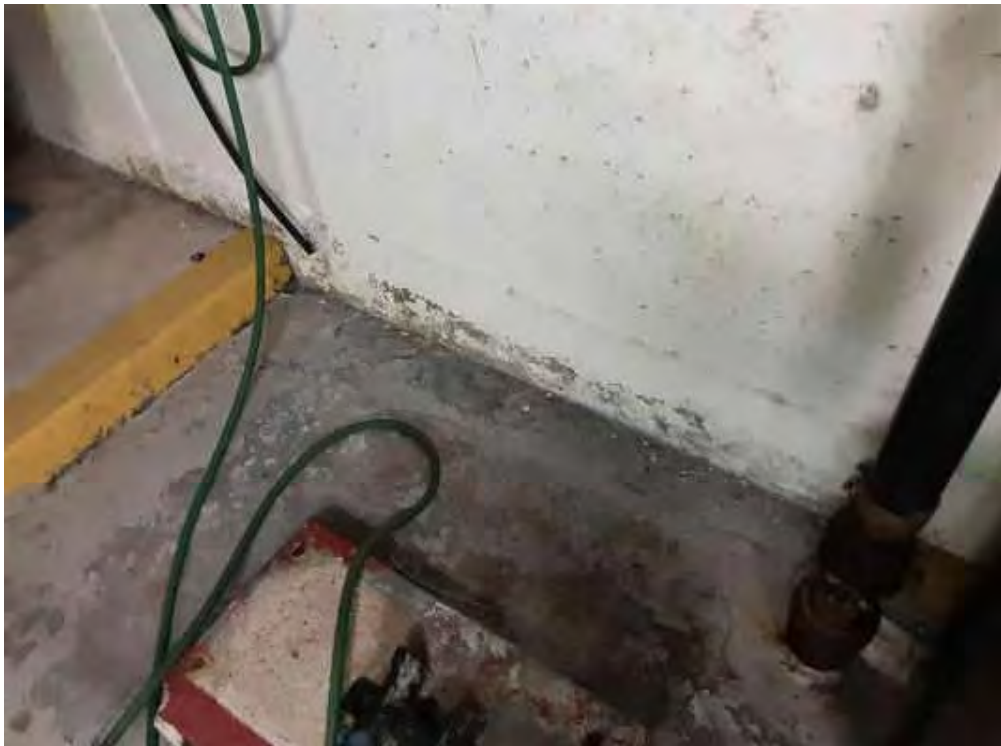
Duct, AI, None Found, Balcony (Location #: 4)



Concrete (poured), Grey, L0001(Lead (Low)), Fan Room (Location #: 1)



Concrete (poured), Grey, V0001(Lead (Low)), Filter Room (Location #: 2)



Concrete (poured), Light Grey, L0002(Lead (Low)), Filter Room (Location #: 2)



Concrete (poured), Light Grey, L0002(Lead (Low)), Filter Room (Location #: 2)



Concrete (poured), Red, L0003(Lead (High)), Filter Room (Location #: 2)



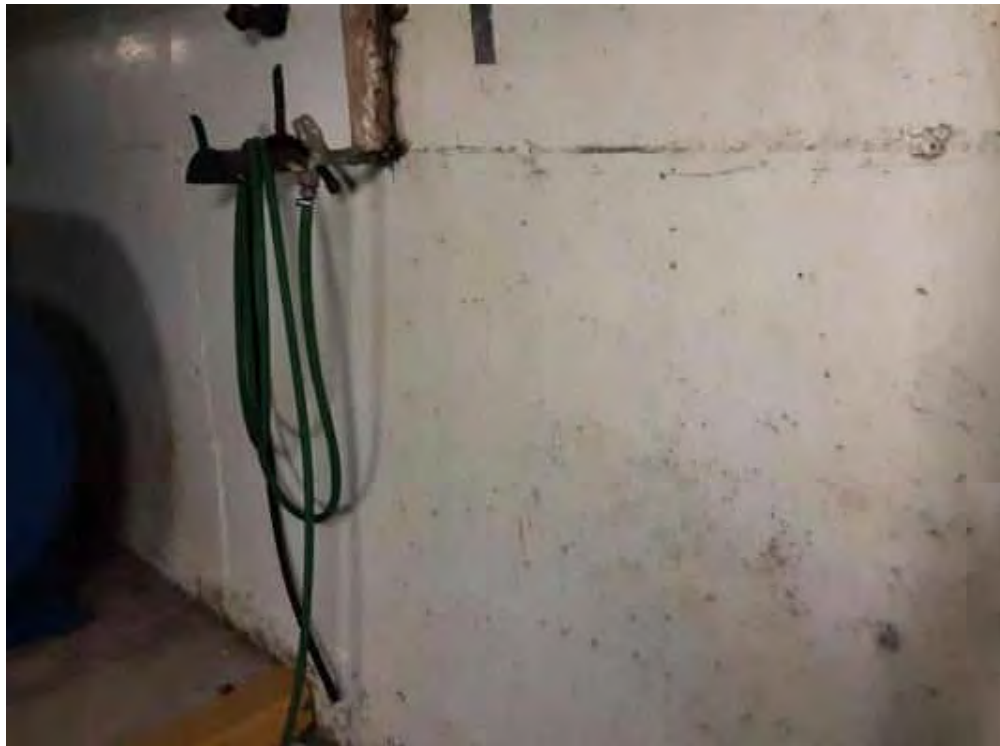
Metal, Off white, L0004(Lead (Low)), Filter Room (Location #. 2)



Metal, Off white, L0004(Lead (Low)), Filter Room (Location #. 2)



Masonry, Off white, L0005(Lead (Low)), Filter Room (Location #: 2)



Concrete (poured), white, L0007(Lead (High)), Filter Room (Location #: 2)



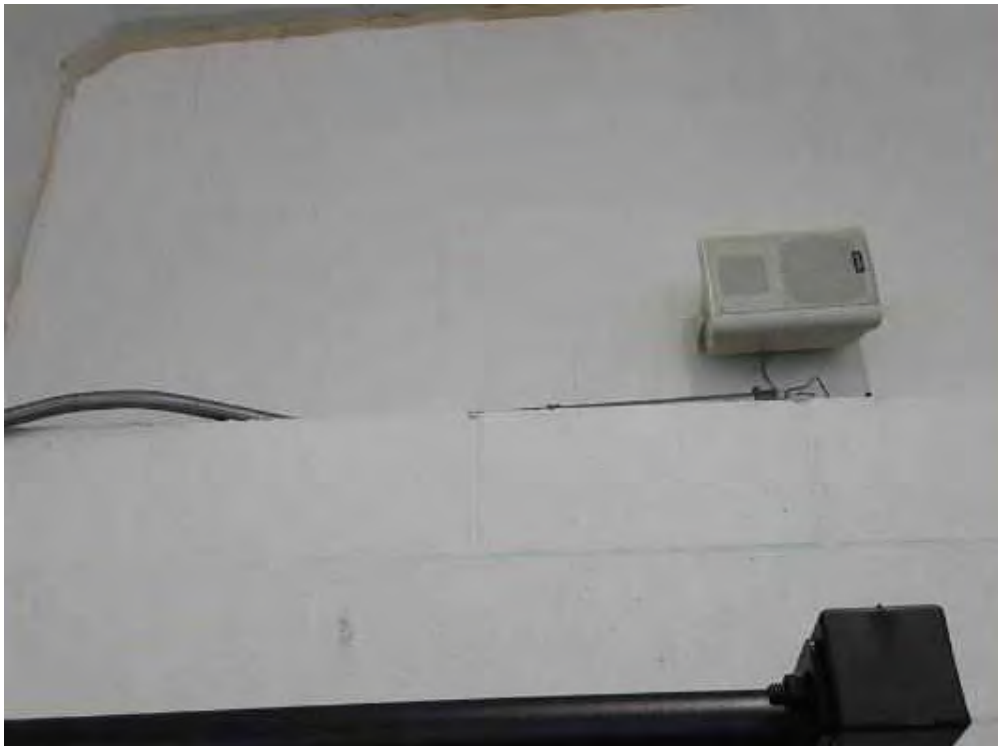
Concrete (poured), Yellow, L0006(Lead (High)), Filter Room (Location #: 2)



Concrete (poured), Yellow, L0006(Lead (High)), Filter Room (Location #: 2)



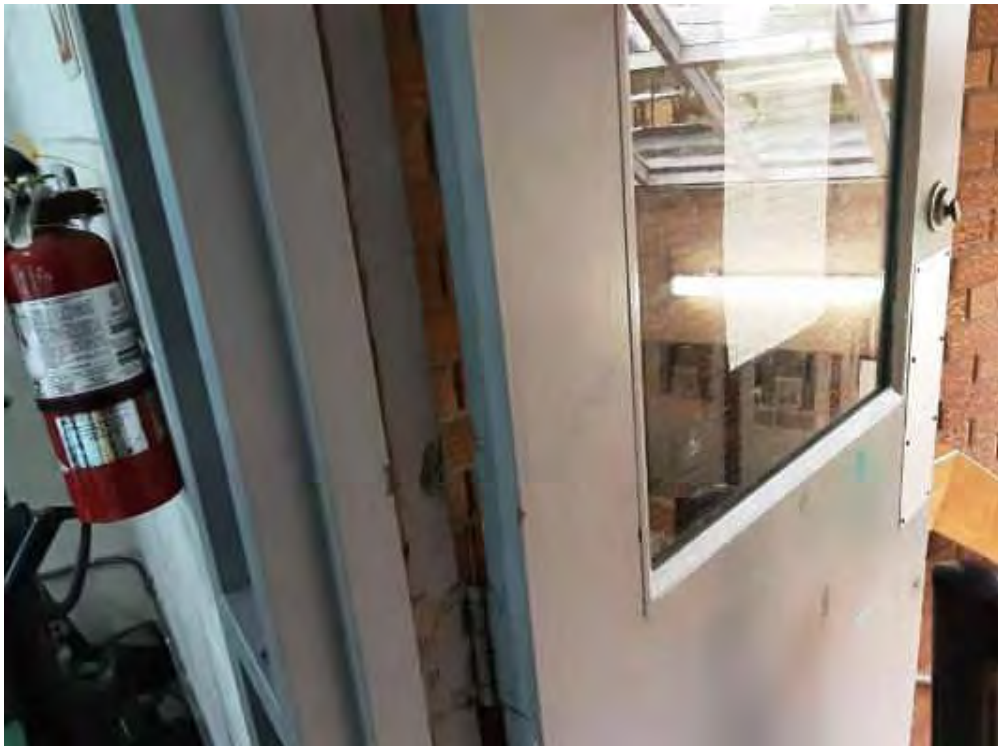
Masonry, Off white, L0008(Lead (Low)), Balcony (Location #: 4)



Masonry, Off white, L0008(Lead (Low)), Balcony (Location #: 4)



Concrete (poured), Dark grey, L0009, Balcony (Location #: 4)



Metal, Dark grey, L0012(Lead (High)), Balcony (Location #: 4)



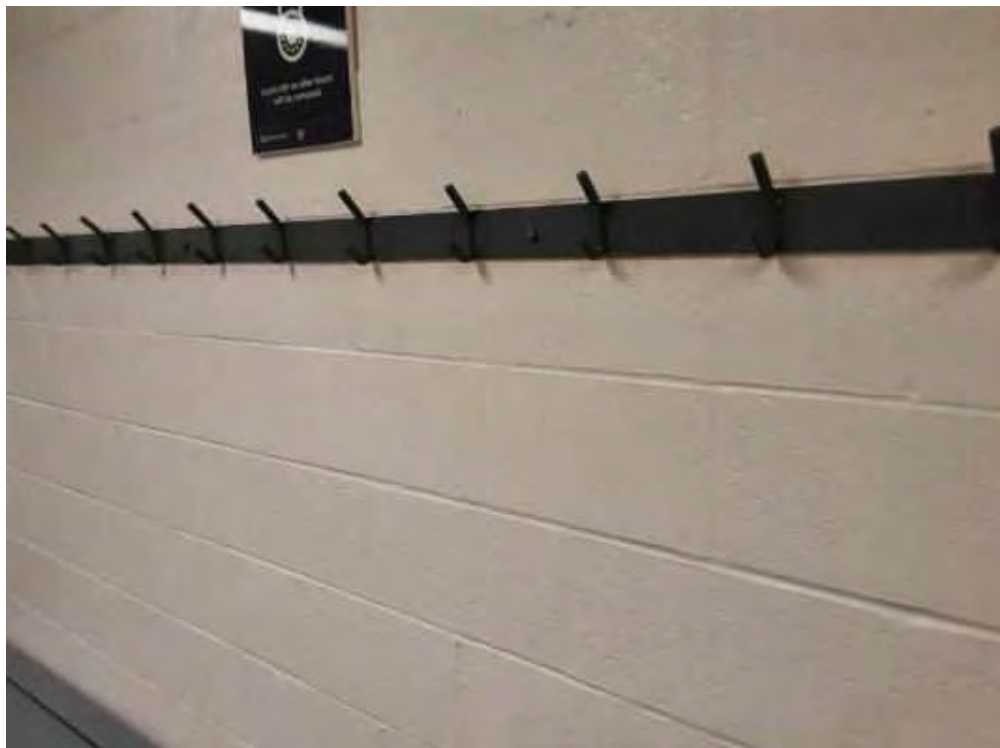
Masonry, Green, L0010(Lead (High)), Balcony (Location #: 4)



Concrete (poured), Black, L0011(Lead (High)), East Stairwell (Location #: 5)



Metal, Blue, L0016(Lead (High)), Pool Office (Location #: 8)



, , , Men's Change Room (Location #: 9)



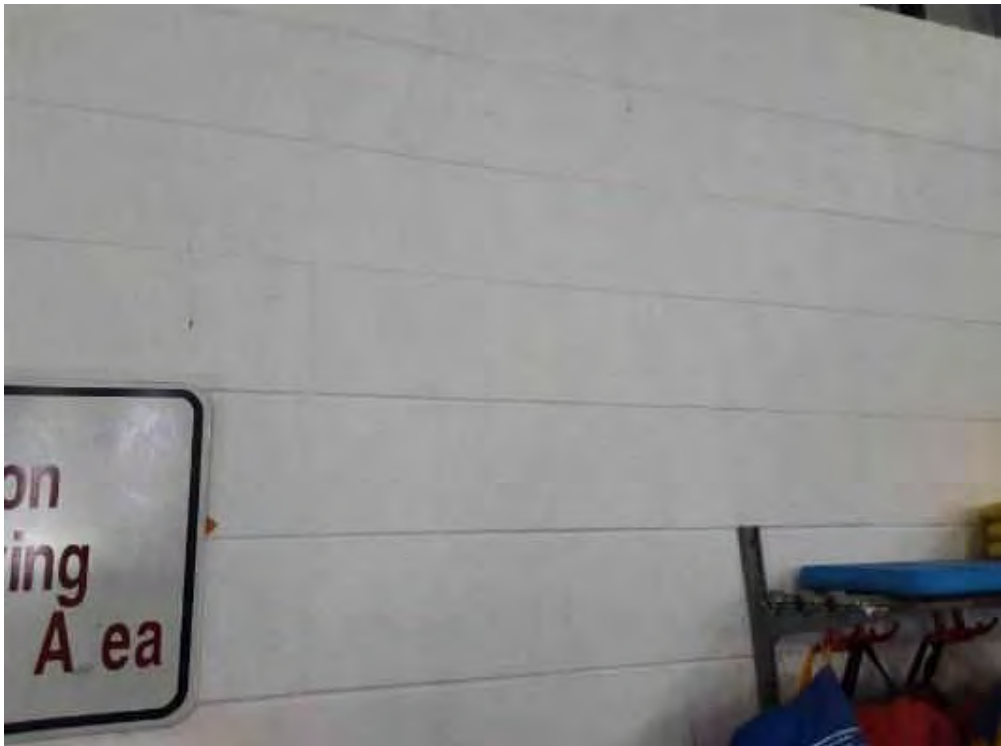
Masonry, Light beige, L0013(Lead (Low)), Men's Change Room (Location #: 9)



Masonry, Light beige, L0013(Lead (Low)), Men's Change Room (Location #: 9)



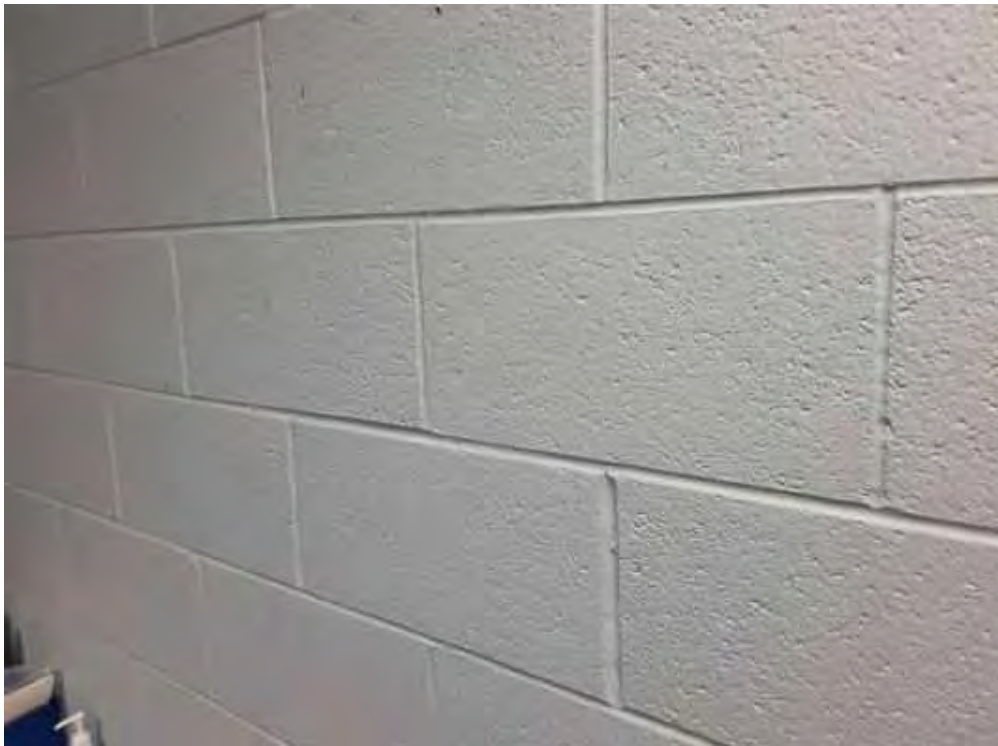
Masonry, White, V0012(Lead (High)), Women's Change Room (Location #: 12)



Masonry, Light beige, L0017(Lead (Low)), Indoor Pool (Location #: 13)



Masonry, Light beige, L0017(Lead (Low)), Indoor Pool (Location #: 13)



Masonry, Light grey, L0014, Supervisor Office (Location #: 15)



Masonry, White, V0012(Lead (High)), Equipment Room 2 (Location #: 20)



Concrete (poured), Grey, V0001(Lead (Low)), Mechanical Room And Stairwell (Location #: 21)



Metal, Grey, L0015(Lead (Low)), Mechanical Room And Stairwell (Location #: 21)



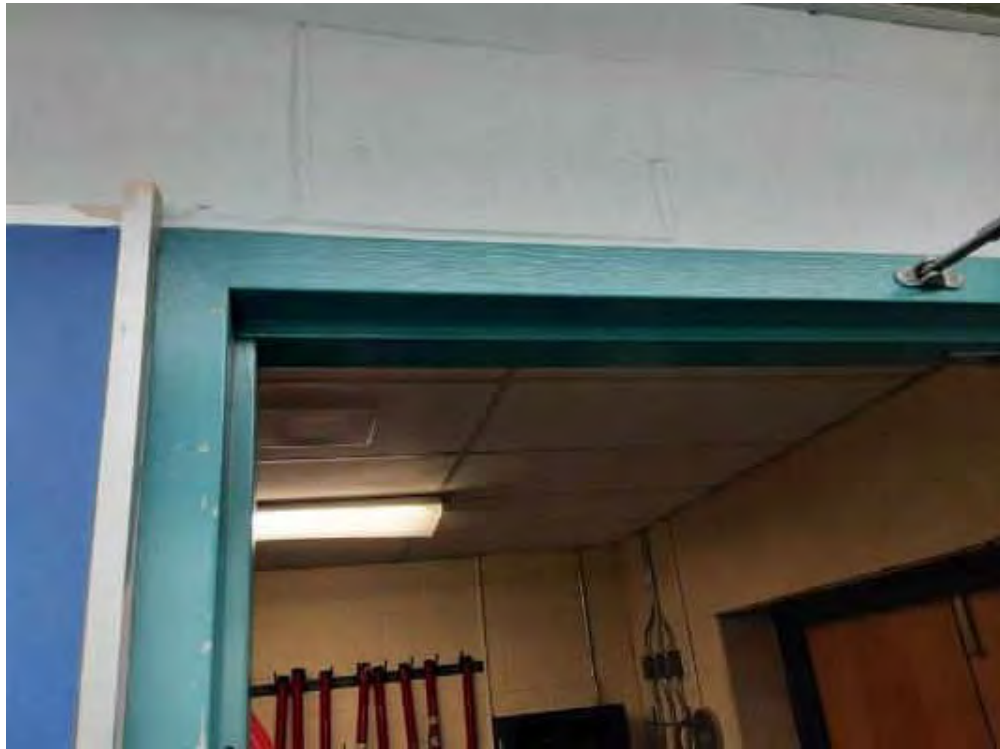
Metal, Grey, L0015(Lead (Low)), Mechanical Room And Stairwell (Location #: 21)



Metal, Red, V0003(Lead (High)), Mechanical Room And Stairwell (Location #: 21)



Metal, Yellow, V0006(Lead (High)), Mechanical Room And Stairwell (Location #: 21)



Metal, Light teal, L0021, Phys. Ed. Room (Location #: 24)



Metal, Dark teal, L0023, Phys. Ed. Room (Location #: 24)



Masonry, Beige, L0019(Lead (Low)), Gym Storage (Location #: 25)



Concrete (poured), Blue, L0020, Gym Storage (Location #: 25)



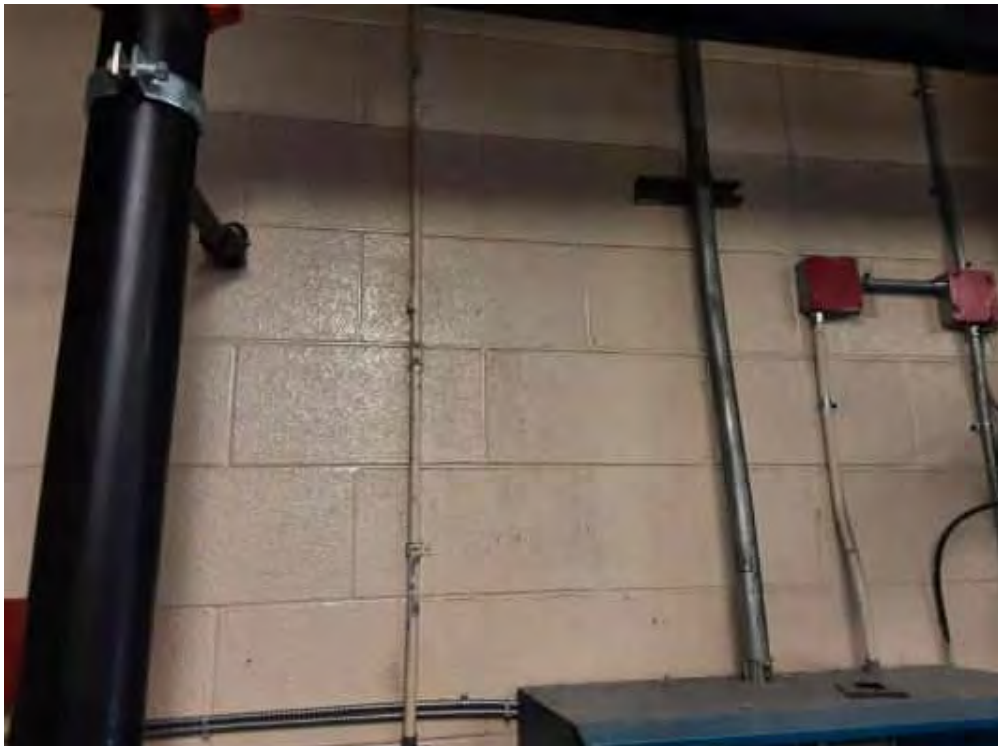
Concrete (poured), Teal, L0022(Lead (Low)), Store Room (Location #: 26)



Concrete (poured), Light beige, V0017(Lead (Low)), Corridor (Location #: 27)



Masonry, Light Yellow, L0025(Lead (Low)), Custodian (Location #: 29)



Masonry, Light Yellow, L0025(Lead (Low)), Custodian (Location #: 29)



Masonry, White, V0008(Lead (Low)), Custodian (Location #: 29)



Drywall and joint compound, Light yellow, L0024, Custodian (Location #: 29)



Pb Products, Tunnel Area (Location #: 3)



Pb Products, Balcony (Location #: 4)



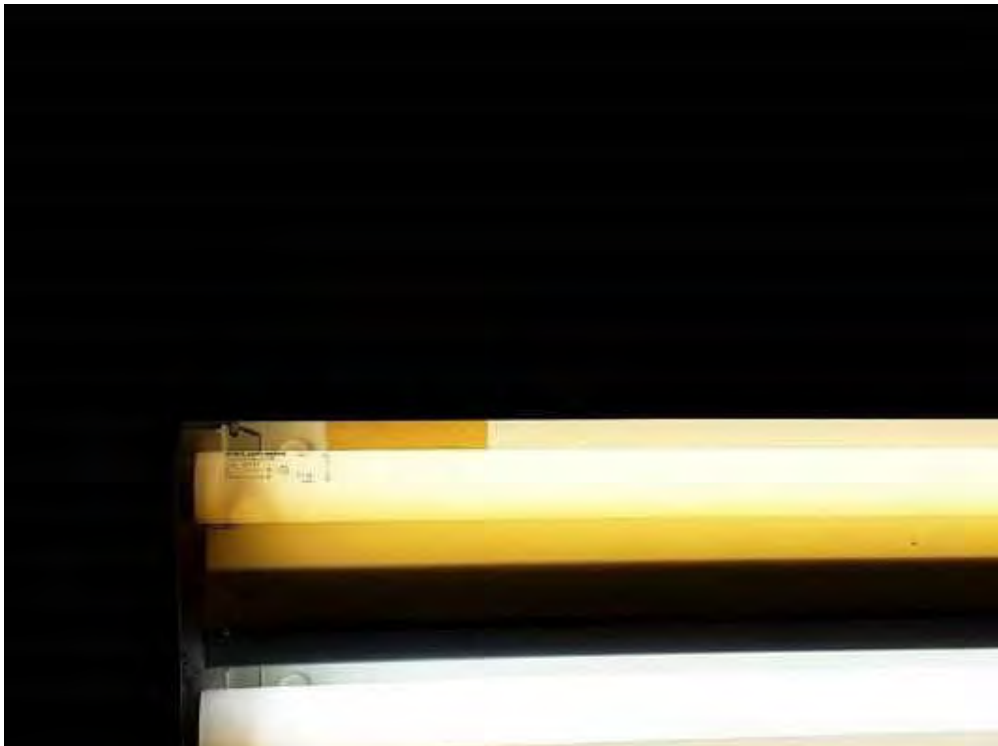
Pb Products, Women's Change Room (Location #: 12)



Pb Products, Women's Change Room (Location #: 12)



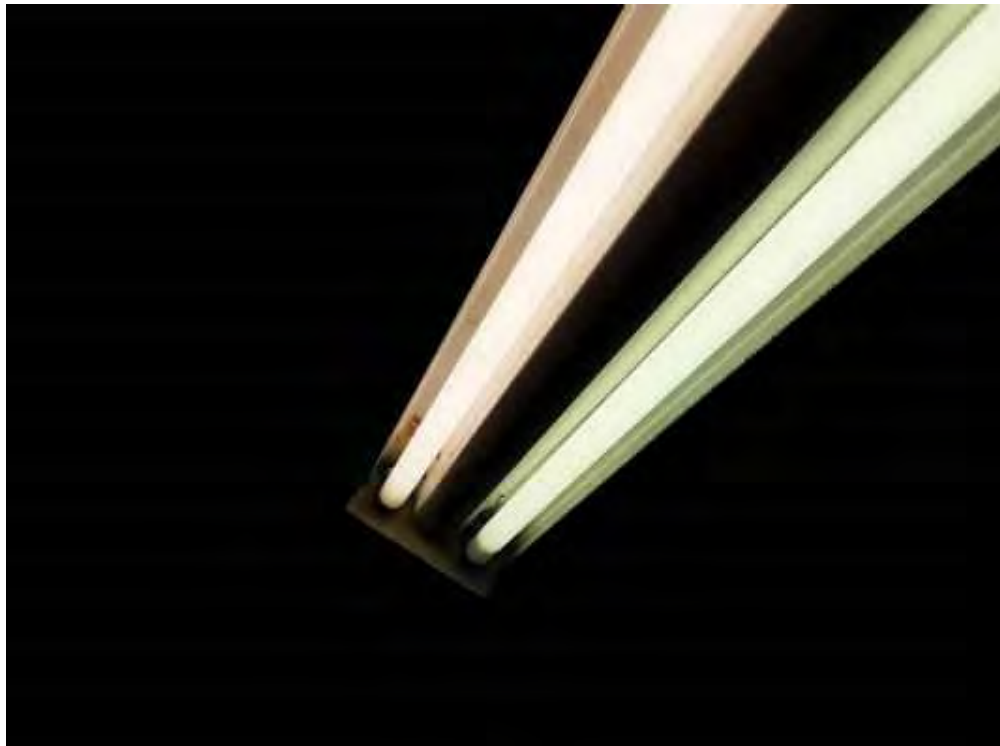
Pb Products, Indoor Pool (Location #: 13)



Mercury, Fan Room (Location #: 1)



Mercury, Filter Room (Location #: 2)



Mercury, Filter Room (Location #: 2)



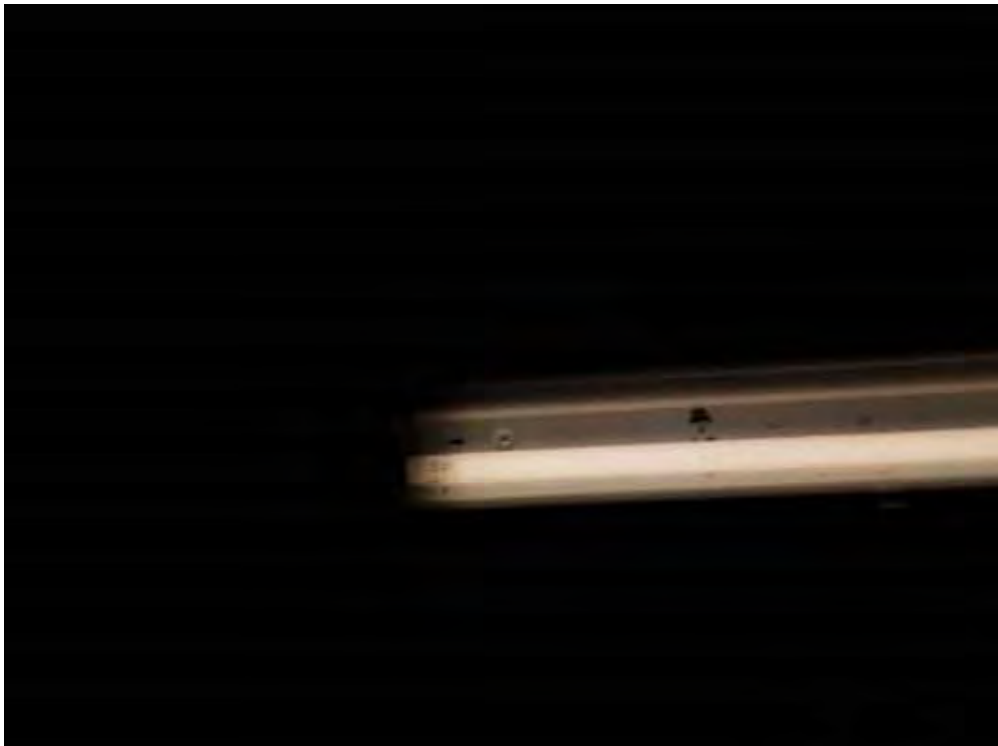
Mercury, Filter Room (Location #: 2)



Mercury, Filter Room (Location #: 2)



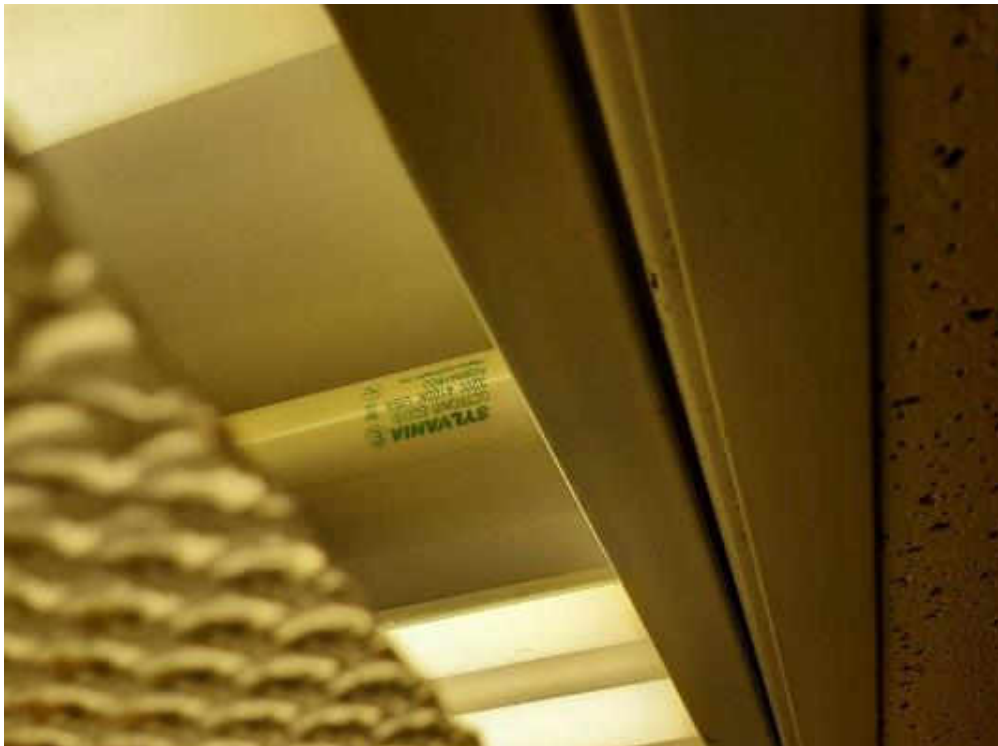
Mercury, Tunnel Area (Location #: 3)



Mercury, East Stairwell (Location #: 5)



Mercury, East Stairwell (Location #: 5)



Mercury, Entrance Vestibule (Location #: 6)



Mercury, Entrance Vestibule (Location #: 6)



Mercury, Men's Change Room (Location #: 9)



Mercury, Women's Change Room (Location #: 12)



Mercury, Women's Change Room (Location #: 12)



Mercury, Indoor Pool (Location #: 13)



Mercury, Indoor Pool (Location #: 13)



Mercury, Supervisor Office (Location #: 15)



Mercury, Equipment Room 2 (Location #: 20)



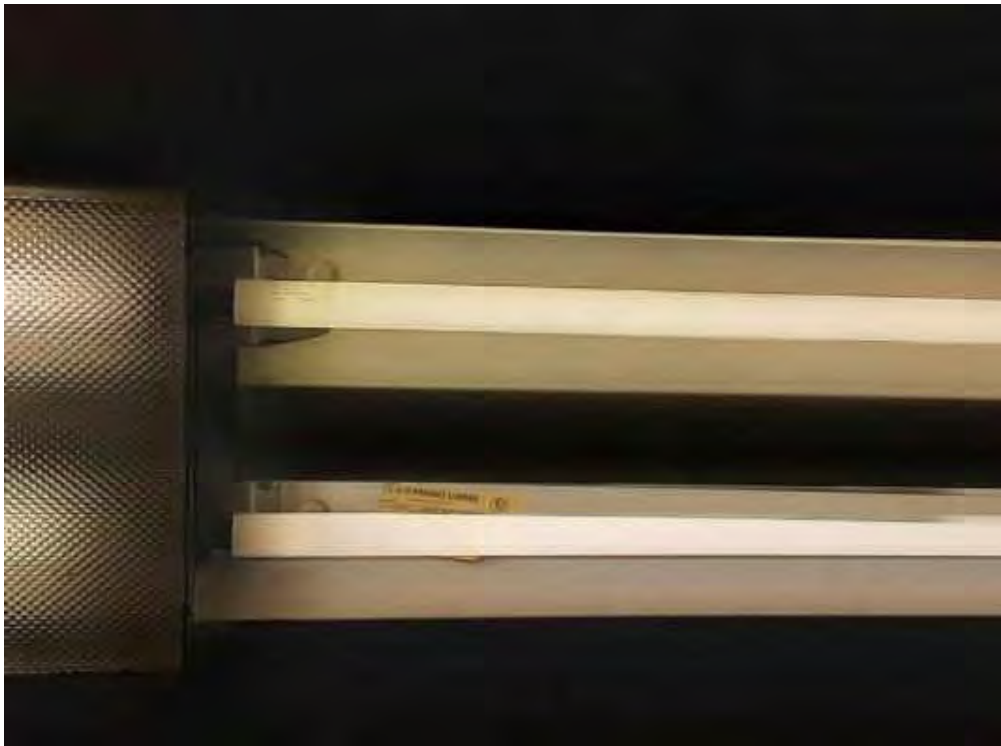
Mercury, Mechanical Room And Stairwell (Location #: 21)



Mercury, Mechanical Room And Stairwell (Location #: 21)



Mercury, Corridor (Location #: 27)



Mercury, Custodian (Location #: 29)



PCB, Balcony (Location #: 4)



PCB, Balcony (Location #: 4)



PCB, Balcony (Location #: 4)



PCB, Entrance Vestibule (Location #: 6)



PCB, Entrance Vestibule (Location #: 6)



PCB, Exterior (Location #: 14)



PCB, Exterior (Location #: 14)



PCB, Exterior (Location #: 14)



PCB, Lower Roof (Location #: 17)



Tunnel Area (Location #: 3)



Balcony (Location #: 4)



Lower Roof (Location #: 17)



Lower Roof (Location #: 17)



Pool roof (Location #: 18)



Pool roof (Location #: 18)

1 General

1.1 **SECTION INCLUDES**

- .1 Labour, Products, equipment and services necessary for demolition and removals Work in accordance with the Contract Documents.
- .2 Work included: Requirements for demolishing, salvaging and removing wholly or in part the various items designated on the drawings or required to be removed or partially removed for the receipt of the Work of this Contract, including not necessarily limited to:
 - .1 Partial removal of existing roofing system in preparation for a new roof membrane system in accordance with Section 07 50 00.
 - .2 Alteration and renovations to existing building.
 - .3 Cutting and removing of walls, floors, ceilings, doors and frames, in the existing buildings as indicated on Drawings.
 - .4 Patching, making good openings and chases in walls, floors, ceilings, including the supply and installation of lintels, channels and finishes.
 - .5 Removal of rubbish, debris, demolished fixtures, fitments and items not scheduled to remain the Owner's property, resulting from the demolition and preparatory work.
 - .6 Remove abandoned services such as conduits, pipes, wiring, ducts, fixtures, equipment, etc. where required for the work or indicated on the drawings.
 - .7 Removal of asphalt pavements, concrete curbs and walks, and other site amenities as indicated on drawings.
 - .8 Removal of all mechanical items including plumbing fixtures, services etc. where required for the work or indicated on drawings and or where not required to be relocated.
 - .9 Removal of existing electrical items including fixtures, etc. where required for the work or indicated on the drawings and not required to be relocated.
 - .10 Dust control during the operations of the work of this Section.
 - .11 Removal shall mean removal from site and safe disposal in a legal manner.

1.2 **REFERENCES**

- .1 CSA S350-M, Code of Practice for Safety in Demolition of Structures.
- .2 OPSS, Ontario Provincial Standard Specification.

1.3 **SUBMITTALS**

- .1 Where required by Authorities having jurisdiction, submit a Fire Plan to local fire department for review and approval.
- .2 Submit shop drawings, diagrams and details in accordance with Section 01 33 00.
- .3 30 calendar days prior to start of demolition and removals work, submit for review, drawings, diagrams or details showing sequence of disassembly work of supporting structures in accordance with authorities having jurisdiction.

- .4 Submit for approval, a plan showing impacts, interruptions and delays to Owners operations.
- .5 Have submissions signed and sealed by Professional Engineer licensed in Province of Ontario.
- .6 Submit to Consultant, details of where rubble, debris and other materials are to be disposed or reused. Include each disposal/reuse site location, operator's name and business address, type of license under which site operates, and criteria used by site to assess suitability of rubble, debris and other materials for disposal.
- .7 Give notice to Utility Authorities controlling services and appurtenances which will be affected by demolition work.

1.4 **QUALITY ASSURANCE**

- .1 Prepare waste audits, waste reduction workplans, source separation programs and recycling programs as required by jurisdictional authorities and update programs and implement such programs as required.
- .2 Perform the work of this section in accordance with the 'Environmental Protection Act' including Ontario Regulation 102 and the 'Environmental Assessment Act' including Ontario Regulation 103.
- .3 Conform to Fire Code, Regulation under the Fire Marshals Act.
- .4 The demolition contractor must engage a registered professional engineer who holds a certificate of authorization and an appropriate level of liability insurance to prepare demolition procedures.
- .5 As part of the contract requirements, the engineer for the demolition contractor should be required to sign the general review commitment required by city building departments.

1.5 **SITE CONDITIONS**

- .1 Interruptions to Owners operations will not be permitted.
- .2 Perform operations, machine and equipment movements, deliveries and removals at time or times that will permit uninterrupted operations in and around structures, including parking, deliveries, and Site access and egress.
- .3 Take over structures to be demolished based on condition on date that Tenders close.
- .4 Do not remove existing roofing membrane when weather conditions threaten the integrity of the building contents or intended continued occupancy.

2 Products

2.1 **MATERIALS**

- .1 All materials requiring removal shall become the Contractor's property and shall be removed and disposed of from the site, as the work progresses, unless indicated otherwise.
- .2 Salvaged material:
 - .1 Salvage and stockpile Products, materials, and equipment as specified herein, indicated on Site or indicated on drawings.
 - .2 Coordinate items to be salvaged with Consultant.
 - .3 Salvaged materials shall not be chipped, cracked, split, stained or damaged.
 - .4 Store items off of moist surfaces.

3 Execution

3.1 **GENERAL**

- .1 Clean up rubble and debris, resulting from work promptly and dispose at end of day or place in waste disposal bins. Empty bins on regular basis.
- .2 Stockpiling of rubble, debris, and surplus Products on Site will not be permitted.
- .3 Remove, handle and transport Products indicated to be salvaged and stored for future use. Transport Products to storage area(s) designated by Consultant. Perform work to prevent any damage to Products during removal and in storage. Products damaged during removal, will be inspected by Consultant. Consultant will determine extent of damage and accept or refuse Products.
- .4 List and description of items to be removed and stored or reused:
 - .1 Exterior signage
 - .2 Power door operators
 - .3 Irrigation system controls
 - .4 Refer to Drawings for all items indicated or by the Consultant.
- .5 Tag and log all items to be salvaged to the satisfaction of the Consultant. Ensure identification tags do not damage items to be salvaged and are non-permanent, removable and durable.
- .6 Take precautions to guard against movement, settlement or collapse of adjacent services, sidewalks, driveways, or trees. Be liable for such movement, settlement or collapse caused by failure to take necessary precautions. Repair promptly such damage when ordered.

3.2 **EXAMINATION**

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.
- .2 Examine adjacent structures and other installations prior to commencement of demolition and removals work.
- .3 Verify that existing roof surface is clear and ready for work of this section.

3.3 **PRESERVATION OF REFERENCES**

- .1 Record location and designation of survey markers and monuments located within demolition area, prior to removal. Store and restore markers and monuments upon completion of Work or relocate as directed by Consultant.

3.4 **PROTECTION**

- .1 Prevent movement or damage of adjacent structures, parts of existing structure to remain. Supply and install bracing, as required. Make good damage caused by demolition to acceptance of Consultant.
- .2 Protect adjacent structures and property against damage which might occur from falling debris or other causes. Repair or replace damage caused from work of this Section to acceptance of Consultant.
- .3 Do not interfere with use of adjacent structures and Work areas. Maintain free, safe passage to and from adjacent structures and Work areas.
- .4 Take precautions to support affected structures. If safety of structure being demolished, adjacent structures or services are endangered, cease demolition operations and take necessary action to support endangered item. Immediately inform Consultant. Do not resume demolition until reasons for endangering have been determined and corrected and action taken to prevent further endangering.
- .5 If movement or settlement occurs, install additional bracing as necessary and make good damage to acceptance of Consultant.
- .6 Hang tarpaulins where debris and other materials are lowered. Build in around openings with wood and plywood at locations used for removal of debris and materials.
- .7 Prevent debris from blocking surface drainage system, elevators, mechanical, and electrical systems which are required to remain in operation.
- .8 Pay particular attention to prevention of fire and elimination of fire hazards which would endanger Work or adjacent structures and premises.

- .9 Supply and install adequate protection for materials to be re-used, set on ground and prevent moisture pick-up. Cover stockpiles of materials with tarpaulins.
- .10 Close off access to areas where demolition is proceeding by barricades and post warning signs.
- .11 Supply, install and maintain legal and necessary barricades, guards, railings, lights, warning signs, security personnel and other safety measures, and fully protect persons and property.
- .12 Dust/weather partitions:
 - .1 Prior to demolition work proceeding in existing structures, temporarily enclose Work areas, access and supply and install dustproof [and weatherproof] partitions. Design partitions to prevent dust and dirt infiltration into adjoining areas, prevent ingress of water, and to resist loads due to wind.
 - .2 Prevent dust, dirt and water from demolition operations entering operational areas.
 - .3 Adjust and relocate partitions as required for various operations of work.
 - .4 Upon completion of work, remove and dispose of partitions from Site.
- .13 Blasting is not permitted.

3.5 **PREPARATION**

- .1 Disconnect and/or re-route electrical data, communication and telephone service lines entering structures to be demolished. Remove abandoned lines as indicated on Contract Drawings. Post warning signs on electrical lines and equipment which is required to remain energized.
- .2 Disconnect and cap designated mechanical services:
 - .1 Natural gas supply lines: As indicated on drawings, to be removed by gas company.
 - .2 Sewer and water lines: Remove and dispose of as indicated on Contract Drawings.
 - .3 Other underground services: Remove and dispose of as indicated on Contract Drawings.
- .3 Disassemble and remove mechanical equipment, ductwork and piping complete with supports and associated components.
- .4 Do not disrupt active or energized utilities designated to remain undisturbed traversing premises.
- .5 Perform rodent and vermin control to comply with health regulations.

3.6 CONCRETE CUTTING AND CORING

- .1 Prior to cutting or coring any concrete slab, suspended or on grade, or any concrete beam, investigate by telemetrically scanning the element for presence of embedded services (piping, cabling, conduit, etc.), and for locations of reinforcing steel in suspended concrete slabs and beams.
- .2 Acceptable telemetric scanning systems include:
 - .1 X-Ray scanning of suspended slabs and for concrete beams.
 - .2 (Ground-penetrating) radar for slab on grade, for suspended slabs and for concrete beams.
- .3 Magnetic radio scanners not acceptable for telemetric scanning.
- .4 The term x-rays include gamma ray methods, and procedures that use electrically generated x-rays.
- .5 Where x-rays employed:
 - .1 Provide Owner minimum 5 working days advance notice of scanning time in order to provide sufficient advance notice to personal that may be affected by the x-ray work.
 - .2 Conform to Owner's radiation protection requirements prior to start of any x-ray work.
- .6 Provide Owner and Consultant with inspection agency's written report, summarizing investigations and conclusions.
- .7 Obtain Consultant's direction where investigations reveal that cutting or coring required in Contract would cut or damage embedded services, or cut or damage reinforcing steel in suspended concrete slabs or beams.
- .8 Execute cutting and coring to prevent damage to all embedded services. Make good all damage arising from cutting embedded services.
- .9 Execute cutting and coring to prevent damage (cutting in whole or in part) reinforcing steel in suspended concrete slabs with Consultant's prior authorization.
- .10 Make good all damage arising from cutting reinforcing steel in suspended concrete slabs and beams.

3.7 DEMOLITION

- .1 Perform demolition with extreme care. Confine effects of demolition to those parts which are to be demolished.
- .2 Perform work and prevent inconvenience to persons outside those parts which are to be demolished.
- .3 Carry out demolition in accordance with the requirements of CSA S350-M.

- .4 Demolish parts of structure to permit remedial work as indicated.
- .5 Demolish foundation, walls and footings, and concrete floors below or on grade within areas shown on Contract Drawings.
- .6 Demolition shall proceed safely in systematic manner from roof to grade and as necessary to accommodate remedial work indicated. Work on each floor level shall be complete before commencing work on supporting structure and safety of its supports are impaired. Parts of building which would otherwise collapse prematurely shall be securely shored. Walls and piers shall not be undermined.
- .7 Complete Work in existing building within hours indicated in the Conditions of the Contract.
- .8 For buildings without basement, remove concrete slabs or wood floor construction at grade level.
- .9 Do not overload floor or wall with accumulations of material or debris or by other loads.
- .10 Perform work to minimize dusting. Keep work area wetted down with fog sprays to prevent dust and dirt rising. Supply and install temporary water lines and connections that may be required. Upon completion, remove installed temporary water lines. Use covered chutes, water down.
- .11 Do not sell or burn materials on Site.
- .12 Remove existing equipment, services, and obstacles where required for refinishing or making good of existing surfaces, and replace as Work progresses.
- .13 At end of day's work, leave Work in safe condition with no part in danger of toppling or falling. Protect interiors of parts not to be demolished from exterior elements.
- .14 Drainage and sewer system protection:
 - .1 Ensure that no dust, debris or slurry enters drainage and sewer system on Site.
 - .2 Remove and dispose of debris and slurry promptly from Site.
 - .3 Comply with City of Mississauga Sewer Use By-Law.
- .15 Asphalt pavement:
 - .1 Break out and remove existing asphalt pavement, curbs and sidewalks within confines of Work as shown on Contract Drawings.
 - .2 Square up adjacent surfaces to remain in place by saw cutting or other methods acceptable to Consultant to avoid damage to remaining pavement.
 - .3 Protect adjacent joints and load transfer devices.
 - .4 Protect underlying granular materials.

- .16 Concrete:
 - .1 Demolish concrete by methods which avoid impact loads on items which are not to be demolished.
 - .2 Where only part or parts of a concrete floor, wall, roof, foundation or other items are to be demolished, use saw cuts to isolate areas which are to be demolished except where existing reinforcing steel is to be left in place. Prior to such isolating, install suitable support to prevent premature movement of area(s) being isolated and undesirable transfer of loads as cutting progresses. If necessary remove area(s) to be demolished by successively isolating small sections.
 - .3 Where reinforcing steel is to be left in place, use saw cuts from surface of concrete around perimeter(s) of area(s) to be demolished, chip concrete without damaging reinforcing steel. Retouch damaged epoxy coating of existing reinforcing steel.

- .17 Masonry:
 - .1 Demolish block or brick walls in small sections of not more than 2 m². Do not permit masonry to fall in mass from one level to another.
 - .2 Where only part(s) of a wall is to be demolished, install adequate support for adjacent part(s).
 - .3 After removal of masonry walls, grind smooth floors ready for new floor finish.

- .18 Masonry paint removal: Brush, roll or spray paint remover paste over surface to be stripped in accordance with Consultant's recommendations and manufacturer's written instructions. Wash stripped surface with clean water.

- .19 Steel: Where only part or parts of structure is to be demolished, dismantle and maintain structure stable. Do not place excessive loads on components. Install adequate temporary guys and supports to ensure stability and to prevent excessive loading. Support each component being disconnected from structure, and lower, do not drop, component after it is disconnected.

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

- .21 Where doors are scheduled to be removed, include:
 - .1 Removal in re-usable condition of doors and door hardware, and store at the Place of the work.
 - .2 Removal of door frames.

- .22 Remove interior partitions, fittings, fixtures and accessories as indicated on drawings. Partitions and walls shall be removed full height to structure above.

- .23 Remove interior finishes, such as ceiling and floor finishes, where new finishes are indicated on Room Finish Schedule.
 - .1 Removal of existing ceilings shall include complete removal including bulkheads and suspension system.

- .2 Removal of adhesive applied finishes shall include complete removal to substrate including adhesive. Take adequate care to prevent damage to substrate.
- .24 Remove existing floor finishes, include mortar bed, underlayment or other cleavage membranes, underpad, base, floor moulding and transition strips.
- .25 Break out and dispose of terrazzo and concrete base back to divider strip. Approximate thickness of concrete base is 22 mm and terrazzo is 16 mm.
- .26 Where floor finishes are scheduled to be removed, include stripping of all adhesive, underlayment or other cleavage membranes and leave sub-base, flush, smooth and level suitable for new floor finish.
- .27 Where acoustic ceiling tiles are indicated for removal and subsequent reinstallation, the tile are to be removed and stored on site in a dry and safe location approved with the Consultant and Owner. The suspension system and framing is to be removed only as required for work above the ceiling, and subsequently re-installed with the ceiling tiles.
- .28 Demolish all other items indicated or required.

3.8 **RECYCLING**

- .1 Whenever possible, all materials shall be recycled. Pay all costs for this work.
- .2 Deliver to nearest appropriate recycling depot all materials accepted for recycling by Authorities having jurisdiction over the Place of Work, including but not limited to cardboard, paper, plastic, aluminum, steel, and glass.
- .3 Deliver to nearest appropriate depot all scrap and excess gypsum wallboard for recycling of this material.
- .4 Ceiling tiles to be stacked on skids and wrapped for recycling and delivered to nearest appropriate recycling depot.
- .5 Carpet tile to be recycled by Viking Recycling or by Interface (only when a new order is placed).
- .6 Base building light fixture lamps to be placed on skids and wrapped for recycling and delivered to nearest appropriate recycling depot.

3.9 **DISPOSAL OF MATERIALS**

- .1 Remove from Site, rubble, debris, and other materials that can not be recycled resulting from demolition and removals work in accordance with Authorities having Jurisdiction, except where specified or indicated on Contract Drawings to be reused.

- .2 Conform to requirements of municipality's Works Department regarding disposal of waste materials.
- .3 Materials prohibited from municipality waste management facilities shall be removed from Site and dispose of at recycling companies specializing in recyclable materials.

3.10 **RESTORATION**

- .1 Where demolition removed a structure or installation, rough grade and restore area in accordance with Authorities having Jurisdiction.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for masonry work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM A167, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.

.2 ASTM A1064/A1064-M, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.

.3 ASTM C207, Specification for Hydrated Lime for Masonry Purposes.

.4 CAN/CSA A82, Fired Masonry Brick Made From Clay or Shale.

.5 CSA A165 Series, CSA Standards on Concrete Masonry Units.

.6 CSA A179, Mortar and Grout for Unit Masonry.

.7 CSA A370, Connectors for Masonry.

.8 CSA A371, Masonry Construction for Buildings.

.9 CAN/CSA A3001, Cementitious Materials for Use in Concrete.

.10 CSA G30.18, Carbon Steel Bars for Concrete Reinforcement.

.11 CSA S304, Design of Masonry Structures.

1.3 **DESIGN REQUIREMENTS**

.1 Design unit masonry in accordance with following Climatic Design Data for Mississauga contained in the Ontario Building Code:

.1 Design temperature: January 1%, July 2 1/2%.

.2 Hourly wind pressures: 1 in 50 year occurrence.

.3 Seismic design: Class “[...]”.

1.4 **SUBMITTALS**

.1 Shop drawings:

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

.2 Wall sections and details, reinforcing and anchors, special detailing, patterning and locations of control joints.

- .2 Samples:
 - .1 Submit samples in accordance with Section 01 33 00:
 - .2 Submit samples of each type and colour of masonry unit used prior to placing order.
 - .3 Submit samples of coloured mortar to match masonry samples.
 - .4 Submit samples of masonry anchors, and ties.
 - .5 Submit 250 x 200 mm samples of dampproof course and flashing.
- .3 Quality control submittals: Submit manufacturer's certificates stating that materials supplied are in accordance with this Specification.

1.5 **QUALITY ASSURANCE**

- .1 Provide plain and reinforced masonry in accordance with CSA A370, CSA A371, and CSA S304.
- .2 Retain a licensed Professional Engineer, registered in Province of Ontario, to perform following services for unit masonry work:
 - .1 Design of unit masonry work.
 - .2 Design of brick ties and anchors.
 - .3 Review, stamp and sign shop drawings.
 - .4 Conduct shop and field inspections and prepare and submit inspection reports.
- .3 Cold Weather Protection:
 - .1 To CAN/CSA-A371 and as follows:
 - .1 Maintain temperature of mortar between 5°C and 50°C until batch is used or becomes stable.
 - .2 Maintain ambient temperature of masonry work and it's constituent materials between 5°C and 50°C and protect site from windchill.
 - .3 Maintain temperature of masonry above 0°C for minimum of 3 days, after mortar is installed.
 - .4 Preheat unheated wall sections in enclosure for minimum 72 hours above 10°C, before applying mortar.
 - .5 Do not use scorched aggregate. Do not use salts or anti-freezes. Only use approved smokeless heaters.
- .4 Hot Weather Requirements:
 - .1 To CAN/CSA-A371 and as follows:
 - .1 Plan in advance for hot weather construction. Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.
 - .2 Avoid using dry masonry in hot weather conditions. Use predampened masonry unit nominally saturated, but surface dry at time of laying. Do not dip masonry unit in bucket of water.
 - .3 Spread only enough mortar to permit soft setting of masonry units; do not over mix mortar materials; do not retemper mortar after 2 hours of use; do not retemper pigment coloured mortar; do not spread more than 900 mm (3') of mortar for placement of masonry unit.

- .5 Mock-up:
 - .1 Construct one mock-up panel of unit masonry construction, 1200 mm wide x 1200 mm high in a location accepted by Consultant.
 - .2 Demonstrate use of reinforcement, ties, through-wall flashing, weep holes, jointing, coursing, coping and sills, mortar, bonding, control joints, and workmanship.
 - .3 Mock-up may form part of Work if accepted by Consultant. Mock-ups which do not form part of Work are to be removed from Site during final cleanup, or when directed by Consultant.

1.6 **DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver, store and handle Products in accordance with the Conditions of the Contract and as specified herein.
- .2 Remove unacceptable materials from Site and replace to acceptance of Consultant. Store materials off ground protected from wetting by rain, snow or ground water, or inter-mixture with earth or other materials. Store metal ties and reinforcement to prevent corrosion.
- .3 Do not concentrate storage of materials on any part of structure beyond design load, take particular care not to overload unsupported portions of structure which may have not attained their full design strength.
- .4 Comply with CSA A371. Do not use salt or calcium-chloride to remove ice from masonry surfaces.
- .5 Deliver mortar materials in original unbroken and undamaged packages with the maker's name and brand distinctly marked thereon. Prevent damage to units.
- .6 Keep masonry materials free from ice and frost. Keep units protected from concrete, mortar and other materials which could cause staining.

2 Products

2.1 **MASONRY UNITS**

- .1 Burned clay brick: CAN/CSA A82, type to match existing.
- .2 Concrete block units: Lightweight units for use at all fire rated applications and block exposed to view, CSA A165 Series, sizes indicated on Contract Drawing, classifications as follows:
 - .1 H/15/D/M.
 - .2 SS/15/D/M.
 - .3 SF/15/D/M.

- .3 Concrete block units: Normalweight units for all non-fire rated applications and where concealed, CSA A165 Series, sizes indicated on Contract Drawing, classifications as follows:
 - .1 H/15/A/M.
 - .2 SS/15/A/M.
 - .3 SF/15/A/M.
- .4 Precast concrete sills and shapes: Reinforced and constructed of 27.5 MPa concrete with slopes in direction indicated. Provide drips. Dowel and hook anchors to be stainless steel. Finish: Smooth unless otherwise indicated.
- .5 Special shapes: Unless indicated otherwise, supply and install corner returns, bull-nosed or double bull-nosed units for exposed and external corners, bond beams, sash blocks for control joints, solid block where noted, concrete block lintels over openings in concrete block walls and any additional special shapes as indicated.
- .6 Obtain each masonry unit type from same manufacturer. Supply and install units of uniform texture and colour for each kind required.
- .7 Supply masonry units with exposed surfaces free of cracks, chips, blemishes, and broken corners.

2.2 ACCESSORIES

- .1 Reinforcement: CSA A370, CSA A371, and ASTM A1064/A1064-M, all components to be hot dip galvanized unless otherwise specified:
 - .1 This specification is based on products manufactured by Blok-Lok Limited. Products by Dur-O-Wal Ltd. and Fero Corporation are approved alternatives.
 - .2 Type 1 (single wythe): Truss type; >Blok-Trus BL30'.
 - .3 Type 2 (cavity wall block back-up): Adjustable truss type, fabricated from minimum 4.76 mm wire, complete with adjustable box anchor and insulation fasteners; >Adjustable Econo-Cavity Blok-Trus II BL37 System 2000' with >wedge-Lok Insulation Retainers=. Insulation retainer to straddle wire bridging the cavity.
 - .4 Type 3 (cast-in-place back-up): Adjustable type, anchors fabricated from minimum 2.65 mm plate with 4.76 mm wire; 'BLT-8 Dovetail Flex-O-Lok Anchor System'. Supply dovetail slots for installation as part of concrete work.
 - .5 Type 4 (steel stud back-up): Anchors fabricated from 1.5 mm plate with 4.76 mm wire, complete with screws; 'BL-407 Shear Anchor' with 'Flex-O-Lok tie'.
 - .6 Type 5 (existing block wall back-up): Anchors fabricated from 1.5 mm plate with 4.76 mm wire, complete with screws; 'BL-5407 Shear Anchor' with 'Flex-O-Lok tie'.
 - .7 Connectors: CSA A370 and CSA S304.1.
 - .8 Reinforcing steel: CSA G30.18, Grade 400, refer to Contract Drawings for number, size, and location.
- .2 Cavity wall insulation: In accordance with Section 07 21 00.

- .3 Loose steel lintels and lateral support angles: Supplied as part of work of Section 05 50 00.
- .4 Precast concrete shapes: Fabricate to shapes and sizes shown on drawings, 35 MPa concrete in accordance with CSA A23.4, galvanized steel reinforced. Dowel and hook anchors to be stainless steel.
- .5 Through wall flashings: prefinished metal flashings in accordance with Section 07 62 00, continuous strips with a 19 mm folded drip edge.
- .6 Dampproof course and flashing: Reinforced SBS rubberized asphalt compound laminated to cross-laminated polyethylene film, 40 mils thick; 'Blueskin TWF' by Henry or 'Airshield Thru Wall Flashing' by W.R. Meadows or approved alternative, complete with primer and adhesive recommended by flashing manufacturer.
- .7 Compressible filler: 75 x 6 mm thick preformed, polyurethane foam; 25V by Emseal Joint Systems Ltd.
- .8 Control joint filler: Prefabricated extruded rubber joint to suit wall thickness; RS Series Rubber Control Joint by Blok-Lok or approved alternative.
- .9 Mortar mesh: 250 mm high x thickness to suit cavity, 90% open HDPE mesh; 'Mortar Trap' by Blok-Lok Limited or 'Mortar Net' by Hohmann & Barnard, Inc.
- .10 Weep hole vents:
 - .1 Flexible ultra-violet resistant polypropylene-copolymer plastic, 'Cell-Vent' by Blok-Lok, 'Mortar Maze Cell Vents' by Advanced Building Products Inc. or approved alternative.
 - .2 Provide manufacturer recommended clear silicone adhesive for suspended applications.
 - .3 Colour: To be selected by the Consultant.

2.3 **MORTAR MATERIALS**

- .1 Loadbearing masonry: CSA A179, Type S, proportion method.
- .2 Interior non-loadbearing masonry: CSA A179, Type N, proportion method.
- .3 Exterior non-loadbearing masonry: CSA A179, Premixed 1-1-6 Type N, portland cement/lime, proportion method.
- .4 Cement: CAN/CSA A3001, normal Portland, Type GU. Provide white cement where required for white or light coloured mortars.
- .5 Masonry aggregate: CSA A179. Provide white aggregate where required for white or light coloured mortars.
- .6 Hydrated lime: ASTM C207, Type S.

- .7 Water: Clean potable, free from deleterious elements and free from salts that can cause efflorescence.
- .8 Mortar pigment: 'Bay Ferrox' by Bayer Inc. or approved alternative by Huntsman Pigments and Additives and Solomon Colors, Inc. Colour to later selection by Consultant.
- .9 Concrete fill and grout: Minimum 12.5 Mpa concrete in accordance with CSA A179.

3 Execution

3.1 EXAMINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 PROTECTION

- .1 Supply and install temporary waterproof, non-staining coverings, secured against displacement, to extend over walls and down sides to protect masonry Work from snow and wind driven rain, and from drying too quickly, until masonry work is completed and protected by flashings or other permanent construction.
- .2 Supply and install non-staining, protective coverings on horizontal and vertical surfaces to protect work of this Section from damage, staining, marking, and mortar droppings.

3.3 WORKMANSHIP

- .1 Perform masonry work in accordance with CSA A371 and as indicated.
- .2 Supply and install masonry work plumb, level and true to line, with vertical joints in alignment and horizontal courses level, uniform, and straight.

3.4 MASONRY - GENERAL INSTALLATION

- .1 Construct masonry work as required by jurisdictional authorities.
- .2 Before commencing masonry work, verify required limitations for wall heights, wall thicknesses, openings, bond, anchorage, lateral support, and compressive strengths of masonry units and mortars.
- .3 Construct masonry fire protection and fire separations of the thickness indicated on Drawings for the fire resistant ratings as noted on Drawings, and conforming to the Fire-Performance Ratings, Appendix 'D' to the National Building Code of Canada.

- .4 Fire Separations and Fire Separations with Fire Resistance Ratings: Construct walls tightly to construction above and at perimeter, and without openings or voids. Do not reduce the thickness of walls to less than the thickness indicated on the Drawings or for the required fire resistance rating where required.
- .5 Do not butter corner units, throw mortar droppings into joints, or excessively furrow bed joints. Do not shift or tap units after mortar has taken initial set. If adjustment is necessary after mortar has started to set, remove and replace with fresh mortar.
- .6 Do not use admixtures without Consultant's written acceptance.
- .7 Tool mortar joints slightly concave with non-staining tools unless indicated otherwise. Strike joints flush in non exposed areas or where shown on Contract Drawings. Use sufficient force to press mortar tight against masonry units on both sides of joints. Remove excess, remaining mortar material and burrs.
- .8 Install masonry walls 25 mm clear of underside of steel building frames, roof or floor deck. Install masonry with a 19 mm space beneath shelf angles and install compressible filler.
- .9 Cut masonry units with a wet saw to obtain straight, clean, even, unchipped edges. Cut units as required to fit adjoining work neatly or for flush mounted electrical outlets, grilles, pipes, conduit, leaving 3 mm maximum clearance. Use full-size units without cutting wherever possible.
- .10 Reinforce veneer walls with adjustable wall reinforcing at maximum 400 mm o.c. vertically and 600 mm o.c. horizontally. Install reinforcing in accordance with manufacturer's instructions. In veneer walls extend reinforcement from support wall, spanning cavity into exterior wythe. Place at maximum 75 mm o.c. each way around perimeter of openings, within 300 mm of openings.
- .11 Reinforce block walls with continuous wire reinforcement in every second block course. Supply and install prefabricated L and T sections. Cut, bend and lap reinforcing units as per manufacturer's printed directions for continuity at returns, offsets, pipe enclosures, and other special conditions. Bending of masonry reinforcement is not permitted.
- .12 Reinforce masonry walls with reinforcing steel as indicated on Drawings. Vertical reinforcing shall be fully grouted in masonry cores with grout.
- .13 At openings in block walls install extra reinforcement, so that first and second courses above and below openings are reinforced. Extend extra reinforcement 600 mm beyond opening in each direction.
- .14 Reinforce joint corners and intersections with strap anchors 400 mm o.c.
- .15 Do not place reinforcement across masonry wythes at control joints.

- .16 Install masonry with 10 mm thick joints unless indicated otherwise. Make vertical and horizontal joints equal and of uniform thickness.
- .17 Build control joints in masonry walls at intervals and in locations shown. Form joints for block walls using sash block units in accordance with details shown. Form joints for veneer walls by leaving head joints between stacked units void of mortar. Fill chase and joint with joint filler full height of control joints. Leave a depth of 13 mm for sealing unless otherwise shown.
- .18 Install control joints in masonry walls where indicated on drawings and at projections and changes in direction. Where control joints have not been indicated provide joints at 6100 mm o.c. for exterior walls and 9150 mm o.c. for interior walls.
- .19 If required, provide movement joints, similar to building control joints, installed between areas with different support conditions.
- .20 Supply and install solid block or metal lath under block, and fill block cells solid for lintel bearing and as required to secure built-in anchor bolts and/or anchors shown.
- .21 Do not tooth intersections of walls except as otherwise indicated.
- .22 Install weep hole vents in accordance with manufacturer's directions, in exterior wythe of masonry above dampproof courses and flashings and at tops of walls using adhesive. Space weep hole vents maximum 600 mm o.c. horizontally. Prevent weep hole vents from becoming plugged with mortar or debris.
- .23 Coordinate installation of masonry with installation of air barrier and vapour retarder to ensure continuity of these systems.

3.5 **DAMPPROOF COURSES AND FLASHING**

- .1 Install dampproof courses beneath first masonry bearing course on slabs-on-grade. Trim dampproofing to conceal it.
- .2 Install flashings in masonry in accordance with CSA A371.
- .3 Install flashings under exterior masonry bearing on foundation walls, slabs, shelf angles, and steel angles over openings and elsewhere as indicated. Where flashings occur over openings in walls extend them past openings a minimum of 200 mm and turn up minimum 150 mm at each end to create a waterproof dam to prevent water draining into cavity.
- .4 In veneer walls install flashings continuously from front edge of masonry, under outer wythe, turn up backing minimum 200 mm and provide watertight seal against support wall.
- .5 Lap dampproofing and flashing 150 mm and seal in accordance with manufacturer's instructions.

- .6 At bottom of cavity install mortar mesh to manufacturer's instructions. Apply additional mortar mesh layer as required to fill cavity thickness. Place mesh in continuous layer.
- .7 Before masonry work begins, place specified dampproofing under first course of masonry. Install continuous dampproofing with ends lapped and cut flush with exterior face of wall. Place similar dampproofing over top course.

3.6 **MORTAR MIXING**

- .1 Thoroughly mix mortar ingredients in proper quantities needed for immediate use to requirements of CSA A179.
- .2 Measure and batch mortar materials either by volume or weight, to accurately control and maintain proportions. Do not measure materials by shovel.
- .3 Mix mortar with maximum amount of water consistent with workability for maximum tensile bond strength within capacity of mortar.
- .4 Do not use mortar which has begun to set. Use mortar within 2 hours after initial mixing. Re-temper mortar during 2 hour period only as required to restore workability.
- .5 Add mortar colour and admixtures to requirements of manufacturer's instructions.
- .6 Provide uniformity of mix and colouration.

3.7 **BLOCK**

- .1 Lay blocks in running bond except as indicated otherwise. Align block webs vertically and install thicker ends of face shells up.
- .2 Install a full bed of mortar for first courses of masonry, for masonry units 100 mm thick and less, and between solid units. For remaining courses bed face shells, including vertical end joints, fully in mortar.
- .3 Install special shaped and sized concrete block units as indicated and as required for a complete and coordinated assembly and to minimize cut units.
- .4 Supply and install two courses of solid block beneath lintel bearing.
- .5 Stagger end joints in every course. Align joints plumb over each other in every other course.
- .6 Bond intersecting block walls in alternate courses. Where block work abuts concrete, anchor each block course to concrete.

3.8 MASONRY VENEER

- .1 Prior to installation of masonry veneer, coordinate installation of air and vapour retarder with Section 07 26 00.
- .2 Prior to installation of cavity insulation, examine air and vapour retarder and make good damage. Install cavity wall insulation in accordance with Section 07 21 00.
- .3 Lay masonry veneer in running bond, unless indicated otherwise, and in a full bed of mortar.
- .4 Form angle corners with special shaped units; cutting of units is not permitted.
- .5 Erect exterior cavity wall construction as shown on Contract Drawings.
- .6 Install masonry veneer to prevent mortar droppings and protrusions from impeding drainage and pressure equalization of rainscreen cavities and drained walls.
- .7 Apply sufficient mortar on end of stretchers to ensure end joints are compressed full when masonry unit is pressed into place.

3.9 PRECAST SHAPES

- .1 Install dampproofing or flashings continuous under full length of precast shapes.
- .2 Install precast shapes in full mortar bed and secure units to each other with stainless steel dowels and to masonry units with stainless steel hook anchors, fully grouted.

3.10 LINTELS

- .1 Install concrete block lintels over openings in masonry except where steel lintels are indicated.
- .2 Set lintels with minimum of 200 mm uniformly distributed bearing at each end. Provide bond breaker under bearing ends.
- .3 Install reinforcing steel and concrete fill in block lintels.
- .4 Install loose steel lintels, as indicated in Contract Drawings. Centre over opening width.

3.11 LATERAL SUPPORT ANGLES

- .1 Where non load bearing unit masonry partitions meet structural elements at top of partitions, install [supplied] lateral supports as required by the Ontario Building Code and in accordance with Structural details. In areas where ceilings are scheduled, use 150 mm lengths of steel angle located each side of partition at 1200 mm and staggered.

3.12 BUILT-IN ITEMS

- .1 Coordinate and locate build-in items required to be built into masonry or supplied under work of other Sections including hollow metal doors, windows, lintels, sleeves, inserts, etc. Build-in items to present a neat, rigid, true and plumb installation.
- .2 Build wall openings, slots, and recesses required for ducts, grilles, pipes and other items.
- .3 Coordinate installation of conduit, outlet boxes and other mechanical and electrical built-ins with work of Divisions 21, 22, 23 and 26.
- .4 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as Work progresses.
- .5 Brace door jambs to maintain plumbness. Set anchors between metal frames and masonry and fill voids between hollow metal frames and masonry walls with mortar.

3.13 INSTALLATION TOLERANCES

- .1 Install masonry work to a plane flatness and exposed end tolerance of 3 mm in 3000 mm.
- .2 Variation in Alignment from Unit to Adjacent Unit: 1.5 mm maximum.
- .3 Plumb within 6 mm in 3 m, or in 6 mm in 6 m at external corners, expansion joints, or other conspicuous lines.
- .4 Level within 6 mm in any bay or 6 m maximum distance, and 12 mm in 12 m or more.
- .5 Located from position shown, and from related position of columns, walls, and partitions within 12 mm in any bay or 6 m maximum distance, and 19 mm in 12 m or more.
- .6 Opening sizes within 6 mm of designated dimension.
- .7 Column and wall cross-section dimensions within minus 6 mm and plus 12 mm.
- .8 Joint widths to dimensions indicated or specified herein, but in no case greater than 12 mm. Variation of Mortar Joint Thickness: 1 mm every metre.

3.14 REPAIR AND POINTING

- .1 Remove and replace masonry units which are loose, chipped, broken, cracked, marked, stained, discoloured, or otherwise damaged. Supply and install new units to match adjoining units and install in fresh mortar, and point to eliminate evidence of replacement.

- .2 During tooling of joints, enlarge any cracks, holes, or other defects, point and completely fill with mortar.
- .3 Point-up joints including corners, openings and adjacent Work for a neat, uniform appearance, properly prepared for application of sealant compounds.

3.15 **CLEANING**

- .1 Obtain and follow unit masonry manufacturer's written instructions for cleaning of masonry.
- .2 Clean exposed, masonry surfaces, removing excess mortar as work progresses. Allow mortar droppings to partially dry then dry brush with a stiff fibre brush.
- .3 Cleaning of stone work:
 - .1 Protect adjacent surfaces and other work from damage.
 - .2 Remove large particles with stiff fibre brushes without damaging surface. Saturate masonry with clean water and flush off loose mortar and dirt.
 - .3 Scrub with solution of 25 mL trisodium phosphate and 25 mL household detergent dissolved in 1 L of clean water using stiff fibre brushes, then clean off immediately with clean water using hose.
 - .4 Repeat cleaning process as often as necessary to remove mortar and other stains.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Design, labour, Products, equipment and services necessary for the miscellaneous and metal fabrication work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM A53, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

.2 ASTM A123, Specification for Zinc (Hot Dip Galvanized) Coatings on Iron & Steel Products.

.3 ASTM A153, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

.4 ASTM A307, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.

.5 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.6 CISC/CPMA 1.73a, A Quick-Drying One-Coat Paint for Use on Structural Steel.

.7 CAN/CSA-G40.20/G40.21-M, General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steels.

.8 CAN/CSA S16.1-M, Limit States Design of Steel Structures.

.9 CSA S136.1-M, Commentary on CAN/CSA S136-M, Cold Formed Steel Structural Members.

.10 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.

.11 CSA W48, Filler Metal and Allied Materials for Metal Arc Welding.

.12 CSA W59-M, Welded Steel Construction (Metal Arc Welding).

.13 CAN/CSA W117.2-M, Safety in Welding, Cutting and Allied Processes.

.14 CAN/CGSB 1.40-M, Primer, Structural Steel, Oil Alkyd Type.

.15 CGSB 85-GP-16M, Painting Galvanized Steel.

.16 NAAMM, The National Association of Architectural Metal Manufacturers.

- .17 Steel Structures Painting Council (SSPC), Steel Structures Painting Manual, Vol. 2.

1.3 DESIGN REQUIREMENTS

- .1 Design details and connections, where not shown on Drawings, in accordance with CAN/CSA-S16.1 and CSA S136.1.

1.4 SUBMITTALS

- .1 Shop drawings:
 - .1 Submit shop drawings for fabrication and erection of miscellaneous and metal items in accordance with Section 01 33 00 indicating:
 - .1 Materials, core thicknesses, class of finish (AMP 555), connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

1.5 QUALITY ASSURANCE

- .1 Retain a Professional Engineer, licensed in the Province of Ontario, with experience in work of comparable complexity and scope, to perform the following services as part of the work of this Section:
 - .1 Design metal fabrication items that are required to resist live, dead, lateral, wind, or seismic loads.
 - .2 Review, stamp, date and sign shop drawings.
- .2 Workmanship: Fabricate work of this Section to meet the required class of workmanship indicated below in accordance with NAAMM's AMP 555, Section 8.
 - .1 Class 1: for use on direct exposed to view fabricated items:
 - .1 Exposed surfaces are finished smooth without pits, mill marks, nicks, burrs, sharp edges, and scratches filled or ground off. Defects should not show when painted, polished, or finished.
 - .2 Welds should be concealed where possible. Exposed welds are ground to small radius with uniform sized cove unless otherwise noted.
 - .3 Distortions should not be visible to the eye.
 - .4 Exposed joints are fitted to a hairline finish.
- .3 Execute welding by firms certified in accordance with CSA W47.1 Division 1 or 2.1. Ensure welding operators are licensed per CSA W47.1 for types of welding required by Work.
- .4 Perform stainless steel work in accordance with NAAMM, Code of Standard Practice for the Metal Industry, Workmanship, Class 1.

2 Products

2.1 **MATERIALS**

.1 General:

- .1 All materials under work of this Section, including but not limited to, primers and paints are to have low VOC content limits.
 - .2 Unless detailed or specified herein, standard products will be acceptable if construction details and installation meet intent of Drawings and Specifications.
 - .3 Include all materials, products, accessories, and supplementary parts necessary to complete assembly and installation of work of this Section.
 - .4 Incorporate only metals that are free from defects which impair strength or durability, or which are visible. Install only new metals of best quality, and free from rust or waves and buckles, and that are clean, straight, and with sharp defined profiles.
- .2 Structural shapes, plates, and similar items: CAN/CSA-G40.20/G40.21-M, Grade 350W. Hollow structural sections: CAN/CSA-G40.20/G40.21-M, Grade 350W, Class H.
 - .3 Galvanized sheet steel: ASTM A653/A653M Grade A, Z275 Commercial Quality zinc coating, size and shape as shown.
 - .4 Welding materials: CSA W48 and CSA W59-M.
 - .5 Fasteners: Conforming to ASTM A307, Grade A, in areas not exposed to view, use unfinished bolts with hexagon heads and nuts. In areas exposed to view, use bolts, nuts, washers, rivets, lock washers, anchor bolts, machine screws and machine bolts Z275 zinc coated in accordance with ASTM A653/A653M. Supply bolts of lengths required to suit thickness of material being joined, but not projecting more than 6 mm beyond nut, without the use of washers.
 - .6 Primer paint: CAN/CGSB-1.40-M or CPMA 1.73a.
 - .7 Galvanized primer paint: Inorganic zinc rich primer. For use on galvanized fabrications where touch up is to remain unpainted in finished work; Carbozinc 11WB by Carboline Company, Catha-Coat 305 by Devoe Coatings or Zinc Clad XI by Sherwin Williams.
 - .8 Drilled inserts: "HSL-3" by Hilti Inc. or "Dynabolt Sleeve Anchors" by ITW Construction Products, heavy-duty anchors, sizes as shown.
 - .9 Adhesive anchor system: 'HIT HY 200 Injectable Mortar with Hilti HAS Stainless Steel Anchor Rod System' by Hilti Ltd. or approved alternative by ITW Construction Products, complete with all components required for a complete installation.

2.2 FABRICATION

- .1 Verify dimensions of existing Work before commencing fabrications and report any discrepancies to the Consultant.
- .2 Fit and assemble work in shop where possible. Execute work in accordance with details and reviewed shop drawings.
- .3 Use self-tapping shake-proof screws on items requiring assembly by screws or as indicated. Use screws for interior metal work. Use welded connections for exterior metal work unless otherwise found acceptable by the Consultant.
- .4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush. Seal exterior steel fabrications against corrosion in accordance with CAN/CSA S16.1-M.
- .5 Execute shop welding to requirements specified.
- .6 Carefully make and fit details. Take special care with exposed finished work to produce a neat and correct appearance to the Consultant's acceptance.
- .7 Assemble members without twists or open joints.
- .8 Correctly size holes for connecting work of other trades where such can be determined prior to fabrication. Where possible, show holes on shop drawings. Place holes not to cause appreciable reduction in strength of member.
- .9 Draw mechanical joints to hairline tightness and seal countersunk screw and access holes for locking screws with metal filler where these occur on exposed surfaces.

2.3 FABRICATED ITEMS

- .1 Refer to Drawings for details of metal fabrication work and related items not specifically listed in this Section.
- .2 Where work is required to be built into work of other Sections supply such members to respective Sections.
- .3 Provide miscellaneous and metal fabrications indicated on the drawings, listed below, and not indicated to be supplied under other Sections. Provide miscellaneous and metal fabrications including but not limited to the following:
- .4 Handrails, guardrails, and posts:
 - .1 Design railings to withstand minimum horizontal and vertical loads as required to meet requirements of authorities having jurisdiction. In no instance shall load design of railings be less than 3.0 kN/m horizontally and 1.5 kN/m vertically.

- .2 Close open ends of steel handrails with 1.9 mm thick closure neatly welded. Fabricate railings, handrails, and guardrails as shown on drawings.
- .3 Handrail bracket: Fabricate as shown. After fabrication, galvanized bracket in accordance with ASTM A123.
- .5 Lintels: Fabricated from CAN/CSA-G40.20/G40.21-M, Grade 350W, size and location as shown, width to be not less than 25 mm less than width of wall and extend 200 mm beyond opening at each end. Unless otherwise shown, fabricate lintels in block walls of steel sections.
- .6 Masonry lateral support angles:
 - .1 Supply only, to Section 04 20 00 for installation, all horizontal lateral support anchors at top of non-load-bearing masonry walls.
 - .2 Refer to Structural Drawings for size and spacing of required support anchors. Provide drilled holes as required for anchorage.
 - .3 Galvanized for all exterior wall and unheated and high humidity locations.
- .7 Shelf Angles: Of size indicated on Drawings and as specified in structural steel specifications, with adjustable inserts for vertical adjustment and slotted holes for horizontal; galvanized.
- .8 Channel door frames: Structural channel sections, selected for trueness of web and flange, with joints welded and ground smooth. Supply bar stop and bent bar anchors for anchorage to masonry or concrete as required. Fit frames with temporary spreaders to prevent frame from springing out of shape.
- .9 Corner Guards: 100 x 100 x 3.0 mm, stainless steel 2000 mm high with adjustable masonry anchors welded to back at maximum 400 mm centres.
- .10 Miscellaneous steel brackets, supports and angles
 - .1 Supply and install or supply for installation by trades responsible, all loose steel brackets, supports and angles where indicated, except where such brackets, supports and angles are specified under work of other Sections. Drill for countersunk screws, expansion anchors and anchor bolts.
 - .2 Unless otherwise specified, prime paint for interior installation; galvanized finish for exterior installation.

2.4 **ANCHORS AND FASTENING**

- .1 Use weld studs of size not larger than 10 mm for attaching miscellaneous materials and equipment to building steel. If weight of item requires larger fasteners use clips or brackets and secure by welding or through bolting.
- .2 Use self drilling expansion type concrete anchors for attaching to masonry and concrete
- .3 Do not secure items to steel deck.

- .4 Use steel beam clamps of two bolt design to transmit load to beam web. Do not use C and I clamps.

2.5 WELDING

- .1 Perform welding by electric arc process.
- .2 Execute welding to avoid damage or distortion to Work. Execute welding in accordance with following standards:
 - .1 CSA W48 - for Electrodes. If rods are used, only coated rods are allowed.
 - .2 CSA W59-M and CSA W59S1-M for design of connections and workmanship.
 - .3 CAN/CSA W117.2-M - for safety.
- .3 Thoroughly clean welded joints and expose steel for a sufficient distance to perform welding operations. Finish welds smooth. Supply continuous and ground welds which will be exposed to view and finish paint.
- .4 Test welds for conformance and remove work not meeting specified standards and replace to Consultant's acceptance.

2.6 SHOP PAINTING

- .1 Clean steel to SSPC SP6 and remove loose mill scale, weld flux and splatter.
- .2 Shop prime steel with one coat of primer paint to dry film thickness of 0.07 mm. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 deg C. Paint items under cover and leave under cover until primer is dry. Follow paint manufacturer's recommendations regarding application methods, equipment, temperature, and humidity conditions.
- .3 Shop prime galvanized steel in accordance with CGSB 85-GP-16M.
- .4 Clean but do not paint surfaces being welded in field.
- .5 Do not paint surfaces embedded in concrete, but clean as if they were to be primed.
- .6 Do not prime steel to be fireproofed or to receive intumescent paint coating.
- .7 Do not prime machine finished surfaces, but apply an effective anti-rust compound.
- .8 Take precautions to avoid damage to adjacent surfaces.

2.7 HOT DIP GALVANIZING

- .1 After fabrication, hot dip galvanize specific miscellaneous steel items as indicated. After galvanizing, plug relief vents air tight with appropriate aluminum plugs as suitable and required for intended metal fabricated item. Straighten shapes and assemblies true to line and plane after galvanizing. Repair damaged galvanized surfaces with zinc rich primer in accordance with manufacturer's printed directions.
- .2 Hot-dip galvanize members in accordance with requirements of the following ASTM, with minimum coating weights or thicknesses as follows:
 - .1 Rolled, pressed and forged steel shapes, plates, bars and strips: ASTM A123; average weight of zinc coating per square/metre of actual surface, for 4.8 mm and less thickness members 600 g/m² for 6 mm and heavier members 640 g/m².
 - .2 Iron and steel hardware: ASTM A153; minimum weight of zinc coating, in ounces per square foot of surface, in accordance with ASTM A153, Table 1 for the various classes of materials used in the Work.

3 Execution

3.1 EXAMINATION

- .1 Examine previously installed Work, upon which this Section depends, verify dimensions and condition of existing Work, and coordinate repairs, alterations, and rectification if necessary. Commencement of work of this Section is deemed to signify acceptance of existing, prior conditions.
- .2 Obtain Consultant's written approval prior to field cutting or altering of structural members.

3.2 ERECTION

- .1 Install metal fabrications in accordance with reviewed shop drawings and manufacturer's written instructions.
- .2 Fit joints and intersecting members accurately. Make work in true planes with adequate fastenings. Build and erect work plumb, true, square, straight, level and accurate to sizes detailed, free from distortion or defects detrimental to appearance or performance.
- .3 Perform drilling of concrete and steel as required to fasten work of this Section.

3.3 TOUCH UPS

- .1 Paint bolt heads, washers, nuts, field welds and previously unpainted items. Touch up shop primer damaged during transit and installation, with primer to match shop primer.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for rough carpentry work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM A153, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

.2 ASTM A325, Specification for Bolts Quenched/Tempered Steel Nominal Thread Diameter M16 - M36 For Structural Steel Joints.

.3 ASTM A653, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.4 ASTM E84, Standard Test Method for Surface Burning Characteristics of Building Materials.

.5 ASTM F1667, Driven Fasteners: Nails, Spikes and Staples.

.6 CAN/CSA O80 Series M, Wood Preservation.

.7 CSA O121-M, Douglas Fir Plywood.

.8 CAN/CSA O141, Softwood Lumber.

.9 CSA O151-M, Canadian Softwood Plywood.

.10 CAN/ULC-S102, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

.11 CWC, Canadian Wood Council, Wood Reference Book.

.12 NLGA, Standard Grading Rules for Canadian Lumber, National Lumber Grades Authority

1.3 **QUALITY ASSURANCE**

.1 Lumber identification: Grade stamp of an agency certified by the Canadian Lumber Standards Accreditation Board.

.2 Plywood identification: Grade mark in accordance with applicable CSA standards.

.3 Lumber quality: Carefully select individual pieces so that knots and obvious defects will not interfere with placing bolts, proper nailing or making proper connections.

- .4 Moisture Content of wood at time of construction shall be 19% maximum.
- .5 Each piece of pressure treated lumber and fire retardant treated lumber shall be shop marked with the pressure treatment brand and ULC monogram respectively, in accordance with CAN/CSA O80-M.
- .6 Dimensions of lumber shall conform to dressed sizes specified in CAN/CSA-0141 unless actual dimensions are otherwise indicated or specified.
- .7 Dimensional references to lumber on Drawings and in Specifications are to nominal sizes unless actual dimensions are indicated. Such actual dimensions shall be dry size.
- .8 Lumber defects: Discard wood with defects which will render a piece unable to serve its intended function. Lumber will be rejected by Consultant for excessive warp, twist, bow, crook, mildew, fungus, or mould, as well as for improper cutting and fitting, whether or not it has been installed.

1.4 ENVIRONMENTAL REQUIREMENTS

- .1 When it is required that wood maintain dimensional stability and tolerances to ensure accurate installation of later work, store and install it only in dry areas, and where no further installation of moist materials is contemplated.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

- .1 Store materials in a dry area. Cover materials with tarpaulins or polyethylene sheets to prevent moisture absorption and impairment of structural and aesthetic properties. Vent to allow air movement. Tie covering to keep in place.

2 Products

2.1 MATERIALS

- .1 General:
 - .1 Materials used for work of this Section are to include, but not be limited to the following criteria:
 - .1 Certified wood.
 - .2 Low VOC content limits.
 - .2 Adhesives - Urea-formaldehyde-free glues.
 - .3 All dimensional lumber and plywood to be FSC certified.
 - .4 All composite wood and/or agrifibre products (including core materials) and adhesives used to fabricate laminated assemblies used in building must not contain added urea-formaldehyde.

- .2 Lumber: Softwood, G4S, moisture content 19% or less at time of installation, in accordance with the following:
 - .1 Lumber shall be of same species and grade, equally seasoned and shall be processed and stamped at same mill.
 - .2 CSA O141 and NLGA Standard Grading Rules for Canadian Lumber.
 - .3 Board quality: Construction or better.
 - .4 Dimension quality:
 - .1 Structural joists, planks, and framing: No. 1 Select Structural.
 - .2 Light framing: Construction.
- .3 Plywood: CSA O121-M, G1S unsanded, T & G, standard construction, laminated with waterproof adhesive, exterior grade, Thickness as indicated on drawings.
- .4 Sheathing: Douglas Fir, CSA 0121-M or CSA O151-M; Select-Tight Face, exterior grade, T & G.
- .5 Roof lumber: NLGA, Construction grade light framing, Jack Pine, S4S, pressure treated to CAN/CSA-O80 series using copper based waterborne preservative treatment, impregnated to a net retention of 4 kg/ m³ of preservative unless otherwise specified by preservative manufacturer.
- .6 Surface applied wood preservative: Green coloured copper naphthenate or 5% pentachlorophenol solution, water repellent preservative or same copper based preservative as used for shop impregnation, in accordance with CAN/CSA O80.
- .7 Fire retardant treatment of lumber and plywood (interior and protected locations): 'Dricon FRT' fire retardant treatment by Biewer Lumber or approved alternative, conforming to ASTM E84, to provide a flame spread rating of 25 or less.
- .8 Rough hardware: Conforming to ASTM F1667; Nails, bolts, screws, anchors, expansion shields, and other fastenings required to frame and fix rough carpentry as follows:
 - .1 Nails, spikes and staples: Spiral type.
 - .2 Bolts: ASTM A325; 12.7 mm diameter minimum with nuts and washers unless noted otherwise.
 - .3 Screws: Countersunk head, full thread type.
 - .4 Proprietary fasteners: Toggle bolts, expansion shields, lag bolts, screws, inorganic fibre plugs, recommended for purpose by manufacturer.
 - .5 Galvanize rough hardware used in fire treated wood and hardware exposed to the atmosphere.
- .9 Fasteners for use in pressure treated wood: Provide hot dipped galvanized fasteners complying to ASTM A153 and connectors in accordance with ASTM A653, Class G185 for non-structural members. Provide type 304 or 316 stainless steel fasteners and connectors for use in Structural, pressure treated wood.

3 Execution

3.1 **EXAMINATION**

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **GENERAL**

- .1 Lay out work carefully and to accommodate work of others. Cut and fit accurately: erect in position indicated by Drawings.
- .2 Install rough carpentry to allow for expansion and contraction of the materials.
- .3 Cut work into lengths as long as practicable and with square ends. Align, level, square, plumb, and secure work permanently in place. Brace work temporarily as required. Join work only over solid backing.
- .4 Bore holes true to line and to same size as bolts. Drive bolts into place for snug fit, and use plates or washers for bolthead and nut bearings. Turn up bolts and lag screws tightly when installed, and again just before concealed by other work or at completion of Work.
- .5 Provide anchors, bolts, and inserts required for attachment of the work of this Section, to those performing the work of other Sections and who are responsible for their installation.
- .6 Do not attach work by wood plugs or blocking in concrete or masonry. Use lead shields, expansion shields, or similar methods only as approved by Consultant.

3.3 **MISCELLANEOUS WOODWORK**

- .1 Fit and install wood furring, strapping, grounds and blocking. Adequately size, correctly place and conceal members for finishes, fitments and for work under other Sections. Do not assume that Drawings show required work exactly or completely. Anchor wood members securely in place.
- .2 Install rough bucks, nailing strips and linings to rough openings as required for backing for frames and other work.
- .3 Except where steel supports are specifically shown, provide wood blocking and supports in metal stud partitions for fastening of item such as casework and other wall mounted accessories. Have respective trades approve the location of such wood blocking.
- .4 Bolt wood blocking or nailing strips to steel framing.

.5 Align and plumb faces of furring and blocking to tolerance of 1:600.

.6 Use fire retardant lumber for blocking/framing in ceiling\ spaces, partitions and bulkheads.

3.4 **ROOF WOODWORK**

.1 Install continuous wood nailers around roof perimeters, curbs and roof openings larger than 150 x 150 mm, and at edges of insulation as detailed. Install cut cant strips and continuous nailers on copings and curbs as detailed.

.2 Install wood backing, dressed, tapered and recessed slightly below top surface of roof insulation and roof hopper.

3.5 **BACKBOARDS**

.1 Install plywood backboards, primed and painted white on both sides, with fire retardant paint.

.2 Use minimum 19 mm thick plywood on 19 x 38 mm furring around perimeter and at maximum 300 mm intermediate spacing.

3.6 **FASTENERS**

.1 Frame, anchor, fasten, tie and brace members for required strength and rigidity.

.2 Use hot dipped galvanized fasteners for exterior work and work below grade.

.3 Countersink bolts and bolt heads as required for clearance of other work.

.4 Size fasteners to penetrate base member by half of fastener length minimum. Minimize splitting of wood members by staggering nails in direction of grain.

.5 For plywood use spiral, annular or resin coated nails and staples.

3.7 **SURFACE-APPLIED WOOD PRESERVATIVE**

.1 Treat raw surfaces, drilled holes and cut ends of pressure treated wood with 2 coats of wood preservative immediately after cutting.

.2 Apply preservative by dipping, by brush or by pouring into plugged holes to completely saturate surface.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for the dampproofing work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM D41/D41M, Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.

.2 ASTM D4479/D4479M, Specification for Asphalt Roof Coatings, Asbestos Free.

1.3 **SUBMITTALS**

.1 Product data:

.1 Submit manufacturer's Product data in accordance with Section 01 33 00 for each Product indicating:

.1 Installation details, physical properties and detailed application and installation instructions, marked as applicable to Work.

.2 Certificates: Submit manufacturer's certification stating compliance with criteria specified and that Products are compatible.

1.4 **QUALITY ASSURANCE**

.1 Installer's qualifications: Perform work of this Section by company approved by Product manufacturer and having 5 years recent experience in work of comparable complexity and scope.

1.5 **SITE CONDITIONS**

.1 Do not proceed with work when wind chill effect causes Product to set before correct curing takes place.

.2 Supply and install temporary protection and heating to maintain air temperature and structural base temperature at dampproofing installation area above 5°C for 24 h before, during and 24 h after installation.

.3 Do not apply dampproofing in wet weather.

.4 Supply and install forced air circulation during installation and curing periods for enclosed applications.

2 Products

2.1 **MATERIALS**

- .1 All materials under work of this Section, including but not limited to, primers are to have low VOC content limits.
- .2 Primer: Penetrating asphalt primer to ASTM D41, Type 2; 'HE910' by Henry Company Canada Inc. or '600 Asphalt Primer' by W. R. Meadows.
- .3 Dampproofing: Cold applied, solvent based, asphalt dampproofing to ASTM D4479, Type 1; '710-11' by Henry Company Canada Inc. or '501 Foundation Coating' by W. R. Meadows.
- .4 Sealing compound: Polymer modified sealing compound; 'Polybitume 570-05' by Henry Company Canada Inc. or approved alternative by W. R. Meadows.
- .5 Reinforcing fabric: Open weave, glass fibre reinforcing consisting of glass fibre yarn saturated with synthetic resins; 990-06 Yellow Jacket by Henry Company Canada Inc. or approved alternative by W. R. Meadows.

3 Execution

3.1 **EXAMINATION**

- .1 Verify condition of previously installed Work upon which this Section depends. Report defects to Engineer. Commencement of work of this Section means acceptance of existing conditions.
- .2 Ensure that surfaces of concrete are dry and in accordance with manufacturer's instructions before applying dampproofing material.

3.2 **PREPARATION**

- .1 Seal exterior joints between foundation walls and footings, cracks in foundation walls, and around penetrations through dampproofing with sealing compound. Apply sealing compound in accordance with manufacturer's instructions.
- .2 Prime substrates to be dampproofed in accordance with manufacturer's instructions.

3.3 **APPLICATION**

- .1 Apply dampproofing in accordance with manufacturer's instructions.
- .2 Seal exterior joints between foundation walls and footings with sealing compound before applying dampproofing.

- .3 Apply dampproofing in continuous, uniform coating to exterior side of foundation walls enclosing rooms below finished grade. Dampproof from 50 mm below finished grade level to and including tops of foundation walls and footings. Include exterior backfilled portion of interior walls where floors in adjacent rooms are at different elevations.
- .4 Brush reinforcing fabric into place overlapping fabric 50 mm at all joints with a soft bristle brush, eliminating wrinkles, air pockets or blisters and ensuring full contact.
- .5 Apply two additional coats of dampproofing and two layers of reinforcing fabric to vertical corners and construction joints for minimum width of 230 mm on each side, around penetrations and along pipes passing through walls for minimum of 230 mm.
- .6 Apply a seal coat of dampproofing over entire area at minimum 1 l/m²

3.4 **CLEAN-UP**

- .1 Clean, repair, or replace surfaces soiled or otherwise damaged in connection with work of this Section as directed by Engineer. Replace finishes or materials that cannot be cleaned to acceptance of Engineer.

END OF SECTION

- 1 General
- 1.1 **SECTION INCLUDES**
 - .1 Labour, Products, equipment and services necessary for sheet waterproofing work in accordance with the Contract Documents.
- 1.2 **SUBMITTALS**
 - .1 Product data: Submit manufacturer's Product data in accordance with Section 01 33 00 indicating characteristics, performance criteria, and limitations. Indicate preparation, installation requirements and techniques, Product storage, and handling criteria.
 - .2 Shop drawings: Submit shop drawings in accordance with Section 01 33 00 indicating location and extent of system and system finish applications; system and joint sealant treatment materials, details of terminations at end of each days' work; large scale details, including relationships with adjacent construction; installation sequence and methods; connections; edge treatment at discontinuous edges; and accessories and other pertinent information required for proper and complete installations.
 - .3 Samples: Submit following samples in accordance with Section 01 33 00:
 - .1 Two 300 x 300 mm samples of waterproofing membrane.
 - .2 Two samples, 300 mm long, of fastening bar.
 - .3 Two samples 300 x 300 mm of protection board.
 - .4 Certification: Submit installer's certification verifying compliance with specification requirements.
 - .5 Extended warranty: Submit extended warranty signed and registered by the manufacturer providing the warranty in the name of the Owner for the timeframe and coverage specified in this Section.
- 1.3 **QUALITY ASSURANCE**
 - .1 Qualifications: Execute work of this Section by manufacturer-approved, skilled, qualified, and experienced workers, trained in installation of work of this Section.
- 1.4 **SITE CONDITIONS**
 - .1 Do not install the work of this Section outside of environmental ranges as recommended by manufacturer without Consultant's and Product manufacturer's written acceptance.

- .2 Supply and install temporary protection and facilities to maintain Product manufacturer's, and above specification, environmental requirements before, during, and after installation.

1.5 **EXTENDED WARRANTY**

- .1 Submit an extended written warranty for sheet waterproofing work in accordance with the Conditions of the Contract, except that warranty period is extended to five (5) years from date of Ready-for-Takeover.
 - .1 Warrant work against defects including adhesive failure, cohesive failure, waterproofing failure, and water leakage.
 - .2 Coverage: Complete replacement including effected adjacent Work.

2 Products

2.1 **MATERIALS**

- .1 All materials under work of this Section, including but not limited to, primers are to have low VOC content limits.
- .2 All components of the waterproofing system shall be supplied by one manufacturer.
- .3 Primer:
 - .1 'Aquaprime' by Henry Company Canada Inc.
 - .2 'CCW AWP' by Carlisle Coatings and Waterproofing.
 - .3 'Elastocol Stick' by Soprema.
 - .4 'Mel-Prime Primer by W. R. Meadows
- .4 Mastic:
 - .1 'Polybitume 570-05 Sealing Compound' by Henry Company Canada Inc.
 - .2 'CCW 704 Mastic' by Carlisle Coatings and Waterproofing.
 - .3 'Sopramastic 200' by Soprema
 - .4 'Pointing Mastic' by W. R. Meadows
- .5 Sheet waterproofing: 1.5 mm thick, single-ply, self adhering, self sealing, rubberised asphalt, bonded to a cross-laminated high density polyethylene film.
 - .1 'Blueskin WP 200' by Henry Company Canada Inc.
 - .2 'CCW Miradri 860/861' by Carlisle Coatings and Waterproofing.
 - .3 'Colphene 3000' by Soprema
 - .4 'Mel-Rol' by W. R. Meadows
- .6 Fastening bar: Continuous 25 mm wide x 3 mm thick aluminum bar, predrilled for mechanical attachment.

- .7 Protection Board:
 - .1 '990-31' by Henry Company Canada Inc.
 - .2 'CCW Protection Board - V' by Carlisle Coatings and Waterproofing.
 - .3 'Sopraboard' by Soprema Inc.
 - .4 'Sealtight Vibraflex Waterproofing Protection Board' by W. R. Meadows.
- .8 Accessories: As recommended by waterproofing system manufacturer.

3 Execution

3.1 **EXAMINATION**

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.
- .2 Verify that existing substrates to receive waterproofing are clean, dry, sound, smooth, and continuous.
- .3 Coordinate sealing of interruptions in, and protrusions through waterproofing membrane. Verify that other work items projecting through waterproofing membrane are in place and are securely installed.

3.2 **MASTIC AND PRIMER**

- .1 Fill substrate voids, gaps, depressions, cracks, and joints with mastic until continuous, smooth, substrate for waterproofing is achieved.
- .2 Prime substrate surfaces to receive waterproofing in accordance with manufacturer's instructions, at recommended application rate, allow to dry. Vary coverage to suit surface porosity.
- .3 Prime surfaces. Re-prime surfaces if not covered with waterproofing membrane within 4 hours.

3.3 **WATERPROOFING**

- .1 Install mastic where required to ensure integrity of waterproofing installation at protrusions and other complex details.
- .2 Install waterproofing in accordance with manufacturer's instructions.
- .3 Lap waterproofing ends and edges 50 mm minimum. Roll waterproofing and laps for continuous adhesion over entire substrate area; use manufacturer's recommended roller.

- .4 Extend waterproofing as required to connect to other components of work comprising waterproofing system.
- .5 Cut and fit waterproofing as required for passage of protrusions, ensuring continuous adherence to substrate.
- .6 At end of days' work, trowel mastic water cut-off along uppermost edge of incomplete waterproofing assembly, to prevent loss of adhesion and damage waterproofing.
- .7 Supply and install continuous mechanical fastening bar to clamp waterproofing both sides of unfilled gaps, cracks, and joints.
- .8 Supply and install protection board in accordance with detailed system, and manufacturer's instructions.

3.4 **REPAIR**

- .1 Repair misaligned or inadequately lapped seams, punctures, or other damage with additional ply of waterproofing sized to extend 150 mm minimum in all directions from repair edge.

END OF SECTION

-
- 1 General
 - 1.1 **SECTION INCLUDES**
 - .1 Labour, Products, equipment and services necessary for the thermal insulation work in accordance with the Contract Documents.
 - 1.2 **REFERENCES**
 - .1 CAN/ULC-S701, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .2 CAN-ULC-S704, Standard Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Faced.
 - 1.3 **SUBMITTALS**
 - .1 Product data: Submit manufacturer's Product data in accordance with Section 01 33 00 indicating characteristics, performance criteria, and limitations. Indicate installation requirements and techniques, storage, and handling criteria and installation procedure acceptable to manufacturer.
 - .2 Certification: Submit installer's certification verifying compliance with specification requirements.
 - 1.4 **QUALITY ASSURANCE**
 - .1 Qualifications: Execute work of this Section by company specializing in thermal insulation work with minimum of three years, recent, documented experience, on work of comparable complexity and scope.
 - 2 Products
 - 2.1 **MATERIALS**
 - .1 All materials under work of this Section, including but not limited to, adhesives are to have low VOC content limits.
 - .2 Rigid insulation: CAN/ULC-S701, Type 4; Minimum RSI of 0.87, Extruded polystyrene, ship-lapped edges. Thickness: As indicated on Drawings.
 - .1 Styrofoam SM by Dow Chemical Canada Inc.
 - .2 Foamular C-300 by Owens Corning Canada Inc.
 - .3 Continuous Wall Insulation: Closed cell polyisocyanurate foam core with a reflective aluminum foil facer on one side and a white acrylic-coated aluminum foil facer on the other, conforming to CAN-ULC-S704 and CAN-ULC-S114, Type 3, Class 2, R-value to CAN-ULC-S770 for long term thermal resistance (LTTR): 6/25. Thickness as indicated on Contract Drawings. Energysield Pro by Atlas Roofing Corporation.

.4 Spray foam insulation: In accordance with Section 07 21 19.

.5 Adhesive for polystyrene insulation: As recommended by insulation manufacturer and approved by air/vapour barrier manufacturer when adhesive is in direct contact with air/vapour barrier membrane.

3 Execution

3.1 **EXAMINATION**

.1 Verify condition of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

.2 Ensure substrate surfaces are dry, clean, suitable to receive adhesive and free from other deleterious substances.

3.2 **INSTALLATION**

.1 Install thermal insulation in longest panel sizes possible in accordance with manufacturer's instructions.

.2 Butt insulation with moderate contact and, cut and fit them tightly around other construction elements. Offset single layer vertical joints and both vertical and horizontal joints in multiple layer applications.,

.3 Make thermal insulation continuous, maintain thermal protection continuity and secure to prevent displacement. Ensure that insulation is tight to substrate without air gaps.

.4 Cut and fit thermal insulation tightly around electrical boxes, plumbing and heating pipes and ducts, exterior doors and windows, and other protrusions.

.5 Leave 75 mm separation between thermal insulation and heat emitting devices such as recessed light fixtures.

.6 Cut and trim thermal insulation neatly to fit spaces; do not compress insulation to fit. Install only thermal insulation boards which are free from chipped or broken edges.

.7 Fill miscellaneous cavities with insulation to maintain continuity of thermal barrier. Do not compress insulation to fit.

.8 Arrange for Consultant to review thermal insulation before it is enclosed.

3.3 SECUREMENT

- .1 Rigid insulation (Adhesive attachment):
 - .1 Apply adhesive to thermal insulation foam boards in accordance with manufacturer's recommendations.
 - .2 Omit adhesive bonding of foam board insulation over expansion and control joints.
- .2 Spray foam insulation: In accordance with Section 07 21 19.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for sprayed foam insulation work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.

.2 ASTM D1621, Standard Test Method for Compressive Properties Of Rigid Cellular Plastics.

.3 ASTM D1622, Standard Test Method for Apparent Density of Rigid Cellular Plastics.

.4 ASTM D1623, Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.

.5 ASTM D2842, Standard Test Method for Water Absorption of Rigid Cellular Plastics.

.6 ASTM E96, Standard Test Methods for Water Vapor Transmission of Materials.

.7 CAN/ULC S705.1, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Material Specification.

.8 CAN/ULC S705.2, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Application.

1.3 **SUBMITTALS**

.1 Product data:

.1 Submit duplicate copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:

.1 Performance criteria, characteristics, and limitations.

.2 Product transportation, storage, handling and installation requirements.

.2 Shop drawings: Submit shop drawings in accordance with Section 01 33 00 indicating:

.1 Elevations, sections, materials, details of joint conditions, including door, window, entrance framing, flashings, and roof parapet connection.

.3 Samples: Submit following samples in accordance with Section 01 33 00:

.1 Two 150 x 150 x 75 mm thick samples of sprayed insulation

.2 Two 300 x 300 mm samples of transition strips.

- .4 Certificates: Submit the following certificates in accordance with Section 01 33 00:
 - .1 Applicator's current certificate of approval by CUFCA/NECA or BASF Canada's training program.
 - .2 Applicator's current certificate of approval from material manufacturer.

1.4 **QUALITY ASSURANCE**

- .1 Perform work of this Section by a company that has a minimum of five years proven experience in installations of similar size and nature.
- .2 Contractor to be a certified member of the Canadian Urethane Foam Contractors Association/ National Energy Conservation Association (CUFCA/NECA) or be licensed under the BASF Canada Quality and Training Program "Raising Performance to New Heights" and in accordance with CAN/ULC S705.2 installation standard.
- .3 Provide quality assurance testing in accordance with CAN/ULC S705.2. Record daily results in a log book for Consultant's review.
- .4 Provide adhesion tests on transition membranes, in accordance with manufacturer's written instructions, at the perimeters of all openings. If the project comprises more than 10 openings, adhesion tests should be conducted on 15% of them. For jobs comprising 10 or fewer openings, 30% of these should undergo adhesion tests. Adhesion tests should be performed on the transition membranes at every tenth column or beam.
- .5 Mock-up:
 - .1 Construct mock-up of 3 m² minimum, of spray-in-place foam insulation to thickness as indicated on drawings, including one inside corner and one outside corner.
 - .2 Arrange for Consultant's review and acceptance, allow 24 hours before proceeding with work.
 - .3 When accepted, mock-up will demonstrate minimum standard for this work. Mock-up may remain as part of Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.

1.5 **SITE CONDITIONS**

- .1 Do not install work of this Section outside of following environmental ranges without Consultant's and Product manufacturer's written acceptance:
 - .1 Ambient air and surface temperature: 5^oC to 40^oC.
 - .2 Relative Humidity: Above 85%.
- .2 Supply and install temporary protection and facilities to maintain Product manufacturer's, and above specified environmental requirements for 48 hours before, during, and 48 hours after installation.

2 Products

2.1 **MATERIALS**

- .1 All materials under work of this Section, including but not limited to, primers and sealants are to have low VOC content limits.
- .2 Sprayed foam insulation: Sprayed/frothed polyurethane foam conforming to CAN/ULC S705.1. and utilizing a HFO blowing agent and conforming to the following minimum requirements:
 - .1 Density (ASTM D1622): 29.6 kg/m³.
 - .2 Open cell content (ASTMD2856): 5.6%.
 - .3 Tensile strength (ASTM D1623): 313 kPa.
 - .4 Compressive strength (ASTM D1621): 236 kPa.
 - .5 Water absorption (ASTM D2842): 0.6% by volume.
 - .6 Water vapour permeance (ASTM E96): 50mm sample 56 ng/Pa·s·m² (0.98 perms).
 - .7 Flame spread: <500.
 - .8 Sprayed urethane foam: 'Walltite CM01' by BASF or 'Heatlok Soya HFO' by Huntsman Building Solutions.
- .3 Primers: As recommended by sprayed foam insulation manufacturer.
- .4 Transition strip membrane:
 - .1 Membrane: 1.0 mm thick, single-ply, self adhering, self sealing, rubberised asphalt, bonded to a cross-laminated high density polyethylene film. 'Blueskin SA' by Henry Company Canada, 'Sopraseal Stick 1100' by Soprema, 'Exo-Air 110' by Tremco, or 'Air-Shield' by W. R. Meadows.
 - .2 Primer: 'Aquatac' by Henry Company Canada Inc., 'Elastocol Stick H20' by Soprema, 'ExoAir WB Primer' by Tremco, or 'Mel-Prime Water Base' by W.R. Meadows.
 - .3 Mastic: 'Polybitume 570-05' by Henry Company Canada Inc., 'Sopramastic' by Soprema, 'Acoustical Sealant' by Tremco, or 'Sealtight Pointing Mastic' by W.R. Meadows.
 - .4 Fastening bar: Continuous 25 mm wide x 3 mm thick aluminum bar, predrilled for mechanical attachment.
 - .5 Fasteners: As specified herein or manufacturer's recommended fastener for attaching to Substrate.
- .5 Sheet metal closures:
 - .1 Sheet metal: 0.711 mm thick, ASTM A653/A653M Grade A, Z275 Commercial Quality zinc coating.
 - .2 Joint sealing tape: 100% solid, cross linked butyl, preformed sealant tape; 'Tremco 440 Tape' by Tremco Ltd. or approved alternative.
 - .3 Sealant: 'One-part, non-sag; 'TRS 600' by Tremco Ltd., 'NovaLink' by ChemLink, or approved alternative.

3 Execution

3.1 **EXAMINATION**

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **PREPARATION**

- .1 Verify substrate surfaces are solid, free from surface water, frozen matter, dust, oil, grease, scaling or laitance, projections and any other foreign matter detrimental to performance. Obtain manufacturer's approval of substrate in writing, submit copy to Consultant.
- .2 Provide ventilation in area to receive sprayed foam insulation, introducing and exhausting fresh air continuously during and for 24 hours after application.
- .3 Provide temporary enclosures to prevent spray from contaminating air beyond application area, and damage from overspray and dusting on adjacent surfaces.
- .4 Supply and install temporary protection to adjacent surfaces to prevent damage resulting from work of this Section.
- .5 If required, apply primer to substrate surfaces in accordance with manufacturer's written instructions.

3.3 **TRANSITION STRIPS**

- .1 Install transition strips at all openings, penetrations, joints, cracks, dissimilar materials, and other locations of movement to ensure continuity of air/vapour retarder.
- .2 Mastic and Primer:
 - .1 Fill substrate voids, gaps, depressions, cracks, and joints with mastic until continuous, smooth, substrate for transition strip membrane is achieved.
 - .2 Prime substrate surfaces to receive membrane in accordance with manufacturer's instructions, at recommended application rate, allow to dry. Vary coverage to suit surface porosity.
 - .3 Prime surfaces. Re-prime surfaces if not covered with transition strip membrane within 4 hours.
- .3 Transition strip membrane installation:
 - .1 Install mastic where required to ensure integrity of transition strip membrane installation at protrusions and other complex details.
 - .2 Install transition strip membrane in accordance with manufacturer's instructions in locations indicated.

- .3 Lap membrane ends and edges 50 mm minimum. Roll membrane and laps for continuous adhesion over entire substrate area; use manufacturer's recommended roller.
- .4 Extend transition strip membrane as required to connect to other components of work comprising transition strip system.
- .5 Cut and fit membrane as required for passage of protrusions, ensuring continuous adherence to substrate.
- .6 At end of days' work, trowel mastic water cut-off along uppermost edge of incomplete membrane assembly, to prevent loss of adhesion and damage to transition membrane.

- .4 Fastening bars: Supply and install continuous mechanical fastening bar to clamp transition strip membrane both sides of unfilled gaps, cracks, and joints.

3.4 **SHEET METAL CLOSURES**

- .1 Provide sheet metal closures at all joints over 25 mm. Ensure surfaces receiving sealant or tape are dry, firm, straight, and free of loose material, projections, ice, frost, grease or oil, or other detrimental material.
- .2 Secure sheet metal closures with self-tapping screws at 150 mm oc along edges of panels and 450 mm oc at intermediate fixings.
- .3 At overlapping sheet metal edges, apply a continuous strip of tape; also gun-apply a continuous 6 mm bead of sealant along sheet metal edges. Liberally butter all screw fastenings penetrating the metal sheet closures or use self-sealing (EPDM) washers at each screw fastener.

3.5 **SPRAY INSULATION**

- .1 Install insulation in accordance with manufacturer's written instructions and conforming to CAN/ULC S705.2.
- .2 Apply sprayed foam insulation to thickness indicated on drawings and to provide continuous air retarder in locations indicated on the Drawings. Apply insulation to within 3 mm of thickness indicated on drawings. Provide one measuring pin for every 50 m².
- .3 Apply insulation in maximum 50 mm pass thickness, with a minimum wait time between passes as recommended by manufacturer.
- .4 Insulation to be continuous, level, plumb and uniform thickness throughout. Insulation shall be free of voids and imbedded foreign materials.

3.6 **INSPECTION AND TESTING**

- .1 Arrange for third party site-inspection by approved company. Cost of inspections shall be included in bid price.

- .2 Site inspection shall be carried out at 5%, 50% and 95% completion to verify conformance with CAN/ULC S705.2, manufacturers written instructions and this Section.
- .3 Written inspection reports shall be forwarded to Consultant within three (3) working days of test being performed.

END OF SECTION

-
- 1 General
 - 1.1 **SECTION INCLUDES**
 - .1 Labour, Products, equipment and services necessary for air/vapour barriers Work in accordance with the Contract Documents.
 - 1.2 **REFERENCES**
 - .1 ASTM E1643, Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
 - .2 ASTM E1745, Standard Specification for Water Vapour Retarders used in contact with Soil or Granular Fill under Concrete Slabs.
 - .3 CAN/CGSB 19.21-M, Sealing and Bedding Compound, Acoustical.
 - .4 CAN/CGSB-51.34-M, Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.
 - 1.3 **SUBMITTALS**
 - .1 Product data:
 - .1 Submit duplicate copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
 - .1 Performance criteria, compliance with appropriate reference standard, characteristics, and limitations.
 - .2 Product transportation, storage, handling and installation requirements.
 - .2 Samples: Submit following samples in accordance with Section 01 33 00:
 - .1 Two 300 x 300 mm samples of air/vapour barriers.
 - .2 Two samples, 300 mm long, of fastening bar.
 - .3 Duplicate samples of pipe and conduit boot.
 - 1.4 **QUALITY ASSURANCE**
 - .1 Mock-up:
 - .1 Construct one 10 m² mock-up of each type air/vapour barrier in location acceptable to Consultant indicating as a minimum one lap joint, one inside corner, one window interface, one wall electrical box, and floor pipe penetration.
 - .2 Arrange for Consultant's review and acceptance.
 - .3 Mock-up may remain as part of Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.

1.5 **SITE CONDITIONS**

- .1 Do not install the Work of this Section outside of environmental ranges as recommended by manufacturer without Consultant's and Product manufacturer's written acceptance.
- .2 Supply and install temporary protection and facilities to maintain Product manufacturer's, and above specification, environmental requirements before, during, and after installation.

2 Products

2.1 **WALL AIR/VAPOUR BARRIER MATERIALS**

- .1 All materials under Work of this Section, including but not limited to, primers and sealants are to have low VOC content limits.
- .2 Membrane air/vapour barrier: 1.0 mm thick, single-ply, self adhering, self sealing, rubberised asphalt, bonded to a cross-laminated high density polyethylene film.
 - .1 'CCW 705' by Carlisle Coatings & Waterproofing.
 - .2 'Blueskin SA' by Henry Company Canada Inc.
 - .3 'Sopraseal Stick 1100 T' by Soprema.
 - .4 'Exo-Air 110' by Tremco.
 - .5 'Air-Shield" by W. R. Meadows.
- .3 Primer:
 - .1 'Cav-Grip Primer' by Carlisle Coatings & Waterproofing.
 - .2 'Blueskin Adhesive' by Henry Company Canada Inc.
 - .3 'Elastocol Stick' by Soprema.
 - .4 'ExoAir Primer' by Tremco
 - .5 'Mel-Prime' by W.R. Meadows.
- .4 Mastic:
 - .1 'CCW 704 Mastic' by Carlisle Coatings & Waterproofing.
 - .2 'Polybitume 570-05' by Henry Company Canada Inc.
 - .3 'Sopramastic' by Soprema.
 - .4 'Acoustical Sealant' by Tremco
 - .5 'Sealtight Pointing Mastic' by W.R. Meadows.
- .5 Fastening bar: Continuous 25 mm wide x 3 mm thick aluminum bar, predrilled for mechanical attachment.
- .6 Fasteners: As specified herein or manufacturer's recommended fastener for attaching to Substrate.

2.2 UNDER SLAB VAPOUR RETARDER MATERIALS

- .1 All materials under Work of this Section, including but not limited to, primers and sealants are to have low VOC content limits.
- .2 Vapour retarder (under slab): ASTM E1745, Class A, 0.38 mm (15 mil) thick; 'Stego Wrap Vapor Barrier' by Stego Industries or 'Perminator' by W.R. Meadows.
 - .1 Joint sealing tape: High density polyethylene tape with pressure sensitive adhesive with minimum width 100 mm. Type recommended by sheet vapour retarder manufacturer.
 - .2 Pipe and conduit boots: Construct pipe and conduit boots from vapour retarder material and pressure sensitive tape as recommended by manufacturer.

2.3 SHEET VAPOUR RETARDER MATERIALS

- .1 All materials under Work of this Section, including but not limited to, primers and sealants are to have low VOC content limits.
- .2 Sheet vapour retarder: 'Super Six' Polyethylene film to CAN/CGSB-51.34, 0.15 mm (6 mil) thick.
 - .1 Joint sealing tape: Air and vapour resistant pressure sensitive adhesive tape, type recommended by sheet vapour retarder manufacturer, 50 mm wide for lap joints and perimeter seals, 25 mm wide elsewhere.
 - .2 Sealant: CAN/CGSB 19.21; One-part, non-sag, non-bleeding, non-drying, non-hardening, sealant shall remain tacky for permanent bonding to all surfaces; 'Tremco Acoustical Sealant' by Tremco Ltd. or approved alternative.

3 Execution

3.1 EXAMINATION AND COORDINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.
- .2 Verify that existing substrates to receive air/vapour barrier are clean, dry, sound, smooth, and continuous.
- .3 Coordinate installation of air/vapour barriers with work of other Sections to achieve a air/vapour tight building envelope.

3.2 MEMBRANE WALL AIR/VAPOUR BARRIER INSTALLATION

- .1 Fill substrate voids, gaps, depressions, cracks, and joints with mastic until continuous, smooth, substrate for air/vapour barrier is achieved.
- .2 Prime substrate surfaces to receive air/vapour barrier in accordance with manufacturer's instructions, at recommended application rate, allow to dry. Vary coverage to suit surface porosity.
- .3 Prime surfaces. Re-prime surfaces if not covered with air/vapour barrier within 4 hours.
- .4 Install mastic where required to ensure integrity of air/vapour barrier installation at protrusions and other complex details.
- .5 Install air/vapour barrier in accordance with manufacturer's instructions in locations indicated.
- .6 Lap air/vapour barrier ends and edges 50 mm minimum. Roll air/vapour barrier and laps for continuous adhesion over entire substrate area; use manufacturer's recommended roller.
- .7 Extend air/vapour barrier as required to connect to other components of Work comprising air/vapour barrier system.
- .8 Cut and fit air/vapour barrier as required for passage of protrusions, ensuring continuous adherence to substrate.
- .9 At end of days' Work, trowel mastic water cut-off along uppermost edge of incomplete air/vapour barrier assembly, to prevent loss of adhesion and damage air/vapour barrier.
- .10 Supply and install continuous mechanical fastening bar to clamp air/vapour barrier both sides of unfilled gaps, cracks, and joints.

3.3 UNDER SLAB VAPOUR RETARDER INSTALLATION

- .1 Install sheet vapour retarder under the floor slab prior to installation of floor slab, to form a continuous vapour retarder in accordance with ASTM E1643 and manufacturer's written instructions.
- .2 Lap vapour barrier over footings and seal to foundation walls.
- .3 Overlap joints 150 mm and seal with manufacturer approved sealing tape.
- .4 Seal all penetrations (including conduits and pipes) with manufacturer's pipe boot.
- .5 Use sheets of largest practical size to minimize joints.

- .6 Inspect for continuity. Repair punctures and tears with sealing tape before work is concealed.
- .7 Ensure continuity of vapour retarder is maintained at junctures with other materials.

3.4 **SHEET VAPOUR RETARDER INSTALLATION**

- .1 Ensure services are installed and inspected prior to installation of retarder.
- .2 Install sheet vapour retarder on the warm side of exterior wall, roof, and ceiling assemblies, prior to installation of roof insulation or interior finishes to form a continuous vapour retarder.
- .3 Use sheets of largest practical size to minimize joints.
- .4 Inspect for continuity. Repair punctures and tears with sealing tape before work is concealed.
- .5 At exterior surface openings, cut vapour retarder to form openings and ensure material is lapped and sealed to frame.
- .6 Ensure continuity of vapour retarder is maintained at junctures with other materials.
- .7 At perimeter seals, seal perimeter of sheet vapour retarder as follows:
 - .1 Apply continuous bead of sealant to substrate at perimeter of sheets.
 - .2 Lap sheet over sealant and press into sealant bead.
 - .3 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.
- .8 Seal lap joints of sheet vapour retarder as follows:
 - .1 Attach first sheet to substrate.
 - .2 Apply continuous bead of sealant over solid backing at joint.
 - .3 Lap adjoining sheet minimum 150 mm and press into sealant bead.
 - .4 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.
- .9 Seal electrical switch and outlet device boxes that penetrate vapour retarder as follows:
 - .1 Wrap boxes with film sheet providing minimum 300 mm perimeter lap flange.
 - .2 Apply sealant to seal edges of flange to main vapour retarder and seal wiring penetrations through box cover.

3.5 **FIELD QUALITY CONTROL**

- .1 Inspect air/vapour barrier continuity immediately prior to installation of subsequent construction. Repair punctures, rips and tears to ensure continuity of air/vapour barrier.
- .2 Where punctures and tears are extensive, replace entire damaged section.

- .3 Do not cover or permit to be covered any portion of air/vapour barrier until it has been inspected by Consultant.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Provide work of this Section including but not limited to the following:
 - .1 Cut openings through existing roofing to accommodate new penetrations.
 - .2 Make good roofing around new penetrations.
 - .3 New roof to match existing.

1.2 **REFERENCES**

- .1 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
- .2 ASTM C920, Specification for Elastomeric Joint Sealants.
- .3 ASTM D2178, Specification for Asphalt Glass (Felt) Used in Roofing and Waterproofing.
- .4 CSA A123.4-M, Bitumen for Use in Construction of Built-Up Roof Coverings and Dampproofing and Waterproofing Systems.
- .5 CAN/CSA-G40.20/G40.21-M, General Requirements for Rolled or Welded Structural Quality Steel/ Structural Quality Steels.
- .6 CAN/CSA S16.1-M, Limit States Design of Steel Structures.
- .7 CSA S136.1-M, Commentary on CAN/CSA S136-M, Cold Formed Steel Structural Members.
- .8 CAN/ULC S701, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- .9 CAN/ULC S704, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Faced.
- .10 CISC/CPMA 1.73a, A Quick-Drying One-Coat Paint for Use on Structural Steel.
- .11 CRCA Roofing Manual, Canadian Roofing Contractors Association.
- .12 OIRCA, Ontario Industrial Roofing Contractors Association.

1.3 **DESIGN REQUIREMENTS**

- .1 Design steel reinforcing as required for roof repair work in accordance with CAN/CSA-S16.1 and CSA S136.1.
- .2 Design reinforcement for openings or holes through existing deck up to 450 mm maximum width, measured perpendicular to span of deck.

1.4 SUBMITTALS

- .1 Product data: Submit copies of manufacturer's Product data in accordance with Section 01 33 00 indicating systems, materials, and methods of installation proposed for use, showing system and each component. Certify compliance of each component with applicable standards.
- .2 Shop drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 indicating:
 - .1 Details of roof system, flashings, control joints, method of tying in existing vapour retarder with new vapour retarder, insulation and similar items.
 - .2 Steel and adhesive reinforcing for openings or holes through deck up to 450 mm maximum width, measured perpendicular to span of deck.
- .3 Extended warranties: Submit extended warranties signed and registered by the manufacturer providing the warranties in the name of the Owner for the timeframe and coverage specified in this Section.

1.5 QUALITY ASSURANCE

- .1 Retain a Professional Engineer, licensed in the Province of Ontario, with experience in work of comparable complexity and scope, to perform the following services as part of the work of this Section:
 - .1 Design steel and adhesive reinforcing for roof repair work.
 - .2 Review, stamp, date and sign shop drawings.
- .2 Qualification: Perform work of this Section by a company that is a member in good standing of the Ontario Industrial Roofing Contractors Association (OIRCA) and has a minimum of 5 years proven acceptable roofing experience on installations of similar complexity and scope.
- .3 Perform roofing work in accordance with the CRCA Roofing Specifications Manual and in accordance with membrane manufacturer's printed installation instructions.

1.6 SITE CONDITIONS

- .1 Interruptions to Owners operations will not be permitted.
- .2 Do not remove existing roofing system when weather conditions threaten the integrity of the building contents or intended continued occupancy.

1.7 **EXTENDED WARRANTY**

- .1 At completion of this work, provide a signed OIRCA warranty to the Owner covering defects of workmanship for a period of 2 years commencing from date of Ready-for-Takeover. Agree to make good promptly any defects which occur or become apparent within the warranty period in conjunction with the membrane manufacturer's warranty. Defects shall include but not be limited to leakage, failure to stay in place, lifting, and deformation.
- .2 At completion of this work, provide a signed warranty from the roofing system manufacturer to the Owner covering defects in workmanship and materials for a period of 5 years commencing from date of Substantial Performance. The existing roofing system on adjacent existing building is covered by a roofing warranty by roof manufacture. Notify the warrantor and obtain necessary information regarding warranty requirements, to keep the warranty safe from breach of contract.
 - .1 Warrant against failure to meet design criteria and requirements

2 Products

2.1 **MATERIALS**

- .1 General: The existing roofing is an insulated 2-ply modified bitumen in a conventional assembly on a 76 mm Syporex Deck. Verify actual system in the field by means of a simple cut test and report to the Consultant result of test. Make good cut areas.
- .2 Roofing system components
 - .1 Roofing and Flashing Membrane: 2-ply SBS modified bitumen, mopping grade, with granulated cap sheet.
 - .2 Bitumen: Asphalt conforming to CSA A123.4-M, Type 2 for roofing and Type 3 for baseflashings and installation of insulation.
 - .3 Insulation: CAN/ULC-S704, Type 3; Closed cell polyisocyanurate. Provide appropriate cover board.
 - .4 Miscellaneous Components: To match existing.
- .3 Concrete Deck: Syporex Deck system as per Drawings.
- .4 Prepainted sheet steel: ASTM A653/A653M; Classification LFQ, Grade A, Z275 zinc coating designation, 0.60 mm minimum base steel thickness, commercial quality, prefinished with Perspectra Series coating system by U.S. Steel Canada, or WeatherX by Vicwest Steel. Colour: to match existing.
- .5 Fasteners: Single component polyurethane adhesive as recommended by roof system manufacturer. Of same material as deck secured, of type, length and size suitable for the particular conditions.
- .6 Dimension lumber: Grade stamped, dressed, kiln dried lumber having a maximum moisture content at time of installation, of 15% for 50 mm or less in thickness, and 19% for stock over 50 mm thick in accordance with NLGA.

- .7 Roof lumber: NLGA, 122b-Construction Light Framing Grade Jack Pine, S4S, pressure treated to CAN/CSA O80-M using CCA waterborne preservative treatment, impregnated to a net retention of 0.25 lbs/cu.ft. Treated lumber shall bear quality assurance grade stamp of certifying agency.
- .8 Structural shapes, plates, and similar items: CAN/CSA-G40.20/G40.21-M, Grade 300W; primer to CPMA 1.73a.
- .9 Sealant: Compatible with roofing system components.
- .10 Stack flashing units: By Division 22.
- .11 Roof drains: By Division 22.
- .12 Roof access hatch: Type S-20 by Bilco Canada, 914 mm x 762 mm, insulated, gasketed, complete with spring latch with inside and outside handles, padlock hasps, automatic hold open and operating arm, zinc plated and chromate sealed hardware.
- .13 Penetration seals:
 - .1 Modular curb: Precast polyester resin curb, 50 mm high, for bonding to roof around penetration, forming 25 mm cavity to be filled with non-shrinking rubber sealant.
 - .2 Adhesive and sealant: ASTM C920, Type S, Grade NS, Class 25; One component polyether based.
 - .3 Pourable sealer: ASTM C920, Type S, Grade s, Class 25; One component polyether based.
 - .4 Acceptable manufacturer: 'ChemCurb System' by Chemlink (as distributed by Building Resource Inc.) or approved alternative.

2.2 FABRICATION

- .1 Fabricate and install metal flashings to detail shown on reviewed shop drawings and in accordance with OIRCA.
- .2 Fabricate reinforcing for existing deck as a result of roof repair work required by the Project. Fabricate reinforcing in accordance with reviewed shop drawings.

3 Execution

3.1 EXAMINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **PROTECTION**

- .1 Provide adequate protection to materials and work of this Section from damage.
- .2 Provide protection covering of 19 mm thick plywood underlaid with 25 mm thick polystyrene board adhered to plywood sheathing. Place protection covering over all roofed areas when working from, or over, such roof surfaces where the roofing membrane is exposed to potential damage.
- .3 Existing Roofing: Do not use existing roof areas as storage or work staging area, except to extent required in accomplishing work. Provide temporary protection boards as previously specified, and protect areas of work from precipitation while existing construction is open.

3.3 **REMOVAL OF EXISTING ROOF**

- .1 Verify that existing roof surface is clear and ready for work of this Section.
- .2 Coordinate work with removal and reinstallation of affected mechanical and electrical equipment and associated roof penetrations.
- .3 At all locations where new openings are required in the existing roofing system, carefully cut and remove portions of existing roofing as required for remedial work required by this Section, including but not limited to cants, blocking and metal flashings. Seal all open roof edges to prevent damage to unfinished and undisturbed roof areas.
- .4 Remove only enough existing roofing system materials that can be replaced with new roof system the same day of as the weather will permit in a day.
- .5 Where sections of roof are removed or where new roofing are required. Cut back minimum of 230 mm outside line of opening or removal area to facilitate future flashing.
- .6 Remove membrane, plywood, insulation and vapour retarder over area to be demolished. Remove panels or cut roof decking with power tools to ensure straight edges. Leave free ends 300 mm maximum in length, unless adequately supported.
- .7 Supply and install plywood catchboard immediately under areas to be cut, to protect structure interior from falling debris. Install catchboard in combination with dust/weather protection.
- .8 Provide temporary protective sheeting over uncovered deck surfaces. Turn sheeting up and over parapets and curbing. Retain sheeting in position with weights or temporary fasteners. Provide for surface drainage from sheeting to existing drains.
- .9 Do not permit traffic over unprotected or repaired deck surface.

3.4 REINFORCEMENT FRAMING

- .1 Provide new reinforcing for openings created in existing roof under this Section to support altered roofing assembly as required.
- .2 Reinforce openings, up to 450 mm in any dimension, in existing deck with reinforcement framing in accordance with reviewed shop drawings and the following requirements:
 - .1 Openings smaller than 125 mm square or diameter: No reinforcement is required.
 - .2 Openings with any one dimension 150 to 450 mm: Reinforce as recommended by the deck manufacturer, except as otherwise indicated.
 - .3 Openings with any one dimension greater than 450 mm and for areas of concentrated load: Reinforce in accordance with structural framing details, except as otherwise indicated.

3.5 PREPARATION AND INSTALLATION

- .1 Clean roof back a sufficient distance to perform the cutting of openings and other work on the roof. Clean overlap area free from dirt and loose material with compressed air before proceeding with roofing work.
- .2 After installation of new work, reinstate roofing system and provide sheet metal flashings as shown.
- .3 Rough Carpentry: Install continuous wood nailers around roof openings at edges of insulation. Use cadmium plated self tapping screws for securing wood to metal deck. Pressure treated wood cut on the job shall have cut ends coated with a concentrated solution of wood preservative.
- .4 Insulation: Place insulation in tight contact with abutting surfaces. Cut insulation board through the board thickness and trim to provide plain butt joints; do not break or tear insulation board to fit detail. Verify method of existing insulation securement. Secure insulation through vapour barrier into roof deck ribs to match existing.
- .5 Base sheet roofing installation
 - .1 Apply base sheet to insulation with Type 3 asphalt.
 - .2 Begin application of the base sheet at the lowest edge or drain. Proceed up the slope from the lowest point. Position and unroll base sheet to achieve correct overlap and alignment. Re-roll one end a minimum of 3000 mm and adhere membrane to substrate. Complete application of remainder of sheet.
 - .3 Apply asphalt hot, so that its mopping temperature is not below 204 °C, when measured at the mop cart to facilitate correct interply thickness, adhesion and uniformity. Unroll membrane into the hot asphalt immediately. Do not mop more than 1200 mm ahead of unrolling. Unroll into asphalt mopped at the rate of 0.2 to 0.3 lbs./sq.ft., lapping 75 mm on sides and 150 mm on ends. Observe the presence of a bead of asphalt flowing out the seams.

- .6 Base sheet flashing installation
 - .1 Lay base sheet flashing in vertical strips one metre wide to curb surfaces extending on to flat roof surface minimum 100 mm from toe of cant or curb. Provide 75 mm side laps staggered minimum 100 mm from laps of base sheet of roof membrane.
 - .2 Adhere flashing directly to substrates with Type 3 asphalt, proceeding from bottom to top and therefore resulting in uniform adhesion over entire surface. Nail top leading edge to nailer at 300 mm on centre as applicable.
- .7 Cap sheet roofing installation
 - .1 Unroll cap sheet membrane dry over base sheet for alignment. Starting from lowest point on roof from perimeter curb, adhere to base sheet with adhesive. Extend cap sheet to base of cant or curb. Observe the presence of asphalt bead pushed out in front of membrane interface as cap sheet is laid.
 - .2 Stagger cap sheet seams from base sheet seams minimum of 300 mm. Provide 75 mm side laps and 150 mm end laps. Embed surface granules on end laps prior to installation of next sheet.
 - .3 During installation take care to avoid asphalt seepage greater than 6 mm at seams.
- .8 Cap sheet flashing installation
 - .1 Lay cap sheet flashing in strips one metre wide to curb surfaces as shown, extending on to flat roof surface minimum 150 mm from toe of cant. Provide 75 mm side laps staggered minimum 100 mm from cap sheet roofing laps and from base sheet flashing laps.
 - .2 Embed surface granules on laps over cap sheet roofing. Use chalk lines to ensure straight interface line on flat of roof.
 - .3 Adhere cap sheet flashing to cap sheet roofing, and to base sheet flashing with bitumen, proceeding from bottom to top, providing uniform adhesion over entire surface of baseflashing. Extend cap sheet as shown and nail top leading edge to nailers 300 mm on centre as applicable.
- .9 Sheet metal flashings: Flash penetrations passing through the membrane.
- .10 Sealant: Apply sealant where required to form weathertight seal between flashing and adjoining surfaces and between flashing and other work of this Section. Use primers and joint filler recommended by sealant manufacturer. Work shall consist of bedding between members where possible and with neatly formed bead where exposed.
- .11 Make all repairs to existing roof as necessary in accordance with [OIRCA] [CRCA] requirements, best standard practice and to complete satisfaction of the Consultant.

3.6 **PENETRATION SEALS**

- .1 Install penetration seals where required to waterproof penetrations as shown on Contract Drawings in accordance with manufacturer's written instructions.

- .2 Set modular curb into place to ensure proper fit, cut as necessary to fit ensuring a minimum 25 mm cavity. Install modular curb in sealant with additional sealant around base and down centre of section.
- .3 Apply pourable sealer and tool all surfaces smooth.

3.7 ROOF ACCESSORIES

- .1 Prior to application of flood coat and gravel, set roof hatches, stack flashing units and other roof penetration accessory units in accordance with manufacturer's product data. Set integral deck flange in full bed of roofing cement and strip-in with three plies of roofing membrane set in full moppings of bitumen. Extend flood coat and gravel to vertical projection of units. Install removable cap per accessory manufacturer product data as applicable.
- .2 Prior to application of membrane, set roof access hatch, stack flashing units, and other roof penetration accessory units in accordance with manufacturer's Product data. Install removable cap per accessory manufacturer's Product data as applicable.
- .3 Seal joints at items projecting through membrane watertight to acceptance of Consultant.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Labour, Products, equipment and services necessary for flashing and sheet metal work in accordance with the Contract Documents.

1.2 **REFERENCES**

- .1 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
- .2 ASTM C1193, Standard Guide for Use of Joint Sealants.
- .3 ASTM C920, Specification for Elastomeric Joint Sealants.
- .4 CSA A123.21, Standard Test Method for the Dynamic Wind Uplift Resistance of Membrane-Roofing Systems.
- .5 CRCA Roofing Manual, Canadian Roofing Contractors Association.

1.3 **DESIGN REQUIREMENTS**

- .1 Design flashing elements and fastenings to withstand wind loading and perimeter and corner uplift pressures for roof system in accordance with CSA A123.21.

1.4 **SUBMITTALS**

- .1 Shop drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 indicating:
 - .1 Proposed method of shaping, forming, jointing.
 - .2 Application of flashing and sheet metal work.
 - .3 Flashing fastening method, fasteners, and fastener spacing to meet wind loading and uplift pressures.
- .2 Samples:
 - .1 Submit following samples in accordance with Section 01 33 00:
 - .1 50 x 50 mm samples of sheet metal material, colour and finish.
 - .2 Representative sample section of prepainted metal flashing illustrating S locking jointing method, minimum 600 mm long.

2 Products

2.1 **MATERIALS**

- .1 All materials under work of this Section, including but not limited to, sealants and paints are to have low VOC content limits.
- .2 Flashing: To match existing flashing as per Drawings.
- .3 Plastic cement: Trowel grade asphalt mastic.
- .4 Sealant: ASTM C920, Type S, Grade NS, Class 25; High-performance, medium-modulus, one-part, neutral-cure silicone sealant. 'Dowsil CWS' by Dow Consumer Solutions, 'Sikasil 305CN' by Sika or 'Tremsil 400' by Tremco.
- .5 Cleats and starter strips: Starter strips to be continuous, of same material as flashing used, 1.2 mm thick.
- .6 Fasteners: Flat head roofing nails of length, type and thickness suitable for metal flashing application.
- .7 Washers: of same material as sheet metal, 1 mm thick with rubber packings.
- .8 Touch-up paint: Same colour and material as prepainted sheet steel, as recommended by prefinished coating manufacturer.

2.2 **FABRICATION**

- .1 Fabricate copings, flashings, curb counter flashings, starter strips, scuppers, and miscellaneous flashings in accordance with CRCA and to details shown.
- .2 Form prepainted sheet material at shop to shapes shown. Make end joints where adjacent lengths of metal flashing meet, in accordance with jointing method specified.
- .3 Form pieces in 2400 mm maximum practical lengths. Make allowance for expansion at joints.
- .4 Hem exposed edges 13 mm minimum on underside for appearance and stiffness. Mitre and seal corners with sealant.
- .5 Reglets and Cap flashing: Form flashings of as detailed and in accordance with CRCA. Provide slotted fixing holes and steel/plastic washer fasteners.

3 Execution

3.1 **EXAMINATION**

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **INSTALLATION**

- .1 Install coping flashings, curb counter flashings, starter strips, scuppers, miscellaneous flashings, and fasteners to details indicated and in accordance with reviewed shop drawings and CRCA requirements.
- .2 Use concealed fasteners. Exposed fasteners such as pop rivets are not allowed.
- .3 Install continuous starter strips to present a true, non-waving, leading edge. Anchor to back-up for a rigid, secure installation.
- .4 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs. Flash joints using S-lock forming tight fit over hook strips.
- .5 Make end joints using an S lock joint. Execute by inserting end coping length in 25 mm deep S lock formed in end of adjacent length. Extend concealed portion of S lock 25 mm outwards and nail to substrate. Face nailing of joints will not be permitted.
- .6 Seal where necessary to form weathertight seal between flashing and adjoining surfaces and between flashing and other work. Sealing work consists of bedding between members where possible. Tool sealant to concave profile where exposed. Install sealant in accordance with ASTM C1193.
- .7 Insert metal flashing under cap flashing to form weathertight junction.
- .8 Caulk flashing at cap flashing with sealant.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for firestopping and smoke seals work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM C303, Standard Test Method for Dimensions and Density of Preformed Block and Board-Type Thermal Insulation.

.2 ASTM C920, Standard Specification for Elastomeric Joint Sealants.

.3 ASTM C1104, Standard Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation.

.4 ASTM E814, Test Method for Fire Tests of Through-Penetration Fire Stops.

.5 ASTM E2174, Standard Practice for On-Site Inspection of Installed Fire Stops.

.6 CAN/ULC S102, Surface Burning Characteristics of Building Materials and Assemblies.

.7 CAN/ULC S114, Standard Method of Test for Determination of Non-Combustibility in Building Materials.

.8 CAN/ULC S115, Standard Method of Fire Tests of Firestop Systems.

.9 CAN/ULC S129, Standard Method Of Test For Smoulder Resistance Of Insulation (Basket Method).

.10 CAN/ULC S702, Thermal Insulation, Mineral Fibre for Buildings.

1.3 **DEFINITIONS**

.1 Fire Separation: A construction assembly, plane or device, either vertical or horizontal, which is required to prevent the passage of fire and smoke for a prescribed period of time. Proof of compliance to required time rating shall be by ULC, Warnock Hersey (or similar approved) certification or shall be as listed in the Ontario Building Code Supplementary Standard SB-2.

.2 Smoke Separation: A construction assembly, plane or device, either vertical or horizontal, which is not required to prevent the passage of fire for a prescribed period of time but is required to prevent the passage of smoke. A "Smoke Separation" is also known as a "Fire Separation with No Rating" or a "Zero Hour Rated Separation".

- .3 Non-Rated Separation: A construction assembly, plane or device, either vertical or horizontal, which is not required to prevent the passage of fire for a prescribed period of time and is not required to prevent the passage of smoke.

1.4 **SYSTEM DESCRIPTION**

- .1 Firestopping and smoke seals: ULC or Intertek Testing Services listed Products and systems in accordance with CAN/ULC S115 suitable to actual application and installation conditions.
- .2 Firestop applications that exist for which no ULC or cUL tested system is available through a manufacturer, a manufacturer's engineering judgment derived from similar ULC or cUL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineer judgment drawings must follow requirements set forth by the International Firestop Council.
- .3 Firestop and smoke seal system shall achieve a fire resistance rating and smoke seal rating equal to that of assemblies into which they are installed.
- .4 Provide smoke sealants over firestopping materials or combination smoke seal/firestop seal material to form air tight barriers to retard the passage of gas and smoke.
- .5 Firestopping and smoke seals located at movement joints shall be designed with movement capability.
- .6 Firestopping and smoke seals within mechanical and electrical assemblies shall be provided as part of the work of Divisions 21, 22, 23, 26, 27, and 28 respectively.

1.5 **SUBMITTALS**

- .1 Product data:
 - .1 Submit copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
 - .1 Performance criteria, compliance with appropriate cUL or ULC reference standard, characteristics, limitations.
 - .2 Product transportation, storage, handling and installation requirements.
 - .3 Submit firestop and smoke seal manufacturer's Product data for materials and prefabricated devices, including manufacturer's printed installation instructions.
 - .2 Shop drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 indicating:
 - .1 Fire rated and smoke sealed systems for each typical application.
 - .2 Construction details, accurately reflecting actual job conditions.
 - .3 ULC or Intertek Testing assembly listing.

- .4 Each floor and wall assembly requiring firestop system with each corresponding ULC firestop system.
- .3 Certification:
 - .1 Submit certified documentation from manufacturer for each worker performing work of this Section.
 - .2 Submit installer's and Product manufacturer's certification verifying compliance with the Contract Documents and conformance with ASTM E814 and CAN/ULC S115.

1.6 QUALITY ASSURANCE

- .1 Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in the installation of firestopping and smoke seal work of a similar size and nature and that is approved by manufacturer. Submit to Consultant, applicator's current certificate of approval by the material manufacturer as proof of compliance.
- .2 Manufacturer's direct representative and/or fire protection specialist shall be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures conforming to manufacturer's written recommendations published in their literature and drawing details.
- .3 Pre-construction meetings: Arrange with manufacturer's representative, Contractor, Consultant and Field Engineer to determine responsibility for handling such issues as FT rated partitions, firestop custom details, compatibility, mixed penetrations, and to review installation procedures 48 hours in advance of installation.

1.7 DELIVERY STORAGE AND HANDLING

- .1 Deliver materials to Place of Work in manufacturer's unopened containers, containing classification label with labels intact and legible at time of use.
- .2 Do not use damaged or adulterated materials exceeding their expiry date.

1.8 SITE CONDITIONS

- .1 Conform to manufacturer's requirements and maintain a minimum temperature of 5⁰ C for a minimum period of 24 h before application, during, and until application is fully cured.
- .2 Maintain sealant at a minimum 18° C for best workability.

2 Products

2.1 **ACCEPTABLE MANUFACTURERS**

- .1 Acceptable manufacturers of rated systems include:
 - .1 3M
 - .2 Hilti Canada Corporation.
 - .3 Specified Technologies Inc. (STI Firestop)
 - .4 Tremco Ltd.

2.2 **GENERAL SYSTEM REQUIREMENTS**

- .1 All materials under work of this Section, including but not limited to, primers and sealants are to have low VOC content limits.
- .2 Do not use Products containing asbestos.
- .3 Firestopping components shall not contain volatile solvents or require special application to protect plastic pipe from firestopping compound.
- .4 Provide smoke seal sealant in following colours:
 - .1 Grey or white in finished areas.
 - .2 Red in unfinished areas.
- .5 Smoke sealant for overhead and vertical joints for floor to be self-levelling and non-sagging sealant.
- .6 Smoke sealant at vertical through penetrations in areas with floor drains shall be waterproof type.

2.3 **MATERIALS**

- .1 Following materials have been provided for convenience. Contractor shall provide complete system with all components and accessories as required for fire resistant and smoke seal installation.
- .2 Firestop sealant: single component, low modulus, silicone rubber, moisture curing sealant to ASTM C920, ULC labelled to CAN/ULC S115.
- .3 Pre-Installed firestop devices for use with non-combustible and combustible pipes, conduit and/or cable bundles penetrating concrete floors and walls.
 - .1 Cast-in place firestop device complete with aerator adaptor when used in conjunction with aerator system. Model CP 680-P by Hilti or approved alternative.
 - .2 Cast-in place firestop device for use with noncombustible penetrants. Model CP 680-M by Hilti or approved alternative.
 - .3 Speed sleeve for use with cable penetrations. Model CP 653 by Hilti or approved alternative.
 - .4 Firestop block. Model CFS-BL by Hilti or approved alternative.

- .4 Re-penetrable, round cable management devices for use with new or existing cable bundles penetrating walls:
 - .1 Speed sleeve with integrated smoke seal fabric membrane. Model CP 653 by Hilti or approved alternative.
 - .2 Firestop Sleeve. Model CFS-SL SK by Hilti or approved alternative.
 - .3 Retrofit sleeve for use with existing cable bundles. Model CFS-SL RK by Hilti or approved alternative.
 - .4 Gangplate for use with multiple cable management devices. Model CFS-SL GP by Hilti or approved alternative.
 - .5 Gangplate Cap for use at blank openings in gangplate for future penetrations. Model CFS-SL GP CAP by Hilti or approved alternative.
- .5 Firestop insulation: to CAN/ULC S702, Type 2; mineral fibre manufactured from rock or slag, suitable for manual application.
 - .1 Density: Minimum 64 kg/m³ when tested to ASTM C303.
 - .2 Combustibility: Noncombustible to CAN/ULC S114.
 - .3 Melt temperature: >1175 degrees C.
 - .4 Surface burning characteristics: to CAN/ULC S102, maximum flame spread of 0, smoke developed of 0.
 - .5 Moisture Absorption: 0.04 percent when tested to ASTM C1104.
 - .6 Smoulder Resistance: 0.01 percent when tested to CAN/ULC S129.
- .6 Damming, back-up, supports, and anchorage: In accordance with manufacturer's fire rated systems and to acceptance of authorities having jurisdiction.
- .7 Primer: As recommended by firestopping sealant manufacturer.

3 Execution

3.1 EXAMINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.
- .2 Verify that substrates and surfaces to receive firestopping and smoke seals are clean, dry, and frost free.

3.2 PREPARATION

- .1 Prepare, modify, and adjust void sizes, proportions, and conditions to conform to fire rated and smoke sealed assembly requirements such as assembly opening size and dimensional restrictions.
- .2 Clean surfaces to remove material detrimental to bond including dust, paint, rust, oil, grease, moisture, frost and other foreign matter to manufacturers recommendations.

- .3 Mask adjacent surfaces to avoid spillage and over-coating of adjacent surfaces.
Remove stains from adjacent surfaces.

3.3 **INSTALLATION**

- .1 Install firestopping and smoke seal systems in accordance with reviewed Shop Drawings, manufacturer's instructions and fire rated assembly to establish continuity and integrity of fire separations.
- .2 Install firestop insulation in compacted thicknesses required by ULC design.
Compress insulation approximately 50 percent.
- .3 Install primers as recommended by firestop and smoke seal Product manufacturers.
- .4 Install temporary forming, damming, back-up as required, remove after materials have achieved initial cure and will resist displacement.
- .5 Install firestop and smoke seal filler in horizontal joints providing 25% compression fit.
- .6 Use resilient, elastomeric firestopping and smoke seal systems in following locations:
 - .1 Openings and sleeves for future use.
 - .2 Penetration systems subject to vibration or thermal movement.
 - .3 Penetration systems in acoustical containment enclosures.
- .7 Trowel and tool exposed firestop and smoke seal. Product surfaces to uniform, smooth finish.
- .8 Seal joints to ensure an air and water resistant seal capable of withstanding compressions and extensions due to thermal wind or seismic joint movement.
- .9 Taped joints will not be acceptable.
- .10 Repair damaged firestopped and smoke sealed surfaces to acceptance of Consultant.
- .11 Identify each firestop and smoke seal penetration assembly with permanent label listing following:
 - .1 Assembly and rating in hours.
 - .2 Date of installation.
 - .3 Installing company's name and telephone number.
- .12 Do not cover materials until full cure has taken place.

3.4 **INSPECTION AND TESTING**

- .1 Inspection of through-penetration firestopping shall be performed in accordance with ASTM E2174 to ensure that firestopping and smoke seals have been installed in accordance with Contract documents and to tested and listed firestop system.

3.5 CLEAN-UP

- .1 Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.
- .2 Remove excess materials and debris immediately after application.

3.6 SCHEDULE OF FIRESTOP AND SMOKE SEAL LOCATIONS

- .1 Following firestop and smoke seal location schedule is included for convenience and may not be complete. Examine Contract Drawings and other specification sections and determine entire extent of work of this Section. Generally provide systems with required fire and smoke ratings at following locations:
 - .1 Gaps at intersections of fire-resistance rated walls and partitions.
 - .2 Control and sway joints in fire-resistance rated walls and partitions.
 - .3 Gaps at top of fire-resistance rated partitions and walls.
 - .4 Penetrations through fire-resistance rated walls and partitions including but not limited to mechanical and electrical services and openings and sleeves for future use.
 - .5 Penetrations through fire-resistance rated floor slabs, ceilings, and roofs.
 - .6 Gaps at edge of floor slabs at exterior walls.
 - .7 Perimeter of retaining angles on rigid ducts greater than 0.012 m², firestopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.
 - .8 Where indicated on drawings.
 - .9 At non-rated assemblies that require a smoke seal.
 - .10 Where required by Ontario Building Code.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

- .1 Labour, Products, equipment and services necessary for sealant work in accordance with the Contract Documents.
- .2 Work of this Section does not include sealants in firestopping and smoke sealed assemblies.
- .3 Work of this Section does not include sealant work identified in individual specification sections.

1.2 **REFERENCES**

- .1 ASTM C834, Specification for Latex Sealants.
- .2 ASTM C920, Specification for Elastomeric Joint Sealants.
- .3 ASTM C1330, Specification for Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.

1.3 **SUBMITTALS**

- .1 Product data: Submit copies of Product data in accordance with Section 01 33 00 describing type, composition and recommendations or directions for surface preparation, material preparation and material installation.
- .2 Samples:
 - .1 Submit following samples in accordance with Section 01 33 00:
 - .1 Two samples of sealant/caulking, for colour selection.
 - .2 Two samples of back-up material and primer for physical characteristics.
- .3 Extended warranty: Submit extended warranty signed and registered by the manufacturer providing the warranty in the name of the Owner for the timeframe and coverage specified in this Section.

1.4 **QUALITY ASSURANCE**

- .1 Qualifications: Work of this Section shall be executed by trained applicators approved by sealant manufacturer and having a minimum of 5 years proven experience.
- .2 Retain a Professional Engineer, licensed in Province of Ontario, with experience in scaffolding and rigging work of comparable complexity and scope, to perform following services as part of work of this Section:
 - .1 Design of scaffolding and rigging.
 - .2 Review, stamp, and sign shop drawings.

.3 Conduct on-site inspections, prepare and submit written inspection reports verifying that this part of Work is in accordance with Contract Documents and reviewed shop drawings.

.3 Mock-up:

.1 Construct one 1200 mm long mock-up of each sealant type in location acceptable to Consultant.

.2 Demonstrate joint preparation, sealant application and tooling.

.3 Arrange for Consultant's review and acceptance.

.4 Mock-up may remain as part of Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.

.5 Upon acceptance, mock-up shall serve as a minimum standard of quality for the balance of the work of this Section.

.4 Pre-installation meetings: Arrange with manufacturer's representative and Consultant to inspect substrates, and to review installation procedures 48 hours in advance of installation.

1.5 **SITE CONDITIONS**

.1 Do not install materials when ambient air temperature is less than 5°C, when recesses are wet or damp, or to manufacturer's recommendations.

1.6 **DELIVERY, STORAGE AND HANDLING**

.1 Arrange delivery of materials in original, unopened packages with labels intact, including batch number, and ensure that on-site storage is kept to a minimum. Do not store materials on site where there exists any danger of damage from moisture, direct sunlight, freezing and other contaminants.

1.7 **EXTENDED WARRANTY**

.1 Submit an extended warranty for Sealant work in accordance with General Conditions, except that warranty period is extended to 2 years from date of Ready-for-Takeover of the Work.

.1 Warrant against leakage, cracking, crumbling, melting, shrinkage, running, loss of adhesion and staining adjacent surfaces.

.2 Coverage: Complete replacement including affected adjacent work.

2 Products

2.1 **MATERIALS**

.1 General:

.1 All materials under work of this Section, including but not limited to, primers and sealants are to have low VOC content limits.

.2 Use materials as received from manufacturers, without additives or adulterations. Use one manufacturer's Product for each kind of Product specified.

- .2 Sealant **Type A:** ASTM C920, Type S, Grade NS, Class 25; One-part, non-sag type, silicone sealant, in standard colours selected.
 - .1 'Dowsil CWS' by Dow Consumer Solutions.
 - .2 'Sikasil 305CN' by Sika.
 - .3 'Tremsil 400' by Tremco.

- .3 Sealant **Type B:** ASTM C834; Pure acrylic siliconized sealant; in standard white colour (paintable).
 - .1 '950A Siliconized Acrylic Latex Caulk' by Sherwin Williams.
 - .2 'Tremflex 834 Silconized Sealant' by Tremco Ltd.

2.2 ACCESSORIES

- .1 Primers: Type recommended by material manufacturers for various substrates, primers to prevent staining of adjacent surfaces encountered on project.

- .2 Joint backing: ASTM C1330; Round, solid section, closed cell, skinned surface, soft polyethylene foam gasket stock, compatible with primer and sealant materials, 30 to 50% oversized, Shore A hardness of 20, tensile strength 140 to 200 kPa. Bond breaker type surface.

- .3 Bond breaker: Type recommended by material manufacturers.

- .4 Void filler around the window frames to be one part expanding polyurethane foam.

- .5 Cleaning agents: As recommended by material manufacturer, non-staining, harmless to substrates and adjacent finished surfaces.

2.3 MIXING

- .1 Follow manufacturers instructions on mixing, shelf and pot life.

3 Execution

3.1 EXAMINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 INSPECTION

- .1 Arrange for the manufacturer of sealant to have a qualified technical representative visit the Site prior to commencement of caulking to discuss with applicator and Consultant the procedures to be adopted, to analyse conditions under which work will be done and to inspect surfaces and joints to be sealed, in order that alternative recommendations may be made should adverse conditions exist.

3.3 PREPARATION

- .1 Erect scaffolding and rigging required to perform sealant work in accordance with reviewed Shop Drawings.
- .2 Protect adjacent exposed surfaces to prevent smearing, staining or other damage, by masking or other means, prior to performing work. Make good any damage caused by sealant application. Remove protection upon completion and clean adjacent, exposed surfaces of any compound deposited upon such surfaces.
- .3 Prepare joints to receive sealants to manufacturer's instructions. Ensure that joints are clean and dry and ferrous surfaces are free from rust and oil.
- .4 Clean recesses to receive sealant, to be free of dirt, dust, loose material, oil, grease, form release agents and other substances detrimental to sealant's performance.
 - .1 Remove lacquer or other protective coatings from metal surfaces, without damaging metal finish, using oil-free solvents. Remove rust, mill scale and coatings from ferrous metals by wire brush, grinding or sand blasting.
 - .2 Ensure recess is dry.
 - .3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings. Remove incompatible coatings as required.
- .5 Ensure that all materials in contact with sealant are compatible. Test substrate for adhesion.
- .6 Depth of recess: Maintain depth to $\frac{1}{2}$ joint width up to a maximum of 13 mm and not less than 6 mm at centre of joint. For greater depth, use joint backing under. Where recess is less than specified depth, cut back surface of recess to specified recess depth.
- .7 Install polyethylene backing rod in joints 6 mm or more in width. Roll backing rod into joint. Do not stretch or bend backing rod. Install bond breaker to back of recess.
- .8 Prime sides of recess, in accordance with sealant manufacturer's instructions.
- .9 Condition products for use in accordance with manufacturer's recommendations.

3.4 INSTALLATION

- .1 Apply sealant immediately after adjoining work is in condition to receive such work. Apply sealant in continuous bead using gun with correctly sized nozzle. Use sufficient pressure to evenly fill joint.
- .2 Ensure sealant has full uniform contact with, and adhesion to, side surfaces of recess. Superficial painting with skin bead is not acceptable. Tool sealant to smooth surface, free from ridges, wrinkles, sags, air pockets, embedded impurities, dirt, stains or other defects.
 - .1 At recesses in angular surfaces, finish sealant with flat profile, flush with face of material at each side.

- .2 At recesses in flush surfaces, finish compound with concave face, flush with face of material at each side.
- .3 Make sealant bead uniform in colour.
- .4 Cure sealants in accordance with sealant manufacturer's instructions. Do not cover up sealants until proper curing has taken place.
- .5 Immediately remove excess compound or droppings which would set up or become difficult to remove from adjacent finished surfaces, using recommended cleaners, as work progresses. Do not use scrapers, chemicals or other tools which could damage finished surfaces. Remove defective sealant.
- .6 Clean recesses and re-apply sealant.
- .7 Remove masking tape immediately after joints have been sealed and tooled.

3.5 **CLEANING**

- .1 Clean surfaces adjacent to joints, remove sealant smears or other soiling resulting from application of sealants. At metal surfaces, remove residue. Do not mar or damage finishes on materials adjacent to joints. Repair or replace marred or damaged materials.

3.6 **SCHEDULE OF LOCATIONS**

- .1 Following sealant location schedule is included for convenience and may not be complete. Examine Contract Drawings and other specification sections and determine entire extent of work of this Section. Generally seal following locations:
 - .1 Concrete, masonry, wood and stone to metal.
 - .2 Wood to masonry, concrete and stone.
 - .3 Metal to metal.
 - .4 All dissimilar materials.
 - .5 Where 'sealant' or 'caulking' is indicated on drawings.
- .2 Sealant **Type A**:
 - .1 Exterior joints between masonry and steel or aluminum.
 - .2 Exterior joints between masonry and shelf angle.
 - .3 Exterior joints between steel or aluminum and concrete or masonry.
 - .4 Interior and exterior control joints, except in floors.
 - .5 Door frames, interior and exterior side.
 - .6 Protrusions through interior and exterior walls and floors, interior and exterior side, except where fire rated seals are required.
 - .7 Seal thresholds.

- .3 Sealant **Type B:**
 - .1 Perimeter of interior windows.
 - .2 Junction between drywall and masonry.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for metal door and frame work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.

.2 ASTM A924/A924M, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

.3 CAN4/ULC-S104M, Standard Method for Fire Test of Door Assemblies.

.4 CAN4/ULC-S105M, Standard Specification for Fire Door Frames, Meeting the Performance Required by CAN4/ULC-S104M.

.5 CAN/CGSB-1.198, Cementitious Primer, (for Galvanized Surfaces).

.6 CGSB 41-GP-19Ma, Rigid Vinyl Extrusions for Windows and Doors.

.7 CAN/ULC-S702, Thermal Insulation, Mineral Fibre for Buildings.

.8 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures.

.9 CSA W59-M, Welded Steel Construction (Metal Arc Welding).

.10 CSDMA, Canadian Steel Door Manufacturers Association.

.11 NFPA 80, Standard for Fire Doors and Other Opening Protectives.

.12 NFPA 252, Standard Methods of Fire Tests of Door Assemblies.

1.3 **DESIGN REQUIREMENTS**

.1 Design exterior frame assemblies to accommodate expansion and contraction when subjected to minimum and maximum surface temperature of -35°C to 35°C.

.2 Maximum deflection for exterior metal doors under wind load of 1.2 kPa not to exceed 1/175th of span.

1.4 **SUBMITTALS**

.1 Product data: Submit manufacturer's Product data in accordance with Section 01 33 00 indicating door and frame construction.

- .2 Shop drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 for each type of door and frame indicating:
 - .1 Thickness and type of steel.
 - .2 Thickness and type of core.
 - .3 Thickness and type of steel stiffeners and location of them within the door.
 - .4 Thickness and type of metal facing on edges of door and method of fastening.
 - .5 Location of mortises, reinforcement, anchorages, joining, welding, sleeving, exposed fasteners, openings and arrangement for hardware.
 - .2 Include schedule identifying each unit with door marks and numbers relating to numbering on Contract Drawings and in door schedule. Indicate doors and frames to be fire rated.
- .3 Extended warranties: Submit extended warranties signed and registered by the manufacturer providing the warranties in the name of the Owner for the timeframe and coverage specified in this Section.

1.5 **QUALITY ASSURANCE**

- .1 Perform work in accordance with requirements of the Canadian Steel Door Manufacturer's Association (CSDMA).
- .2 Label and list fire rated doors and frames by an organization acceptable to authorities having jurisdiction and accredited by the Standards Council of Canada in conformance with CAN4/ULC-S104M and CAN4/ULC-S105M for ratings indicated, Labelling shall be in accordance with NFPA 80.

1.6 **EXTENDED WARRANTY**

- .1 Submit an extended warranty for metal door and frames work in accordance with General Conditions, except that warranty period is extended to 3 years from date of Ready-for-Takeover.
 - .1 Warrant against leaking, warping, twisting, joint, and finish failure.
 - .2 Coverage: Complete replacement including affected adjacent parts.

2 Products

2.1 **ACCEPTABLE MANUFACTURERS**

- .1 Baron Metal Industries.
- .2 Fleming Doors Products.
- .3 Or approved alternative.

2.2 MATERIALS

- .1 General: All materials under work of this Section, including but not limited to, primers are to have low VOC content limits.
- .2 Steel: ASTM A924/A924M, Class 1; Commercial grade steel, hot dip galvanized to ASTM A653/A653M, ZF120 galvanized coating.
- .3 Minimum base steel thickness:
 - .1 Frames 1.6 mm
 - .2 Typical doors 1.6 mm
 - .3 Interior stiffeners 0.9 mm
 - .4 Lock/strike reinforcements 1.6 mm
 - .5 Hinge reinforcements 2.7 mm
 - .6 All other reinforcement 1.6 mm
 - .7 Top and bottom channels 1.2 mm
 - .8 Glazing stops 0.9 mm
 - .9 Guard boxes 0.9 mm
 - .10 Jamb spreaders 0.9 mm
- .4 Top caps and thermal breaks: CGSB 41-GP-19Ma; Rigid PVC extrusions.
- .5 Primer: CAN/CGSB 1.198.
- .6 Core material:
 - .1 Exterior doors: Rigid poly/isocyanurate, closed cell insulation, 32 kg/m³ (2.0 lbs/ft³), thermal value: RSI 1.9.
 - .2 Fire rated doors: Mineral fibre insulation to CAN/ULC S702, Type 1A; 24 kg/m³ (1.5 lbs/ft³).
- .7 Screws: Stainless steel screws with countersunk flat head.
- .8 Door silencers: Type 6-180, black neoprene.
- .9 Frame anchors:
 - .1 Frames in masonry: 1.2 mm minimum, adjustable T-strap jamb anchors.
 - .2 Frames in steel stud partitions: 0.9 mm minimum steel anchors of suitable design securely welded inside each jamb.
 - .3 Labeled frames: In accordance with ULC requirements.
- .10 Floor anchors: 1.6 mm minimum adjustable floor clip angles with 2 holes for anchorage to floor.
- .11 Labels for fire doors and door frame: Brass plate, riveted to door and door frame.
- .12 Grilles: Corrosion resistant steel with baked enamel finish. Model 61DG Series by Nailor Industries Inc or approved alternative by Hart and Cooley.
- .13 Glass and glazing: In accordance with Section 08 80 00.

- .14 Thresholds: Anodized aluminum finish, threshold of type recommended by door manufacturer

2.3 FABRICATION

- .1 General
 - .1 Fabricate doors and frames in accordance with reviewed shop drawings.
 - .2 Welding: CSA W59-M to produce a finished unit with no visible seams or joints, square, true and free of distortion.
 - .3 Welding: Continuous unless specified otherwise. Execute welding by a firm fully acceptable to the Canadian Welding Bureau to requirements of CSA W47.1.
 - .4 Form profiles accurately to details shown on Contract Drawings.
 - .5 Ream and remove burrs from drilled and punched holes.
 - .6 Grind welded corners and joints to a flat plane and fill with metallic filler and sand to a uniform smooth finish. Apply one coat of primer.
 - .7 Provide weather strip for exterior doors in accordance with Section 08 70 00 and door manufacturer.
- .2 Frames, windows, and screens:
 - .1 Fabricate frames of welded construction. Cut mitres and joints accurately and weld continuously on inside of frame profile. Exterior frames to be thermally broken.
 - .2 Construct large frame sections with provision for on Site assembly to suit Site conditions.
 - .3 Blank, reinforce, drill and tap frames for mortised, templated hardware. Protect mortised cut-outs with guard boxes.
 - .4 Reinforce frames where required for surface mounted hardware.
 - .5 Reinforce frames over 1200 mm wide with roll formed steel channels or hollow structural sections specified in Section 05 50 00 and as indicated on drawings.
 - .6 Furnish exterior door frames with a continuously welded integral steel weather drip at head of frame.
 - .7 Prepare each door opening for single stud rubber door silencers, 3 for single door openings located in strike jamb, and 2 for double door openings located in head.
 - .8 Install 2 channel or angle spreaders per frame, to ensure correct frame alignment. Install stiffener plates or spreaders between frame trim where required, to prevent bending of trim and to maintain alignment when setting in place.
 - .9 Form channel glazing stops minimum 16 mm height, accurately cut, mitred, fitted and fastened to frame sections with stainless steel counter-sunk, flat head screws spaced at maximum 450 mm throughout and 50 mm from each end.
 - .10 Provide the following requirements for electrified frame applications:
 - .1 Low voltage wire conduit for required electrified hardware devices.
 - .2 Junction boxes for all frame mounted electrified hardware devices, complete with required connectors to in frame low voltage wire conduit.

- .3 Anchorage:
 - .1 Anchor units to floor and wall construction. Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb, minimum number of anchors for each jamb:
 - .1 Frames up to 2285 mm 3 anchors.
 - .2 Frames from 2285 mm to 2440 mm 4 anchors.
 - .2 Where frames are to be set in masonry or concrete, supply adjustable anchors to trade installing frame.
 - .3 Fabricate frames for installation in steel stud partitions with steel anchors of suitable design, minimum number of anchors for each jamb:
 - .1 Frames up to 2285 mm height 4 anchors.
 - .2 Frames 2285 mm to 2440 mm 5 anchors.

- .4 General Door Requirements:
 - .1 Hollow steel construction, flush swing type, of sizes to conform to details, schedules and reviewed shop drawings with provisions for cut-outs for glass and grilles and reinforced to receive hardware fastenings.
 - .2 Blank, reinforce, drill and tap doors for mortised, templated hardware. Where required, reinforce doors for surface mounted hardware and door closers.
 - .3 Reinforce oversized doors with steel channels and plates specified in Section 05 50 00 and as indicated on drawings.
 - .4 Where openings are required, form integral cut-outs with framing, glass stop moldings and division bars.
 - .5 Install grilles to fit tight and secure into openings.
 - .6 Bevel both stiles of single doors 1 in 16.
 - .7 Reinforce doors with galvanized metal stiffeners at 150 mm o.c.
 - .8 Provide the following requirements for electrified door applications:
 - .1 In door low voltage wire raceways.
 - .2 Steel astragals for hollow metal doors.
 - .3 Reinforcement for all door mounted electrified hardware devices as required and as indicated on Contract Drawings.

- .5 Exterior Doors:
 - .1 Supply and install inverted, recessed, fully welded channels at top and bottom of doors. Supply and install PVC top caps.
 - .2 Fabricate doors with joints between front and back panels meeting on stile edges. Make joints continuously welded for entire height of door. After welding has been completed, grind joints smooth to match metal. Ensure that no filler is used in joints.
 - .3 Fill hollow space within door from top to bottom with rigid polyisocyanurate insulation.

- .6 Fire Rated Doors:
 - .1 Supply and install inverted, recessed, spot welded channels at top and bottom of doors. Supply and install steel flush top caps on exterior doors.

- .2 Fabricate doors with joints between front and back panels meeting on stile edges. Make joints continuously welded for entire height of door. After welding has been completed, grind joints smooth to match metal. Ensure that no filler is used in joints.
- .3 Fabricate doors to achieve fire rating as indicated on drawings and in accordance with ULC. Provide ULC label plate on door at hinged edge midway between top hinge and head of door.

3 Execution

3.1 **EXAMINATION**

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **HOLLOW METAL DOOR, FRAME, WINDOW AND SCREEN INSTALLATION**

- .1 Install hollow metal doors, frames, windows, and screens in accordance with reviewed shop drawings, manufacturer's written instructions and to meet CSDMA requirements.
- .2 Install hollow metal doors, frames, windows, and screens plumb, square, level, secure, and at correct elevation.
- .3 Install doors clear of floor finishes, and with the correct rebate opening for the door installation. Install door silencers.
- .4 Secure anchorages and connections to adjacent construction. Brace frames rigidly in position while building-in. Remove temporary steel shipping jamb spreaders. Install wood spreaders at third points of frame rebate height to maintain frame width. Supply and install vertical supports as indicated on drawings for openings over 1200 mm in width. Remove wood spreaders after frames have been built-in.
- .5 Allow for structural deflection and prevent structural loads from being transmitted to hollow metal frames.
- .6 Touch-up areas where galvanized coating has been removed or damaged with primer.
- .7 Fire rated doors: Install fire rated doors and frames in accordance with requirements of NFPA 80.

3.3 **ADJUSTING AND CLEANING**

- .1 Adjust doors for smooth and balanced door movement.
- .2 Clean doors, frames, windows and screens.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Design, labour, Products, equipment and services necessary for aluminum window work in accordance with the Contract Documents.

1.2 **REFERENCE**

- .1 AAMA 611, Voluntary Standards for Anodized Architectural Aluminum.
- .2 AAMA/WDMA/CSA 101/I.S.2/A440, Standard Specification for Windows, Doors, and Unit Skylights.
- .3 ANSI H35.1M, Alloy and Temper Designation Systems for Aluminum (Metric).
- .4 ASTM B209M, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- .5 ASTM B211, Specification for Aluminum-Alloy Extruded Bars, Rods, Wires, Shapes and Tubes.
- .6 ASTM C920, Specification for Elastomeric Joint Sealants.
- .7 ASTM F738M, Specification for Stainless Steel Metric Bolts, Screws, and Studs.
- .8 CAN/CGSB-12.3-M, Flat, Clear Float Glass.
- .9 CAN/CGSB-12.8-M, Insulating Glass Units.
- .10 CAN/CGSB 79.1-M, Insect Screens.
- .11 CSA A440S1, Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440-17, North American Fenestration Standard/Specification for windows, doors, and skylights
- .12 IGMA, Insulating Glass Manufacturers Alliance.
- .13 NFRC 100, Procedure for Determining Fenestration Product U-factors.
- .14 NFRC 200, Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

1.3 **DESIGN REQUIREMENTS**

.1 Design windows to meet requirements of AAMA/WDMA/CSA 101/I.S.2/A440, NFRC 100, NFRC 200 and to meet performance and energy requirements specified herein and as required by authorities having jurisdiction.

- .2 Design complete window systems, including glazing, to meet the following performance criteria:
 - .1 U-factor: Maximum 2.33.
 - .2 SHGC: Maximum 0.39.

- .3 Design aluminum work in accordance with following Climatic Design Data for Mississauga contained in the Ontario Building Code:
 - .1 Design temperature: January 1%, July 2 1/2%.
 - .2 Hourly wind pressures: 1 in 50 year occurrence.

- .4 Design aluminum work to accommodate following without producing detrimental effect:
 - .1 Cyclic 40 degrees C daily thermal swing of components.
 - .2 Cyclic, dynamic loading and release of loads such as wind loads.
 - .3 13 mm vertical deflection in supporting structure and movement of supporting structure due to live, dead load, and creep or deflections, seismic load, sway displacement and similar items.

- .5 Design to prevent accumulation of condensate on interior side of aluminum work framing under the following service conditions:
 - .1 Interior temperature: 25°C.
 - .2 Exterior temperature: -25°C.
 - .3 Interior RH: 35%.

- .6 Design and detail controlled drainage path to actively discharge water, which enters into or forms within aluminum work, to exterior; prevent accumulation or storage of water within aluminum work.

- .7 Design windows in accordance to AAMA/WDMA/CSA -101/I.S.2/ A440 and CSA A440S1, to the following performance levels:
 - .1 Performance class: CW
 - .2 Minimum performance grade (PG): 30.
 - .3 Minimum positive design pressure: 1440 Pa.
 - .4 Minimum negative design pressure: - 1440 Pa.
 - .5 Minimum water penetration test pressure: 220 Pa.
 - .6 Minimum water leakage: B7 (700 Pa).
 - .7 Minimum air infiltration/exfiltration: A3 Fixed (maximum air leakage -0.55 (m³/h/m)).
 - .8 Minimum wind load resistance: C5 (5000 Pa)
 - .9 Condensation resistance:
 - .1 Fixed frame: 71 minimum
 - .2 Glass: 67 Minimum.

- .8 Design and detail air barrier, vapour retarder, and rainscreen products and assemblies into continuous and integrated aluminum work envelope. Optimize aluminum work design to align envelope layers and to minimize thermal bridges.

- .9 Prevent deflection and permanent or progressive glazing displacement. Restrict horizontal and vertical mullion deflection to less than L/175 (under uniformly distributed positive design wind load), and 10 mm maximum regardless of span.
- .10 Design anchorage inserts for installation as part of other Sections of Work. Design anchorage assemblies to accommodate construction and installation tolerances.

1.4 **SUBMITTALS**

- .1 Shop drawings: Submit shop drawings in accordance with Section 01 33 00 indicating:
 - .1 Fabrication and erection of glazing elements indicating materials, thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.
 - .2 Calculations or modelling confirming windows conforms to specified performance and energy requirements.
- .2 Samples:
 - .1 Submit following samples in accordance with Section 01 33 00.
 - .2 Submit one 300 x 300 mm of each type of insulating glass unit.
- .3 Certificates: Submit manufacturer's certification that glass and glazing materials are compatible.
- .3 Submit compatibility and adhesion test reports from sealant manufacturer indicating that glazing materials were tested for compatibility and adhesion with glazing sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed for adhesion.
- .4 Compatibility test report from manufacturer of insulating glass edge sealant, indicating that glass edge sealants were tested for compatibility with other glazing materials including sealants, setting blocks, edge blocks and any other material that contacts or can affect the edge seal.
- .5 IGMA Compliance Audit: Submit in accordance with Section 01 33 00, a written certification of successful completion of a Compliance Audit within the last six months.
- .6 Extended warranty: Submit extended warranty signed and registered by the manufacturer providing the warranty in the name of the Owner for the timeframe and coverage specified in this Section.

1.5 **QUALITY ASSURANCE**

- .1 Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in the installations of a similar size and nature and that is approved by manufacturer. Submit to Consultant, applicator's current certificate of approval by the material manufacturer as proof of compliance. Submit proof of experience upon Consultant's request.
- .2 Independent inspection:
 - .1 Inspection and testing of windows may be performed by an inspection and testing firm designated and paid for by the Owner.
 - .2 Inspection and testing by the independent inspection company may be performed on or off site. Inspection and testing will be performed to ensure that windows meet specified design criteria. Coordinate with inspection and testing company.
 - .3 Tested windows shall meet or exceed requirements of this Section.
 - .4 Copies of test reports will be provided to Contractor.
 - .5 Air infiltration test will be performed before water resistance test.
 - .6 At conclusion of tests there shall be no glass breakage, damage of fasteners, hardware parts, or any other damage.
 - .7 Windows not meeting design criteria will be replaced at no cost to Owner.
- .3 Mock-up:
 - .1 Construct one field sample mock-up of window in location acceptable to Consultant.
 - .2 Demonstrate installation of anchoring devices and air/vapour retarder sealing and relation of window to surrounding construction.
 - .3 Arrange for Consultant's review and acceptance.
 - .4 Mock-up may remain as part of Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.
 - .5 Upon acceptance, mock-up shall serve as a minimum standard of quality for the balance of the work of this Section.

1.6 **DELIVERY, STORAGE, AND HANDLING**

- .1 Handle aluminum work in accordance with AAMA CW-10.
- .2 Protect aluminum surfaces with strippable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather. Do not remove before final cleaning of building.

1.7 **EXTENDED WARRANTY**

- .1 Submit an extended warranty for aluminum work in accordance with General Conditions, except that warranty period is extended to 5 years from date of Ready-for-Takeover.
 - .1 Warrant against failure to meet the design criteria and requirements such as interior leakage, insulating glass unit failure, finish degradation, frame condensation.
 - .2 Coverage: Complete replacement including affected adjacent work.

2 Products

2.1 **ACCEPTABLE MANUFACTURERS**

- .1 Fixed windows: '990 Series' by Alumicor Limited, '516 Isoport Windows' by Kawneer Company Canada Limited, or approved alternative.
- .2 Operable Windows: 'UniVent 1350 Series' by Alumicor Limited, '526 Windows' by Kawneer Company Canada Limited or approved alternative.

2.2 **MATERIALS**

- .1 All materials under work of this Section, including but not limited to, primers and sealants are to have low VOC content limits.
- .2 Unless detailed or specified herein, standard products in accordance with AAMA/WDMA/CSA -101/I.S.2/ A440 will be acceptable if construction details and installation meet intent of Drawings and Specifications.
- .3 Aluminum extrusions and channels: ASTM B211 and ANSI H35.1 AA6063 alloy, T6 temper.
 - .1 Profile and dimensions: Refer to Contract Drawings.
 - .2 Thermal breaks in frame members: Vertically aligned with glazing.
- .4 Aluminum sheet: ASTM B209 and ANSI H35.1 AA1100 aluminum alloy, H14 temper, minimum 1.29 mm for sheets less than 610 mm wide and minimum 2.05 mm for sheets of a greater dimension.
- .5 Float glass: CAN/CGSB-12.3-M; glazing quality, 6 mm thick float unless otherwise specified, clear.
- .6 Low-E coating: High performance sputtered low-E coating. Provide insulating glass units with low-E coating edge deletion. Apply low-E coating to second surface unless otherwise indicated. Use 'Solarban 60' clear by PPG or approved alternative.

- .7 Insulating glass units: To CAN/CGSB-12.8-M and IGMA requirements utilizing approved non-metallic PVC or Fibreglass edge spacer in black. Dual seal with a PIB primary seal and silicone secondary seal.
- .8 Glazing Compound: 400 polyisobutylene-butyl tape by Tremco (Canada) Ltd. and sealant to CAN/CGSB-19.13-M type G-2-25-A-N or window manufacturer's standard factory glazing system.
- .9 Setting Blocks: Neoprene, Shore 'A' hardness 80-90, width equal to thickness of sealed double glazed unit and 75-100 mm long.
- .10 Joint Primer, Surface Conditioners and Cleaning Agents: As recommended by respective glazing and sealant compound manufacturer.
- .11 Window hardware: Heavy duty window hardware to include all components as required for smooth, secure and complete operation and to be reviewed by the Consultant prior to ordering.
- .12 Joint backing: Closed cell foam polyethylene rod, outsized minimum 30-50% larger than joint width and compatible with joint sealant. Product as recommended by sealant manufacturer.
- .13 Joint Primer, Surface Conditioners and Cleaning Agents: As recommended by respective glazing and sealant compound manufacturer.
- .14 Sealant: ASTM C920, Type S, Grade NS, Class 100; One-part, Moisture -curing silicone, 'Dowsil 790' by Dow Consumer Solutions or Spectrum 1 by Tremco. Colour: As selected by Consultant.
- .15 Screws, bolts and other fasteners: ASTM F738M; Stainless Steel Type 304. Aluminum; screws and bolts, AS2024 or 6061, and nuts AS6262.
- .16 Foam insulation: One component polyurethane foam-in-place moisture cured caulking sealant insulation, 16 kg per m³ to 32 kg per m³ density; injected from prepackaged pressurized containers for installation within closures and fillers; foam shall be CFC free. Enerfoam by DuPont de Nemours Inc. or approved alternative.

2.3 FABRICATION

- .1 Fabricate sections true to detail, free from defects impairing appearance, strength and durability. Fabricate extrusions with sharp, well defined corners.
- .2 Fabricate panel system in accordance with reviewed shop drawings.
- .3 Fabricate, fit, and secure framing joints and corners accurately, with flush surfaces, and hairline joints. Apply frame sealant at joints for weatherproof seams.

- .4 Conceal anchors, reinforcement and attachments from view. Fabricate reinforcement in accordance with design requirements.
- .5 Fabricate continuous sill flashings with intermediate anchor clips, and joint reinforcing, form to profile shown. Fabricate filler and closure pieces as necessary for a complete and weather tight installation.
- .6 Do not expose manufacturer's identification labels on aluminum window assemblies.
- .7 Certify aluminum windows as complying with the AAMA/WDMA/CSA -101/I.S.2/ A440 design criteria and requirements using an easily removable label located on the inside face of glazing.
- .8 Fabricate window closures and trim from aluminum sheet. Form to profile shown. Make weathertight.
- .9 Fabricate glazing recess with drainage to exterior.

2.4 **FINISH**

- .1 Extrusion finish: Clear anodized to AAMA 611 per Aluminum Association Designation System for Aluminum Finishes AA-M12C22A31.
- .2 Panel and sheet finish: As indicated on drawings to match adjacent extrusion finish.

3 Execution

3.1 **EXAMINATION**

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **INSTALLATION**

- .1 Install windows in accordance with AAMA/WDMA/CSA -101/I.S.2/ A440, reviewed shop drawings and manufacturer's instructions.
- .2 Install work of this Section securely, in correct location, level, square, plumb, at proper elevations, free of warp or twist.
- .3 Install reinforcing and supporting members as specified or indicated as part of the work of this Section.
- .4 Do not force units into place, nor subject them to loads for which they were not designed.

- .5 Install window flashings, closures, and trim pieces.
- .6 Provide for thermal movement to take place between units and adjacent construction.
- .7 Conceal anchors, clips, blocking, and all other attachments. Provide all fastenings or anchors to be built in under other Sections.
- .8 Fill voids between framing and adjacent construction with foam insulation.
- .9 Install sills in maximum lengths possible. For sills over 1200 mm in length, maintain 3 mm to 6 mm space at each end.
- .10 Install units with consideration for finish variations. Abrupt variations of appearance or colour in adjacent components will not be acceptable without approval of Architect before installation.

3.3 **GLAZING**

- .1 Provide neat, straight sight lines. Trim excess glazing material flush with top of stops and fixed leg of frames.
- .2 Remove protective coatings, glazing stops, clean rebate and glass contact surfaces with solvent, wipe dry.
- .3 Apply primer/sealer to contact surfaces, prior to glazing.
- .4 Apply glazing tape as per manufacturer's instructions including recommended corner sealant.
- .5 Use setting blocks at 1/4 points and spacers to centre glass unit in frame.
- .6 Install glazing in accordance with reviewed shop drawings and manufacturer's written instructions. Install glazing with full contact and adhesion at perimeter. Maintain edge clearance recommended by glass manufacturer.
- .7 Apply a continuous heel bead of sealant around perimeter of inboard lite of the sealed unit and the metal framing.
- .8 Re-install glazing stops ensuring continuous contact and rattle-free installation. Do not distort glass. Trim tape protruding more than 2 mm above stop.
- .9 Install glazing gasket in accordance with manufacturer's recommendations.
- .10 Install glass presence markers in two cross stripes extending from diagonal corners. Maintain markers until final clean-up.

3.4 ERECTION TOLERANCES

- .1 Tolerances: Non-cumulative.
- .2 Maximum variation from plumb: 1.5 mm/3 m non-cumulative.
- .3 Maximum misalignment of two adjoining members abutting in plane: 0.8 mm.
- .4 Vertical and horizontal positions: +/- 3 mm.
- .5 Racking of face: 6 mm, nil in elevation.
- .6 Maximum perimeter sealant joint between window and adjacent construction: 13 mm.

3.5 JOINT BACKING AND SEALANT

- .1 Prepare substrate surface, mask as recommended by sealant manufacturer.
- .2 Install joint backing and frame sealant at window system joints and perimeter for weathertight installation in accordance with window sealant manufacturer's instructions. Remove excess sealant.
- .3 Seal joints between windows and window sills with sealant. Bed sill expansion joint cover plates and drip deflectors in sealant. Seal between sill upstand and window-frame. Seal butt joints in continuous sills.

3.6 CLEANING

- .1 Maintain windows, inside and outside, in clean condition throughout duration of work.
- .2 Remove protective material, and glass presence markers from surfaces.
- .3 Remove AAMA/WDMA/CSA -101/I.S.2/ A440 certification labeling when directed by Consultant, in writing.
- .4 Wash windows with solution of mild detergent in warm water, with particular attention to recesses and corners. Wipe surfaces clean and dry.

END OF SECTION

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- 1 General
 - 1.1 **SECTION INCLUDES**
 - .1 Labour, Products, equipment and services necessary for finish hardware work in accordance with the Contract Documents.
 - 1.2 **REFERENCES**
 - .1 BHMA, Builders Hardware Manufacturing Association.
 - .2 NFPA 80, Standard for Fire Doors and Other Opening Protectives.
 - 1.3 **SUBMITTALS**
 - .1 Product data: Submit manufacturer's Product data in accordance with Section 01 33 00 indicating compliance with reference standards, transportation, storage, handling and installation requirements.
 - .2 Shop Drawings:
 - .1 Submit Shop Drawings and 3 complete hardware lists in accordance with Section 01 33 00 indicating:
 - .1 Door locations, sizes, hardware manufacturer's catalogue numbers, finish symbols and quantities required.
 - .2 Locations and mounting heights of each type of hardware.
 - .2 Supply templates and required information to door and frame manufacturer to enable accurate sizes, locations of cut-outs and reinforcement for hardware.
 - .3 Submit templates to required trade to arrange for provisions for accurate setting and fitting of hardware.
 - .3 Samples:
 - .1 Submit 2 samples in accordance with Section 01 33 00 of each item that is different from hardware specified and include manufacturer's parts lists and installation instructions.
 - .2 Submit hardware component samples illustrating style, colour and finish. Tag samples identifying applicable Specification article number, brand name and number, finish, building location, date and catalogue number.
 - .3 Do not order hardware until samples have been accepted. Submit new samples to replace rejected samples. Supply hardware and finishes identical to each accepted sample.
 - .4 Closeout submittals:
 - .1 Submit the following in accordance with Section 01 78 00 for each Product for incorporation into Operation and Maintenance Manual:
 - .1 Maintenance data.
 - .2 Operating instructions and safety precautions.
 - .3 Parts list with name and address of supplier.
 - .4 Lubrication schedule and type of lubricant recommended.
 - .5 Keys, tools and special devices.

- .6 Inspection procedures related to preventive maintenance.

1.4 **QUALITY ASSURANCE**

.1 General:

- .1 Manufacturers: Companies specializing in manufacturing door hardware and registered with BHMA.
- .2 Hardware supplier: Company specializing in supplying commercial door hardware and acceptable to manufacturer.

.2 Certifications:

- .1 Employ an Architectural Hardware Consultant to prepare hardware schedule and inspect completed installation and certify that hardware has been installed in accordance with manufacturer's printed instructions, Authorities having Jurisdiction and as specified.
- .2 Submit manufacturer's certificate that finish hardware and fire rated hardware meets specified requirements.

1.5 **DELIVERY, STORAGE, AND HANDLING**

- .1 Be responsible for packaging of hardware, on a set by set basis. As material is received from various manufacturers identify it to correspond to Hardware List symbols.
- .2 Label packages legibly, indicating manufacturer's number, types, sizes, opening number and Hardware List reference number. Wrap hardware and include in package, screws, bolts and fastening necessary for correct installation. If hardware package is not complete, pay additional charges incurred by installer.
- .3 Deliver hardware to Site packaged, labelled and cross-referenced to hardware list for each item and its scheduled installation location.
- .4 Accept Products of this Section on Site and ensure that each item is undamaged.
- .5 Catalogue and store hardware in secure area.

2 Products

2.1 **GENERAL**

- .1 Carefully check and verify Hardware List against Contract Drawings to ensure that hardware listed can be used as specified. Inform Consultant of concerns regarding quality, quantity, operation or function of hardware selected:
 - .1 Verify hand of doors, examine details on Contract Drawings and at Site to ensure hardware supplied can be correctly installed and is correct for work as constructed.
 - .2 Select hardware in accordance with applicable codes and regulations and to approval of local Fire Marshal.

- .3 Replace and pay for defective hardware including hardware which was incorrectly selected, and remedial and installation costs.
- .2 Ensure that hardware selected will function correctly, meets Contract requirements and Ontario Building Code and authorities having jurisdiction.
- .3 Ensure that each hardware item is of same type, design and by same manufacturer.
- .4 Manufacturer's names or trade marks are not permitted on exposed surfaces of hardware.
- .5 Include in packing slip a list of parts, name of supplier and door number in which lock is to be installed.
- .6 Hardware for fire rated and labelled door and frame assemblies: ULC listed or as accepted by authorities having jurisdiction.
- .7 Fire rated assemblies:
 - .1 Hardware: Selected and installed in accordance with applicable codes and regulations, NFPA-80 and to approval of Ontario Fire Marshal.
 - .2 Fire rated doors: ULC labelled hardware. Submit written certification of conformance to ULC requirements for each type of hardware prior to delivery.
 - .3 Locksets and latchsets on fire rated doors: 19 mm throw minimum.

2.2 **ACCESSORIES**

- .1 Items to be attached to masonry or concrete with expandable shields, lag screws, bolts or other fastening devices as required. Exposed screws: Stainless steel, Phillips or Robertson heads.

2.3 **FINISHES**

- .1 Metal finishes: Free from defects, clean, unstained and of a uniform colour for each type of finish required. Exposed surfaces and anchors: Specified finish symbol of item.

3 Execution

3.1 **EXAMINATION**

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **INSTALLATION**

- .1 Install hardware in accordance with reviewed Shop Drawings, manufacturer's installation instructions, and applicable Codes and regulations.

- .2 Install hardware in accordance with hardware templates.
- .3 Adjust fixed and operable hardware for correct clearances and function.
- .4 Mount hardware measured from finished floor to centre of hardware, unless indicated otherwise or required by Code:
 - .1 Top hinge: 250 mm from head of door to top.
 - .2 Bottom hinge: 265 mm from finished floor to bottom of hinge.
 - .3 Intermediate hinge: Equal distance between top and bottom hinge.
 - .4 Locksets, latchsets: 1000 mm.
 - .5 Panic device crossbar: 1000 mm.
 - .6 Push plates: 1100 mm to bottom of plates.
 - .7 Guard bars: 1100 mm.
 - .8 Door pulls: 1100 mm to bottom of pulls.
 - .9 Blank strike: 1450 mm.
 - .10 Blank fronts: 1450 mm.
- .5 Include for supply and installation of wiring for electric strikes from electrical junction box to electric strike hardware.
- .6 Locate door stops to contact doors 75 mm from latch edge.
- .7 Install hardware and trim square and plumb to doors.
- .8 Replace wrappings for hardware provided by manufacturer after installation.
- .9 Safeguard keys to keep them out of unauthorized hands, tag them with door number, and deliver them to person designated by Consultant at building completion.

3.3 FIELD QUALITY CONTROL

- .1 Have hardware inspected after installation by hardware supplier's representative, obtain certification in writing that hardware has been supplied and installed in accordance with Specifications and hardware manufacturer's instructions and is functioning correctly.
- .2 Inspect fire rated openings to ensure they are installed in compliance with NFPA 80 requirements and Authorities having Jurisdiction.
- .3 Test access control system and electrified hardware devices for proper operation. Verify electric door release hardware operates properly upon activation of fire alarm system.

3.4 ADJUSTING

- .1 Verify under work of this Section, that installed hardware functions properly.

- .2 Adjust hardware so that latches and locks operate smoothly and without binding, and closers act positively with the least possible resistance in use. Lubricate hardware if required by manufacturer's instructions.
- .3 Adjust doors with self closing devices or automatic closing devices for proper operation after the HVAC system is balanced and adjusted. Verify spring power of non sized door closers is properly adjusted.

3.5 CLEANING

- .1 Remove wrappings at completion of the Project and clean hardware in accordance with manufacturer's instructions.

3.6 HARDWARE GROUPS/SCHEDULE

- .1 Hardware groups/schedule: Refer to hardware groups/schedule appended to this Section.

END OF SECTION

Finishing Hardware Schedule

Glenforest Pool Demolition PDSB 2024

Architect

Etude Architects Inc.

Detailer: **Ryan Ruprecht**

Consultant: **Ross Ruprecht B.A., A.H.C.**

Submittal Date: **Mar 8/24**



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2150 WINSTON PARK DR
UNIT 16
OAKVILLE , ON., ross@cdh.ca

Glenforest Pool Demolition PDSB 2024

Submittal Date: Mar 8/24

Manufacturers & Finishes

Manufacturers

Best
Crowder
Gallery
K.N. Crowder
MISC
Norton Rixson
Stanley

Finishes

626 - Satin chromium plated
over nickel
630 - Satin stainless steel
689 - Aluminum painted
US26D - Satin chromium plated
over nickel
US3 - Bright brass, clear coated
US32D - Satin stainless steel



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Openings Schedule

Opening Number(s)	Qty	Type	Location 1	To/ From	Location 2	Nominal Width	Nominal Height	Door Thickness	Hand	Label	Degree of Opening	Hardware Group	Heading Num.	Remarks
170a	1	Pair	STORAGE	FROM	STORAGE	950, 950	2150	45	RHRA		110°, 90°	STORAGE PR	1	
186	1	Pair	EXTERIOR	FROM	VESTIBULE	950, 950	2150	45	LHRA/RHRA			EXISTING	2	
189	1	Pair	EXTERIOR	FROM	STORAGE	915, 915	2032	45	RHRA		110°	EXTERIOR PR STORAGE	3	
MISC	1											MISC	4	



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Hardware Schedule

Heading #1

Item #1	1 Pair of doors 170a, STORAGE FROM STORAGE	110°,90° RHRA
	950, 950 x 2150 x 45 - HM DR x HM FR	
<hr/>		
6	Standard Hinge Stanley FBB179 (4 1/2" x 4) US26D	US26D
2	Flush Bolt Gallery GSH 401 UL C26D IN ACT LEAF	US26D
1	Lockset Best 45H7D (Std.) 15 H 630 ACT LEAF	630
1	Cylinder Best 1E74(Std.) RP3 626	626
1	Cylinder Best BEST Permanent Core 1C7N1 GMK 2 Keys	626
1	Cylinder Best CONST CORE BRASS GREEN 7235611 (7p)	
1	Surface Closer BEST HD8016 SDS 689 ACT LEAF	689
2	Kick Plate Gallery GSH 80A C32D (200 x 40MM LDW)	US32D
1	Wall Door Stop Gallery GSH 240B C32D IN ACT LEAF	US3
1	Weatherstripping K.N. Crowder ASTRAGAL W-8SP x 2150mm	

Heading #2

Item #2	1 Pair of doors 186, EXTERIOR FROM VESTIBULE	LHRA/RHRA
	950, 950 x 2150 x 45 - EXIST HM DR x EXIST HM FR	
	EXISTING HM DR & FRAME TO REMAIN. RE USE EXISTING HARDWARE. GC TO PAINT EXISTING DR , FRAME & SIDELITE.	



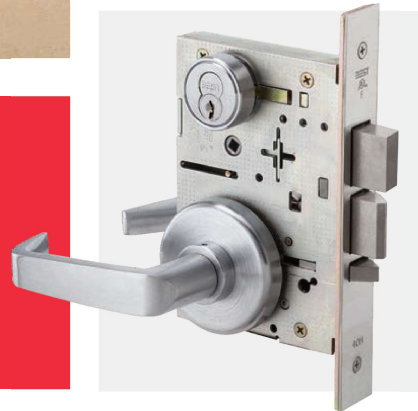
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40H Series
Heavy Duty Mortise Locks
by BEST



BEST: Setting the Standard for Security

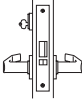
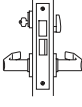
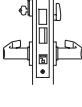
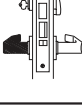
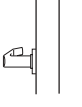
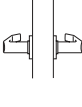
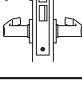


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Functions

Function & Diag (ANSI No)	Description	Outside Lever or Knob		Inside Knob/Lever		
		Latch operated by	Deadbolt operated by	Locked by	Unlocked by	Locked by
Single keyed (continued)						
Classroom Holdback (RH) F06 	Rotating inside lever Turning key in outside cylinder O/S lever except when locked by outside key Latchbolt held retracted by turning O/S key while holding up I/S lever. The latchbolt is deadlocked with an auxiliary deadlatch	N/A	Turning key in outside cylinder	Turning key in outside cylinder	Cannot be locked	Always unlocked
Dormitory (T) F13 	Rotating inside lever Rotating outside lever—only when deadbolt is retracted Turning key in outside cylinder	Turning key in outside cylinder; Inside turn lever Inside lever retracts deadbolt and latch simultaneously.	Turning key in outside cylinder Turning inside turn lever	Turning key in outside cylinder Turning inside turn lever. Rotating inside lever	Cannot be locked	Always unlocked
Dormitory (TA) F12 	Rotating inside lever Rotating O/S lever only when locking toggle is in unlocked position and deadbolt is retracted. Turning key in outside cylinder	Turning key in outside cylinder Turning inside turn lever: (Rotating inside lever retracts deadbolt and latch simultaneously.)	Placing locking toggle in locked position Projecting deadbolt by key or turning inside turn lever.	Turning key in outside cylinder and placing locking toggle in unlocked position	Cannot be locked	Always unlocked
Dormitory (TD) 	Rotating inside lever Turning key in outside cylinder The latchbolt is deadlocked with an auxiliary deadlatch	Turning inside turn lever Rotating inside lever retracts deadbolt and latch simultaneously.) Turning key in outside cylinder.	Always unlocked	Cannot be unlocked	Cannot be locked	Always unlocked
Non-keyed						
Single Dummy Trim (1DT) 	This is a single, surface-mounted lever for an inactive door or a non-latching door					
Double Dummy Trim (2DT) 	This is a through bolt mounted pair of matching levers for an inactive door or a non-latching door					
L-Privacy (F19) 	Rotating inside lever Rotating outside lever only when deadbolt is retracted.	Turning the emergency key, Turning inside turn lever: (Rotating inside knob/lever retracts deadbolt and latch simultaneously.)	Turning inside turn lever Turning the emergency key.	Turning inside turn lever Rotating inside lever retracts latch and dead-bolt simultaneously Turning the emergency key.	Cannot be locked	Always unlocked





HD8000
HD7000
SL6000

Surface Applied
Door Closers



HD8000 SERIES SURFACE CLOSERS



Versatile, durable, and reliable, featuring modern styling for institutional or high-traffic commercial applications.

BEST HD8000 series, Grade 1 hydraulic surface closers are housed in corrosion-resistant aluminum with a hardened pinion/piston providing toughness and high-strength. The arm hub is made from forged steel.

Standard on the HD8000 series closers are backcheck with two adjustment valves and adjustable spring size options from 1 - 6 or 5 - 6. The HD8000 series closers are ideal for a variety of heavy-duty, as well as barrier-free applications.

HD8000—Features

- Available with fully adjustable spring sizes 1 -6. Size 1 (5 lb opening force) meets interior barrier-free AD requirements.
- May be used on doors up to 48" wide interior (42" wide exterior) and up to 180 lb.
- Available with adjustable spring sizes of 5 -6 +50% for use on exceptionally wide, tall, or heavy doors.
- Non-handed for regular, top jamb, and parallel arm applications.
- Backcheck (BC) valve (standard) provides adjustable-intensity hydraulic cushioning, preventing uncontrolled door opening to protect door and frame during abusive or abrupt opening.
- AVB - advanced variable backcheck option maintains an effective backcheck range on parallel arm applications. Valve is accessible with the closer installed.
- Full adjustment using BC, Sweep and Latch valves standard.
- DA, AVB & AVB DA options with separate independent valve to allow for unobstructed passage through opening.
- Full plastic cover standard. Lead lined as well as full and oversized metal and plastic covers available to assist in concealing existing holes.
- All tamper-resistant (hex key) valve adjustments.
- Standard components required for three mounting configurations (Reg, T, J, PA).
- SNDTPK - Standard fasteners include separate self-drilling and self-tapping and sex nuts for 1-3/4" thick doors and machine screws.
- A variety of specialty arm options, interchangeable across most surface closer models.
- Full complement of optional plates and brackets available for special applications

HD8000—Certification

- ANSI/BHMA A156.4 Grade 1 certified
- UL and CUL listed
- Meets UL10C for positive pressure
- Meets ANSI/BHMA A117.1 and ADA for barrier-free accessibility.



dormakaba USA quality and environmental management systems in Reamstown, PA and Indianapolis, IN are certified to ISO 9001:2015 and ISO 14001:2015.

BEST Surface Applied Door Closers | 3

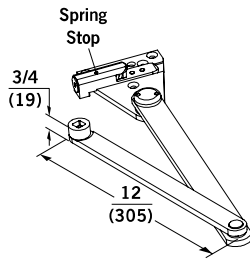
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2150 WINSTON PARK DR
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Glenforest Pool Demolition PDSB 2024

Submission Date: Mar 8/24

Arms



Spring Stop Door Saver Arm

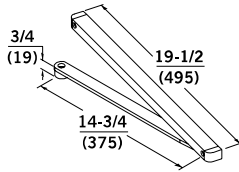
Heavy-duty parallel arm with spring assisted dead stop function. Available in non-hold open and thumb turn hold open. Units can be installed to achieve either stop at 85°, 90°, 100°, and 110° or stop and hold open function. Maximum opening is 110° (conditions permitting). Arm is non-handed. Non-hold open arm illustrated.

SDS – Spring stop door saver arm.

SDS/R – Heavy duty parallel arm, compression stop with LCN PA foot

SDS/RCP – Heavy duty parallel arm, compression stop with LCN PA foot & CP4040 conv. plate

SDST – Spring stop door saver arm thumb turn hold open.

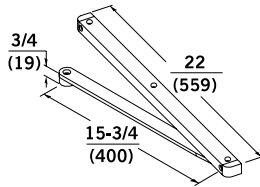


Track Arm

Provides slide track function for improved aesthetics and vandal resistance. Units can be installed to provide 85°, 90°, 110°, or 180° of door opening (conditions and application permitting). Arm is non-handed.

T – Track arm complete. Can be used on pull-side T applications (closer on door, track on frame) and JT applications (track on frame, closer on door). Can also be used with FT flush transom applications (closer on transom, track on door).

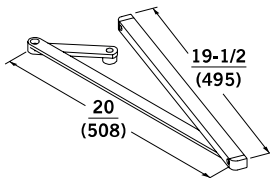
TH – Track hold open arm complete. Can be used in same applications as T arm. Range of hold open and maximum opening varies with mounting application.



Push Side Track Arm

PT – Push-side track arm complete. Used with PT track applications (closer on door, track on soffit).

PTH – Push-side track hold open arm complete. Used with PT track applications (closer on door, track on soffit).



TDE Track Arm

Provides slide track function for pull-side reveal conditions up to 3-1/2". Provides 117° of door opening (conditions permitting). Arm is handed. Also available with hold open option to provide selective single point hold open between 30° and 110°.

Arm requires a minimum 3-3/4" clearance between door face and wall when opened 90° and greater.

TDE – Double egress track arm complete.

TDEH – Double egress hold open track arm complete.

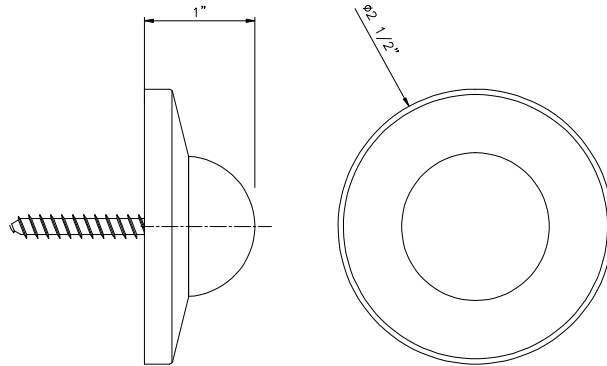
GSH 240B WALL STOP

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- Back Plate Mounting
- Fasteners Included
- C3, C4, C10, C10B, and C32D



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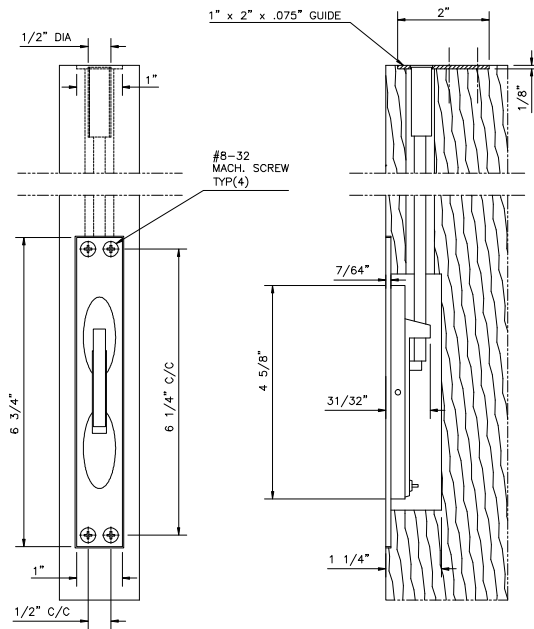
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GSH 401/401 UL EXTENSION FLUSH BOLT



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- Brass Construction
- 12" Standard
- C3, C4, C10, C10B, C26, and C26D

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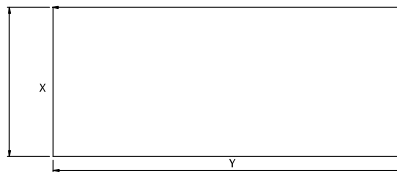
GSH 80 KICK PLATE

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- Base Metal: Brass, Bronze, Aluminum and stainless steel (Type 304).
- Screw Mounting with Beveled Edges supplied standard
- Finishes: All Standard
- Tape Mounting available
 - GSH80 = 20ga
 - GSH80A = 18ga
 - GSH80B = .062ga
 - GSH80C = .125ga



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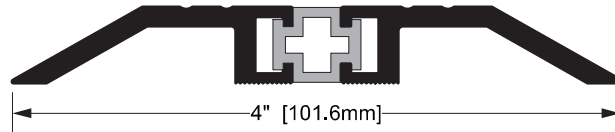
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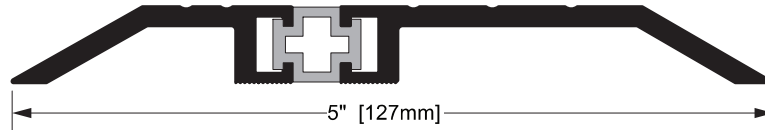
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1/2" THERMAL BREAK THRESHOLDS

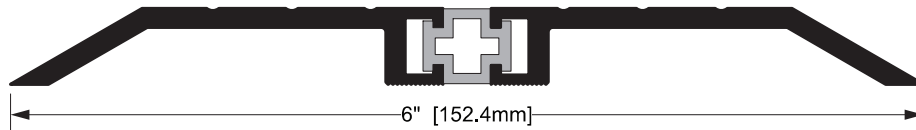
CT-44
EXTRUDED ALUMINUM
WITH RIGID P.V.C.



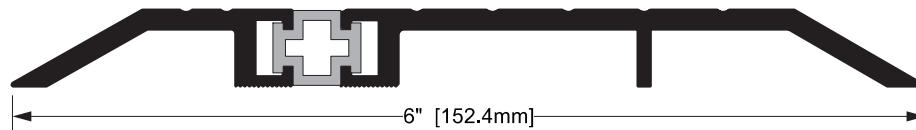
CT-45
EXTRUDED ALUMINUM
WITH RIGID P.V.C.



CT-46
EXTRUDED ALUMINUM
WITH RIGID P.V.C.



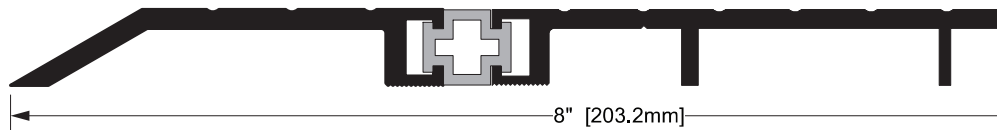
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CT-42-1
FROST INSERT



CT-44-1
CT-43-1
FROST INSERT



CT-45-1
CT-43-1
FROST INSERT



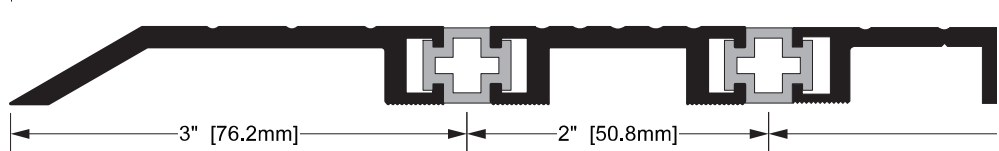
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CT-43-1
FROST INSERT



CT-43-1
CT-43-1
FROST INSERT



CT-45-1
CT-41-1
CT-43-1
FROST INSERT

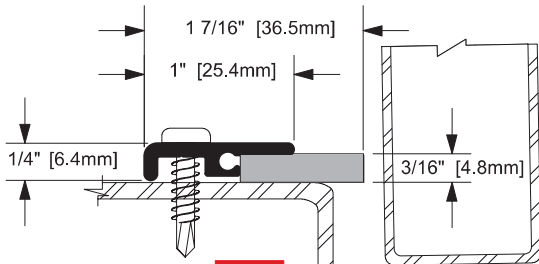


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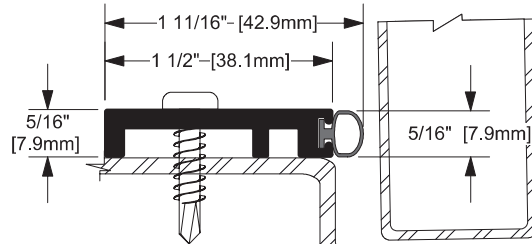
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WEATHERSTRIP



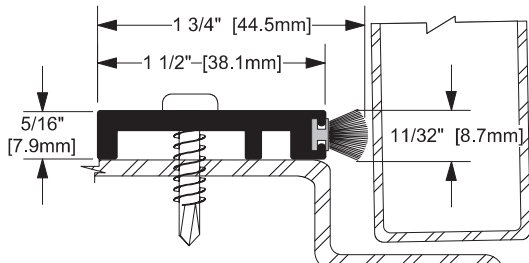
W-18

CLEAR ANODIZED ALUMINUM
AND CLOSED CELL NEOPRENE



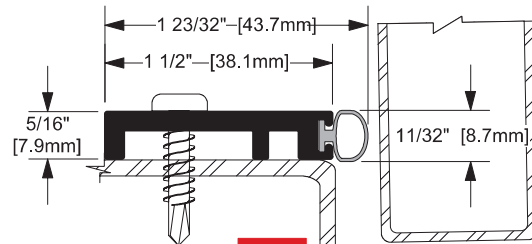
W-20N

CLEAR ANODIZED ALUMINUM
AND NEOPRENE



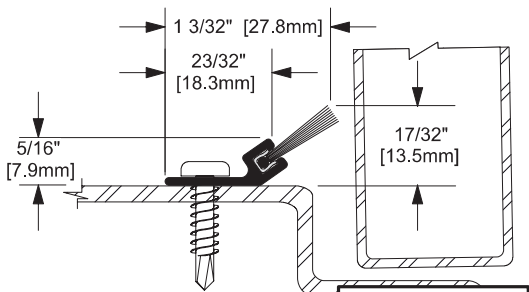
W-20P

CLEAR ANODIZED ALUMINUM
AND PILE WITH FIN SEAL



W-20S

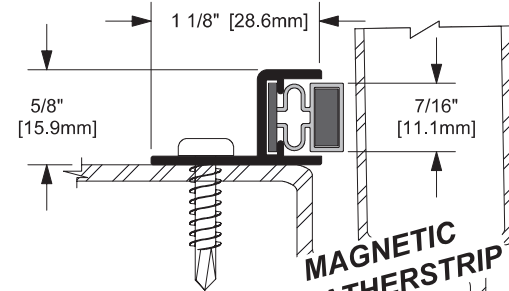
CLEAR ANODIZED ALUMINUM
AND SILICONE RUBBER



W-23

CLEAR ANODIZED ALUMINUM
AND NYLON BRUSH

FULL
BRUSH SEAL
LISTINGS ON
PAGE 27

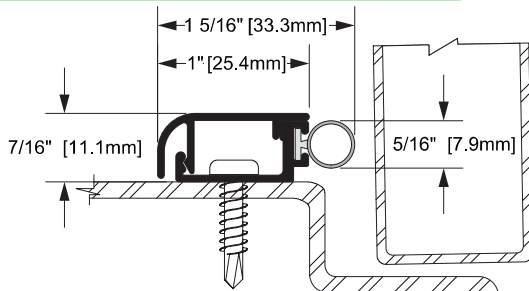


W-27

CLEAR ANODIZED ALUMINUM
AND VINYL WITH MAGNET

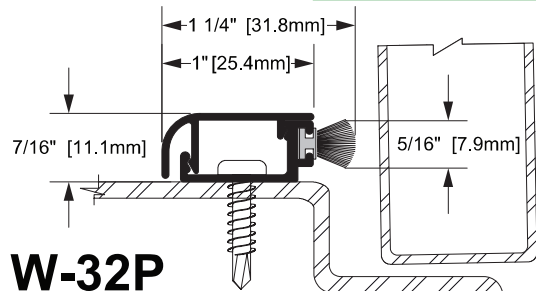
MAGNETIC
WEATHERSTRIP

WEATHERSTRIP



W-32N

CLEAR ANODIZED ALUMINUM 2-PIECE
W/SNAP ON COVER AND NEOPRENE

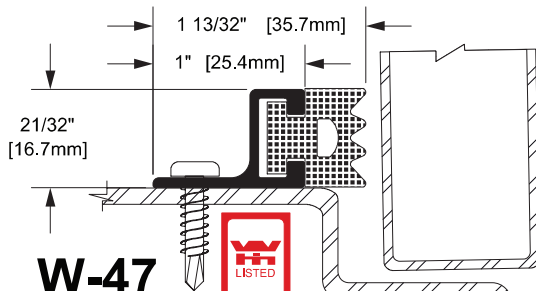


W-32P

CLEAR ANODIZED ALUMINUM 2-PIECE
W/SNAP ON COVER AND PILE WITH FIN SEAL

W-32S

CLEAR ANODIZED ALUMINUM 2-PIECE
W/SNAP ON COVER AND SILICONE

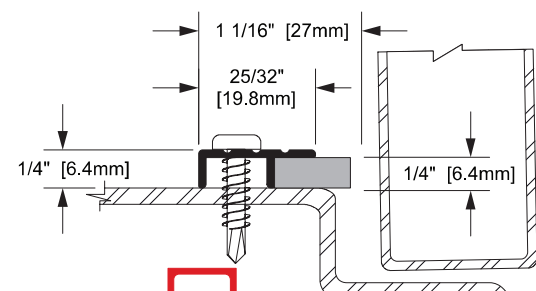


W-47

CLEAR ANODIZED ALUMINUM
AND EXTRUDED NEOPRENE

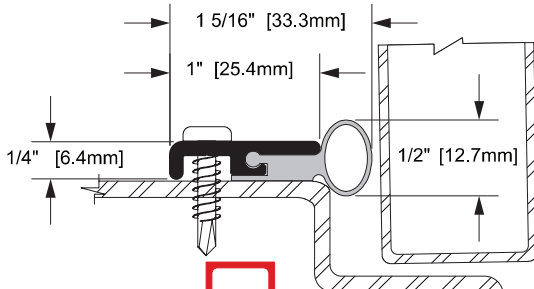
W-47S

CLEAR ANODIZED
ALUMINUM AND
SILICONE



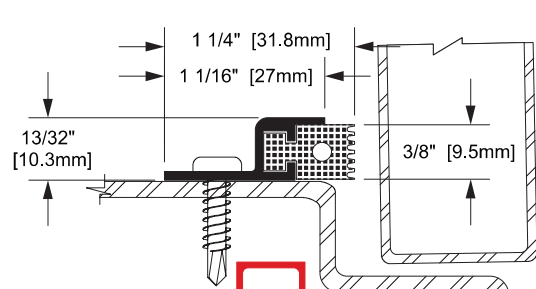
W-49

MILL FINISH ALUMINUM
AND CLOSED CELL NEOPRENE



W-50S

CLEAR ANODIZED ALUMINUM
AND SILICONE RUBBER SUITABLE
FOR -110°F (-80°C) TO +570°F (+300°C)



W-61N

CLEAR ANODIZED ALUMINUM
AND EXTRUDED NEOPRENE

100% CANADIAN OWNED AND OPERATED

www.kncrowder.com

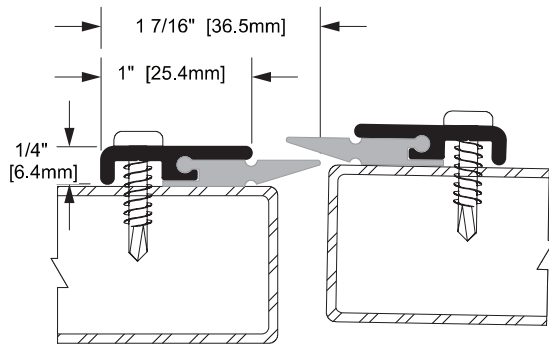


COMMERCIAL DOORS & HARDWARE LTD.
2150 WINSTON PARK DR
UNIT 16
OAKVILLE, ON., ross@cdh.ca

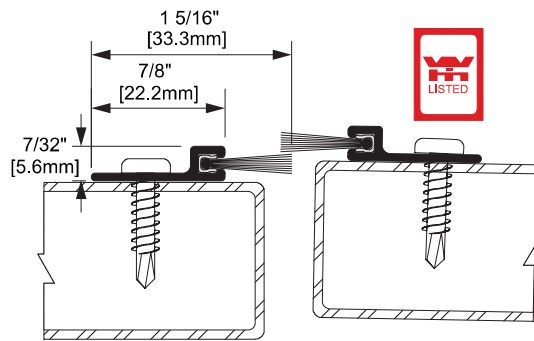
Glenforest Pool Demolition PDSB 2024

Submission Date: Mar 8/24

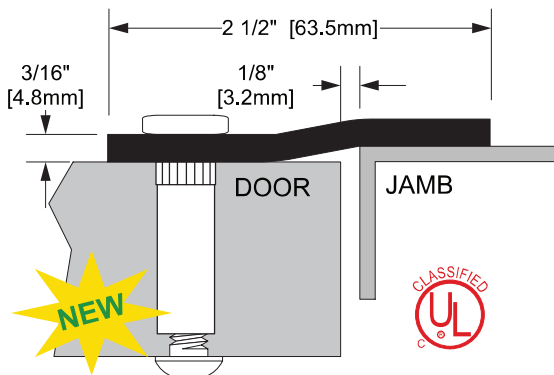
ASTRAGALS



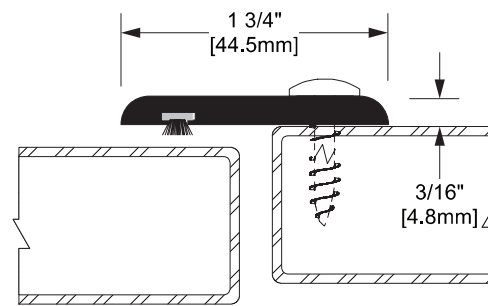
W-5 CLEAR ANODIZED ALUMINUM AND VINYL



W-25 CLEAR ANODIZED ALUMINUM AND NYLON BRUSH



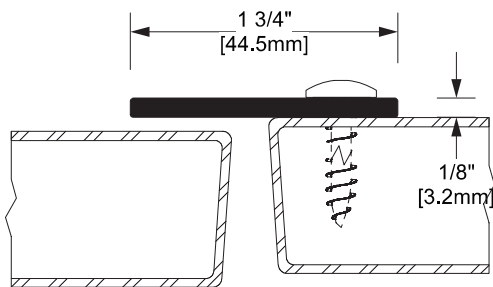
W-7 SECURITY ASTRAGAL
PRIMED C.R. STEEL c/w SECURITY SLEEVE



W-8 EXTRUDED ALUMINUM

W-8P EXTRUDED ALUMINUM WITH PILE

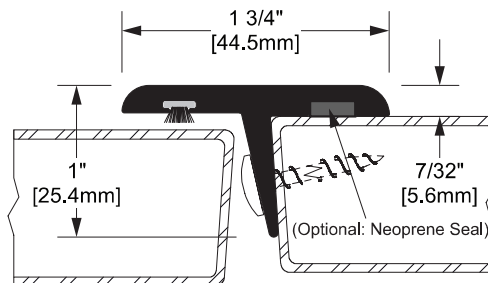
W-8SL EXTRUDED ALUMINUM WITH SILICONE



W-8S C.R. STEEL WITH CONDITIONED EDGES

W-8SP AS ABOVE, PRIMED FINISH

W-8SS STAINLESS STEEL, SEE PG. 20

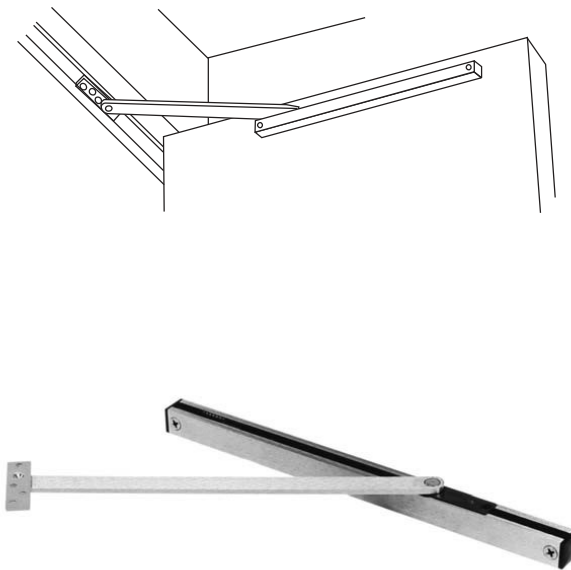


W-9 EXTRUDED ALUMINUM WITH PILE

W-9S EXTRUDED ALUMINUM WITH SILICONE

9 Series

CHECKMATE® STOPS & HOLDERS SURFACE MOUNT



Application

- Interior or exterior doors
- Doors are single acting
- Non-handed
- Recommended for high traffic, heavy abuse installations

Features

- Heavy-duty
- Slide track design
- Heavy shock absorber spring provides 5-7° compression before deadstop
- LS option omits spring for special application
- On/off knob on hold open models
- Stop, friction stay or hold open function
- Complete screw packet with thru-bolts for door, wood and machine screws for frame
- Torx® screws optional for security applications
- Standard architectural finishes
- Durable slider cam and shock block
- 110° maximum opening
- 1-3/4" minimum door thickness
- 1-3/16" square channel
- For pull side mounting or flush mounting on push side or for rabbeted push side use angle jamb bracket adapter 5458-LH or 5459-RH
- Hanging means other than standard butts or offset pivots require special templating

Compliance

- Stop function UL listed for fire door assemblies
- ANSI: C02531 (Friction)
C02511 (HO)
C02541 (Stop)

DOOR OPENING CHART (IN INCHES)

Butts Offset Pivots	Center Hung Pivots	Model Number		
		Friction	H.O.	Stop
*24 - 28	25-1/2 - 30	9-116	9-126	9-136
28-1/16 - 33	30-1/16 - 36	9-216	9-226	9-236
33-1/16 - 38	36-1/16 - 41	9-316	9-326	9-336
38-1/16 - 43	41-1/16 - 46	9-416	9-426	9-436
43-1/16 - 48	46-1/16 - 50	9-516	9-526	9-536

*Butt hung only on this size door. No swing clear hinges.

RIXSON®
ASSA ABLOY

ASSA ABLOY, the global leader
in door opening solutions

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CDH

COMMERCIAL DOORS & HARDWARE LTD.
2150 WINSTON PARK DR
UNIT 16
OAKVILLE, ON., ross@cdh.ca

Glenforest Pool Demolition PDSB 2024

Submission Date: Mar 8/24

- 1 General
- 1.1 **SECTION INCLUDES**
 - .1 Design, labour, Products, equipment, tools, and services necessary for glass and glazing work in accordance with the Contract Documents.
- 1.2 **REFERENCES**
 - .1 ASTM C920, Specification for Elastomeric Joint Sealants.
 - .2 ASTM C1036, Standard Specification for Flat Glass.
 - .3 ASTM C1048, Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
 - .4 ASTM D2240, Test Method for Rubber Property - Durometer Hardness.
 - .5 ASTM E84, Test Method for Surface Burning Characteristics of Building Materials.
 - .6 CAN/CGSB-12.1-M, Tempered or Laminated Safety Glass.
 - .7 CAN/CGSB-12.3-M, Flat, Clear Float Glass.
 - .8 Glass Association of North America (GANA) Glazing Manual.
- 1.3 **DESIGN REQUIREMENTS**
 - .1 Limit glass deflection to flexural limit of glass with full recovery of glazing materials.
 - .2 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.
- 1.4 **SUBMITTALS**
 - .1 Shop drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 indicating as a minimum:
 - .1 Fabrication and erection of glazing elements indicating materials, thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.
 - .2 To sealant manufacturer for their review and approval of tensile bead contact/bite dimension and thickness.
 - .2 Samples:
 - .1 Submit following samples in accordance with Section 01 33 00.
 - .2 Submit one sample of each type of glass.
 - .3 Certificates: Submit manufacturer's certification that glass and glazing materials are compatible.

- .3 Submit compatibility and adhesion test reports from sealant manufacturer indicating that glazing materials were tested for compatibility and adhesion with glazing sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed for adhesion.
- .4 Compatibility test report from manufacturer of insulating glass edge sealant, indicating that glass edge sealants were tested for compatibility with other glazing materials including sealants, setting blocks, edge blocks and any other material that contacts or can affect the edge seal.
- .5 Extended warranty: Submit extended warranty signed and registered by the manufacturer providing the warranty in the name of the Owner for the timeframe and coverage specified in this Section.

1.5 **QUALITY ASSURANCE**

- .1 Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in the installation of glazing units of a similar size and nature.

1.6 **SITE CONDITIONS**

- .1 Glaze with compounds, sealants, or tapes only when glazing surfaces are at temperatures over 4°C, and when positive that no moisture is accumulating on them from rain, mist, or condensation.
- .2 When temperature of glazing surfaces is below 4°C, obtain from Consultant and material manufacturer approval of glazing methods and protective measures which will be used during glazing operations.

1.7 **EXTENDED WARRANTY**

- .1 Provide a 5 year warranty, commencing from date of Ready-for-Takeover, against defects in interior glazing work and warrant them to be free from:
 - .1 Cracked or scratched glass, shrinking, cracking, staining, hardening, sagging of glazing materials; loosening or rattling of glass; All will be considered defective work.
 - .2 Warranty to include the removal of defective Products, replacement with new Products conforming to the specifications, and restoration of work damaged by removal and replacement including labour and installation costs.

2 **Products**

2.1 **ACCEPTABLE MANUFACTURERS**

- .1 Glass manufacturers:
 - .1 AGC Flat Glass.

- .2 Cardinal Glass Industries.
- .3 Guardian Industries.
- .4 Viracon Inc.
- .5 Vitro Architectural Glass (formerly PPG Industries Ltd.)

2.2 MATERIALS

- .1 All materials under work of this Section, including but not limited to, primers, coatings, sealers, sealants, adhesives and cleaners are to have low VOC content limits.
- .2 Float glass (**FGL**): CAN/CGSB-12.3-M; clear, glazing quality. Clear or tinted as indicated. Heat strengthened as required.
 - .1 Sizes:
 - .1 Standard: minimum 6 mm thick
 - .2 Only were permitted: 4 mm thick for interior panel.
- .3 Tempered glass (**TGL**): CAN/CGSB-12.1-M, Type 2, Class B, Category II, clear.
 - .1 Sizes:
 - .1 Standard: minimum 6 mm thick
 - .2 Only were permitted: 4 mm thick for interior panel.
- .4 Glazing and rebate primers, sealants, sealers, and cleaners: Compatible with each other. Type as recommended by sealant, spline, and glass manufacturer.
- .5 Glazing sealant: Silicone sealant as recommended by glazing manufacturer. Verify compatibility with insulating glass unit secondary sealant.
- .6 Heel & toe bead: Silicone sealant as recommended by glazing manufacturer.
- .7 Glazing gasket: 'Visionstrip' or Polyshim II' by Tremco Ltd., glazing seal, size as recommended by manufacturer.
- .8 Glazing tape: 'Polyshim II' glazing tape EPDM shim.
- .9 Glazing splines: EPDM or neoprene, extruded shape to suit glazing channel retaining slot, colour as selected.
- .10 Setting blocks (regular): EPDM, 80 - 90 Shore A durometer hardness to ASTM D2240, sized to suit glazing method, glass unit weight and area.
- .11 Edge blocks: EPDM, 60-70 Shore A Durometer hardness, self adhesive on face, sized with 3 mm clearance from glass edge and spanning glass thickness(es).
- .12 Glass presence markers: Easily removable, non-residue depositing.
- .13 Screws, bolts and fasteners: Type 304 stainless steel.

2.3 GLAZING SCHEDULE

- .1 Glass types shall be as indicated on drawing unless otherwise required due to thermal stress analysis.

2.4 FABRICATION

- .1 Verify glazing dimensions on Site.
- .2 Clearly label each glass lite with maker's name and glass type. Ensure labels are easily removable, non-residue depositing type. Do not remove labels until after Work is accepted by Consultant.
- .3 Fabricate glazing not less than 3 mm smaller than rebate size in either dimension; allow for edge spacers, shims, and setting blocks as necessary.
- .4 Work shall have smooth finished surfaces free from distortion and defects detrimental to appearance and performance.
- .5 Carefully make and fit details. Take special care with exposed finished work to produce a neat and correct appearance to the Consultant's acceptance.
- .6 Grind and polish a 1.5 mm arris to both edges of exposed glazing at locations where glazing is not encapsulated in framing and where edges are exposed to occupants.

3 Execution**3.1 EXAMINATION**

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.
- .2 Verify that openings for glazing are correctly sized and within tolerance.
- .3 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 and wipe dry.
- .2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- .3 Prime surfaces scheduled to receive sealant.

3.3 INSTALLATION

- .1 Install glazing to the work of Sections 08 11 16 and 08 56 88.
- .2 Provide neat, straight sight lines. Trim excess glazing tape flush with top of stops and fixed leg of frames.
- .3 Remove protective coatings, glazing stops, clean rebate and glass contact surfaces with solvent, wipe dry.
- .4 Apply primer/sealer to contact surfaces, prior to glazing.
- .5 Apply glazing tape as per manufacturer's instructions including recommended corner sealant.
- .6 Use setting blocks at 1/4 points and spacers to centre glass unit in frame.
- .7 Install glazing in accordance with reviewed shop drawings and manufacturer's written instructions. Install glazing with full contact and adhesion at perimeter. Maintain edge clearance recommended by glass manufacturer.
- .8 Apply a continuous heel bead of sealant around perimeter of inboard lite of the sealed unit and the metal framing.
- .9 Re-install glazing stops ensuring continuous contact and rattle-free installation. Do not distort glass. Trim tape protruding more than 2 mm above stop.
- .10 Install glazing gasket in accordance with manufacturer's recommendations.
- .11 Do not cut or abrade tempered, heat treated, or coated glass.
- .12 Install glass presence markers in two cross stripes extending from diagonal corners. Maintain markers until final clean-up.
- .13 Remove, dispose of, and replace broken, cut, abraded glass, and defective glass including but not limited to production dimples, roller wave or marks, tong marks, chips, cracks, etc.
- .14 Interior glass: Glaze interior glass using glazing gasket glazing tape.

3.4 CLEANING

- .1 Immediately remove sealant and compound droppings from finished surfaces.
- .2 Remove labels, protective material, and glass presence markers from prefinished surfaces.

- .3 Clean glass surfaces with cleaning agents and methods in accordance with Manufacturer's written instructions.

END OF SECTION

- 1 General
- 1.1 **SECTION INCLUDES**
 - .1 Labour, Products, equipment and services necessary for terrazzo restoration work in accordance with the Contract Documents.
- 1.2 **REFERENCES**
 - .1 CAN/CGSB 51.34-M, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
 - .2 CSA A23.1, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
 - .3 CAN/CSA A3000, Cementitious Materials Compendium.
 - .4 CSA G30.5-M, Welded Steel Wire Fabric for Concrete Reinforcement.
 - .5 TTMAC, Terrazzo, Tile and Marble Association of Canada
- 1.3 **SUBMITTALS**
 - .1 Product data:
 - .1 Submit duplicate copies of manufacturer's Product data in accordance with Section 01 10 10 indicating:
 - .1 Performance criteria, compliance with appropriate reference standard(s), characteristics, limitations, and trouble-shooting protocol.
 - .2 Product transportation, storage, handling and installation requirements.
 - .2 Shop drawings:
 - .1 Submit shop drawings in accordance with Section 01 10 10 indicating:
 - .1 Terrazzo layout.
 - .2 Perimeter conditions, junctions with dissimilar materials.
 - .3 Setting details.
 - .3 Certificates: Submit manufacturer's certificates stating that materials supplied are in accordance with this specification.
 - .4 Closeout submittals: Submit recommended maintenance instructions and listing of recommended maintenance Products for incorporation into Operations and Maintenance Manuals in accordance with Section 01 10 10.

1.4 **QUALITY ASSURANCE**

- .1 Installers qualifications: Perform work of this Section by a company that has a minimum of five years proven experience in the installation of terrazzo units of a similar size and nature and that is approved by manufacturer. Submit to Consultant, applicator's current certificate of approval by the material manufacturer as proof of compliance.

1.5 **SITE CONDITIONS**

- .1 Do not install work of this Section outside of the following environmental ranges without the Consultant's and Product manufacturer's written acceptance:
 - .1 Ambient air and surface temperature: 15°C to 45°C.
 - .2 Precipitation: None.
- .2 Install temporary protection and facilities to maintain the Product manufacturer's, and specified, environmental requirements for 7 Days before, during, and 7 Days after installation.

2 Products

2.1 **MATERIALS**

- .1 Cement: Portland cement to meet specified requirements of CAN/CSA A3000, Normal or High-Early strength. Use white portland cement in white matrix.
- .2 Sand: To meet specified requirements of CSA A23.1, sharp, screened, washed. Use white sand in white matrix.
- .3 Water: Potable, free from acids, alkalies, oil, or organic materials.
- .4 Topping:
 - .1 Marble Chips: To meet specified requirements of Terrazzo, Tile and Marble Association of Canada, match existing size gradation and colour.
 - .2 Colour pigments: Pure mineral, alkali-resistant, non-fading, colour to match existing.
- .5 Cleaner: To meet specified requirements of #1000 Series of Terrazzo, Tile and Marble Association of Canada.
- .6 Sealer: To meet specified requirements of #2000 Series of Terrazzo, Tile and Marble Association of Canada.
- .7 Floor Finish: To meet specified requirements of Type #3001 of Terrazzo, Tile and Marble Association of Canada.
- .8 Curing Agent: Non-staining, maximum moisture retention 0.015 grams, to meet specified requirements of Terrazzo, Tile and Marble Association of Canada.

2.2 MIXES

- .1 Topping:
 - .1 Marble chip aggregate and cement mixed dry with colour pigments to match existing. Grind a small area to determine the true colours of existing terrazzo and chip gradation.
 - .2 Water shall not exceed 18 L /bag of cement.
 - .3 Prepare topping by mechanical mixing with materials added in the following order: one-half of aggregate, total of cement, water, remaining aggregate.

3 Execution

3.1 EXAMINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.
- .2 Ensure that environmental conditions and backing surfaces have been provided according to specified requirements. Do not proceed with work until satisfied that installation will meet specified standard.

3.2 PREPARATION

- .1 Take extreme care that surfaces adjacent to terrazzo work are protected from staining by terrazzo materials, and that slurry is not tracked into other building areas any time during installation.
- .2 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.
- .3 Sweep backing surfaces clean of all loose materials, and remove the debris. Clean off contaminants which would cause a defective installation.
- .4 Locate and prepare for equipment or accessories recessed in finished terrazzo work.

3.3 INSTALLATION

- .1 General:
 - .1 Installation shall match existing type. Profile of base shall match existing. Where bases are of different profiles, install new base of profile to match finished installation.
 - .2 When patching terrazzo, extend area to nearest divider strip in all directions.
- .2 Divider Strips:
 - .1 Install divider strips in underbed while it is still semi-plastic.

- .2 Locate divider strips accurately. Set them straight, aligned, to line up with existing and at correct level; make junctions tight; and firmly trowel them along edges into underbed to ensure anchorage.
- .3 Set edging strips at junctions with other floor finishes to provide precisely for their thicknesses and finished levels after grinding. At openings set edging strips under doors.
- .4 Extend divider strips at right angles across borders.

.3 Placing of Topping:

- .1 Let underbed cure for at least 24 hours.
- .2 Wet top of underbed with water, remove excess, and when surface water had dried slush into soaked underbed a neat Portland cement grout of same colour cement and pigment as for matrix.
- .3 Apply topping to slurry or underbed while it is still wet.

3.4 **TOPPING**

.1 Standard Finish:

- .1 Into wet topping surface of floors, sprinkle wet aggregate of same materials in same proportions as specified for topping.
- .2 Apply so that finish surfaces match existing.

.2 Surface Preparation:

- .1 After finish aggregates are added, immediately roll floor topping with a heavy roller to compact and to remove excess water and cement. Pack bases.
- .2 Hand trowel all terrazzo surfaces to expose divider strips level with topping.

.3 Curing:

- .1 Cure topping for a minimum of six days following placing.
- .2 Cure to ensure that topping is kept damp until cement is hydrated.
- .3 Use wet mats or sand, paper or plastic sheets, or liquid curing compound.

3.5 **FINISHING**

.1 Grind terrazzo surfaces by machine. Hand rub places inaccessible to grinding machines.

.2 Constantly flood surfaces with water during grinding.

.3 For initial grinding, use 24 to 60 grit grinding stones.

.4 After initial grinding, wash surfaces clean, remove all residue from holes and voids, and thoroughly rinse with only water.

.5 Trowel plastic grout, of same mix and colour as matrix, into holes and voids of wetted surface, and remove excess. When grout begins to set, work it into holes and voids with burlap or excelsior pads, and remove excess.

.6 Cure grout for a minimum of 48 hours as specified above for curing.

.7 Give final grinding with 120 grit stones and water.

.8 Wash off surfaces thoroughly after grinding.

3.6 **SITE TOLERANCES**

.1 Finish surfaces shall be level or straight within a tolerance of 1.6 mm [1/16"] between division strips.

3.7 **REPAIR**

.1 Before Project completion, remove and replace defective, off-colour, and damaged work. Defective work shall include areas where distribution of surface aggregate is visually different from surrounding area. Removed areas shall be completely bounded by divider strips or edges. Regrout and regrind surfaces left with open fissures and holes.

3.8 **CLEANING**

.1 Scrub terrazzo surfaces with an abundance of clean water. Use machine scrubbers where possible for floors.

.2 Rinse with clean water and allow to dry.

.3 Remove dust with heavy-duty vacuum cleaner.

.4 If further cleaning is required, use Terrazzo, Tile and Marble Association of Canada #1001 cleaner in accordance with their specifications.

.5 Sealing:

.1 As soon as possible after final cleaning, apply a coat of sealer. Wipe off excess before it dries.

.2 Just before completion of Project, clean terrazzo, as specified above, and apply a second coat of sealer as before.

.3 Apply two coats of floor finish.

3.9 **PROTECTION**

.1 Prevent all traffic and work on newly laid floors by barricading areas for at least 24 hours following installation.

END OF SECTION

-
- 1 General
- 1.1 **SECTION INCLUDES**
- .1 Design, labour, Products, equipment and services necessary for acoustical ceilings work in accordance with the Contract Documents.
- 1.2 **REFERENCES**
- .1 ASTM A653/A653M, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
- .2 ASTM C423, Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
- .3 ASTM C635, Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- .4 ASTM C636, Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
- .5 ASTM C645, Specification for Non-Load Bearing (Axial) Steel Studs, Runners (Tracks), and Rigid Furring Channels for Screw Application of Gypsum Board.
- .6 ASTM C665, Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- .7 ASTM E1264, Classification for Acoustical Ceiling Products.
- 1.3 **DESIGN REQUIREMENTS**
- .1 Design acoustical ceiling system in accordance with following Climatic Design Data for Mississauga contained in the Ontario Building Code:
- .1 Design temperature: January 1%, July 2 1/2%.
- .2 Hourly wind pressures: 1 in 50 year occurrence.
- .2 Design ceiling suspension systems in accordance with ASTM C636 and manufacturer's printed directions.
- .3 Design tile ceiling system for adequate support of electrical fixtures as required by the current bulletin of the Electrical Safety Authority. Acoustic panel system is not designed to carry the weight of electrical equipment.
- .4 Design hanger anchor and entire suspension system static loading not to exceed 25% of their ultimate capacity including lighting fixture dead loads.

- .5 Design tile suspension system to support weight of mechanical and electrical items such as air handling boots and lighting fixtures, and with adequate support to allow rotation/relocation of light fixtures. Acoustic panel system is not designed to carry the weight of mechanical and electrical equipment.
- .6 Design subframing as necessary to accommodate, to avoid conflicts and interferences where ducts or equipment prevent regular spacing of hangers.

1.4 SUBMITTALS

- .1 Shop drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 indicating:
 - .1 Suspension system layout including hangers and supports for acoustic tile system.
 - .2 Acoustic panel system including suspension system, hangers, supports and panel sizes and locations.
 - .3 Conditions at abutting, intersecting, and penetrating construction.
 - .4 Dimensioned locations of lighting fixtures, diffusers, sprinkler heads and other items that pierce the ceiling plane.
 - .2 Samples:
 - .1 Submit following samples in accordance with Section 01 33 00:
 - .1 One full-size sample of each type of tile panels to be used.
 - .2 One of each type of suspension system members.
 - .3 Certificates: Submit written certification stating that suspended ceiling system is designed for adequate support of electrical fixtures as required by the current bulletin of the Electrical Safety Authority.

1.5 QUALITY ASSURANCE

- .1 Mock-up:
 - .1 Construct one 3 m² mock-up for each type of ceiling system incorporating typical light fixture and other typical mechanical and electrical fixtures.
 - .2 Test the adequacy of the suspension system to support the fixtures without deflection of ceiling or failure of hanging wire anchorage. Supply copy of Test Results to Consultant.
 - .3 Change materials and installation methods if tests indicate proposed system is inadequate and re-test as necessary until system approved.
 - .4 Give early notice to Consultant and Mechanical and Electrical Trades and co-operate with them in selecting suitable location for sample ceiling and timing of installation and test.
 - .5 Do not commence general installation work until sample ceiling approved, then install ceiling to conform with approved samples.
 - .6 Mock-up may form part of final Work, if acceptable to Consultant. Remove and dispose of mock-ups which do not form part of Work.

1.6 **SITE CONDITIONS**

- .1 Do not install the work of this Section until:
 - .1 Mechanical and electrical work above the ceiling is complete.
 - .2 Relative humidity is below 80 %.
 - .3 Ventilation is adequate to remove excess moisture.
 - .4 Areas are closed and protected against weather, and maintained at no less than 10°C.
- .2 Install temporary protection and facilities to maintain Product manufacturer's, and above specification, environmental requirements 24 h before, during, and after installation.

1.7 **MAINTENANCE**

- .1 Submit extra acoustic ceilings amounting to 2% of gross ceiling area, allowing proportionately for each pattern and type specified to nearest full carton. Submit Products which are part of same production run as installed Products. Store maintenance Products as directed by Consultant.

1.8 **DELIVERY, STORAGE AND HANDLING**

- .1 Transport, handle and store material in manner to prevent warp, twist, damage to panel edges and surfaces in accordance with Manufacturer's recommendations.
- .2 Any warped and/or damaged panels and trim shall be rejected and be replaced by new, straight, undamaged and acceptable material at no cost to Owner.
- .3 Bent, twisted or otherwise damaged Tee grid suspension components shall not be used under any circumstances. Replace such damaged items with new undamaged material at no additional cost to Owner.
- .4 Store material in warm, dry place away from water and the elements. Protect against undue loading stresses and shock.
- .5 All packaged material shall be delivered in original manufacturers wrappers and containers with labels and seals intact. All cartons shall bear U.L. label.

2 Products

2.1 **MATERIALS**

- .1 Galvanized steel sheet: ASTM A653/A653-M, Z275; cold rolled, galvanized steel sheet.
- .2 Main carrying channels: ASTM C645; Channels formed from galvanized steel sheet, 38 x 19 mm cold rolled.

- .3 Subframing: ASTM C645; Channels formed from galvanized steel sheet, dimensions and spans as required.
- .4 Hangers: 2.6 mm minimum diameter, galvanized steel wire.
- .5 Tie wire: 1.6 mm minimum diameter, soft annealed galvanized steel wire.
- .6 Concrete anchors: tie wire sleeve anchors, 'Redi-Drive Anchors' by ITW Red Head or approved alternative.
- .7 Wall mouldings and accessories, including but not limited to, corner caps, edge mouldings, panel hold over clip, metal closures, and trim. Finish and colour: same as main tees.
- .8 Exposed main, cross tees, and relocatable cross tees: ASTM C635, 38 mm high steel, bulb tee design double steel web, rectangular single spans without exceeding a deflection of 1/360 of the span. Splices to be integral and reversible; cross tee interlocking into main tee. Colour and finish: Manufacturer's standard white.
 - .1 Suspension system manufacturers:
 - .1 Armstrong World Industries Inc.
 - .2 CGC Inc.
 - .3 Certainteed Ceilings Canada.
 - .4 Rockfon/Chicago Metallic.
- .9 Acoustic tile: ASTM E1264, Patch, repair and make good all affected surfaces to match existing tile.
- .10 Wall mouldings: To match acoustical ceiling suspension system.

3 Execution

3.1 EXAMINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 SUSPENSION SYSTEM

- .1 Coordinate locations and openings of mechanical and electrical services support, and penetration through the acoustical ceilings. Coordinate field conditions, clearances, measurements, and mechanical and electrical services testing and commissioning, above the acoustical ceilings.
- .2 Install hanger wires plumb and securely anchored to the building structural framing, independent of walls, pipes, ducts, and metal deck; install additional framing and hangers to bridge interference items.

- .3 Install acoustical ceiling systems in accordance with manufacturer's written instructions, reviewed shop drawings, and ASTM C636, listed in order of precedence.
- .4 Install hanger wires at 1200 mm maximum centres along carrying channels, not less than 25 mm, and not more than 150 mm from channel ends.
- .5 Install additional hangers at lighting fixture and air distribution ductwork locations. Do not attach hanger wires to mechanical or electrical equipment. Do not support mechanical and electrical fixtures and fitting on ceiling without the ceiling manufacturer's written acceptance.
- .6 Install acoustical ceiling suspension system to a tolerance of 1:1200 of span and 0.4 mm maximum between adjacent metal members. Tolerances are not cumulative. Refer to Electrical Contract Drawings for fixture layout.
- .7 Do not bend or twist hangers as a means of levelling. Form double loops tightly and lock to prevent vertical movement or rotation within the loop.
- .8 Install edge moulding at intersection of ceiling and vertical surfaces.
- .9 Centre acoustical ceiling suspension systems on room axis; install equal border pieces. Install hangers onto the ends of main tee runners at not more than 150 mm from ends of runners, adjacent and perpendicular to walls.
- .10 Support the suspension system independently of walls, columns, ducts, pipes and conduits.
- .11 Install main runners in maximum available lengths. Layout joints in suspension members to avoid the perimeters of recessed fixtures. Lock grid members to form a rigid assembly. Install additional tee, suspension system framing around recessed fixtures, diffusers, grilles and other items for a complete assembly.

3.3 **ACOUSTIC LAY-IN TILES**

- .1 Install acoustic tile in grid system openings supported by bottom flanges of members. Provide special shapes and sizes to provide a complete installation by cutting tile to fit into openings. Fit tile moderately tight between upright legs of members.
- .2 Carefully cut and trim acoustic tiles to accommodate items piercing the finished ceiling plane.
- .3 Remove and replace acoustic tiles with broken edges, or damaged, marked, discoloured, soiled, or stained faces.

3.4 **ADJUSTMENTS AND CLEANING**

- .1 Clean soiled or discoloured surfaces of exposed work on completion of work.
- .2 Replace components which are visibly damaged, marred or uncleanable.

END OF SECTION

- 1 General
- 1.1 **SECTION INCLUDES**
 - .1 Labour, Products, equipment and services necessary for resilient base work and accessories in accordance with the Contract Documents.
- 1.2 **REFERENCES**
 - .1 ASTM F1861, Specification for Resilient Wall Base.
- 1.3 **SUBMITTALS**
 - .1 Product data:
 - .1 Submit copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
 - .1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations.
 - .2 Product transportation, storage, handling and installation requirements.
 - .2 Samples: Submit two 250 mm long samples of resilient base in accordance with Section 01 33 00.
 - .3 Closeout submittals: Submit maintenance and cleaning data for incorporation into Operations and Maintenance Manuals in accordance with Section 01 78 00.
- 1.4 **SITE CONDITIONS**
 - .1 Maintain air temperature and structural base temperature at installation area above 20°C for 48 hr before, during and 48 hr after installation.
 - .2 Store materials for 2 days prior to installation in area of work to achieve temperature stability.
 - .3 Do not install base in conditions of high humidity or where exposed to cold drafts. In hot weather, protect from direct sunlight.
 - .4 Provide adequate ventilation during installation.
- 1.5 **MAINTENANCE**
 - .1 Submit extra 5% or to nearest full roll of each colour, pattern and type of base required for maintenance use. Identify each carton. Store where directed.

2 Products

2.1 **MATERIALS**

- .1 All materials under work of this Section, including but not limited to, primers, and adhesives are to have low VOC content limits.
- .2 Base: ASTM F1861, to be selected by Consultant.
- .3 Primers and adhesives: Low VOC, waterproof, recommended by base manufacturer for specific material on applicable substrate, above, at or below grade.

3 Execution

3.1 **EXAMINATION**

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.
- .2 Defective work resulting from application to unsatisfactory surfaces will be considered the responsibility of those performing the work of this Section.

3.2 **RESILIENT BASE APPLICATION**

- .1 Install resilient base in accordance with manufacturer's written instructions.
- .2 Lay out base to keep number of joints at minimum.
- .3 Prior to installing base, fill cracks and irregularities with a filler recommended by base manufacturer.
- .4 Set base in adhesive using a 3 kg hand roller, against wall and floor surfaces.
- .5 Install straight and level to variation of 1:1000.
- .6 Scribe and fit to door frames and other obstructions.
- .7 Cope internal corners.

3.3 **CLEANING**

- .1 Forty-eight hours after installation, clean resilient base surfaces with a mild soap solution approved by finish manufacturer.

END OF SECTION

- 1 General
- 1.1 **SECTION INCLUDES**
 - .1 Labour, Products, equipment and services necessary for epoxy flooring work in accordance with the Contract Drawings.
- 1.2 **SUBMITTALS**
 - .1 Product data: Submit manufacturer's Product data in accordance with Section 01 33 00 indicating:
 - .1 Two copies of manufacturer's Product data on characteristics, performance criteria, and limitations.
 - .2 Preparation, installation requirements and techniques, Product storage, and handling criteria.
 - .2 Samples: Submit duplicate samples of each type and colour of epoxy flooring mounted on 250 x 200 mm hardboard in accordance with Section 01 33 00.
 - .3 Reports: Submit manufacturer's acceptance of substrate prior to installation in writing. Submit verification of moisture content of floor prior to installation.
 - .4 Close-out submittals: Submit maintenance data for incorporation into Operations and Maintenance manuals in accordance with Section 01 78 00.
- 1.3 **QUALITY ASSURANCE**
 - .1 Perform work of this Section by a company that has a minimum of five years proven experience in installations of a similar size and nature and that is approved by manufacturer. Submit to Consultant, applicator's current certificate of approval by the material manufacturer as proof of compliance.
 - .2 Mock-up:
 - .1 Construct one 3 m² mock-up of each type and colour of epoxy flooring in location acceptable to Consultant.
 - .2 Arrange for Consultant's review and acceptance, allow 48 hours after acceptance before proceeding with work.
 - .3 Mock-up may remain as part of Work if accepted by Consultant. Remove and dispose of mock-ups which do not form part of Work.
 - .4 Upon acceptance, mock-up shall serve as a minimum standard of quality for the balance of the work of this Section.
 - .3 Pre-installation meetings: Arrange with manufacturer's representative and Consultant to inspect substrates, and to review installation procedures 48 hours in advance of installation.

1.4 SITE CONDITIONS

- .1 Do not install the work of this Section outside of the following environmental ranges without Product manufacturer's written acceptance:
 - .1 Ambient air and surface temperature: 15°C to 30°C.
 - .2 Relative Humidity: In accordance with manufacturers' requirements.
 - .3 When no dust is being raised.
 - .4 In well-ventilated and broom clean areas.
- .2 Do not apply epoxy flooring over materials that contain over 4% moisture.
- .3 Install temporary protection and facilities to maintain the Product manufacturer's, and the above specification, environmental requirements for 24 hours before, during, and 24 h after installation.
- .4 Post do not enter and appropriate warning signs at conspicuous locations.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Package, seal and label each epoxy flooring material to show manufacturer's and product name, and colour.
- .2 Store materials at site in an area specifically set aside for purpose that is locked, ventilated, and maintained at a minimum temperature of 16°C.
- .3 Ensure that health and fire regulations are complied with in storage area, and during handling and application.

2 Products

2.1 MATERIALS

- .1 General:
 - .1 All materials under work of this Section, including but not limited to, primers and epoxy flooring are to have low VOC content limits.
 - .2 Each material used in the application of each flooring system shall be as recommended or manufactured by the supplier of the flooring system.
- .2 Epoxy flooring and base: Trowelled system, silica sand filled 100% epoxy binder, minimum 6 mm thick, with one coat of 100% solids chemical free resistant epoxy top coat. Colours and finishes to later selection by Consultant from manufacturer's full colour range; 'MasterTop 1245CLAD' by Master Builders Solutions or 'Sikafloor Morritex Trowel System' by Sika Canada Inc.
- .3 Primer: As recommended by manufacturer.

3 Execution

3.1 **EXAMINATION**

- .1 Verify condition of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.
- .2 Verify that concrete floor has cured 28 days minimum and that substrate is acceptable to epoxy manufacturer.
- .3 Test surfaces for moisture content to ensure that they are suitable for application.

3.2 **PREPARATION**

- .1 Prepare substrate using steel aggregate blast method and vacuum substrate free of debris and dust.
- .2 Fill minor cracks and voids and prime surfaces in accordance with manufacturer's recommendations.
- .3 Protect adjacent surfaces from damage resulting from this work. Mask and/or cover adjacent surfaces, fixtures, and equipment as necessary.
- .4 Fill open control joints, and other cracks and voids with material compatible with epoxy materials.
- .5 Clean prime and seal surfaces as recommended by epoxy manufacturer.

3.3 **APPLICATION**

- .1 Apply epoxy flooring in accordance with manufacturer's printed instructions. Epoxy manufacturer shall supervise application.
- .2 Stop epoxy in a straight line on each side of control joints; fill space over expansion joint with a self-levelling, non-sag polyurethane sealant.
- .3 Apply epoxy with care to ensure that no laps, voids, or other marks or irregularities are visible, and with an appearance of uniform colour, sheen and texture, all within limitations of materials and areas concerned.
- .4 Match colours and textures of approved samples.
- .5 Make clean true junctions with no visible overlap between adjoining applications of epoxy.

- .6 Chase edge of adjacent floor systems so that epoxy finishes flush with adjacent floor systems.

3.4 **SITE TOLERANCES**

- .1 Finish surfaces shall be level, or straight where sloped to drains, within a tolerance of 1.5 mm in 3 m, and shall not vary more than 0.8 mm in any running 300 mm.

3.5 **REPAIR**

- .1 Touch-up and refinish minor defective work. Refinish entire coated surface areas where finish is damaged or otherwise unacceptable.

3.6 **CLEANING**

- .1 Remove promptly as work progresses spilled or spattered materials from surfaces of work performed under other Sections. Clean floors on completion of work. Do not mar surfaces while removing.
- .2 Leave storage and mixing areas in same condition as equivalent spaces in project.

3.7 **PROTECTION**

- .1 Erect barriers to prevent the entry and presence of personnel not performing work of this Section during application of epoxy flooring, and for 48 hours following completion of application.

END OF SECTION

- 1 General
- 1.1 **SECTION INCLUDES**
 - .1 Labour, Products, equipment and services necessary for painting work in accordance with the Contract Documents.
- 1.2 **REFERENCES**
 - .1 Master Painters Institute (MPI), Painting Specification Manual.
 - .2 SSPC Steel Structures Painting Council, Standards.
- 1.3 **SUBMITTALS**
 - .1 Product data:
 - .1 Submit copies of manufacturer's Product data in accordance with Section 01 33 00 indicating:
 - .1 Performance criteria, compliance with appropriate reference standard, characteristics, limitations.
 - .2 Product transportation, storage, handling and installation requirements.
 - .2 Submit listing of manufacturer's Product types, Product codes, and Product names, number of coats, and dry film thicknesses, corresponding to each Painting Schedule code; submit listing minimum of 8 weeks before materials are required.
 - .2 Samples:
 - .1 Submit following samples in accordance with Section 01 33 00.
 - .1 Three 300 x 150 mm draw downs of each colour minimum 4 weeks before paints are required.
 - .2 Identify each sample with Contract number and title, colour reference, sheen, date, and name of applicator.
 - .3 Certificates:
 - .1 Submit certification from paint manufacturer, on company letterhead, indicating each product proposed for use is Manufacture's premium grade, first line Product.
 - .2 Submit certified documentation to confirm each airless spray painter has minimum of 5 years experience on applications of similar complexity and scope.
 - .3 Submit certified documentation to confirm each worker has Provincial Tradesman Qualification certificate of proficiency.

- .4 Reports:
 - .1 Submit written field inspection and test report results after each inspection.
 - .2 Submit Field Quality Control test result reports for alkali content, substrate moisture, and dry film thickness.
 - .3 Submit electronic moisture meter manufacturer's specifications including tolerances. Submit record of latest meter calibration to meet manufacturer's recommendations.

1.4 **QUALITY ASSURANCE**

- .1 Finishing work: Perform work to MPI requirements for premium grade.
- .2 Supervision: Have work supervised by a full-time qualified foreperson who has 10 years minimum experience on Contracts of similar complexity and scope.
- .3 Mock-up:
 - .1 Construct three 3 m² mock-ups of different Paint Schedule code systems, selected by Consultant, in locations acceptable to Consultant to demonstrate installation workmanship, colour, and hiding power of Products.
 - .2 Obtain Consultant's acceptance in writing before proceeding with the work of this Section.
 - .3 Mock-ups may remain as part of the Work if acceptable to Consultant and will serve as a standard for similar code systems.
 - .4 Repaint over mock-ups which do not form part of the Work.

1.5 **DELIVERY, STORAGE, AND HANDLING**

- .1 Install correct, safe temporary storage for paint, thinner, solvents, and other volatile, corrosive, hazardous, and explosive materials in accordance with requirements of authorities having jurisdiction.
- .2 Post hazard warning signage in areas of storage and mixing. Install and maintain sufficient CO₂ fire extinguishers of minimum 9 kg capacity, accessible in each storage mixing and storage areas.
- .3 Maintain storage enclosures at minimum 10°C ambient temperature and to manufacturer's instructions.

1.6 **SITE CONDITIONS**

- .1 Apply coatings under the following conditions:
 - .1 Exterior coatings (except Latex): 5° C minimum.
 - .2 Exterior latex coatings: 10°C minimum.
 - .3 24 hours minimum after rain, frost, condensation, or dew.
 - .4 When no condensation is possible (unless specifically formulated against condensation).
 - .5 Interior coatings: 7°C minimum.

- .6 Relative humidity: 85% maximum.
- .7 Not in direct exposure to sun light.

- .2 Maintain temperature conditions indicated above for 24 hours before, during and 24 hours after painting.

- .3 Install clean plywood sheets to protect floors and walls in storage and mixing areas, from paint drips, spatters, and spills.

- .4 Apply sufficient masking, clean drop cloths, and protective coverings for full protection of work not being painted including, but not limited to, the following:
 - .1 Light fixtures, fire and smoke detectors.
 - .2 Data cabling and data infrastructure.
 - .3 Sprinkler heads.
 - .4 Prepainted diffusers and registers.
 - .5 Prepainted equipment.
 - .6 Fire rating labels and equipment specification plates.
 - .7 Finished surfaces.

1.7 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

- .1 Provide paint products meeting MPI "Green Performance Standard GPS-1-12.

1.8 MAINTENANCE

- .1 Deliver to Owner's place of storage on completion of work, sealed containers of each finish painting material applied, and in each colour. Label each container as for original, including mixing formula. Provide the following:
 - .1 1 L of extra materials when less than 50 L are used for Project;
 - .2 3.78 L of extra stock when 50 to 200 L are used;
 - .3 7.57 L of extra stock when over 200 L are used.

2 Products

2.1 MATERIALS

- .1 Paint:
 - .1 All materials under work of this Section, including but not limited to, primers, stains, and paints are to have low VOC content limits.
 - .2 Products in accordance with the MPI Painting Specification Manual, Exterior and Interior Systems;
 - .1 For each MPI paint code, manufacture's premium grade, first line Products is to be use.
 - .2 Uniform dispersion of pigment in a homogeneous mixture.
 - .3 Ready-mixed and tinted whenever possible.
 - .3 Products within each MPI paint system code: From single manufacturer.

- .4 Acceptable manufacturers:
 - .1 AkzoNobel.
 - .2 Benjamin Moore.
 - .3 PPG Industries Inc.
 - .4 Sherwin Williams.

2.2 COLOUR SCHEDULE

- .1 Consultant will select choice of colours and gloss when compiling a Colour Schedule after award of Contract; allow for colour selection beyond paint manufacturer's standard colour range.
- .2 Refer to Colour Schedule for selected colour references.
- .3 Conform to gloss reflectance definitions listed in MPI Specification Manual.

2.3 PAINTING AND FINISHING SCHEDULE

- .1 Refer to Table 1, MPI Painting and Finishing Schedule coded systems, comply with MPI Painting Specification Manual.

Table 1: Painting and Finishing Schedule				
INTERIOR SUBSTRATES	Typical substrates (Including but not limited to)	MPI Manual Ref.	MPI Finish System Code	Topcoat
Concrete walls and ceilings		INT 3.1	INT 3.1A	Latex
Concrete floors		INT 3.2	INT 3.2C	Epoxy
Concrete block masonry		INT 4.2	INT 4.2A	Latex
Galvanized metal	HM doors & door frames, handrails	INT 5.3	INT 5.3M	High Performance Latex

3 Execution

3.1 **EXAMINATION**

- .1 Verify condition of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **PREPARATION**

.1 General:

- .1 Clean substrate surfaces free from, dust, grease, soiling, or extraneous matter, which are detrimental to finish.
- .2 Patch, repair, and smoothen minor substrate defects and deficiencies e.g. machine, tool and sand paper marks, shallow gouges, marks, and nibs.
- .3 Clean, sweep, and vacuum floors and surfaces to be painted, debris and dust-free prior to painting.
- .4 Refer to MPI Painting Specification Manual for surface preparation requirements of substrates not listed here.

- .2 Where finish hardware has been installed remove, store, re-install finish hardware, to accommodate painting. Do not clean hardware with solvent that will remove permanent lacquer finishes.

.3 Alkali Content tests and neutralization:

- .1 Test for ph level using litmus paper on dampened substrate.
- .2 Neutralize surfaces over 8.5 ph with 4% solution of Zinc Sulphate for solvent based systems and tetrapotassium pyrophosphate for latex based systems, to below 8.0 ph, and allow to dry.
- .3 Brush-off any residual Zinc Sulphate crystals.
- .4 Coordinate paint system primer / sealer to be alkali-resistant.

.4 Substrate moisture tests:

- .1 Test for moisture content over entire surface to be painted, minimum one test/ 2 m² in field areas and one test/600 mm along inside corners including at ceiling to wall juncture.
- .2 If any test registers above 10% allow entire substrate surfaces, within the plane, to dry further before paint system application. Install temporary drying fans if necessary.
- .3 Re-test employing same criteria.

- .5 Mildew removal: Scrub with solution of trisodium phosphate and sodium hypochlorite (Javex) bleach, rinse with water, and allow to dry completely.

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- .6 Cementitious and masonry (existing): Clean existing surfaces by pressure washing where indicated on drawings with a TSP solution and pressure range of 1500 - 4000 PSI at 6 - 12". Rinse areas with clean water and allow to thoroughly dry. Provide for collection and disposal of water.
 - .7 Cementitious and masonry (Concrete, block, brick, stucco, cement rendering):
 - .1 Allow 28 days cure before painting.
 - .2 Coordinate repair of protrusion-chipping and grinding, and honeycomb filling with responsible trades.
 - .3 Remove dirt, loose mortar, scale, powder, efflorescence, and other foreign matter.
 - .4 Remove form oil and grease with trisodium phosphate, rinse, and allow to dry thoroughly.
 - .5 Remove rust stains with solution of sodium metasilicate after thorough wetting; allow to dry thoroughly.
 - .8 Concrete floors (existing): Clean existing surfaces by pressure washing where indicated on drawings with a TSP solution and pressure range of 1500 - 4000 PSI at 6 - 12". Rinse areas with clean water and allow to thoroughly dry. Provide for collection and disposal of water.
 - .9 Concrete floors (new):
 - .1 Allow 28 days cure before painting.
 - .2 Remove contamination, acid etch, rinse with water, and allow to dry completely. Test and adjust for neutral ph.
 - .10 Metal Fabrications (existing): Scrape and either hand or power wire brush surfaces to remove mill and scale.
 - .11 Aluminum (mill finish): Wash with Xylene solvent, apply etching primer, then paint immediately.
 - .12 Galvanized steel sheet:
 - .1 Z275 (Satin & Spangled Sheet): SSPC SP7 brush blast.
 - .2 ZF075 (Wiped Coat): Remove contamination, wash with Xylene solvent.
 - .3 Touch-up damaged galvanized areas with organic zinc rich primer.
 - .13 Galvanized iron and steel: Prepare galvanized and ungalvanized metal surfaces as follows:
 - .1 Unpassivated, unweathered and weathered: Remove contamination, wash with Xylene or Toluol solvent, allow to dry thoroughly. Make paint system primer/sealer an etching type primer.
 - .2 Manufacturer pre-treated (including passivated): SSPC SP7.
 - .3 Touch-up damaged galvanized areas with organic zinc rich primer.

- .14 Structural steel and miscellaneous metal fabrications:
 - .1 Coordinate the following with the responsible trades:
 - .1 Rust, mars, mill scale, and weld-burn touch-ups.
 - .2 Oil, grease, weld flux and other residue removal.
 - .2 Prime paint items, not otherwise indicated to be primed as part of another Section.
 - .3 Touch-up damaged galvanized areas with organic zinc rich primer.
- .15 Coordinate with other trades to prevent:
 - .1 Damage, and inadvertent activation of fire and smoke detectors.
 - .2 Odour and dust distribution by permanent HVAC systems including fouling of ducts and filters.
- .16 Field-mix Products in accordance with manufacturer's written instructions.

3.3 **APPLICATION**

- .1 Apply painting systems in accordance with the MPI Painting Specification Manual. Apply each Product to manufacturer's recommended dry film thickness.
- .2 Painting systems listed are required minimal, apply additional coats if necessary to obtain substrate hiding acceptable to the Consultant.
- .3 Tint intermediate coats lighter than final top coats for identification of each succeeding coat and to facilitate inspections. Include only manufacturer's recommended reducing and tinting accessories. Do not add adulterants.
- .4 Primer to be specialized primer coating system as required by manufacturer for selected colour. Standard primer being tinted shall be tinted to a maximum of 1.5% by volume.
- .5 Sand lightly between coats to achieve a tooth or anchor for subsequent coats.
- .6 Apply paint uniformly in thickness, colour, texture, and gloss, as determined by the Consultant under adequate illumination and viewed at a distance of 1500 mm. Apply finishes free of defects in materials and application which, in the opinion of the Consultant, affect appearance and performance. Defects include, but are not limited to:
 - .1 Improper cleaning and preparation of surfaces.
 - .2 Entrapped dust, dirt, rust.
 - .3 Alligatoring, blisters, peeling.
 - .4 Scratches, blemishes.
 - .5 Uneven coverage, misses, drips, runs, and poor cutting in.
- .7 Do not apply coatings on substrates which are not sufficiently dry. Unless indicated otherwise, allow each painting system coat to cure dry and hard before following coats are applied.

- .8 Repaint entire areas of damaged or incompletely covered surfaces, to the nearest inside or outside corner; patching will not be permitted.
- .9 Miscellaneous painting requirements:
 - .1 Paint projecting ledges, and tops, bottoms and sides of doors both above and below sight lines to match adjacent surfaces.
 - .2 Paint door frames, access doors and frames, door grilles, prime coated butts, and prime coated door closers to match surface in which they occur.
 - .3 Finish closets and alcoves as specified for adjoining rooms.
 - .4 Paint light covers white whether a light lense is installed or not, unless otherwise indicated.
 - .5 Paint interior columns to match walls of room.
 - .6 Allow for:
 - .1 2 wall colours per room, one ceiling colour per room.
 - .2 Different door colours in each functionally different area.
 - .3 Different colours on both sides of same door.
- .10 Mechanical, electrical and other painting coordination:
 - .1 Paint following items unless specified or indicated on drawings not to be painted.
 - .2 Paint mechanical services in accordance with Mechanical Identification Division 21, 22 and 23.
 - .3 Coordinate painting of pipes, ducts, and coverings with the work of Division 21, 22 and 23 to precede pipe colour banding, flow arrows, and other pipe identification labeling installation.
 - .4 Paint exposed conduit, pipes, hangers, ductwork, grilles, gratings, louvres, access panels, fire hose cabinets, registers, convector and radiator covers, enclosures, and other mechanical and electrical equipment including services concealed inside cupboard and cabinet work; apply colour and sheen to match adjacent surfaces, except as noted otherwise.
 - .5 Paint portions of surfaces such as duct interiors, piping, ductwork, hangers, insulation, walls, and similar items, visible through grilles, louvres, convector covers etc., matte black in colour.
 - .6 Remove the following to accommodate painting, carefully store, clean, then re-install on completion of each area and when dry:
 - .1 Switch and receptacle plates, fittings and fastenings, grilles, gratings, louvres, access panels, convector covers, and enclosures.

3.4 FIELD QUALITY CONTROL

- .1 Dry film thickness tests:
 - .1 Test for film thickness over entire surface to be painted, minimum one test/2 m² in field areas and one test/600 mm along inside corners including at ceiling to wall juncture.
 - .2 If any test registers below specified thickness, re-apply paint to entire surface to nearest inside and outside corners.

- .3 If test registers more than 50% above specified thickness, consult with paint manufacturer, determine if problem exists, offer solutions to Consultant, and repair as directed.
- .4 Re-test employing same criteria after repair.

3.5 CLEANING

- .1 Remove spilled, splashed, and spattered paint promptly as work proceeds and on completion of work. Clean surfaces soiled by paint spillage and paint spatters. Repair or replace damaged work, as directed by Consultant.

3.6 PROTECTION

- .1 Post Wet Paint signs during drying and restrict or prevent traffic where necessary.
- .2 Post sign, after Consultant's inspection and acceptance of each room, reading:
PAINTING COMPLETE - NO ADMITTANCE WITHOUT CONTRACTOR'S PERMISSION.

END OF SECTION

- 1 General
- 1.1 **SECTION INCLUDES**
 - .1 Labour, Products, equipment and services necessary for miscellaneous specialties work in accordance with the Contract Documents.
- 1.2 **SUBMITTALS**
 - .1 Product data:
 - .1 Submit duplicate copies of manufacturer's Product data for each Product specified in accordance the Conditions of the Contract indicating:
 - .1 Performance criteria, compliance with appropriate reference standard(s), characteristics, and limitations.
 - .2 Product transportation, storage, handling and installation requirements.
 - .2 Shop drawings:
 - .1 Submit stamped shop drawings by a licensed professional engineer conforming to design and quality assurance criteria for stair and guardrail system
 - .3 Closeout submittals: Submit cleaning and maintenance instructions for miscellaneous specialties for incorporation into Operations and Maintenance Manuals in accordance with the Conditions of the Contract.
- 1.3 **DELIVERY, STORAGE, AND HANDLING**
 - .1 Package or crate, and brace products to prevent distortion in shipment and handling. Label packages and crates, and protect finish surfaces by sturdy wrappings.
- 1.4 **EXTENDED WARRANTIES**
 - .1 Submit manufacturer's warranty for Guardrail system.
- 2 Products
- 2.1 **MANUFACTURED UNITS**
 - .1 Roof Barrier Guardrail System: Modular free standing guardrail system as manufactured by Skyline Group – Modular 5001 RB501 Guardrail system, or approved alternate will include tube railings, uprights, weighted bases, fittings and delivery to site. Contact Skyline Group: Toll- free (877) 417-6336.
Components:
 - 1. Tube for handrails, mid rails, and uprights: 1.66", 11 gauge G90 galvanized steel tube manufactured as per A787, c1010 modified grade, 50,000 yield, 55,000 tensile. Finish: galvanized G90 finish
 - 2. Fittings: Elbows, crossovers, wall flanges, tees couplings, shall be fluorocarbon finish or hot dipped galvanized to meet A-787.

3. Railing assembly: capable of resisting evenly distributed vertical load of 1.5kN/m applied at the top of the Guard as per OBC.
4. Weighted bases: Steel base plates are 5/8" thick, supplied with powder coated finish, complete with upright receivers and 3/4" protection mat on the underside of the component.
5. Fasteners: All fasteners shall be 304 or 305 stainless steel.

3 Execution

3.1 **EXAMINATION**

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of work of this Section means acceptance of existing conditions.

3.2 **PREPARATION**

- .1 Verify substrate surfaces are solid, free from surface water, dust, oil, grease, projections and other foreign matter detrimental to performance.
- .2 Items to be built-in: Provide information and templates required for installation of work of this Section, and assist or supervise, or both, the setting of anchorage devices, and construction of other work incorporated with products specified in this Section in order that they function as intended.
- .3 Verify there is adequate supports and/or blocking in gypsum wall assemblies prior to installation of miscellaneous specialty items as required.

3.3 **INSTALLATION**

- .1 Install miscellaneous specialties level and securely and rigidly anchored to substrate in accordance with authorities having jurisdiction, reviewed shop drawings, and manufacturer's written instructions.
- .2 After installation, adjust miscellaneous specialties in accordance with manufacturer's written instructions.

3.4 **CLEANING**

- .1 Clean and polish exposed surfaces prior to acceptance by Consultant.

END OF SECTION

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<u>SECTION</u>	<u>TITLE</u>
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20 06 11	Testing, Adjusting and Balancing
22 11 16	Domestic Water Piping
22 13 13	Drainage Piping and Vent
22 44 14	Plumbing Specialties and Accessories
23 07 13	Ductwork Insulation
23 21 11	Hydronic Piping
23 31 13	Metallic Ductwork
23 33 14	Dampers – Balancing
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23 33 46	Flexible Ducts
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23 37 20	Louver and Vents
23 82 29	Convectors, Cabinet Heaters and Radiant Panels
25 20 11	Building Automation Systems and Controls

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.

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:

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- 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 sign 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

- .1 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 charge, any necessary changes or additions to the runs of drains, pipes, ducts, etc., to accommodate the above conditions. The 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. 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 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.

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.

1.10 CODES, PERMITS, FEES AND CONNECTIONS

- .1 Conform to Federal, Provincial and Municipal regulations and perform work in accordance 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 choose one of those listed and state the choice made on the Bid Form or Supplementary Tender Form (where applicable)

1.12 EQUIVALENTS AND ALTERNATES

- .1 Unless requests for changes in base bid specifications are received and approved min. 5 days prior to the opening of the bids, the Contractors will be held to furnish specified items under the base bid. After the Contract is awarded changes in specifications will be made only as defined in this section (see Material Substitutions below)
- .2 Equipment of the Contractors' choice may be offered as alternates to the items named in the specifications. Alternate proposals must be accompanied by full descriptive and technical data on the article proposed, together with a statement of the amount of addition or deduction from the base bid if the alternate is accepted. Prior approval from the Consultant is not required on submitting alternative items, but the decision on acceptance of the alternate(s) will rest with the Consultant and the Owner Representative.
- .3 Unspecified materials and/or rejected alternates built into the work shall be replaced with specified or accepted materials at no additional cost to the Owner.

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.

1.15 AS-BUILT DRAWINGS

- .1 Maintain up to date “as built” drawings on site.
- .2 At the conclusion of the project, the Contractor shall provide the Consultant a full copy of red-line as-built of all Construction Documents for use to prepare the As-Built Drawings. Changes to the Electronic AutoCAD file shall be done by the Consultant.
- .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

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- 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, Trerice.
- .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 in tended 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 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.

1.44 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.

1.45 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.

1.46 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) Start-Up Reports for all Equipment.
 - (f) Red-Line As-Builts and CAD As-Builts (both completed by the Mechanical Contractor).

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

Primer, Structural Steel, Oil Alkyd Type

CSA B51-03

Boiler, Pressure Vessel, and Pressure Piping Code

CSA B52-99

Mechanical Refrigeration Code

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

General Requirements for Rolled or Welded

Structural Quality Steel/Structural Quality Steel

CAN/CSA-S16-01

Limit States Design of Steel Structures

CSA W47.1-92(R2001)

Certification of Companies for Fusion Welding of

Steel Structures

CAN/CSA W48-01

Filler Metals and Allied Materials For Metal Arc

Welding.

CSA W59-M1989(R2001)

Welded Steel Construction (Metal Arc Welding)

CAN/CSA W117.2-01

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: Galvafroid 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 plate mm (in)	Thickness of 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.

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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.

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.

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.

2.2 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.
- 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.
- 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.

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- 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.

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.
 - .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 15010 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 Applications

- .1 All domestic cold water piping.
- .2 All domestic hot water and recirculation piping.
- .3 All hot water heating piping.
- .4 All condensate piping.
- .5 All horizontal and vertical sections of storm drainage.

2.3 INSULATION THICKNESS

- .1 Hot water/glycol heating, all piping sizes: 1"
- .2 Domestic hot water and recirculation piping less than 2" 1"
- .3 Domestic hot water and recirculation piping larger than 2" 1½"
- .4 Domestic cold water, all piping sizes: 1"
- .5 Condensate, all piping sizes: 1"
- .6 Storm Piping, all piping sizes 1"
- .7 Chilled water/glycol, all piping sizes 1"
- .8 Roof drain body, water meter, all sizes 1"
- .9 Refrigerant suction ½"
- .10 Refrigerant discharge ½"
- .11 Refrigerant liquid ½"

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 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.
- .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 subcontractor of the General Contractor and shall report to and be paid by the General Contractor.
 - .2 The TAB agency shall be either a certified member of AABC to perform TAB service for HVAC and water balancing equipment. The certification shall be maintained for the entire duration of duties specified herein. If, for any reason, the agency loses subject certification during this period, the General Contractor shall immediately notify the Consultant and the Owner and submit another TAB firm for approval.
 - .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 General Contractor within 60 days after the award of the contract.
- .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 5% to plus 10%.
 - .2 Grilles, diffusers and air terminal units (maximum values): -5% 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: -5 % 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: -5 % to +5 %.
 - .7 Heating hot water convectors, forced flow heaters, unit heaters: -5 % to +5 %.
 - .8 Chilled water and condenser water pumps: -5%t to +5 %.
 - .9 Chilled water coils: -5 % 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.

1.2 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 15010.
- 1.3.2 Indicate following: valves.
- 1.3.3 Provide shop drawings for all grooved end components.
- 1.3.4 All grooved end components shall be provided by one manufacturer.

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 GROOVED COPPER METHOD

2.4.1 Application

.1 Grooved piping system may be used in lieu of flanged or sweated copper in size 2" (50 mm) and larger. Couplings shall be designed with angle bolt pads to provide a rigid joint, complete with EPDM flush seal gasket suitable for temperatures from -30°F to 230°F (-34°C to 110°C).

2.4.2 Fittings

.1 Housing: ductile iron conforming to ASTM-A536, Grade 65-45-12

.2 Coating: rust inhibiting lead free paint

.3 Bolts and nuts: heat treated, zinc electroplated carbon steel oval-neck track bolts conforming to ASTM A-183 and zinc electroplated carbon steel heavy hex nuts conforming to ASTM A-563,

.4 Hinge Pin: carbon steel

.5 Gaskets: in accordance with ASTM D-2000. Grade E: EPDM rated for service between -30°F to 230°F (-34°C to 110°C).

.6 Copper Fittings: Copper per ASTM B-75 and ASTM B-584.

- .7 When connecting dissimilar metals in liquid systems from grooved end steel (IPS) to Copper (CTS) provide a dielectric waterway between the two materials.

2.4.3 Standard of Acceptance: Victaulic, Anvil

2.5 GROOVED END BUTTERFLY VALVES

- .1 NPS 2 1/2 and over, grooved ends:
 - .1 Class 300, bubble tight shut off to 300 psi (2065 KPa) bronze body.
 - .2 Operators:
 - .1 NPS 4 and under, lever handle
 - .2 NPS 6 and over, gear operated.
 - .3 Standard of Acceptance: Victaulic Series 608, Grinnell. Mueller

2.6 GATE VALVES

2.6.1 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.

2.6.2 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

2.6.3 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

2.6.4 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

2.6.5 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

2.7 GLOBE VALVES

2.7.1 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

2.7.2 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

2.8 SWING CHECK VALVES

2.8.1 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

2.8.2 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

2.8.3 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

2.9 BALL VALVES

2.9.1 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.

2.10 AUTOMATIC CIRCUIT BALANCING VALVES

2.10.1 Circuit balancing valves shall be of the automatic variety. Manual circuit balancing valves will not be accepted.

2.10.2 Circuit Balancing Valves are required on the domestic hot water recirculation system.

2.10.3 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.

2.10.4 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.

2.10.5 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.

2.10.6 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.

2.10.7 Sizes 40mm and smaller

- .1 Valves shall have forged brass bodies and stainless steel cartridge assembly rated for a minimum of 230 psi/250F.

2.10.8 Valve end connections shall be either female sweat or FPT.

2.10.9 Valves shall be provided with two pressure/temperature taps.

2.10.10 Valves shall be provided with a union tailpiece and built in isolation valve.

2.10.11 The body design shall allow for inspection or removal of the cartridge without disturbing piping connections.

2.10.12 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.

2.10.13 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.

2.10.14 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.

3.1.3 When the local authority does not allow the use of grooved fittings the use of grooved fittings shall only begin after the bypass around the meter is connected to the assembly.

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.

3.2.10 Install all grooved end components as per manufacturer's latest recommendation.

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.

2.3 PUMPED DRAINAGE

2.3.1 Pumped drains shall be galvanized steel.

2.4 SANITARY DRAINAGE, STORM DRAINAGE AND SANITARY VENTS 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 Canron 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 15010.

3.1.4 PVC piping shall not be utilized above grade. PVC piping as specified in Section 15415 is acceptable for below grade piping. 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 as specified in Section 15415 is acceptable for below grade piping. 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 specification Section 15010.

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

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 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

1.3 SUBMITTALS

- .1 Submit product data in accordance with Section 15010 - Mechanical General Requirements.
- .2 Indicate dimensions, construction details and materials for the following: floor drains, cleanouts, water hammer arrestors, strainers, traps, trap seal primers.

1.4 MAINTENANCE DATA

- .1 Provide maintenance data for incorporation into manual specified in Section 01300 - Administrative 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.

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 Apply on all rectangular supply ductwork less than 30" wide, located in the mechanical rooms and ceiling plenums.
- .2 Apply on all exhaust ductwork, min. 10 ft (3 m) upstream of the point of exit from the building
- .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 1½" 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.

**SURI & ASSOCIATES LTD.
GLENFOREST SECONDARY SCHOOL
POOL DEMOLITION
2575 FIELDGATE DRIVE, MISSISSAUGA, ONARIO. L4X 2J6**

**DUCTWORK INSULATION
23 07 13-5**

END OF SECTION

1 General

1.1 DESCRIPTION

- .1 Water piping to connect HVAC equipment, including the following:
 - .1 Heating hot water.

1.2 SUBMITTALS

- .1 Submit in accordance with Section 20 05 11 Mechanical General Requirements, shop drawings, product data, and samples for the following:
 - .1 Pipe and equipment supports.
 - .2 Pipe and tubing, with specification, class or type, and schedule.
 - .3 Pipe fittings, including miscellaneous adapters and special fittings.
 - .4 Flanges, gaskets and bolting.
 - .5 Valves of all types.
 - .6 Strainers.
 - .7 Flexible connectors for water service.
 - .8 Pipe alignment guides.
 - .9 Expansion joints.
 - .10 Expansion compensators.
 - .11 Gages.
 - .1 Thermometers and test wells.
 - .2 Pressure Gauges

2 PRODUCTS

2.1 PIPE AND TUBING

- .1 Heating Hot Water:
 - .1 Steel: ASTM A53 Grade B, seamless or ERW, Schedule 40.
 - .2 Copper water tube option: ASTM B88, Type K or L, hard drawn. Soft drawn tubing, 20 mm (3/4 inch) and larger, may be used for runouts to floor mounted fan coil units or perimeter convectors

2.2 FITTINGS FOR STEEL PIPE

- .1 65 mm (2½ inches) and Larger: Welded or flanged joints.
 - .1 Butt welding fittings: ASME B16.9 with same wall thickness as connecting piping. Elbows shall be long radius type, unless otherwise noted.
 - .2 Welding flanges and bolting: ASME B16.5:

- .3 Weld neck or slip on, plain face, with 6 mm (1/8 inch) thick full face neoprene gasket suitable for 104 degrees C (220 degrees F).
- .4 Flange bolting: Carbon steel machine bolts or studs and nuts, ASTM A307, Grade B.
- .2 50 mm (2 inches) and Smaller: Screwed or welded.
 - .1 Butt welding: ASME B16.9 with same wall thickness as connecting piping.
 - .2 Forged steel, socket welding or threaded: ASME B16.11.
 - .3 Screwed: 150 pound malleable iron, ASME B16.3. 125 pound cast iron, ASME B16.4, may be used in lieu of malleable iron. Bushing reduction of a single pipe size, or use of close nipples, is not acceptable.
 - .4 Unions: ASME B16.39.
 - .5 Welded Branch and Tap Connections: Forged steel weldolets, or branchlets and threadolets may be used for branch connections up to one pipe size smaller than the main. Forged steel half couplings, ASME B16.11 may be used for drain, vent and gage connections.

2.3 FITTINGS FOR COPPER TUBING

- .1 Solder Joint:
 - .1 Joints shall be made up in accordance with recommended practices of the materials applied. Apply 95/5 tin and antimony on all copper piping.
 - .2 Mechanically formed tee connection in water and drain piping: Form mechanically extracted collars in a continuous operation by drilling pilot hole and drawing out tube surface to form collar, having a height of not less than three times the thickness of tube wall. Adjustable collaring device shall insure proper tolerance and complete uniformity of the joint. Notch and dimple joining branch tube in a single process to provide free flow where the branch tube penetrates the fitting.
 - .3 Bronze Flanges and Flanged Fittings: ASME B16.24.

2.4 DIELECTRIC FITTINGS

- .1 Provide where copper tubing and ferrous metal pipe are joined.
 - .1 50 mm (2 inches) and Smaller: Threaded dielectric union, ASME B16.39.
 - .2 65 mm (2½ inches) and Larger: Flange union with dielectric gasket and bolt sleeves, ASME B16.42.
 - .3 Temperature Rating, 99 degrees C (210 degrees F).

2.5 SCREWED JOINTS

- .1 Pipe Thread: ANSI B1.20.
- .2 Lubricant or Sealant: Oil and graphite or other compound approved for the intended service.

2.6 VALVES

- .1 Asbestos packing is not acceptable.
- .2 All valves of the same type shall be products of a single manufacturer. Provide gate and globe valves with packing that can be replaced with the valve under full working pressure.
- .3 Provide chain operators for valves 100 mm (4 inches) and larger when the centerline is located 2400 mm (8 feet) or more above the floor or operating platform.
- .4 Standard of Acceptance: Crane, Jenkins, Toyo, Kitz.
- .5 Gate Valves:
 - .1 50 mm (2 inches) and smaller: MSS SP80, Bronze, 1034 kPa (150 lb.), wedge disc, rising stem, union bonnet.
 - .2 65 mm (2½ inches) and larger: Flanged, outside screw and yoke.
 - .3 MSS SP 70, iron body, bronze mounted, 861 kPa (125 psig) wedge disc.
- .6 Globe, Angle and Swing Check Valves:
 - .1 50 mm (2 inches) and smaller: MSS SP 80, bronze, 1034 kPa (150 lb.) Globe and angle valves shall be union bonnet with metal plug type disc.
 - .2 65 mm (2½ inches) and larger: 861 kPa (125 psig), flanged, iron body, bronze trim, MSS SP 85 for globe valves and MSS SP 71 for check valves.
 - .3 Non Slam or Silent Check Valve: Spring loaded double disc swing check or internally guided flat disc lift type check for bubble tight shut off. Provide where check valves are shown in chilled water and hot water piping.
 - .1 Body: Cast iron, ASTM A126, Class B, or steel, ASTM A216, Class WCB, or ductile iron, ASTM 536, flanged, grooved, or wafer type.
 - .2 Seat, disc and spring: 18 8 stainless steel, or bronze, ASTM B62. Seats may be elastomer material.

.7 Butterfly Valves:

- .1 May be used in lieu of gate valves. Provide stem extension to allow 50 mm (2 inches) of pipe insulation without interfering with valve operation.
- .2 MSS SP 67, flange lug type (for end of line service) or grooved end rated 1205 kPa (175 psig) working pressure at 93 degrees C (200 degrees F).
- .3 Body: Cast iron, ASTM A126, Class B. Malleable iron, ASTM A47 electro-plated, or ductile iron, ASTM A536, Grade 65 45 12 electro-plated.
- .4 Trim: Bronze, aluminum bronze, or 300 series stainless steel disc, bronze bearings, 316 stainless steel shaft and manufacturer's recommended resilient seat. Resilient seat shall be field replaceable, and fully line the body to completely isolate the body from the product. A phosphate coated steel shaft or stem is acceptable, if the stem is completely isolated from the product.
- .5 Actuators: Field interchangeable. Valves for balancing service shall have adjustable memory stop to limit open position.
- .6 Valves 150 mm (6 inches) and smaller: Lever actuator with minimum of seven locking positions, except where chain wheel is required.
- .7 Valves 200 mm (8 inches) and larger: Enclosed worm gear with handwheel, and where required, chain wheel operator.

.8 Ball Valves:

- .1 Brass or bronze body with chrome-plated ball with full port and Teflon seat at 2760 kPa (400 psig) working pressure rating. Screwed or solder connections. Provide stem extension to allow operation without interfering with pipe insulation.

.9 Water Flow Balancing Valves

- .1 For flow regulation and shut off. Valves shall be line size rather than reduced to control valve size and be one of the following types.
- .2 Butterfly valve as specified herein with memory stop.
- .3 Eccentric plug valve: Iron body, bronze or nickel plated iron plug, bronze bearings, adjustable memory stop, operating lever, rated 861 kPa (125 psig) and 121 degrees C (250 degrees F).

.10 Circuit Setter Valve

- .1 A dual purpose flow balancing valve and adjustable flow meter, with bronze or cast iron body, calibrated position pointer, valved pressure taps or quick disconnects with integral check valves and preformed polyurethane insulating enclosure. Provide a readout kit

including flow meter, readout probes, hoses, flow charts or calculator, and carrying case.

.11 Automatic Balancing Control Valves

- .1 Factory calibrated to maintain constant flow (plus or minus five percent) over system pressure fluctuations of at least 10 times the minimum required for control. Provide standard pressure taps and four sets of capacity charts. Valves shall be line size and be one of the following designs:
 - .1 Gray iron (ASTM A126) or brass body rated 1205 kPa (175 psig) at 93 degrees C (200 degrees F), with stainless steel piston and spring.
 - .2 Brass or ferrous body designed for 2067 kPa (300 psig) service at 121 degrees C (250 degrees F), with corrosion resistant, tamper proof, self cleaning piston/spring assembly that is easily removable for inspection or replacement.
 - .3 Combination assemblies containing ball type shut off valves, unions, flow regulators, strainers with blowdown valves and pressure temperature ports shall be acceptable.
- .2 Provide a readout kit including flow meter, probes, hoses, flow charts and carrying case.

.12 Manual Radiator/Convactor Valves

- .1 Brass, packless, with position indicator.

2.7 STRAINERS

- .1 Basket or Y Type. Tee type is acceptable for water service.
- .2 Screens: Bronze, monel metal or 18 8 stainless steel, free area not less than 2 1/2 times pipe area, with perforations as follows: 1.1 mm (0.045 inch) diameter perforations.
- .3 100 mm (4 inches) and larger: 3.2 mm (0.125 inch) diameter perforations.
- .4 Suction Diffusers: Specified in the HYDRONIC PUMPS section.

2.8 EXPANSION JOINTS

- .1 Factory built devices, inserted in the pipe lines, designed to absorb axial cyclical pipe movement which results from thermal expansion and contraction. This includes factory-built or field-fabricated guides located along the pipe lines to restrain lateral pipe motion and direct the axial pipe movement into the expansion joints.
- .2 Manufacturing Quality Assurance: Conform to Expansion Joints Manufacturers Association Standards.

- .3 Bellows Internally Pressurized Type:
 - .1 Multiple corrugations of Type 304 or Type A240-321 stainless steel.
 - .2 Internal stainless steel sleeve entire length of bellows.
 - .3 External cast iron equalizing rings for services exceeding 340 kPa (50 psig).
 - .4 Welded ends.
 - .5 Design shall conform to standards of EJMA and ASME B31.1.
 - .6 External tie rods designed to withstand pressure thrust force upon anchor failure if one or both anchors for the joint are at change in direction of pipeline.
 - .7 Integral external cover.

- .4 Bellows Externally Pressurized Type:
 - .1 Multiple corrugations of Type 304 stainless steel.
 - .2 Internal and external guide integral with joint.
 - .3 Design for external pressurization of bellows to eliminate squirm.
 - .4 Welded ends.
 - .5 Conform to the standards of EJMA and ASME B31.1.
 - .6 Threaded connection at bottom, 25 mm (one inch) minimum, for drain or drip point.
 - .7 Integral external cover and internal sleeve.

- .5 Expansion Compensators:
 - .1 Corrugated bellows, externally pressurized, stainless steel or bronze.
 - .2 Internal guides and anti torque devices.
 - .3 Threaded ends.
 - .4 External shroud.
 - .5 Conform to standards of EJMA.

- .6 Expansion Joint Identification
 - .1 Provide stamped brass or stainless steel nameplate on each expansion joint listing the manufacturer, the allowable movement, flow direction, design pressure and temperature, date of manufacture, and identifying the expansion joint by the identification number on the contract drawings.

- .7 Guides
 - .1 Provide factory-built guides along the pipe line to permit axial movement only and to restrain lateral and angular movement. Guides must be designed to withstand a minimum of 15 percent of the axial force which will be imposed on the expansion joints and anchors. Field-built guides may be used if detailed on the contract drawings.

2.9 GAGES, PRESSURE AND COMPOUND

- .1 ASME B40.100, Accuracy Grade 1A, (pressure, vacuum, or compound for air, oil or water), initial mid scale accuracy 1 percent of scale (Qualify grade), metal or phenolic case, 115 mm (4 1/2 inches) in diameter, 6 mm (1/4 inch) NPT bottom connection, white dial with black

graduations and pointer, clear glass or acrylic plastic window, suitable for board mounting. Provide red "set hand" to indicate normal working pressure.

- .2 Provide brass lever handle union cock. Provide brass/bronze pressure snubber for gages in water service.
- .3 Range of Gages: Provide range equal to at least 130 percent of normal operating range.

2.10 PRESSURE/TEMPERATURE TEST PROVISIONS

- .1 Pete's Plug: 6 mm (1/4 inch) MPT by 75 mm (3 inches) long, brass body and cap, with retained safety cap, nordel self closing valve cores, permanently installed in piping where shown, or in lieu of pressure gage test connections shown on the drawings.
- .2 Provide one each of the following test items to the Owner:
 - .1 6 mm (1/4 inch) FPT by 3 mm (1/8 inch) diameter stainless steel pressure gage adapter probe for extra long test plug. PETE'S 500 XL is an example.
 - .2 90 mm (3 1/2 inch) diameter, one percent accuracy, compound gage, , —100 kPa (30 inches) Hg to 700 kPa (100 psig) range.
 - .3 0 - 104 degrees C (220 degrees F) pocket thermometer one half degree accuracy, 25 mm (one inch) dial, 125 mm (5 inch) long stainless steel stem, plastic case.

2.11 THERMOMETERS

- .1 Mercury or organic liquid filled type, red or blue column, clear plastic window, with 150 mm (6 inch) brass stem, straight, fixed or adjustable angle as required for each in reading.
- .2 Case: Chrome plated brass or aluminum with enamel finish.
- .3 Scale: Not less than 225 mm (9 inches), range as described below, two degree graduations.
- .4 Separable Socket (Well): Brass, extension neck type to clear pipe insulation.
- .5 Scale ranges may be slightly greater than shown to meet manufacturer's standard. Required ranges in degrees C (F):

2.12 VACUUM AND AIR RELIEF VALVES

- .1 Vacuum and air relief valves shall be iron body with bronze trim, and stainless steel floats.

3 EXECUTION

3.1 GENERAL

- .1 The drawings show the general arrangement of pipe and equipment but do not show all required

- fittings and offsets that may be necessary to connect pipes to equipment, fan-coils, coils, radiators, etc., and to coordinate with other trades. Provide all necessary fittings, offsets and pipe runs based on field measurements and at no additional cost to the government. Coordinate with other trades for space available and relative location of HVAC equipment and accessories to be connected on ceiling grid. Pipe location on the drawings shall be altered by contractor where necessary to avoid interferences and clearance difficulties.
- .2 Store materials to avoid excessive exposure to weather or foreign materials. Keep inside of piping relatively clean during installation and protect open ends when work is not in progress.
 - .3 Support piping securely.
 - .4 Install piping generally parallel to walls and column center lines, unless shown otherwise on the drawings. Space piping, including insulation, to provide 25 mm (one inch) minimum clearance between adjacent piping or other surface. Unless shown otherwise, slope drain piping down in the direction of flow not less than 25 mm (one inch) in 12 m (40 feet). Provide eccentric reducers to keep bottom of sloped piping flat.
 - .5 Locate and orient valves to permit proper operation and access for maintenance of packing, seat and disc. Generally locate valve stems in overhead piping in horizontal position. Provide a union adjacent to one end of all threaded end valves. Control valves usually require reducers to connect to pipe sizes shown on the drawing. Install butterfly valves with the valve open as recommended by the manufacturer to prevent binding of the disc in the seat.
 - .6 Offset equipment connections to allow valving off for maintenance and repair with minimal removal of piping. Provide flexibility in equipment connections and branch line take offs with 3 elbow swing joints where noted on the drawings.
 - .7 Tee water piping runouts or branches into the side of mains or other branches. Avoid bull-head tees, which are two return lines entering opposite ends of a tee and exiting out the common side.
 - .8 Provide manual air vent at all piping system high points and drain valves at all low points.
 - .9 Connect piping to equipment as shown on the drawings. Install components furnished by others such as:
 - .1 Water treatment pot feeders and condenser water treatment systems.
 - .2 Flow elements (orifice unions), control valve bodies, flow switches, pressure taps with valve, and wells for sensors.
 - .10 Thermometer Wells: In pipes 65 mm (2 1/2 inches) and smaller increase the pipe size to provide free area equal to the upstream pipe area.
 - .11 Firestopping: Fill openings around uninsulated piping penetrating floors or fire walls, with firestop material.
 - .12 Where copper piping is connected to steel piping, provide dielectric connections.

3.2 PIPE JOINTS

- .1 Welded: Beveling, spacing and other details shall conform to ASME B31.1 and AWS B2.1.
- .2 Screwed: Threads shall conform to ASME B1.20; joint compound shall be applied to male threads only and joints made up so no more than three threads show. Coat exposed threads on steel pipe with joint compound, or red lead paint for corrosion protection.
- .3 Mechanical Joint: Pipe grooving shall be in accordance with joint manufacturer's specifications. Lubricate gasket exterior including lips, pipe ends and housing interiors to prevent pinching the gasket during installation. Lubricant shall be as recommended by coupling manufacturer.
- .4 125 Pound Cast Iron Flange (Plain Face): Mating flange shall have raised face, if any, removed to avoid overstressing the cast iron flange.
- .5 Solvent Welded Joints: As recommended by the manufacturer.

3.3 EXPANSION JOINTS (BELLOWS AND SLIP TYPE)

- .1 Anchors and Guides: Provide type, quantity and spacing as recommended by manufacturer of expansion joint and as shown.
- .2 Cold Set: Provide setting of joint travel at installation as recommended by the manufacturer for the ambient temperature during the installation.
- .3 Preparation for Service: Remove all apparatus provided to restrain joint during shipping or installation. Representative of manufacturer shall visit the site and verify that installation is proper.
- .4 Access: Expansion joints must be located in readily accessible space. Locate joints to permit access without removing piping or other devices. Allow clear space to permit replacement of joints and to permit access to devices for inspection of all surfaces and for adding packing.

3.4 LEAK TESTING

- .1 Inspect all joints and connections for leaks and workmanship and make corrections as necessary, to the satisfaction of the Consultant. Tests may be either of those below, or a combination, as approved by the Owner.
 - .1 An operating test at design pressure, and for hot systems, design maximum temperature. The design maximum pressure would usually be the static head, or expansion tank maximum pressure, plus pump head
 - .2 A hydrostatic test at 1.5 times design pressure.

3.5 FLUSHING AND CLEANING PIPING SYSTEMS

- .1 Water Piping: Clean systems as recommended by the suppliers of chemicals specified.
- .2 Initial flushing:
 - .1 Remove loose dirt, mill scale, metal chips, weld beads, rust, and like deleterious substances without damage to any system component. Provide temporary piping or hose to bypass coils, control valves, exchangers and other factory cleaned equipment unless acceptable means of protection are provided and subsequent inspection of hide out areas takes place. Isolate or protect clean system components, including pumps and pressure vessels, and remove any component which may be damaged. Open all valves, drains, vents and strainers at all system levels. Remove plugs, caps, spool pieces, and components to facilitate early debris discharge from system. Sectionalize system to obtain debris carrying velocity of 1.8 m/S (6 feet per second), if possible. Connect dead end supply and return headers as necessary. Flush bottoms of risers. Install temporary strainers where necessary to protect down stream equipment. Supply and remove flushing water and drainage by various type hose, temporary and permanent piping and Contractor's booster pumps. Flush until clean as approved by the Consultant.
- .3 Cleaning
 - .1 Using products supplied by the chemical treatment manufacturer, circulate systems at normal temperature to remove adherent organic soil, hydrocarbons, flux, pipe mill varnish, pipe joint compounds, iron oxide, and like deleterious substances not removed by flushing, without chemical or mechanical damage to any system component. Removal of tightly adherent mill scale is not required. Keep isolated equipment which is "clean" and where dead end debris accumulation cannot occur. Sectionalize system if possible, to circulate at velocities not less than 1.8 m/S (6 feet per second). Circulate each section for not less than four hours. Blow down all strainers, or remove and clean as frequently as necessary. Drain and prepare for final flushing.
- .4 Final Flushing
 - .1 Return systems to conditions required by initial flushing after all cleaning solution has been displaced by clean make up. Flush all dead ends and isolated clean equipment. Gently operate all valves to dislodge any debris in valve body by throttling velocity. Flush for not less than one hour.

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 Section 15010, Manufacturer's Literature and Data:
.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. Minimal 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 50smoke 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.
- 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 be governed by the requirements of Section 20 05 11 Mechanical General Requirements.

1.2 PRODUCT DATA

- .1 Submit shop drawings in accordance with Section 20 05 11 Mechanical General Requirements.
- .2 Indicated the following:
 - a. Performance curve charts.

1.3 MAINTENANCE DATA

- .1 Provide maintenance data for incorporation into maintenance manual specified in Section 15010.

1.4 CERTIFICATION OF RATINGS

- .1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency.

PART 2 PRODUCTS

2.1 MULTI-LEAF

- .1 Opposed or Parallel blade type. Two position dampers to be parallel, modulating dampers to be opposed blade type.
- .2 Blades to be of extruded aluminum, internally reinforced air-foil design and connected to linkage with 7/16" hexagon rod.
- .3 Blades to be complete with extruded synthetic rubber seals to be secured in an integral slot within the extrusions, spring stainless steel side seals, structurally formed and welded galvanized steel, frame.
- .4 All dampers that are in contact with outside air shall be extruded aluminum, internally insulated with non CFC polyurethane foam. Blades shall be thermally broken and connected to linkage with 7/16" hexagon rod. Complete blade shall have an insulating factor of R15.
- .5 Bearings to be comprised of celcon inner bearing fixed to a hexagon blade pin rotating within a polycarbonate outer bearing inserted in frame, resulting in no metal to metal or metal to plastic contact.

- .6 Linkage: plated steel tie rods, brass pivots and plated steel brackets, complete with plated steel control rod.
- .7 Operator: compatible with damper.
- .8 Performance: leakage in closed position to be less than 0.6% of rated air flow at 4" W.G. differential pressure (4 cfm per square foot). Pressure drop at full open position to be less than 0.03 kPa differential across damper at maximum air flow.
- .9 Dampers to be suitable for operating in temperatures between -40°F (-40°C) and 212°F (100°C).
- .10 Dampers shall be made to size and shall not be limited to standard sizes.
- .11 Standard of Acceptance: Tamco Air Foil Series 1000, and Tamco Air Foil Series 9000, Arrow Series AFD-20 and Arrow Series AFD-20 insulated. Ruskin

PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install insulated dampers for all dampers directly in contact with outside air.
- .2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
- .3 Seal multiple damper modules with UL listed non-transparent silicon sealant.
- .4 Upon system start-up, ensure that dampers operate properly.

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 15010.

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 DRUVE 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.

- .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 CONE DIFFUSERS

- .1 Square type 600 x 600 (24" x 24"), having fixed pattern, 4 cones, 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 SCD, 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.

- .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

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 outlined in Section 20 05 11 Mechanical General Requirements.

1.2 SHOP DRAWINGS

1.2.1 Submit shop drawings in accordance with Section 20 05 11 Mechanical General Requirements.

1.2.2 Indicate:

- .1 Equipment, capacity, piping, and connections.
- .2 Dimensions, internal and external construction details, recommended method of installation with proposed structural steel support, sizes and location of mounting bolt holes.
- .3 Shop drawings shall indicate location of supply and return hook-ups in addition to interconnection details for each zone.
- .4 Total pressure drop through each cabinet heater and convector systems.

1.3 MAINTENANCE DATA

1.3.1 Provide maintenance data for incorporation into maintenance manual specified in Section 20 05 11 Mechanical General Requirements.

1.4 SAMPLES

1.4.1 A mockup of each of the convector shall be provided at the Shop Drawing stage. Mockup to be approved prior to the order for the convectors being placed.

1.5 CAPACITY AND PERFORMANCE

1.5.1 Capacity, performance, sizes and specifications shall be as indicated on the Drawings and Equipment Schedule.

PART 2 - PRODUCTS

2.1 GENERAL

2.1.1 All convector covers, force flow heaters and radiant panels shall be factory painted with factory baked enamel finish. Colour to be chosen at shop drawings stage. A physical paint chip of all options shall be provided to the Architect.

2.1.2 Provide for noiseless expansion of all components.

2.1.3 Radiation to give output indicated on the schedule.

2.2 WALL FIN CONVECTOR

2.2.1 Enclosure lengths are assembled together using concealed joiner strips to give a single unit look in every room. Enclosures shall come with all brackets, element hangers, joggle strips, end caps, inside and outside corners, laps, access doors, pilaster kits and manual dampers as required for a full install.

2.2.2 Enclosures are made of quality cold rolled steel, 16 gauge, formed and reinforced with top supports, degreased, phosphatized and coated inside and out with a corrosion resistant tan primer. Factory paint with enamel finish; colour to be coordinated with the architect.

2.2.3 Panels are manufactured in lengths of 2'0" to 8'0" by 6" increments. Enclosure complete with components for wall to wall installation, following the contour of the wall, complete with end caps, wall trim, concealed joiners, inside corners, outside corners, access doors and pipe covers as required. Joints and filler pieces to be recessed. Support rigidly top and bottom, on wall mounted brackets. Joints and filler pieces to be clear of cover grilles.

2.2.4 Elements:

- .1 Elements are seamless copper tube with aluminum fins. The tubes are expanded within the fins to obtain a permanent thermal bond between the two. These are manufactured in lengths of 1'0" to 10'0" by 6" increments. Both elements can be used on either steam or hot water systems.
- .2 The aluminum fins are square 4" x 4", min. 52 fins/linear foot of heating element.
- .3 All tubes are manufactured to receive standard sweat fittings. The elements designed for use at 300 degree F entry water temperature maximum working conditions.

2.2.5 Enclosure Accessories:

- .1 End Piece: End pieces are used to close off enclosure ends when cabinets do not terminate on an adjacent wall. The end piece is manufactured with rounded corners and protrudes 1" beyond enclosure to give a neat finished appearance.
- .2 Wall Trim: Joiners are manufactured to overlap enclosures and cover the gap between cabinet end and adjacent wall or columns. These are usually supplied in 4", 5", 6" or 8" lengths.
- .3 Concealed Joiner (Butt Joint): This piece fits between two enclosure lengths to give a clean hairline joint appearance to the installation.
- .4 Inside Corner: Inside corners are manufactured to overlap enclosures and are used when piping runs on two or more inside walls to meet heating requirements. These are usually supplied at 90 deg. angles, however may be modified to meet project conditions.

- .5 Outside Corner: Outside corners are manufactured to overlap enclosures and are used when piping runs on two or more outside walls to meet heating requirements. These are usually supplied at 90 deg. angles, however may be modified to meet project conditions.
 - .6 Access Doors: Access doors are manufactured to permit access to valves or other controls located inside enclosure. Two types are available, factory installed 5" x 7" or field mounted 5" x 7" with frame. They are supplied as standard with a screw lock, however a camlock type is also available. For field mounted access doors, the contractor is required to perforate the enclosure.
 - .7 Pipe Covers: Pipe covers are used to hide pipes that run around a column. These are supplied in 5", 11" or 17" heights and are 3 3/4" deep.
- 2.2.6 Controls – Refer to the Controls Specifications.
- 2.2.7 Standard of Acceptance: Rosemex models IRVS (where noted on drawings), Engineered Air (1-B), Rittling
- 2.3 FORCE FLOW UNIT HEATERS**
- 2.3.1 Cabinet:
- .1 The cabinets are constructed of heavy 16 gauge furniture steel with removable fronts to provide easy access to motor, blower and heating element. The cabinets are rust proofed and then finished with a prime coat. Units furnished with a factory enamel finish; colour to be coordinated with the architect.
 - .2 ½" flexible fiber glass duct liner on back and sides off external box, for recess arrangement only. Allows easy access to the piping, valve, filter and full access to fan deck.
- 2.3.2 Coils
- .1 The heating coils are of 5/8" O.D. seamless copper tubes expanded into aluminum fins to form a permanent mechanical bond. Two rows for hot water or steam. Female pipe coil connections. Steam distributing coils have cast iron headers. Supply and return connections on left side of units on all models and sizes.
- 2.3.3 Blowers
- .1 The blowers consist of two double inlet type centrifugal aluminum fans mounted directly on a double ended motor shaft.
- 2.3.4 Access Door
- .1 Provides easier access to controls on left side with camlock fastener.
- 2.3.5 Hinged Panel
- .1 Supplied on ceiling arrangements to remove fan deck & filter.
- 2.3.6 Motors

- .1 Permanent split capacitor type. Steel shell, die cast aluminium shields, galvanized steel cradle. Resilient mount. Self aligning sleeve bearings, horizontal mount, class “B” insulation, thermally protected.
- 2.3.7 Speed Switch
 - .1 Solid state three speed control with off position.
- 2.3.8 Controls
 - .1 Fan operation controlled by the self contained thermostat. No water flow control required. On a call for heat, the fan shall be energized, until setpoint is achieved; at that time, the fan will stop.
- 2.3.9 Filters
 - .1 Filters in these cabinet heaters are removable in seconds, without tools. After simply opening the unit’s front panel, the filter easily slides out. Filters are provided as standard. Filters clean air entering the cabinet heater before it is discharged into conditioned space.
- 2.3.10 Piping
 - .1 Space is provided to allow all piping connections to be made inside the cabinet. Manual reset toggle switch starter with overload protection.
- 2.3.11 Standard of Acceptance: Engineered Air.
- 2.4 RADIANT PANEL**
- 2.4.1 Panels shall be provided as shown on the drawings and details. Radiant panel shall be constructed and installed strictly as shown on details, deviation from this details and Specifications shall not be accepted. Fabrication of non-custom and modular units shall be same as custom made units. Radiant ceiling manufacturer shall prove that they have similar installation in Ontario, utilizing custom made panels.
- 2.4.2 Connections between lengths of panel to be as detailed.
- 2.4.3 The panels shall be extruded aluminum with copper tubing of 12.8 mm I.D. mechanically attached to the aluminum face plate. The copper tube shall be held in place by an aluminum saddle which extends more than half way around the diameter of the tube. A non hardening heat conductive paste shall be placed between the copper tubing and the aluminum face plate. Panels shall weigh no more than 10.5 kg/m² (2.15 lb/ft²) when operating. The use of adhesive and/or clips to attach the copper tube to the extrusion will not be acceptable.
- 2.4.4 Panel colour shall be selected by the Architect at the shop drawing stage.
- 2.4.5 Panel capacities shall be based on an entering and leaving water temperatures as per the Drawings.
- 2.4.6 The supplier shall provide a sample section of the proposed radiant panel on site prior to the order for the balance of the radiant panel. A 3 metre section of the radiator shall be provided for review by the Consultant after the shop drawings have been approved and prior to the order for the balance of the radiant panels.

- 2.4.7 Radiant panels shall be fully assembled at the manufacturer factory, with all integral bends so as to leave each panel with one supply and one return connection. Panel widths as shown on the drawings are minimum widths and shall not exceed the dimensions as noted. Field assembled and field cut panels will not be accepted. Length of all panels shall be site measured prior to fabrication. Unit manufacturer to coordinate with Division 15.
- 2.4.8 Panels shall be complete with removable flush mounted access panels. For sizes and locations of access panels refer to drawings.
- 2.4.9 Radiant panels shall be complete with factory installed integral mounted border frame suitable for drywall installation.
- 2.4.10 Radiant ceiling manufacturer shall supply the panels with insulation connected to the panels. Insulation shall be foil faced back, minimum 50 mm (2") thick.
- 2.4.11 Standard of Acceptance: Rosemex, Engineered Air, Sigma/HTS.

PART 3 - EXECUTION

3.1 INSTALLATION – GENERAL

- 3.1.1 Install in strict accordance with the manufacturer's instruction and with all fittings indicated on the drawings and schematics. Support finned elements using the manufacturer's supplied brackets; space wall-fin supports in accordance with the manufacturer's instructions.
- 3.1.2 Install according to the piping layout. Provide for pipe movement during normal operation.
- 3.1.3 Ensure that adequate space is provided within the equipment enclosures for the isolation valves, control valves and strainers. Ensure that access doors are provided to all control elements. Panels shall be constructed in a manner to allow for disassembly and access to hot water piping connections without damaging the radiator panel.
- 3.1.4 Manufacturer to visit the site prior to submission of shop drawings and perform accurate measurements, to ensure that the wall-fin covers match the exact room sizes.
- 3.1.5 Where redundant openings are left above, below or around the new heating equipment, make good wall to match existing. Where necessary, enlarge the existing wall openings as required to fit the new equipment. Make good all surfaces affected by the work and paint to match existing wall finishes.
- 3.1.6 Provide power and wiring to all new forced flow heaters; provide all new thermostats, sensors, control valves and control wiring.
- 3.1.7 Automatic control valves shall be supplied, installed and wired by the Mechanical Contractor and Controls Contractor.
- 3.1.8 Mechanical contractor shall supply the step-down transformers required to power the control valves. Line voltage to the step-down transformers shall be provided by Division 16.

SURI & ASSOCIATES LTD. CONVECTORS, CABINET HEATERS AND RADIANT PANELS
GLENFOREST SECONDARY SCHOOL 23 82 29-6
POOL DEMOLITION
2575 FIELDGATE DRIVE, MISSISSAUGA, ONARIO. L4X 2J6

- Coordinate the location of junction boxes that will provide the power to the step-down controls transformers.
- 3.1.9 Coordinate with Division 26 the location of junction boxes required.
- 3.1.10 Should deviations beyond allowable clearances arise, request and follow Consultant's directive.
- 3.1.11 Refer to manufacturer's installation drawings. Verify electrical service work with characteristics stamped on unit.
- 3.1.12 Check that all openings for appurtenances and operating weight conform to shop drawings.
- 3.1.13 Valves
- .1 Install valves with stems upright or horizontal unless approved otherwise.
 - .2 Install isolating ball valves and circuit balancing valves on each unit.
- 3.1.14 Provide screwdriver vent on convectors and radiators. Clean all finned tubes and comb straight.
- 3.1.15 Provide clear caulking at all corners of the forced flow heaters and convectors interfacing with a block wall. Verify extent of caulking with the Architect prior to starting caulking work.

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 of the specification.
- .2 The BAS Controls Contractor shall be a Sub-Contractor of the Mechanical Contractor. Include for all costs of the BAS Controls Contractor in the Base Tender Price.

1.2 STANDARD OF ACCEPTANCE

- .1 Johnson Controls

1.3 GENERAL INTENT

- .1 The existing school is currently operated by an existing digital BAS supplied by Johnson Controls
- .2 The general outline of the scope of work includes but is not limited to the following:
 - .1 Expand and upgrade the existing controls to include the controls of the equipment serving the new addition and renovated areas.
 - .2 Revise the location of sensors and controllers in the renovated areas as noted..
 - .3 Supply and install the new BAS components (sensors, wiring, relays, controllers, etc) required to make the new boiler plant operate in accordance with the sequence indicated on the drawings.
 - .4 Modify the programming to match the sequence of operation indicated on the drawings; modify the graphical displays on the Board main server to match the new equipment layout and configuration.
 - .5 Provide all necessary power wiring and hardware to complete the entire project, including but not limited to, wiring, fittings, connectors, conduits, hangers/supports, box covers and all other accessories required to ensure complete, safe and fully operational systems. This shall include the power wiring for all the equipment.
 - .6 Make good all surfaces affected by the work.
- .3 Arrange for Electrical Authority inspection of all electrical work. Submit the Certificate of Inspection and Product Approval Certificate with the as-built documentation.

1.4 QUALITY ASSURANCE

- .1 Installer and Manufacturer Qualifications
 - .1 Installer shall have an established working relationship with Control System Manufacturer.

.2 Installer shall have successfully completed Control System Manufacturer's control system training. Upon request, Installer shall present record of completed training including course outlines.

.3 The Building Automation System supplier shall be a subcontractor to General Contractor who shall be responsible for the complete installation of the controls devices and wiring and guarantee its proper function.

.4 The new controls sensors and devices shall be supplied and installed by one of the two suppliers listed in these specifications. No other suppliers are acceptable, General Contractors shall name the Control supplier at the time of tender.

.5 All existing DDC points shall be included in new graphic displays with the ability to read and write to the new controllers.

.6 The new DDC system serving the school shall be connected via the Board's wide area network to existing central DDC system and monitored by the existing main system. All system functions including displays, programs and graphics shall be accessible from any personal computer on the Board's network with web browser software. The control contractor shall demonstrate to the consultant the ability to access programming and graphics remotely from a location as chosen by the consultant.

.7 The Network Cabling Installer will bring network connection(s) to the Energy Management Control System's supervisory panel and Operators Terminal.

1.5 CODES AND STANDARDS

.1 Work, materials, and equipment shall comply with the most restrictive of local, provincial, and federal authorities' codes and ordinances or these plans and specifications. As a minimum, the installation shall comply with current editions in effect 30 days prior to receipt of bids of the following codes:

- .1 National Electric Code (NEC)
- .2 ANSI/ASHRAE 135-2004: Data Communication Protocol for Building Automation and Control Systems (BACNET)

1.6 SYSTEM PERFORMANCE

.1 Performance Standards. System shall conform to the following minimum standards over network connections. Systems shall be tested using manufacturer's recommended hardware and software for operator workstation (server and browser for web-based systems).

.2 Graphic Display. A graphic with 20 dynamic points shall display with current data within 10 sec.

.3 Graphic Refresh. A graphic with 20 dynamic points shall update with current data within 8 sec. and shall automatically refresh every 15 sec.

.4 Configuration and Tuning Screens. Screens used for configuring, calibrating, or tuning points, PID loops, and similar control logic shall automatically refresh within 6 sec.

- .5 Object Command. Devices shall react to command of a Digital object within 2 sec. Devices shall begin reacting to command of an analog object within 2 sec.
- .6 Alarm Response Time. An object that goes into alarm shall be annunciated at the workstation within 15 sec.
- .7 Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 5 sec. Select execution times consistent with the mechanical process under control.
- .8 Performance. Programmable controllers shall be able to completely execute DDC PID control loops at a frequency adjustable down to once per sec. Select execution times consistent with the mechanical process under control.
- .9 Multiple Alarm Annunciation. Each workstation on the network shall receive alarms within 5 sec of other workstations.
- .10 Reporting Accuracy. System shall report values with minimum end-to-end accuracy listed in Table 1.
- .11 Control Stability and Accuracy. Control loops shall maintain measured variable at setpoint within tolerances listed in Table 2.

Table 1 – Reporting Accuracy

Measured Variable	Reported Accuracy
Space Temperature	±0.5°C (±1°F)
Ducted Air	±0.5°C (±1°F)
Outside Air	±1.0°C (±2°F)
Dew Point	±1.5°C (±3°F)
Water Temperature	±0.5°C (±1°F)
Delta-T	±0.15°C (±0.25°F)
Water Flow	±2% of full scale
Air Pressure (ducts)	±25 Pa (±0.1 in. w.g.)
Electrical (A, V, W, Power Factor)	±1% of reading

- .1 Provide three copies of shop drawings and other submittals on hardware, software, and equipment to be installed or furnished. Begin no work until submittals have been reviewed for conformity with design intent. Provide drawings as AutoCAD 2004 (or newer) compatible files on magnetic or optical disk (file format: .DWG, .DXF, .VSD, or comparable) and 3 prints of each drawing on 11" x 17" paper. When manufacturer's cut sheets apply to a product series rather than a specific product, clearly indicate applicable data by highlighting or by other means. Clearly reference covered specification and drawing on each submittal. General catalogs shall not be accepted as cut sheets to fulfill submittal requirements. Select and show submittal quantities appropriate to scope of work.

.2 Submittal approval does not relieve Contractor of responsibility to supply sufficient quantities to complete work. Provide submittals within 2 weeks of contract award on the following:

.3 Direct Digital Control System Hardware - Distributed

.1 Complete bill of materials indicating quantity, manufacturer, model number, and relevant technical data of equipment to be used.

.2 Manufacturer's description and technical data such as performance curves, product specifications, and installation and maintenance instructions for items listed below and for relevant items not listed below:

- Direct digital controllers (controller panels)
- Transducers and transmitters
- Sensors (include accuracy data) Actuators
- Valves
- Relays
- Electrical and electro-pneumatic switches
- Control panels
- Power supplies
- Batteries
- Operator interface equipment
- Wiring
- Wiring diagrams and layouts for each control panel. Show termination numbers.
- Floor plan schematic diagrams indicating field sensor and controller locations.
- Riser diagrams showing control network layout, communication protocol, and wire types.

.4 Central System Hardware and Software

.1 Web server, software, local workstation: existing to remain. Expand hardware and modify software as required to accommodate the new sensors and controlled devices.

.2 Controlled Systems

- Riser diagrams showing control network layout, communication protocol, and wire types.
- Schematic diagram of each controlled system. Label control points with point names. Graphically show locations of control elements.

- Schematic wiring diagram of each controlled system. Label control elements and terminals. Where a control element is also shown on control system schematic, use the same name.
- Instrumentation list (Bill of Materials) for each controlled system. List each control system element in a table. Show element name, type of device, manufacturer, model number, and product data sheet number.
- Complete description of control system operation including sequences of operation. Include and reference schematic diagram of controlled system. List I/O points and software points specified. Indicate alarmed and trended points.
- Description of process, report formats, and checklists to be used in Control System Demonstration and Acceptance.
- BACnet Protocol Implementation Conformance Statement (PICS) for each submitted type of controller and operator interface.

.5 Schedules

- .1 Schedule of work provided within one month of contract award, indicating:
 - Intended sequence of work items
 - Start date of each work item
 - Duration of each work item
 - Planned delivery dates for ordered material and equipment and expected lead times
 - Milestones indicating possible restraints on work by other trades or situations
 - Monthly written status reports indicating work completed and revisions to expected delivery dates. Include updated schedule of work.

1.8 AS-BUILT DOCUMENTATION

.1 Project Record Documents. Submit three copies of record (as-built) documents upon completion of installation for approval prior to final completion. Submittal shall consist of:

.1 Project Record Drawings. As-built versions of submittal shop drawings provided as AutoCAD 2004 (or newer) compatible files on magnetic or optical disk (file format: .DWG, .DXF, .VSD, or comparable) and 6 prints of each drawing on 11" x 17" paper.

.2 Testing and Commissioning Reports and Checklists. Completed versions of reports, checklists, and trend logs used to meet requirements of Control System Demonstration and Acceptance.

.3 Operation and Maintenance (O&M) Manual. Printed, electronic, or online help documentation of the following:

- As-built versions of submittal product data.
- Names, addresses, and telephone numbers of installing contractors and service representatives for equipment and control systems.
- Operator's manual with procedures for operating control systems: logging on and off, handling alarms, producing point reports, trending data, overriding computer control, and changing setpoints and variables.
- Programming manual or set of manuals with description of programming language and syntax, of statements for algorithms and calculations used, of point database creation and modification, of program creation and modification, and of editor use.
- Engineering installation, and maintenance manual or set of manuals that explains how to design and install new points, panels, and other hardware; how to perform preventive maintenance and calibration; how to debug hardware problems; and how to repair or replace hardware.
- Documentation of programs created using custom programming language including setpoints, tuning parameters, and object database. Electronic copies of programs shall meet this requirement if control logic, setpoints, tuning parameters, and objects can be viewed using furnished programming tools.
- Graphic files, programs, and database on magnetic or optical media.
- List of recommended spare parts with part numbers and suppliers.
- Complete original-issue documentation, installation, and maintenance information for furnished third-party hardware including computer equipment and sensors.
- Complete original-issue copies of furnished software, including operating systems, custom programming language, operator workstation or web server software, and graphics software.
- Licenses, guarantees, and warranty documents for equipment and systems.
- Recommended preventive maintenance procedures for system components, including schedule of tasks such as inspection, cleaning, and calibration; time between tasks; and task descriptions.

.4 Training Materials: Provide course outline and materials for each class at least two weeks before first class. Training shall be furnished via instructor-led sessions, computer-based training, or web-based training. Consultant will modify course outlines and materials if necessary to meet Owner's needs. Consultant will review and approve course outlines and materials at least three weeks before first class.

1.9 WARRANTY

.1 Warrant work as follows:

.1 Warrant labor and materials for specified control system free from defects for a period of 24 months after final acceptance. Control system failures during warranty period shall

be adjusted, repaired, or replaced at no additional cost or reduction in service to the Board. Respond during normal business hours within 24 hours of Board's warranty service request.

.2 Work shall have a single warranty date, even if Board receives beneficial use due to early system start-up. If specified work is split into multiple contracts or a multi-phase contract, each contract or phase shall have a separate warranty start date and period.

.3 If Consultant determines that equipment and systems operate satisfactorily at the end of final start-up, testing, and commissioning phase, Consultant will certify in writing that control system operation has been tested and accepted in accordance with the terms of this specification. Date of acceptance shall begin warranty period.

.4 Provide updates to operator workstation or web server software, project-specific software, graphic software, database software, and firmware that resolve Contractor-identified software deficiencies at no charge during warranty period. If available, Owner can purchase in-warranty service agreement to receive upgrades for functional enhancements associated with above-mentioned items. Do not install updates or upgrades without Owner's written authorization.

1.10 OWNERSHIP OF PROPRIETARY MATERIAL

.1 Project-specific software and documentation shall become Owner's property. This includes, but is not limited to:

- .1 Graphics
- .2 Record drawings
- .3 Database
- .4 Application programming code
- .5 Documentation

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Use new products the manufacturer is currently manufacturing and selling for use in new installations. Do not use this installation as a product test site unless explicitly approved in writing by the Board. Spare parts shall be available for at least five years after completion of this contract.

2.2 COMMUNICATION

.1 Control products, communication media, connectors, repeaters, hubs, and routers shall comprise a BACnet internetwork. Controller and operator interface communication shall conform to ANSI/ASHRAE Standard 135-2004, BACnet.

.2 Install new wiring and network devices as required to provide a complete and workable control network. Use existing Ethernet backbone for network segments marked "existing" on project drawings.

- .3 Each controller shall have a communication port for temporary connection to a laptop computer or other operator interface. Connection shall support memory downloads and other commissioning and troubleshooting operations.
- .4 Internetwork operator interface and value passing shall be transparent to internetwork architecture.
- .5 An operator interface connected to a controller shall allow the operator to interface with each internetwork controller as if directly connected. Controller information such as data, status, and control algorithms shall be viewable and editable from each internetwork controller.
- .6 Inputs, outputs, and control variables used to integrate control strategies across multiple controllers shall be readable by each controller on the internetwork. Program and test all cross-controller links required to execute control strategies specified herein and shown on the drawings. An authorized operator shall be able to edit cross-controller links by typing a standard object address or by using a point-and-click interface.
- .7 Controllers with real-time clocks shall use the BACnet Time Synchronization service. System shall automatically synchronize system clocks daily from an operator-designated controller via the internetwork. If applicable, system shall automatically adjust for daylight saving and standard time.
- .8 System shall be expandable to at least twice the required input and output objects with additional controllers, associated devices, and wiring.

2.3 OPERATOR INTERFACE

- .1 Connection to the PDSB Wide Area Network (WAN)
 - .1 Advise the PDSB representative of the proposed location of the system router/gateway panel within the facility. The PDSB shall provide a network jack (RJ45) in the specified location. The controls vendor shall connect the BAS to the PDSB server and WAN and confirm that network access to the BAS has been established.
 - .2 Submit the proposed site-specific BAS network wiring diagram to the Engineer for approval. The use of field installed hubs/switches is not allowed under any circumstances.
- .2 PDSB Central Server
 - .1 New site databases and graphics files shall be installed on the designated central PDSB central server located in Mississauga, Ontario.
 - .2 Provide written notification to the PDSB representative prior to installing new site databases to the PDSB server. Do not install software or make any changes to the server without the written consent of the PDSB representative.
 - .3 Set up and configure the server software and area routers (where required) to allow for seamless access to the site BAS via the PDSB WAN.

.4 Coordinate all activities related to the central server with the PDSB representatives. Provide the PDSB with detailed documentation related to any changes made to the server software, settings or protocols.

.3 Local Service Ports

.1 Every DDC panel shall be provided with a local network access port to connect to laptop computer. A user connected to the local access port shall have the same level of system access and functionality as being connected to the site workstation PC.

.2 Where BAS points (4 or more) are located in a mechanical room that does not have a local BAS panel installed, a remote network access port shall be provided. The access port shall be installed in a hinged metal enclosure with key-lock set and lamicoid ID label.

.4 Operator Interface.

.1 Web server shall reside on high-speed network with building controllers. Each standard browser connected to server shall be able to access all system information.

.5 Communication.

.1 Web server or workstation and controllers shall communicate using BACnet protocol. Web server or workstation and control network backbone shall communicate using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing as specified in ANSI/ASHRAE 135-2004, BACnet Annex J.

.6 Hardware.

.1 Hardware Base. Industry-standard hardware shall meet or exceed DDC system manufacturer's recommended specifications and shall meet response times specified herein. Hard disk shall have sufficient memory to store system software, one year of data for trended points specified herein, and a system database at least twice the size of the existing database at system acceptance. Configure computers and network connections if multiple computers are required to meet specified memory and performance.

.2 Operator Functions. Operator interface shall allow each authorized operator to execute the following functions as a minimum:

.3 Log In and Log Out. System shall require user name and password to log in to operator interface.

.4 Point-and-click Navigation. Operator interface shall be graphically based and shall allow operators to access graphics for equipment and geographic areas using point-and-click navigation.

.5 View and Adjust Equipment Properties. Operators shall be able to view controlled equipment status and to adjust operating parameters such as setpoints, PID gains, on and off controls, and sensor calibration.

- .6 View and Adjust Operating Schedules. Operators shall be able to view scheduled operating hours of each schedulable piece of equipment on a weekly or monthly calendar-based graphical schedule display, to select and adjust each schedule and time period, and to simultaneously schedule related equipment. System shall clearly show exception schedules and holidays on the schedule display.
- .7 View and Respond to Alarms. Operators shall be able to view a list of currently active system alarms, to acknowledge each alarm, and to clear (delete) unneeded alarms.
- .8 View and Configure Trends. Operators shall be able to view a trend graph of each trended point and to edit graph configuration to display a specific time period or data range. Operator shall be able to create custom trend graphs to display on the same page data from multiple trended points.
- .9 View and Configure Reports. Operators shall be able to run pre-configured reports, to view report results, and to customize report configuration to show data of interest.
- .10 Manage Control System Hardware. Operators shall be able to view controller status, to restart (reboot) each controller, and to download new control software to each controller.
- .11 Manage Operator Access. Typically, only a few operators are authorized to manage operator access. Authorized operators shall be able to view a list of operators with system access and of functions they can perform while logged in. Operators shall be able to add operators, to delete operators, and to edit operator function authorization. Operator shall be able to authorize each operator function separately.

2.4 SYSTEM SOFTWARE.

- .1 Operating System. Web server shall have an industry-standard professional-grade operating system. Acceptable systems include Microsoft Vista, Microsoft Windows XP Pro, Red Hat Linux, or Sun Solaris.
- .2 System Graphics. Operator interface shall be graphically based and shall include at least one graphic per piece of equipment or occupied zone, graphics for each chilled water and hot water system, and graphics that summarize conditions on each floor of each building included in this contract. Indicate thermal comfort on floor plan summary graphics using dynamic colors to represent zone temperature relative to zone setpoint.
- .3 Functionality. Graphics shall allow operator to monitor system status, to view a summary of the most important data for each controlled zone or piece of equipment, to use point-and-click navigation between zones or equipment, and to edit setpoints and other specified parameters.
- .4 Animation. Graphics shall be able to animate by displaying different image files for changed object status.
- .5 Alarm Indication. Indicate areas or equipment in an alarm condition using color or other visual indicator.
- .6 Format. Graphics shall be saved in an industry-standard format such as BMP, JPEG, PNG, or GIF. Web-based system graphics shall be viewable on browsers compatible with World Wide

Web Consortium browser standards. Web graphic format shall require no plug-in (such as HTML and JavaScript) or shall only require widely available no-cost plug-ins (such as Active-X and Macromedia Flash).

.7 System Tools. System shall provide the following functionality to authorized operators as an integral part of the operator interface or as stand-alone software programs. If furnished as part of the interface, the tool shall be available from each workstation or web browser interface. If furnished as a stand-alone program, software shall be installable on standard IBM-compatible PCs with no limit on the number of copies that can be installed under the system license.

.8 Automatic System Database Configuration. Each workstation or web server shall store on its hard disk a copy of the current system database, including controller firmware and software. Stored database shall be automatically updated with each system configuration or controller firmware or software change.

.9 Controller Memory Download. Operators shall be able to download memory from the system database to each controller.

.10 System Configuration. Operators shall be able to configure the system.

.11 Online Help. Context-sensitive online help for each tool shall assist operators in operating and editing the system.

.12 Security. System shall require a user name and password to view, edit, add, or delete data.

.13 Operator Access. Each user name and password combination shall define accessible viewing, editing, adding, and deleting functions in each system application, editor, and object.

.14 Automatic Log Out. Automatically log out each operator if no keyboard or mouse activity is detected. Operators shall be able to adjust automatic log out delay.

.15 Encrypted Security Data. Store system security data including operator passwords in an encrypted format. System shall not display operator passwords.

.16 System Diagnostics. System shall automatically monitor controller and I/O point operation. System shall annunciate controller failure and I/O point locking (manual overriding to a fixed value).

.17 Alarm Processing. System input and status objects shall be configurable to alarm on departing from and on returning to normal state. Operator shall be able to enable or disable each alarm and to configure alarm limits, alarm limit differentials, alarm states, and alarm reactions for each system object. Configure and enable alarm points as specified herein and indicated in the sequences of operation shown on the drawings. Alarms shall be BACnet alarm objects and shall use BACnet alarm services.

.18 Alarm Messages. Alarm messages shall use an English language descriptor without acronyms or mnemonics to describe alarm source, location, and nature.

.19 Alarm Reactions. Operator shall be able to configure (by object) actions workstation or web server shall initiate on receipt of each alarm. As a minimum, workstation or web server shall be

able to log, print, start programs, display messages, send e-mail, send page, and audibly announce.

.20 Alarm Maintenance. Operators shall be able to view system alarms and changes of state chronologically, to acknowledge and delete alarms, and to archive closed alarms to the workstation or web server hard disk from each workstation or web browser interface.

.21 Trend Configuration. Operator shall be able to configure trend sample or change of value (COV) interval, start time, and stop time for each system data object and shall be able to retrieve data for use in spreadsheets and standard database programs. Controller shall sample and store trend data and shall be able to archive data to the hard disk.. Trends shall be BACnet trend objects.

.22 Object and Property Status and Control. Operator shall be able to view, and to edit if applicable, the status of each system object and property by menu, on graphics, or through custom programs.

.23 Reports and Logs. Operator shall be able to select, to modify, to create, and to print reports and logs. Operator shall be able to store report data in a format accessible by standard spreadsheet and word processing programs.

.24 Standard Reports. Furnish the following standard system reports:

.1 Objects. System objects and current values filtered by object type, by status (in alarm, locked, normal), by equipment, by geographic location, or by combination of filter criteria.

.2 Alarm Summary. Current alarms and closed alarms. System shall retain closed alarms for an adjustable period.

.3 Logs. System shall log the following to a database or text file and shall retain data for an adjustable period:

.4 Alarm History.

.5 Trend Data. Operator shall be able to select trends to be logged.

.25 Operator Activity. At a minimum, system shall log operator log in and log out, control parameter changes, schedule changes, and alarm acknowledgment and deletion. System shall date and time stamp logged activity.

.26 Graphics Generation. Graphically based tools and documentation shall allow Operator to edit system graphics, to create graphics, and to integrate graphics into the system. Operator shall be able to add analog and Digital values, dynamic text, static text, and animation files to a background graphic using a mouse.

.27 Graphics Library. Complete library of standard HVAC equipment graphics shall include equipment such as chillers, boilers, air handlers, terminals, fan coils, and unit ventilators. Library shall include standard symbols for other equipment including fans, pumps, coils, valves, piping, dampers, and ductwork. Library graphic file format shall be compatible with graphics generation tools.

.28 Custom Application Programming. Operator shall be able to create, edit, debug, and download custom programs. System shall be fully operable while custom programs are edited, compiled, and downloaded. Programming language shall have the following features:

.1 Language. Language shall be graphically based or English language oriented. If graphically based, language shall use function blocks arranged in a logic diagram that clearly shows control logic flow. Function blocks shall directly provide functions listed below, and operators shall be able to create custom or compound function blocks. If English language oriented, language shall be based on the syntax of BASIC, FORTRAN, C, or PASCAL, and shall allow for free-form programming that is not column-oriented or "fill-in-the-blanks."

.2 Programming Environment. Tool shall provide a full-screen, cursor-and-mouse-driven programming environment that incorporates word processing features such as cut and paste. Operators shall be able to insert, add, modify, and delete custom programming code, and to copy blocks of code to a file library for reuse in other control programs.

.3 Independent Program Modules. Operator shall be able to develop independently executing program modules that can disable, enable and exchange data with other program modules.

.4 Debugging and Simulation. Operator shall be able to step through the program observing intermediate values and results. Operator shall be able to adjust input variables to simulate actual operating conditions. Operator shall be able to adjust each step's time increment to observe operation of delays, integrators, and other time-sensitive control logic. Debugger shall provide error messages for syntax and for execution errors.

.5 Conditional Statements. Operator shall be able to program conditional logic using compound Boolean (AND, OR, and NOT) and relational (EQUAL, LESS THAN, GREATER THAN, NOT EQUAL) comparisons.

.6 Mathematical Functions. Language shall support floating-point addition, subtraction, multiplication, division, and square root operations, as well as absolute value calculation and programmatic selection of minimum and maximum values from a list of values.

.7 Variables: Operator shall be able to use variable values in program conditional statements and mathematical functions.

.8 Time Variables. Operator shall be able to use predefined variables to represent time of day, day of the week, month of the year, and date. Other predefined variables or simple control logic shall provide elapsed time in seconds, minutes, hours, and days. Operator shall be able to start, stop, and reset elapsed time variables using the program language.

.9 System Variables. Operator shall be able to use predefined variables to represent status and results of Controller Software and shall be able to enable, disable, and change setpoints of Controller Software as described in Controller Software section.

.29 Portable Operator's Terminal. Provide all necessary software to configure an IBM-compatible laptop computer for use as a Portable Operator's Terminal. Operator shall be able to

connect configured Terminal to the system network or directly to each controller for programming, setting up, and troubleshooting.

.30 BACnet. Web server or workstation shall have demonstrated interoperability during at least one BMA Interoperability Workshop and shall substantially conform to BACnet Operator Workstation (B-OWS) device profile as specified in ASHRAE/ANSI 135-2001, BACnet Annex L.

2.5 CONTROLLER SOFTWARE

.1 Building and energy management application software shall reside and operate in system controllers. Applications shall be editable through operator workstation or web browser interface.

.2 Scheduling. System shall provide the following schedule options as a minimum:

.1 Weekly. Provide separate schedules for each day of the week. Each schedule shall be able to include up to 5 occupied periods (5 start-stop pairs or 10 events).

.2 Exception. Operator shall be able to designate an exception schedule for each of the next 365 days. After an exception schedule has executed, system shall discard and replace exception schedule with standard schedule for that day of the week.

.3 Holiday. Operator shall be able to define 24 special or holiday schedules of varying length on a scheduling calendar that repeats each year.

.3 System Coordination. Operator shall be able to group related equipment based on function and location and to use these groups for scheduling and other applications.

.4 Remote Communication. System shall automatically contact operator workstation or server on receipt of critical alarms. If no network connection is available, system shall use a modem connection.

.5 PID Control. System shall provide direct- and reverse-acting PID (proportional-integral-derivative) algorithms. Each algorithm shall have anti-windup and selectable controlled variable, setpoint, and PID gains. Each algorithm shall calculate a time-varying analog value that can be used to position an output or to stage a series of outputs.

.6 Staggered Start. System shall stagger controlled equipment restart after power outage. Operator shall be able to adjust equipment restart order and time delay between equipment restarts.

2.6 CONTROLLERS

.1 General. Provide Building Controllers (BC), Advanced Application Controllers (AAC), Application Specific Controllers (ASC), Smart Actuators (SA), and Smart Sensors (SS) as required to achieve performance specified herein and indicated on the drawings. Every device in the system which executes control logic and directly controls HVAC equipment must conform to a standard BACnet Device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L. Unless otherwise specified, hardwired actuators and sensors may be used in lieu of BACnet Smart Actuators and Smart Sensors.

2.7 BACNET.

- .1 Building Controllers (BCs). Each BC shall conform to BACnet Building Controller (B-BC) device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L and shall be listed as a certified B-BC in the BACnet Testing Laboratories (BTL) Product Listing.
- .2 Advanced Application Controllers (AACs). Each AAC shall conform to BACnet Advanced Application Controller (B-AAC) device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L and shall be listed as a certified B-AAC in the BACnet Testing Laboratories (BTL) Product Listing.
- .3 Application Specific Controllers (ASCs). Each ASC shall conform to BACnet Application Specific Controller (B-ASC) device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L and shall be listed as a certified B-ASC in the BACnet Testing Laboratories (BTL) Product Listing.
- .4 Smart Actuators (SAs). Each SA shall conform to BACnet Smart Actuator (B-SA) device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L and shall be listed as a certified B-SA in the BACnet Testing Laboratories (BTL) Product Listing.
- .5 Smart Sensors (SSs). Each SS shall conform to BACnet Smart Sensor (B-SS) device profile as specified in ANSI/ASHRAE 135-2004, BACnet Annex L and shall be listed as a certified B-SS in the BACnet Testing Laboratories (BTL) Product Listing.

2.8 BACNET COMMUNICATION.

- .1 Each BC shall reside on or be connected to a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol and BACnet/IP addressing.
- .2 BACnet routing shall be performed by BCs or other BACnet device routers as necessary to connect BCs to networks of AACs and ASCs.
- .3 Each AAC shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
- .4 Each ASC shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
- .5 Each SA shall reside on a BACnet network using the ARCNET or MS/TP Data Link/Physical layer protocol.
- .6 Each SS shall reside on a BACnet network using ISO 8802-3 (Ethernet) Data Link/Physical layer protocol with BACnet/IP addressing, or it shall reside on a BACnet network using ARCNET or MS/TP Data Link/Physical layer protocol.

2.9 COMMUNICATION.

- .1 Service Port. Each controller shall provide a service communication port for connection to a Portable Operator's Terminal. Connection shall be extended to space temperature sensor ports where shown on drawings.

- .1 Signal Management. BC and ASC operating systems shall manage input and output communication signals to allow distributed controllers to share real and virtual object information and to allow for central monitoring and alarms.
- .2 Data Sharing. Each BC and AAC shall share data as required with each networked BC and AAC.
- .3 Environment. Controller hardware shall be suitable for anticipated ambient conditions.
- .4 Controllers used outdoors or in wet ambient conditions shall be mounted in waterproof enclosures and shall be rated for operation at -29°C to 60°C (-20°F to 140°F).
- .5 Controllers used in conditioned space shall be mounted in dust-protective enclosures and shall be rated for operation at 0°C to 50°C (32°F to 120°F).
- .6 Real-Time Clock. Controllers that perform scheduling shall have a real-time clock.

2.10 SERVICEABILITY.

- .1 Controllers shall have diagnostic LEDs for power, communication, and processor.
- .2 Wires shall be connected to a field-removable modular terminal strip or to a termination card connected by a ribbon cable.
- .3 Each BC and AAC shall continually check its processor and memory circuit status and shall generate an alarm on abnormal operation. System shall continuously check controller network and generate alarm for each controller that fails to respond.

2.11 MEMORY.

- .1 Controller memory shall support operating system, database, and programming requirements.
- .2 Each BC and AAC shall retain BIOS and application programming for at least 72 hours in the event of power loss.
- .3 Each ASC and SA shall use nonvolatile memory and shall retain BIOS and application programming in the event of power loss. System shall automatically download dynamic control parameters following power loss.
- .4 Each controller shall have a min. 25% spare memory to allow for future expansion.
- .5 Immunity to Power and Noise. Controllers shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage. Operation shall be protected against electrical noise of 5 to 120 Hz and from keyed radios upto 5W at 1m(3ft).
- .6 Transformer. ASC power supply shall be fused or current limiting and shall be rated at a minimum of 125% of ASC power consumption.

2.12 INPUT AND OUTPUT INTERFACE

- .1 General. Hard-wire input and output points to BCs, AACs, ASCs, or SAs.

- .2 Protection. Shorting an input or output point to itself, to another point, or to ground shall cause no controller damage. Input or output point contact with up to 24 V for any duration shall cause no controller damage.
- .3 Digital Inputs. Digital inputs shall monitor the on and off signal from a remote device. Digital inputs shall provide a wetting current of at least 12 mA and shall be protected against contact bounce and noise. Digital inputs shall sense dry contact closure without application of power external to the controller.
- .4 Pulse Accumulation Inputs. Pulse accumulation inputs shall conform to Digital input requirements and shall accumulate up to 10 pulses per second.
- .5 Analog Inputs. Analog inputs shall monitor low-voltage (0-10 Vdc), current (4-20 mA), or resistance (thermistor or RTD) signals. Analog inputs shall be compatible with and field configurable to commonly available sensing devices.
- .6 Digital Outputs. Digital outputs shall send an on-or-off signal for on and off control. Building Controller Digital outputs shall have three-position (on-off-auto) override switches and status lights. Outputs shall be selectable for normally open or normally closed operation.
- .7 Analog Outputs. Analog outputs shall send a modulating 0-10 Vdc or 4-20 mA signal as required to properly control output devices. Each Building Controller analog output shall have a two-position (auto-manual) switch, a manually adjustable potentiometer, and status lights. Analog outputs shall not drift more than 0.4% of range annually.
- .8 Tri-State Outputs. Control three-point floating electronic actuators without feedback with tri-state outputs (two coordinated Digital outputs). Tri-State outputs may be used to provide analog output control in zone control and terminal unit control applications such as VAV terminal units, duct-mounted heating coils, and zone dampers.
- .9 Universal Inputs and Outputs. Inputs and outputs that can be designated as either Digital or analog in software shall conform to the provisions of this section that are appropriate for their designated use.

2.13 POWER SUPPLIES AND LINE FILTERING

- .1 Power Supplies. Control transformers shall be UL listed. Furnish Class 2 current-limiting type or furnish over-current protection in primary and secondary circuits for Class 2 service in accordance with NEC requirements. Limit connected loads to 80% of rated capacity.
- .2 DC power supply output shall match output current and voltage requirements. Unit shall be full-wave rectifier type with output ripple of 5.0 mV maximum peak-to-peak. Regulation shall be 1.0% line and load combined, with 100-microsecond response time for 50% load changes. Unit shall have built-in over-voltage and over-current protection and shall be able to withstand 150% current overload for at least three seconds without trip-out or failure.
- .3 Unit shall operate between 0°C and 50°C (32°F and 120°F). EM/RF shall meet FCC Class B and VDE 0871 for Class B and MILSTD 810C for shock and vibration.
- .4 Line voltage units shall be UL recognized and CSA listed.

2.14 POWER LINE FILTERING.

.1 Provide internal or external transient voltage and surge suppression for workstations and controllers. Surge protection shall have:

- .1 Dielectric strength of 1000 V minimum
- .2 Response time of 10 nanoseconds or less
- .3 Transverse mode noise attenuation of 65 dB or greater
- .4 Common mode noise attenuation of 150 dB or greater at 40-100 Hz

2.15 CONTROL DEVICES AND SENSORS

.1 Automatic Control Valves

.1 Automatic control valves, unless otherwise specified, shall be globe type valves. Valves and actuators shall be ordered as one factory-assembled and tested unit.

.2 Submit to the Consultant for review the following information for each valve:

- Valve type and size
- Connection type
- Line size
- Valve manufacturer and model number
- Valve flow coefficient
- Design flow
- Pressure drop across valve
- Maximum close-off pressure
- Actuator manufacturer and model number
- Actuator maximum torque

.3 Valves 2" (50mm) and smaller shall be constructed of bronze. Valves 2 1/2" (65mm) and larger shall have iron bodies and bronze mountings.

.4 All control valves shall have stainless steel stems. The bronze in bodies and bonnets of all bronze valves shall conform to ASTM B62 for valves rated up to 150psig (1035 Kpa) working pressure and to ASTM B61 for valves rated at 200 psig (1380 Kpa) working pressure. The bodies and bonnets of iron body valves shall conform to ASTM A126, Class B.

.5 Control valve discs and seats shall be of bronze for 100 °C or less fluid temperature and of stainless steel for fluid temperatures above 100 °C.

.6 The control valves shall have tight shut-off. Flat disk valves are not acceptable.

.7 Control valves 2" (50mm) and smaller shall be complete with screwed ends type, except for bronze valves installed in soldered copper piping which shall be complete with soldering ends. Control valves larger than 2" (50mm) shall be complete with flanged end type and proper flanged adapters to copper shall be provided where flanged valves are installed in copper piping.

.8 The water control valves shall be sized for a pressure drop of 6 ft. water column or as indicated on mechanical drawings.

.9 Each automatic control valve must provide the design output and flow rates at pressure drops compatible with equipment selected.

.10 Each automatic control valve must be suitable for the particular system working pressure.

.11 Each automatic control valve shall be fitted with a position indicator.

.12 All the same type control valves shall be the products of a single manufacturer and have the manufacturer's name, pressure rating and size clearly marked on the outside of the body.

.13 All heating valves: default position shall be fully open to the coil.

.14 Standard of Acceptance: Belimo, Siemens,

.2 Motorized Control Dampers.

.1 Type. Control dampers shall have linear flow characteristics and shall be parallel- or opposed-blade type as specified below or as scheduled on drawings.

.2 All modulating dampers shall be opposed-blade type. All ON/OFF or other two-position dampers shall be parallel-blade type.

.3 All outdoor air and exhaust air dampers shall be insulated, ultra-low leak type. All return air dampers shall be non-insulated.

.4 Frame. Damper frames shall be 2.38 mm (13 gauge) galvanized steel channel or 3.175 mm (1/8 in.) extruded aluminum with reinforced corner bracing.

.5 Blades. Damper blades shall not exceed 20 cm (8 in.) in width or 125 cm (48 in.) in length. Blades shall be suitable for medium velocity (10 m/s [2000 fpm]) performance. Blades shall be not less than 1.5875 mm (16 gauge).

.6 Shaft Bearings. Damper shaft bearings shall be as recommended by manufacturer for application, oil impregnated sintered bronze, or better.

.7 Seals. Blade edges and frame top and bottom shall have replaceable seals of butyl rubber or neoprene. Side seals shall be spring-loaded stainless steel. Blade seals shall leak no more than 50 L/s•m² (10 cfm per ft²) at 1000 Pa (4 in. w.g.) differential pressure. Blades shall be airfoil type suitable for wide-open face velocity of 7.5 m/s (1500 fpm).

.8 Sections. Damper sections shall not exceed 125 cm - 150 cm (48 in. - 60 in.). Each section shall have at least one damper actuator.

.9 Linkages. Dampers shall have exposed linkages.

.10 Standard of Acceptance: TAMCO 9000 series (insulated) or 1500 series (non-insulated)

.3 Electric Damper and Valve Actuators.

.1 Stall Protection. Mechanical or electronic stall protection shall prevent actuator damage throughout the actuator's rotation.

.2 Spring-return Mechanism. Actuators used for power-failure and safety applications shall have an internal mechanical spring-return mechanism or an uninterruptible power supply (UPS).

.3 Signal and Range. Proportional actuators shall accept a 0-10 Vdc or a 0-20 mA control signal and shall have a 2-10 Vdc or 4-20 mA operating range. (Floating motor actuators may be substituted for proportional actuators in terminal unit applications as described in paragraph 2.6H.)

.4 Wiring. 24 Vac and 24 Vdc actuators shall operate on Class 2 wiring.

.5 Manual Positioning. Operators shall be able to manually position each actuator when the actuator is not powered. Non-spring-return actuators shall have an external manual gear release. Spring-return actuators with more than 7 N•m (60 in.-lb) torque capacity shall have a manual crank.

.6 Standard of Acceptance: Belimo

.4 Temperature Sensors.

.1 Type. Temperature sensors shall be Resistance Temperature Device (RTD) or thermistor.

.5 Duct Sensors.

.1 Duct sensors shall be single point or averaging as shown. Averaging sensors shall be a minimum of 1.5 m (5 ft) in length per 1 m² (10 ft²) of duct cross-section.

.2 Provide duct mounted temperature sensors (DTS) with the following minimum characteristics:

- Sensor encapsulated in a 200mm long, 6mm OD copper or stainless steel probe.
- Operating range 0-60 degrees C.
- End-to-end accuracy +/- 0.3 °C.
- Assembly complete with wiring housing and mounting flange.

.3 Standard of Acceptance: Enercorp

.6 Immersion Temperature Sensors

.1 Existing, to be re-used if possible.

.2 Where new devices are required: Use immersion temperature sensors with thermo- wells for all applications where a temperature of a fluid in a pipe is being sensed.

.3 Provide well-mounted water temperature sensors with the following minimum characteristics:

- The sensors shall be 10k ohm thermistor encapsulated in a 6mm OD, 50m long probe, with screw fitting for insertion into a standard thermowell.
- Operating range -10 to +100 degrees C.
- End-to-end accuracy +/- 0.3 deg. C over the entire operating range.
- The sensors shall be complete with brass thermowell. Provide a stainless steel thermowell where exposed to corrosive liquids.

.4 Use conductive gel when mounting the sensor in the thermowell

.5 The sensors to be mounted on insulated piping shall be installed clear of the insulation.

.6 Standard of Acceptance: Enercorp

.7 Space Sensors.

.1 Mount sensors at a height of 5'-6'' above the finished floor. Unless indicated otherwise, mount new sensors adjacent to the existing thermostat in the space.

.2 Space sensors shall have setpoint adjustment, override switch, display, and communication port as shown.

.3 End-to-end accuracy +/- 0.3 °C over the entire operating range.

.4 Provide a heavy-duty metal guard for all sensors or thermostats mounted in public areas such as stairways, vestibules, lobbies. On the approval of the Consultant, a, stainless steel, ventilated plate-type sensor may be used in lieu of guard or cage.

.5 Do not mount sensors on outside walls or other locations influenced by external thermal sources (e.g. computers, boiler rooms).

.6 Standard of acceptance: Enercorp

.8 Duct Averaging Sensors

.1 Provide plenum mounted mixed air temperature averaging type sensors with the following minimum characteristics:

- Constructed of FT6 plenum rated cable incorporating a minimum of 9 temperature sensors encapsulated at equal distances along the 24 foot length of the element. The assembly acts as a single sensor reporting the average temperature from all individual sensors.

- End-to-end accuracy +/- 0.3 °C.

.2 Mount in a zigzag manner to provide continuous coverage of the entire duct cross-sectional area.

.3 The use of thermistor type sensors is acceptable.

.4 Standard of Acceptance: Enercorp

.9 Outdoor Air Sensors

.1 Existing, to be re-used if possible.

.2 Where new sensors are required: Provide outdoor air temperature sensors with the following minimum characteristics:

- Each sensor shall be a 6", 10K thermistor probe
- Minimum two sensors shall be installed for each site.
- Both sensors shall be mounted inside a heavy-duty (blow-proof) solar shield.

.3 Provide a heavy-duty, metal, wire guard.

.4 Standard of Acceptance: Enercorp

.10 Differential Sensors.

.1 Provide matched sensors for differential temperature measurement.

.11 Flow Switches.

.1 Flow-proving switches shall be paddle (water service only) or differential pressure type (air or water service) as shown. Switches shall be UL listed, SPDT snap-acting, and pilot duty rated (125 VA minimum).

.2 Paddle switches shall have adjustable sensitivity and NEMA 1 enclosure unless otherwise specified.

.3 Differential pressure switches shall have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.

.12 Relays

.1 Control Relays. Control relays shall be plug-in type, UL listed, and shall have dust cover and LED "energized" indicator. Contact rating, configuration, and coil voltage shall be suitable for application.

.2 Time Delay Relays. Time delay relays shall be solid-state plug-in type, UL listed, and shall have adjustable time delay. Delay shall be adjustable $\pm 100\%$ from setpoint shown. Contact rating, configuration, and coil voltage shall be suitable for application. Provide NEMA 1 enclosure for relays not installed in local control panel.

.3 Standard of Acceptance: Enercorp

.13 Override Timers

.1 Unless implemented in control software, override timers shall be spring-wound line voltage, UL Listed, with contact rating and configuration required by application. Provide 0-6 hour calibrated dial unless otherwise specified. Flush mount timer on local control panel face or where shown.

.14 Current Transmitters.

.1 AC current transmitters shall be self-powered, combination split-core current transformer type with built-in rectifier and high-gain servo amplifier with 4-20 mA two-wire output. Full-scale unit ranges shall be 10 A, 20 A, 50 A, 100 A, 150 A, and 200 A, with internal zero and span adjustment. Unit accuracy shall be $\pm 1\%$ full-scale at 500 ohm maximum burden.

.2 Transmitter shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized.

.3 Unit shall be split-core type for clamp-on installation on existing wiring.

.15 Current Transformers.

.1 AC current transformers shall be UL/CSA recognized and shall be completely encased (except for terminals) in approved plastic material.

.2 Transformers shall be available in various current ratios and shall be selected for $\pm 1\%$ accuracy at 5 A full-scale output.

.3 Use fixed-core transformers for new wiring installation and split-core transformers for existing wiring installation.

.16 Voltage Transmitters.

.1 AC voltage transmitters shall be self-powered single-loop (two-wire) type, 4-20 mA output with zero and span adjustment.

.2 Adjustable full-scale unit ranges shall be 100-130 Vac, 200-250 Vac, 250-330 Vac, and 400-600 Vac. Unit accuracy shall be $\pm 1\%$ full-scale at 500 ohm maximum burden.

.3 Transmitters shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA recognized at 600 Vac rating.

.17 Voltage Transformers.

.1 AC voltage transformers shall be UL/CSA recognized, 600 Vac rated, and shall have built-in fuse protection.

.2 Transformers shall be suitable for ambient temperatures of 4°C-55°C (40°F-130°F) and shall provide $\pm 0.5\%$ accuracy at 24 Vac and 5 VA load.

.3 Windings (except for terminals) shall be completely enclosed with metal or plastic.

.18 Current Switches

.1 Current-operated switches shall be self-powered, solid-state with adjustable trip current. Select switches to match application current and DDC system output requirements.

.19 Current Sensors (Analog)

.1 Current sensors (CT) shall be used for status monitoring of all motor-driven equipment, where specified.

.2 Technical Performance – Output should be only 4-20mA only. Voltage output will not be accepted. End-to-end accuracy $\pm 1\%$ of full scale at each range.

.3 The current sensors shall be mounted inside the starter cabinets whenever possible. If this is not possible due to space limitation, provide an enclosure to house the sensor.

.4 Standard of Acceptance: Enercorp

.20 Status Relays (Solid State)

.1 The status relays shall be mounted inside newly provided enclosures mounted near the respective equipment starter cabinets.

.2 Standard of Acceptance: Omron

.21 Differential Pressure Switches.

.1 Differential pressure switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum) and shall have scale range and differential suitable for intended application and NEMA 1 enclosure unless otherwise specified.

.22 Power Monitors.

.1 Power monitors shall be three-phase type and shall have three-phase disconnect and shorting switch assembly, UL listed voltage transformers, and UL listed split-core current transformers.

.2 Power monitors shall provide selectable output: rate pulse for kWh reading or 4-20 mA for kW reading. Power monitors shall operate with 5 A current inputs and maximum error of $\pm 2\%$ at 1.0 power factor or $\pm 2.5\%$ at 0.5 power factor.

.23 Firestopping and Smoke Seal Materials

.1 Asbestos-free elastomeric materials tested, listed and labelled by ULC in accordance with CAN4-S115-M85, for installation in U.L.C. designated firestopping and smoke seal Systems. These Systems shall provide a positive fire, water and smoke seal and a fire-

resistance rating (flame, smoke hose stream and temperature) not less than the fire resistance rating of surrounding construction.

.2 Materials shall form ULC listed or UL classified assemblies and be compatible with abutting dissimilar materials and finishes.

.3 Standard of Acceptance:

- 3M Canada Limited
- A/D Fire Protection System Ltd.
- Fire Stop System

.24 Wall Opening Covering Plates

.1 All hole covering plates used on this project shall be stainless steel 18-8 chrome metal alloy, type 302, non-magnetic type for finished areas and pressed steel for unfinished areas. Finish brush marks shall be run in a vertical direction.

.25 Access Doors

.1 Access doors installed in unfinished areas shall be constructed of 12 ga prime coated steel and of stainless steel for all areas finished with tile or marble surfaces.

.2 Access doors shall be complete with 180° opening door, round safety corners, concealed hinges, screwdriver latches, plaster lock and anchor straps.

.3 Access doors shall be 24'x 24' or 12'x 18' as per site condition.

.4 Access doors in fire rated construction shall be ULC listed and labeled and of a rating to maintain the fire separation integrity.

.5 Standard of Acceptance:

- Zurn Industries Canada Limited
- LeHage Industries Limited
- Acudor Acorn Limited.

2.16 LOCAL CONTROL PANELS.

.1 Indoor control panels shall be fully enclosed NEMA 1 construction with hinged door key-lock latch and removable sub-panels. A common key shall open each control panel and sub-panel.

.2 Prewire internal and face-mounted device connections with color-coded stranded conductors tie-wrapped or neatly installed in plastic troughs. Field connection terminals shall be UL listed for 600 V service, individually identified per control and interlock drawings, with adequate clearance for field wiring.

.3 Each local panel shall have a control power source power switch (on-off) with overcurrent protection.

2.17 FAIL STATE POSITION OF OUTPUTS

.1 Unless specified otherwise, configure BAS output points for the following fail state (e.g. device position upon panel failure):

- | | |
|------------------------|--|
| .1 Heating Valves | Full heat to terminal device |
| .2 3-way mixing valve: | Full open to heating source (primary loop) |
| .3 Heating Pumps | ON |

2.18 LAN CABLING

.1 All LAN cabling shall be Category V as defined by EIA/TIA 568A. The contractor shall test all cabling to verify that 100Mb bandwidth is supported. See commissioning requirements.

.2 Cabling shall be 4 pair, 100 ohm UTP, #24 AWG solid copper conductor PVC insulated, with blue or grey colour coded jacket. FT6 rated cable shall be used unless otherwise required to meet building codes or by-laws.

.3 Data outlets shall be RJ45, 8 pin connectors, with 50 microns of hard gold over nickel, minimum durability of 750 mating cycles and contact pressure of 100 grams per contact. Transmission characteristics shall meet TSB-40 Category V.

.4 Provide one RJ45 data outlet adjacent to each device to be terminated (e.g. workstation PC, DDC panel, hub, etc.) Use a flexible patch cable to connect from the data outlet to the end device. For Delta Controls installations, provide a duplex data outlet at the workstation PC to accommodate the remote security key wiring. LAN cabling shall not be directly terminated to any device.

.5 Provide protection from EMI sources in accordance with CSA-T530 article 4

.6 The contractor shall test all cabling to verify conformance with TIA /EIA TSB-67 - Basic Link Test using a Level 2, bi-directional tester. See commissioning requirements.

.7 Where there are more than 2-90 degree in a conduit run, provide a pull box between sections so that there are two bends or less in any one section.

.8 Where a conduit run requires a reverse bend, between 100 degrees and 180 degrees, insert a pull box at each bend having an angle from 100 degrees to 180 degrees.

.9 Ream all conduit ends and install insulated bushings on each end.

.10 Terminate all conduits that protrude through the structural floor 2" above the concrete base.

.11 Do not use a pull box in lieu of a conduit bend. Align conduits that enter a pull box from opposite ends with each other.

2.19 FIBER OPTIC CABLE SYSTEM

- .1 Optical Cable. Optical cables shall be duplex 900 mm tight-buffer construction designed for intra-building environments. Sheath shall be UL listed OFNP in accordance with NEC Article 770. Optical fiber shall meet the requirements of FDDI, ANSI X3T9.5 PMD for 62.5/125mm.
- .2 Connectors. Field terminate optical fibers with ST type connectors. Connectors shall have ceramic ferrules and metal bayonet latching bodies.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Thoroughly examine project plans for control device and equipment locations. Report discrepancies, conflicts, or omissions to Consultant for resolution before starting rough-in work.
- .2 Inspect site to verify that equipment can be installed as shown. Report discrepancies, conflicts, or omissions to Consultant for resolution before starting rough-in work.
- .3 Remove all existing field and panel mounted control devices (e.g. transducers, controllers, thermostats, etc.) that have been made redundant or inoperative by the new BAS equipment and control strategies. Remove any other controls as specified or directed by the Consultant
- .4 The control sequences indicate only the principal items of equipment controlling the systems. Supplement each control system with relays and auxiliaries to enable each system to perform as specified and to permit proper operation and supervision of it.
- .5 Provide complete identification and labeling for new and existing devices and equipment.
- .6 Provide new cabling, conduits, control cabinets, power supplies and other auxiliary equipment, as required for a complete operational system.
- .7 The layout drawings do not show all controlled devices and operators and are intended to indicate the general location of equipment to be controlled; for full extent of instrumentation refer to the controls diagrams and sequences of operation.

3.2 CUTTING AND PATCHING

- .1 All cutting, patching, painting and making good for the installation of the BAS work shall be done by the BAS Contractor. All cutting shall be performed in a neat and true fashion, with proper tools and equipment to the Consultant's and/or Owner's approval. The surfaces shall be made good to reasonably match existing finishes
- .2 Location of the existing services concealed in the construction, if any, shall be determined prior to drilling or cutting an opening. If required, the Contractor is to x-ray the walls or slabs and in any case he shall not drill or cut any surface without the Owner's representatives approval.
- .3 The Contractor shall be responsible for the repair of any damage to existing services, exposed or concealed, caused as a result of this Work.

3.3 PROTECTION

- .1 Controls Contractor shall protect against and be liable for damage to work and to material caused by Contractor's work or employees.
- .2 Controls Contractor shall be responsible for work and equipment until inspected, tested, and accepted. Protect material not immediately installed. Close open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.4 GENERAL WORKMANSHIP

- .1 Install equipment, piping, and wiring or raceway horizontally, vertically, and parallel to walls wherever possible.
- .2 Provide sufficient slack and flexible connections to allow for piping and equipment vibration isolation.
- .3 Install equipment in readily accessible locations as defined by National Electrical Code (NEC) Chapter 1 Article 100 Part A.
- .4 Verify wiring integrity to ensure continuity and freedom from shorts and ground faults.
- .5 Equipment, installation, and wiring shall comply with industry specifications and standards and local codes for performance, reliability, and compatibility.

3.5 FIELD QUALITY CONTROL

- .1 Work, materials, and equipment shall comply with rules and regulations of applicable local, state, and federal codes and ordinances as identified in this section.
- .2 Continually monitor field installation for code compliance and workmanship quality.
- .3 Contractor shall arrange for work inspection by local or provincial authorities having jurisdiction over the work.

3.6 EXISTING EQUIPMENT

- .1 Wiring. Interconnecting control wiring shall be removed and shall become Contractor's property unless specifically noted or shown to be reused.
- .2 Local Control Panels. Remove and deliver existing control panels to Owner.
- .3 Repair. Unless otherwise directed, Contractor is not responsible for repair or replacement of existing energy equipment and systems, valves, dampers, or actuators. Notify Consultant in writing immediately of existing equipment that requires maintenance.
- .4 Indicator Gauges. Ensure operation of and recalibrate for reasonable accuracy or replace existing gauges.
- .5 Electronic Sensors and Transmitters. Remove and deliver existing sensors and transmitters to Owner.

- .6 Controllers and Auxiliary Electronic Devices. Remove and deliver existing controllers and auxiliary electronic devices to Owner.
- .7 Existing System Operating Schedule. Existing mechanical system may be disabled during this work.
- .8 Patch holes and finish to match existing walls.
- .9 At Owner's request, items to be delivered to Owner shall instead be properly disposed of. Hazardous materials shall be disposed in accordance with current regulations and applicable by-laws.

3.7 WIRING

- .1 Control and interlock wiring and installation shall comply with national and local electrical codes, and manufacturer's recommendations.
- .2 NEC Class 1 (line voltage) wiring shall be UL listed in approved raceway as specified by NEC.
- .3 All wiring shall be installed in EMT conduit unless specified otherwise. Exposed wiring in finished areas (e.g. corridors, classrooms, gymnasiums, etc.) shall be installed in wiremold (colour to match surrounding area).
- .4 Wiring from DDC controllers to sensors and actuators and control system network and low voltage wiring running in accessible ceilings may be installed using LVT cable. Where the ceiling is used as a return air plenum, plenum rated cable shall be used in lieu of LVT cable.
- .5 Install EMT and cable at right angles to building lines, securely fastened, and in accordance with current electrical codes and standards.
- .6 Power and control wiring shall be copper conductor (RW90). For power wiring, provide #12 AWG (minimum) with a 3% maximum voltage drop in accordance with CEC requirements. Control wiring shall be a minimum of #14 AWG, unless otherwise specified.
- .7 The wires smaller than 18 gauge shall not be used and will not be accepted on the project except for: wiring between terminal computer devices, wire in standard communication cables, such as printers and short haul modems, wire used in communication networks, i.e. any cable transferring digital data, using twisted shielded pairs.
- .8 The wiring from panels to devices shall be installed without splices. The use of crimp connectors is not allowed when connecting field wiring to sensor or device leads. The use of wire nuts is acceptable in this application.
- .9 Power for control system shall not be obtained by tapping into miscellaneous circuits that could be inadvertently switched off. Only dedicated circuit(s) shall power the control system. Provide additional breakers or electrical panels as required.
- .10 Mount transformers and other peripheral equipment in panels located in serviceable areas. Provide line-side breakers/fuses for each transformer.

.11 All 120 VAC power for any controls equipment shall be from dedicated circuits. Provide a breaker lock for each breaker used to supply the control system. Update the panel circuit directory.

.12 A dedicated power circuit may be used to power DDC panels and equipment within the same or adjoining mechanical rooms. The use of one power circuit to power DDC panels distributed throughout the building is not acceptable.

.13 The controller may be powered from the equipment that it is directly controlling (i.e. heat pump, rooftop unit) only if the controller controls no other equipment and the power supply to the controller remains energized independently of unit operation or status.

.14 Provide all required code gauge boxes, connectors and other wiring accessories.

.15 For all DC wiring, positive conductors shall be WHITE or RED in colour while negative conductors shall be BLACK in colour.

3.8 COMMUNICATION WIRING

.1 Communication wiring shall be low-voltage Class 2 wiring.

.2 Install communication wiring in separate raceways and enclosures from other Class 2 wiring.

.3 During installation do not exceed maximum cable pulling, tension, or bend radius specified by the cable manufacturer.

.4 Verify entire network's integrity following cable installation using appropriate tests for each cable.

.5 Install lightning arrestor according to manufacturer's recommendations between cable and ground where a cable enters or exits a building.

.6 Each run of communication wiring shall be a continuous length without splices when that length is commercially available. Runs longer than commercially available lengths shall have as few splices as possible using commercially available lengths.

.7 Label communication wiring to indicate origination and destination.

.8 Ground coaxial cable according to NEC regulations article on "Communications Circuits, Cable, and Protector Grounding."

3.9 FIBER OPTIC CABLE

.1 During installation do not exceed maximum pulling tensions specified by cable manufacturer. Post-installation residual cable tension shall be within cable manufacturer's specifications.

.2 Install cabling and associated components according to manufacturers' instructions. Do not exceed minimum cable and unjacketed fiber bend radii specified by cable manufacturer.

3.10 INSTALLATION OF SENSORS

.1 Install sensors according to manufacturer's recommendations.

- .2 Mount sensors rigidly and adequately for operating environment.
- .3 Air seal wires attached to sensors in their raceways or in the wall to prevent sensor readings from being affected by air transmitted from other areas.

3.11 IDENTIFICATION OF HARDWARE AND WIRING

- .1 Label wiring and cabling, including that within factory-fabricated panels, with control system address or termination number at each end within 5 cm (2 in.) of termination.
- .2 Label pneumatic tubing at each end within 5 cm (2 in.) of termination with a descriptive identifier.
- .3 Permanently label or code each point of field terminal strips to show instrument or item served.
- .4 Label control panels with minimum 1 cm (1/2 in.) letters on laminated plastic nameplates.
- .5 Label each control component with a permanent label. Label plug-in components such that label remains stationary during component replacement.
- .6 Label room sensors related to terminal boxes or valves with nameplates.
- .7 Manufacturers' nameplates and UL or CSA labels shall be visible and legible after equipment is installed.
- .8 Label identifiers shall match record documents.

3.12 PROGRAMMING

- .1 Point Naming. Name points as shown on the equipment points list provided with each sequence of operation. See sequences of operation on the drawings. If character limitations or space restrictions make it advisable to shorten the name, the abbreviations given in Appendix B may be used. Where multiple points with the same name reside in the same controller, each point name may be customized with its associated Program Object number. For example, "Zone Temp 1" for Zone 1, "Zone Temp 2" for Zone 2.
- .2 Software Programming. Programming shall provide actions for each possible situation. Graphic- or parameter-based programs shall be documented. Text-based programs shall be modular, structured, and commented to clearly describe each section of the program.
- .3 Application Programming. Provide application programming that adheres to sequences of operation specified and shown on the drawings. Program documentation or comment statements shall reflect language used in sequences of operation.
- .4 System Programming. Provide system programming necessary for system operation.

3.13 OPERATOR INTERFACE.

- .1 Standard Graphics. Provide graphics as specified herein. Show on each equipment graphic input and output points and relevant calculated points such as indicated on the applicable Points List as indicated on the drawings. Point information on graphics shall dynamically update.

.2 Install, initialize, start up, and troubleshoot operator interface software and functions (including operating system software, operator interface database, and third-party software installation and integration required for successful operator interface operation).

3.14 EQUIPMENT ENCLOSURES AND LOCATIONS

.1 Provide new enclosures for all field equipment (e.g. DDC panels, transducers, relays, etc.). Enclosures shall be equipped with a hinged door and latch. Provide a OWNER-standard key/lock set for each enclosure.

.2 Obtain written approval of the Consultant prior to re-using existing enclosures or cabinets. Provide a OWNER-standard lockset for all re-used enclosures or cabinets.

.3 Mount all enclosures in serviceable areas of mechanical rooms, storage rooms or janitor closets. Obtain written approval of the Consultant prior to mounting any enclosure in ceiling spaces or more than 5'-6" above the finished floor.

.4 All transformers and power supplies for control equipment shall be installed in new dedicated metal cabinets with hinged, lockable covers located in the proximity of their dedicated controller cabinets.

.5 Include within a DDC panel enclosure one 120 VAC duplex receptacle for portable PC power, if the controller cabinet is located further than 5'-0" from the nearest wall receptacle.

.6 Ensure that enclosures are sized to allow for ease of servicing of all equipment contained within. Enclosures containing DDC panels shall be sized to allow for the installation of the maximum allowable number of expansion panels/boards. Do not mount other equipment in a manner that may interfere with the future installation of expansion panels/boards.

.7 For enclosures containing pneumatic transducers or devices, provide one pressure gauge (1-1/2" dial, 0-30psi) for the main air line supply.

3.15 IDENTIFICATION AND LABELING OF CONTROL EQUIPMENT

.1 All panels must have a lamicoid tag (min. 3"x1") affixed to the front face indicating panel designation and function (i.e. "BAS Panel 1" or "Relay Panel 3").

.2 All field sensors or devices must have a lamicoid tag (min. 3"x1") attached with tie-wrap or adhesive indicating the point software name and hardware address (i.e. AHU1_MAT, 2.IP4). Tags must be secured by screws where mounted outside of the building, in un-heated spaces, in high humidity areas or where subject to vibration.

.3 Room sensors or other sensors in finished areas must have a lamicoid tag affixed to the front cover. This tag shall be minimum 1"x 1/2" and indicate the point software name and hardware address.

.4 All devices within a field enclosure shall be identified via a label or tag.

.5 All BAS panel power sources must be identified by a label (min. 3"x1") indicating the source power panel designation and circuit number (i.e. "120vac fed from LP-2A cct #1).

- .6 All field control equipment panels fed from more than one power source must have a warning label on the front cover.
- .7 All wires shall be identified with the hardware address with a band-type self-adhesive strips or clip-on plastic wire markers at both ends.
- .8 All rotating equipment controlled by the BAS shall have a tag or label affixed indicating that the equipment may start without warning.
- .9 The location of the phone line manager shall be indicated via a label affixed to the inside cover of the modem enclosure or BAS panel.
- .10 All BAS panels will be supplied with a point's list sheet (within a plastic sleeve) attached to the inside door.
- .11 The points list shall identify the following for each point:
 - .1 Panel number.
 - .2 Panel location.
 - .3 Hardware address.
 - .4 Software name.
 - .5 Point description.
 - .6 Field device type.
 - .7 Point type (i.e. AI or DO).
 - .8 Device fail position.
 - .9 Device manufacturer.
 - .10 Model number or reference.
 - .11 Wire tag reference.
- .12 Provide laminated wiring diagrams for all field mounted relay enclosures. Securely attach to the inside door. Identify power panels and circuit numbers of the equipment being controlled.
- .13 Provide laminated wiring diagrams or modify existing equipment wiring diagrams wherever the BAS interfaces to other equipment. (e.g. boilers, chillers, etc.). Securely attach to the inside of the respective control cabinet.
- .14 Provide lamicoid labels indicating the required operating sequences, on the boilers and valves, where the boiler plants have manual or automatic isolating valves. Submit actual wording to the Consultant for approval prior to fabrication and installation.
- .15 Provide lamicoid or machine labels (as outlined above) for all interposing relays or contactors used in control circuits. The labels shall include the related point software name and hardware address
- .16 Provide a lamicoid label to identify the location of concealed devices above the ceiling space. Mount the label on the ceiling grid t-bar or a permanent surface adjacent to the devices. The label shall contain the wording "BAS Devices Above".
- .17 Provide lamicoid labels for all auxiliary HVAC equipment (e.g. force flow cabinets, unit ventilators, unit heater, window AC units, etc.) controlled by the BAS. Mount the labels in the

vicinity of the existing thermostat or power switch for the unit. The label shall contain the wording "Under BAS Control".

.18 Where directed by the Consultant, provide any and all additional labelling, diagrams, schematics or instructions as may be required to facilitate the correct operation and maintenance of controlled building systems.

3.16 SYSTEMS HARDWARE COMMISSIONING

.1 This contractor shall be responsible for the "end to end" commissioning, testing, verification and start-up of the complete control system hardware including panels, sensors, transducers, end devices, relays and wiring. Where applicable, this shall include any points from an existing and/or re-used automation system in the building.

.2 The contractor shall conduct the hardware commissioning at the facility.

.3 When the site hardware installation is 100% completed (including all labeling and documentation), the contractor shall provide written notification to the Owner to schedule the hardware commissioning dates for each facility.

.4 Owner reserves the right, at it's sole discretion, to discontinue site commissioning at any time if any part of the site hardware installation is found to be incomplete on the date of commissioning. If this occurs, the Contractor shall assume responsibility for any additional costs related to rescheduling of the site commissioning.

.5 The Contractor shall prepare a hardware commissioning report containing the following information and test results:

.1 Analogue inputs (i.e. temperatures, pressure, etc.) shall be verified with an approved calibration device. All actual temperature readings should be with +/- 1C of the readings observed at the workstation. Record calibration adjustments and settings.

.2 Analogue outputs shall be verified by manually commanding the output channel from the operator workstation to two or more positions within the 0-100% range and verifying the actual position of the actuator or device. All devices shall operate over their entire 0-100% range from a minimum control range of 10-90%. Record the actual output scale range (channel output voltage versus controller command) for each analogue end device

.3 Digital outputs shall be verified by witnessing the actual start/stop operation of the equipment under control.

.4 Digital inputs shall be verified by witnessing the status of the input point as the equipment is manually cycled on and off.

.5 Record all out-of-season or unverified points in the commissioning report as "non-commissioned".

.6 Identify any existing equipment (valves, dampers, fan starters, etc..) that are inoperative or require maintenance or repair.

- .6 The BAS field panel power source shall be toggled on and off to ensure reboot functionality and power down memory retention of all parameters. During the power down test, all controlled system outputs shall go to their fail-safe position.
- .7 Verify PID loop tuning parameters by applying a step change to the current setpoint and observing the response of the controlled device. Setpoint should be reached in an acceptable period of time without excessive cycling or hunting of the controlled device. Provide a graph of the trend response to setpoint change for important controlled devices (e.g. valves 1-inch or larger, dampers on major air handlers, etc.)
- .8 Provide confirmation that a series of test alarms has been successfully received at a designated remote monitoring workstations.
- .9 Include with the hardware commissioning report a site floor plan indicating the location of all equipment installed in concealed or recessed locations (e.g. interposing relays in ceiling spaces).
- .10 Provide testing of all LAN cabling to ensure that 100Mb bandwidth is supported.
- .11 Verify conformance with TIA /EIA TSB-67 - Basic Link Test using a Level 2, bi-directional tester. Provide all equipment necessary to carry out the required tests.
- .12 The hardware commissioning report must be signed and dated by the Contractor's technician performing the tests and participating Owner representative.
- .13 At the completion of site commissioning, submit four (4) copies of hardware commissioning report to the Owner.

3.17 SUBSTANTIAL COMPLETION INSPECTION

- .1 At the completion of the site hardware inspection, the Contractor shall test and verify that the system programming, graphics and alarm software is operating correctly and is in compliance all requirements of the specifications.
- .2 The Contractor shall provide written notification to the PDSB that the site is ready for the Substantial Completion Inspection by the Consultant.
- .3 At the conclusion of the Substantial Completion Inspection, the Consultant shall issue a comprehensive site deficiency report to the Contractor for his immediate action.
- .4 The Contractor shall correct all items noted in the site deficiency report within ten (10) business days of receipt.
- .5 The Contractor shall provide written notification to the Owner that all items on the Consultant's site deficiency report have been corrected.

3.18 CONTROL SYSTEM DEMONSTRATION AND ACCEPTANCE

- .1 Demonstration. Prior to acceptance, perform the following performance tests to demonstrate system operation and compliance with specification after and in addition to tests specified above. Provide Consultant with log documenting completion of Substantial Completion Inspection.

- .2 Consultant will be present to observe and review system demonstration. Notify Consultant at least 10 days before system demonstration begins.
- .3 Demonstration shall follow process submitted and approved. Complete approved checklists and forms for each system as part of system demonstration.
- .4 Demonstrate actual field operation of each sequence of operation as specified herein. Provide at least two persons equipped with two-way communication. Demonstrate calibration and response of any input and output points requested by Consultant. Provide and operate test equipment required to prove proper system operation.
- .5 Demonstrate compliance with sequences of operation through each operational mode.
- .6 Demonstrate complete operation of operator interface.
- .7 Demonstrate each of the following.
 - .1 DDC loop response. Supply graphical trend data output showing each DDC loop's response to a setpoint change representing an actuator position change of at least 25% of full range. Trend sampling rate shall be from 10 seconds to 3 minutes, depending on loop speed. Each sample's trend data shall show setpoint, actuator position, and controlled variable values. Consultant will require further tuning of each loop that displays unreasonably under- or over-damped control.
 - .2 Building fire alarm system interface.
 - .3 Trend logs for each system. Trend data shall indicate setpoints, operating points, valve positions, and other data as specified in the points list provided with each sequence of operation. Each log shall cover three 48-hour periods and shall have a sample frequency not less than 10 minutes or as specified on its points list. Logs shall be accessible through system's operator interface and shall be retrievable for use in other software programs.
 - .4 Tests that fail to demonstrate proper system operation shall be repeated after Contractor makes necessary repairs or revisions to hardware or software to successfully complete each test.

3.19 ACCEPTANCE.

- .1 After tests described in this specification are performed to the satisfaction of both Consultant and PDSB, Consultant will accept control system as meeting completion requirements. Consultant may exempt tests from completion requirements that cannot be performed due to circumstances beyond Contractor's control. Consultant will provide written statement of each exempted test. Exempted tests shall be performed as part of warranty.
- .2 System shall not be accepted until completed demonstration forms and checklists are submitted and approved as required.

3.20 CLEANING

- .1 Each day clean up debris resulting from work. Remove packaging material as soon as its contents have been removed. Collect waste and place in designated location.

.2 On completion of work in each area, clean work debris and equipment. Keep areas free from dust, dirt, and debris.

.3 On completion of work, check equipment furnished under this section for paint damage. Repair damaged factory-finished paint to match adjacent areas. Replace deformed cabinets and enclosures with new material and repaint to match adjacent areas.

3.21 TRAINING

.1 Provide training for a designated staff of Board's representatives. Training shall be provided via self-paced training, web-based or computer-based training, classroom training, or a combination of training methods.

.2 Training shall enable students to accomplish the following objectives:

- .1 Proficiently operate system
- .2 Understand control system architecture and configuration
- .3 Understand DDC system components
- .4 Understand system operation, including DDC system control and optimizing routines (algorithms)
- .5 Operate workstation and peripherals
- .6 Log on and off system
- .7 Access graphics, point reports, and logs
- .8 Adjust and change system setpoints, time schedules, and holiday schedules
- .9 Recognize common HVAC system malfunctions by observing system graphics, trend graphs, and other system tools
- .10 Understand system drawings and Operation and Maintenance manual
- .11 Understand job layout and location of control components
- .12 Access data from DDC controllers
- .13 Operate portable operator's terminals
- .14 Create and change system graphics
- .15 Create, delete, and modify alarms, including configuring alarm reactions
- .16 Create, delete, and modify point trend logs (graphs) and multi-point trend graphs
- .17 Configure and run reports
- .18 Add, remove, and modify system's physical points
- .19 Create, modify, and delete application programming
- .20 Add operator interface stations
- .21 Add a new controller to system
- .22 Download firmware and advanced applications programming to a controller
- .23 Configure and calibrate I/O points
- .24 Maintain software and prepare backups
- .25 Interface with job-specific, third-party operator software
- .26 Add new users and understand password security procedures

.3 Divide presentation of objectives into three sessions (1-13, 14-23, and 24-26). Participants will attend one or more of sessions, depending on knowledge level required.

- .1 Day-to-day Operators (objectives 1-13)
- .2 Advanced Operators (objectives 1-13 and 14-23)

- .3 System Managers and Administrators (objectives 1-13 and 24-26)
- .4 Provide course outline and materials. Provide one copy of training material per student.
- .5 Instructors shall be factory-trained and experienced in presenting this material.
- .6 Perform classroom training using a network of working controllers representative of installed hardware.

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 50 00	Lighting Systems
26 52 15	Lighting Controls
28 46 00	Fire Alarm System
28 59 00	Empty Conduit System

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 warranted for a period of twelve (12) 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.
- .2 Substitutions for materials may be proposed by submitting details with Supplementary Tender Form together with price difference to Stipulated Sum Tender amount under the following conditions:
 1. Product name shall be stated together with price difference, if any, to stipulated sum for each substitution proposed.

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 2010 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 and the Building Department.
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 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, Ontario Electrical Safety Code, PDSB 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 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 board in detail prior to commencing any work.

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 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.
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 school board. Consult with the project supervisor prior to pricing. Complete the project within the allocated schedule.
19. Paint all exposed conduit and backboxes, inside and outside of the building, to match the surrounding colour. Minimize exterior conduit run where feasible.
20. All backboxes installed indoors shall be wiremold or approved equal. 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 concealed in the new partitions or above drop ceilings. No exposed run of raceway/wiring will be permitted whatsoever in the new construction area. In the existing building, all exposed raceways shall be wiremold unless approved in writing by the Owner.
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.

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.
 - (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-Built and CAD As-Built (both completed by the Electrical Contractor).
 - (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 has been supplied and installed in accordance with CAN/ULC-S524 and verified as per CAN/ULC-S537."
 - (h) Emergency Lighting illumination testing results.
 - (i) Fire Alarm Verification Report.
 - (j) Lighting Control Commissioning Report, by the Lighting Controls Manufacturer.

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) shall comply with CSA Specification C22.2 No. 83. Connectors and couplings to be forged steel and raintight in sprinklered areas . Connectors to have factory-installed insulated throats.
- .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, Black, 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 CLOCKS AND PROGRAM BELLS

- .1 Clocks to be synchronized analogue type 12" round surface mount on the Modular Control Panel with a white face, Black Finish Case, 12/24 hour, seep second hand, stem for correcting extended through bottom of housing, 120VAC.

Clock shall be American Time R54BHAV904-WEB complete with mounting bracket/hanger or approved equal.

- .2 Program Bells shall be fully recessed, in a recessed stainless steel wall box complete with stainless steel, vandal resistant grille for physical proection. The Contractor shall verify the existing bell circuit voltage and wiring and ensure that the proposed device will suit the existing voltage and wiring configuration. Bells shall be of vibrating type, NEMA 3R rated, 10" size and CSA Certified.

Bell shall be Edwards 340-10N5 (verify voltage and AC/DC configuration of the existing bells on site prior to ordering; order new to match the existing) complete with recessed wall box and stainless steel grille c/w brushed stainless finish.

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 - 400 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.
- .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 with threaded IPS fittings to be used:

 - .1 Where noted and required by regulations.
 - .2 Where subject to mechanical damage.
 - .3 For all exposed conduit work.
- .2 Conduit embedded in concrete or buried below grade floors shall be CSA approved rigid PVC type.
- .3 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 provided with factory-installed insulated throats.

- .4 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.
- .5 Fasten every conduit and cable to structure by means of approved conduit clamps or clips. Wire lashing is not acceptable.
- .6 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).
- .7 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.
- .8 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.
- .9 Conduit installed at the roof level of exposed structures, shall be run tight to roof deck, above purlins and beams.
- .10 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.
- .11 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.
- .12 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.
- .13 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.
- .14 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.
- .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 Main pull and junction boxes (excluding obvious outlet boxes) shall be clearly identified by painting the outside of the cover in accordance with the following schedule:

- Lighting	Yellow
- Power	Blue
- Fire Alarms	Red
- Telephone	Cream
- Control	Brown
- Intercom & Sound	Green
- .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.

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 16 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 - GENERAL

- .1 Ground 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 FIREPROOFING & SEALING

- .1 Make watertight seal at sleeves and other openings through floors above grade. Sleeves to extend minimum 25 mm (1 inch) above finished floors.
- .2 Provide Fireproofing protection of openings through floors and fire rated walls. Refer to

Architectural Drawings for rated surfaces.

- .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.

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 lamps, drivers 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 LAMP AND DRIVER CONDITIONING

- .1 Upon first energizing all LED fixtures shall remain energized for a stabilizing period as recommended by 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 (.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

Interior Fixtures

See Drawings for Specifications.

Exterior Fixtures

See Drawings for Specifications.

2.6 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.

2.7 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.

2.8 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 Do not install or energize lamps until directed by Architect which generally shall be just prior to occupancy of the building by the Owner. Read 'Temporary and Trail Usage'.
- .2 Provide two new safety chains per light fixture for all light fixtures through the existing and new school. 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.
- .2 Recessed incandescent fixtures shall conform with requirements of Ontario Electrical Safety Code and its latest bulletins. Thermal insulation and combustible materials shall be kept clear of recessed fixtures, unless approved, rated fixtures are utilized.

3.3 SUSPENSION STEEL

- .1 Provide angle-iron channels welded to the top side of bottom-chord of the L.S.S.J.'s in the Gymnasium for securing light fixtures.
- .2 Provide supports for light fixtures from separate uni-strut 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.

- .2 Locate and aim emergency lighting remote heads to optimally illuminate egress route.

3.5 COMPLETION

- .1 Fixtures shall be clean at the time of final acceptance.

END OF SECTION

PART 1 – GENERAL

1.1 Summary

- A. Section includes a networked lighting control system comprised of the following components:
 - 1. System Software Interfaces
 - a. Management and Visualization Interface
 - b. Historical Database and Analytics Interface
 - c. Personal Control Applications
 - d. Smartphone Programming Interface for wired devices
 - 2. System Backbone and Integration Equipment
 - a. System Controller
 - b. OpenADR Interface
 - 3. Wired Networked Devices
 - a. Wall Switches, Dimmers and Scene Controllers
 - b. Graphic Wall Stations
 - c. Auxiliary Input/Output Devices
 - d. Occupancy and Photocell Sensors
 - e. Power Packs and Secondary Packs
 - f. Networked Luminaires
 - g. Relay and Dimming Panel
 - 4. Wireless Networked Devices
 - a. Sensor Interface
 - b. Light Controllers
 - c. Digital Sensor Attachments
 - d. Networked Luminaires
 - e. Communication Bridge
- B. The networked lighting control system shall meet all of the characteristics and performance requirements specified herein.
- C. The contractor shall provide, install and verify proper operation of all equipment necessary for proper operation of the system as specified herein and as shown on applicable drawings.

1.2. Related Documents

- A. Section 26 05 00 - Common Work Results for Electrical
- B. Section 26 05 01 - Basic Materials & Methods
- C. Section 26 50 00 - Lighting System

1.3 Submittals

- A. Submittal shall be provided including the following items.
 - 1. Bill of Materials necessary to install the networked lighting control system.
 - 2. Product Specification Sheets indicating general device descriptions, dimensions, electrical specifications, wiring details, and nomenclature.
 - 3. Riser Diagrams showing device wiring connections of system backbone and also typical per room/area type.

4. Information Technology (IT) connection information pertaining to interconnection with facility IT networking equipment and third-party systems.
5. Other Diagrams and Operational Descriptions – as needed to indicate system operation or interaction with other system(s).
6. Contractor Startup/Commissioning Worksheet (must be completed prior to factory start-up).
7. Service Specification Sheets indicating general service descriptions, including startup, training, post-startup support, and service contract terms.
8. Hardware and Software Operation Manuals.

1.4 Approvals

- A. Prior approval from owner's representative is required for products or systems manufactured by companies not specified in the Network Lighting Controls section of this specification.
- B. Any alternate product or system that has not received prior approval from the owner's representative at least 10 days prior to submission of a proposal package shall be rejected.
- C. Alternate products or systems require submission of catalog datasheets, system overview documents and installation manuals to owner's representative.
- D. For any alternate system that does not support any form of wireless communication to networked luminaires, networked control devices, networked sensors, or networked input devices, bidders shall provide a total installed cost including itemized labor costs for installing network wiring to luminaires, control devices, sensors, input devices and other required system peripherals.

1.5 Quality Assurance

- A. Product Qualifications
 1. System electrical components shall be listed or recognized by a nationally recognized testing laboratory (e.g., UL, ETL, or CSA) and shall be labeled with required markings as applicable.
 2. System shall be listed as qualified under DesignLights Consortium Networked Lighting Control System Specification V2.0.
 3. System luminaires and controls are certified by manufacturer to have been designed, manufactured and tested for interoperability.
 4. All components shall be subjected to 100% end of line testing prior to shipment to the project site to ensure proper device operation.
 5. All components and the manufacturing facility where product was manufactured must be RoHS compliant.
- B. Installation and Startup Qualifications
 1. System startup shall be performed by qualified personnel approved or certified by the manufacturer.
- C. Service and Support Requirements
 1. Phone Support: Toll free technical support shall be available.
 2. Remote Support: The bidder shall offer a remote support capability.
 3. Onsite Support: The bidder shall offer onsite support that is billable at whole day rates.
 4. Service Contract: The bidder shall offer a Service Contract that packages phone, remote, and onsite support calls for the project. Response times for each type of support call shall be indicated in the terms of the service contract included in the bid package.

1.6 Warranty

- A. The manufacturer shall provide a minimum five-year warranty on all hardware devices supplied and installed. Warranty coverage shall begin on the date of shipment.
- B. The hardware warranty shall cover repair or replacement any defective products within the warranty period.

1.7 Maintenance & Sustainability

- A. The manufacturer shall make available to the owner new parts, upgrades, and/or replacements available for a minimum of 5 years following installation.

1.8 Installer Experience

- A. The Bidding Contractor shall ensure they are familiar with the installation of the lighting control system as proposed on the drawings and within the specifications. No extra will be granted after award of Contract as a result of unfamiliarity to the requirements of producing a fully operational lighting control system to meet the specified requirements and ASHRAE 90.1 compliance.
- B. The Bidding Contractor shall have a minimum experience of three past projects from the last three years installing a lighting control system of equal or larger size to that proposed on the drawings. The experience shall only be valid if it was installing the base specified system or that of one of the approved equal products and that is the respective system of installation on this project.
- C. The Bidding Electrical Contractor shall retain the services of another Electrical Contractor to perform the full extent of the lighting control system work if they lack the experience outlined in this section. The retention of services shall be included for in the tender price.

PART 2 – EQUIPMENT

2.1 Manufacturers

- A. The basis of this specification and the drawings is the Acuity nLight Lighting Control System.
- B. Alternate systems from Cooper or Wattstopper will be accepted. No other manufacturer is permitted.

2.2 System Performance Requirements

- A. System Architecture
 - 1. System shall have an architecture that is based upon three main concepts: (a) networkable intelligent lighting control devices, (b) standalone lighting control zones using distributed intelligence, (c) optional system backbone for remote, time based and global operation between control zones.
 - a. Intelligent lighting control devices shall have individually addressable network communication capability and consist of one or more basic lighting control components: occupancy sensor, photocell sensor, relay, dimming output, contact closure input, analog 0-10V input, and manual wall station capable of indicating switching, dimming, and/or scene control. Combining one or more of these components into a single device enclosure shall be permissible so as to minimize overall device count of system.

- b. Lighting control zones consisting of one or more networked luminaires and intelligent lighting control devices and shall be capable of providing automatic control from sensors (occupancy and/or photocell) and manual control from local wallstations without requiring connection to a higher level system backbone; this capability is referred to as “distributed intelligence.”
 - c. System must be capable of interfacing directly with networked luminaires such that either low voltage network cabling or wireless RF communication is used to interconnect networked luminaires with control components such as sensors, switches and system backbone (see *Control Zone Characteristics* sections for each type of network connection, wired or wireless).
 2. The system shall be capable of providing individually addressable switching and dimming control of the following: networked luminaires, control zones to include multiple switch legs or circuits, and relay and dimming outputs from centralized panels to provide design flexibility appropriate with sequence of operations required in each project area or typical space type. A single platform shall be used for both indoor and outdoor lighting controls.
 3. Lighting control zones shall be capable of being networked with a higher level system backbone to provide time based control, remote control from inputs and/or systems external to the control zone, and remote configuration and monitoring through a software.
 4. All system devices shall support remote firmware update, such that physical access to each device is not necessary, for purposes of upgrading functionality at a later date.
 5. System shall be capable of “out of box” sequence of operation for each control zone. Standard sequence is:
 - a. All switches control all fixtures in a zone
 - b. All occupancy sensors automatically control all fixtures in the control zone with a default timeout.
- B. Wired Networked Control Zone Characteristics
 1. Following proper installation and provision of power, all networked devices connected together with low voltage network cable shall automatically form a functional lighting control zone without requiring any type of programming, regardless of the programming mechanism (e.g., software application, handheld remote, pushbutton). The “out of box” default sequence of operation is intended to provide typical sequence of operation so as to minimize the system startup and programming requirements and to also have functional lighting control operation prior to system startup and programming.
 2. System shall be able to automatically discover all connected devices without requiring any provisioning of system or zone addresses.
 3. The following types of wired networked control devices shall be provided for egress and/or emergency light fixtures:
 - a. Low-Voltage power sensing: These devices shall automatically provide 100% light level upon detection of loss of power sensed via the low voltage network cable connection.
 - b. UL924 Listed Line-Voltage power sensing: These devices shall be listed as emergency relays under the UL924 standard, and shall automatically close the load control relay(s) and provide 100% light output upon detection of loss of power sensed via line voltage connections.
 - c. Emergency egress devices shall be provided and UL labeled by the lighting control manufacturer.
- C. Wireless Networked Control Zone Characteristics

1. Following proper installation and provision of power, all wireless networked devices paired, meshed or grouped together shall automatically follow the “out of box” default sequence of operations.
2. Wireless network communication shall support uniform and instant response such that all luminaires in a lighting control zone respond immediately and synchronously in response to a sensor or wallstation signal.
3. To support the system architecture requirement for distributed intelligence, wireless network communication shall support communication of control signals from sensors and wallstations to networked luminaires and wireless load control devices, without requiring any communication, interpretation, or translation of information through a backbone device such as a wireless access point, communication bridge or gateway.
4. All wireless communication shall be encrypted using at least 128-bit Advanced Encryption Standard (AES).
5. The following types of wired networked control devices shall be provided for egress and/or emergency light fixtures:
 - a. UL924 Listed Line-Voltage power sensing: These devices shall be listed as emergency relays under the UL924 standard, and shall automatically close the load control relay(s) and provide 100% light output upon detection of loss or interruption of power sensed via line voltage connections.

D. System Integration Capabilities

1. The system shall interface with third party building management systems (BMS) to support two-way communication using the industry standard BACnet/IP or BACnet/MSTP protocols.

2.3 System Software Interfaces

A. Management Interface

1. System shall provide a web-based management interface that provides remote system control, live status monitoring, and configuration capabilities of lighting control settings and schedules.
2. Management interface must be compatible with industry-standard web browser clients, including, but not limited to, Microsoft Internet Explorer®, Apple Safari®, Google Chrome®, Mozilla Firefox®.
3. All system software updates must be available for automatic download and installation via the internet.

B. Historical Database and Analytics Interface

1. System shall provide a browser-based trending and monitoring interface that stores historical data for all occupancy/daylight sensors and lighting loads. Additionally, the system shall optionally upload that data to a cloud based server.

C. Visualization Interfaces

1. System shall provide an optional web-based visualization interface that displays a graphical floorplan. System data, to include status of occupancy sensors, daylight sensors and light output shall be overlaid to the floorplan to provide a graphical status page.

D. Portable Programming Interface for Standalone Control Zones

1. Portable handheld application interface for standalone control zones shall be provided for systems that allows configuration of lighting control settings.
2. Programming capabilities through the application shall include, but not be limited to, the following:
 - a. Switch/occupancy/photosensor group configuration

- b. Manual/automatic on modes
- c. Turn-on dim level
- d. Occupancy sensor time delays
- e. Dual technology occupancy sensors sensitivity
- f. Photosensor calibration adjustment and auto-setpoint
- g. Trim level settings

2.4 System Backbone and System Integration Equipment

A. System Controller

1. System Controller shall be a multi-tasking, real-time digital control processor consisting of modular hardware with plug-in enclosed processors, communication controllers, and power supplies.
2. System Controller shall perform the following functions:
 - a. Facilitation of global network communication between different areas and control zones.
 - b. Time-based control of downstream wired and wireless network devices.
 - c. Linking into an Ethernet network.
 - d. Integration with Building Management Systems (BMS) and Heating, Ventilation and Air Conditioning (HVAC) equipment.
 - e. Connection to various software interfaces, including management interface, historical database and analytics interface, visualization interface, and personal control applications.
3. System Controller shall not require a dedicated PC or a dedicated cloud connection.
4. Device shall automatically detect all networked devices connected to it, including those connected to wired and wireless communication bridges.
5. Device shall have a standard and astronomical internal time clock.
6. Shall be capable of connecting to the customers Local Area Network (LAN) via IEEE 802.11.x Wireless and IEEE 802.3 Wired connection.
7. System Controller shall support BACnet/IP and BACnet/MSTP protocols to directly interface with BMS and HVAC equipment without the need for additional protocol translation gateways.
 - a. BACnet/MSTP shall support a minimum of 50 additional BACnet MS/TP controllers in addition to the Expansion I/O modules.
 - b. BACnet/MSTP shall support 9600 to 115200 baud.
 - c. System Controller shall be BACnet Testing Laboratory (BTL listed) using Device Profile BACnet Building Controller (B-BC) with outlined enhanced features.
 - d. System controller must support BACnet/IP Broadcast Management Device (BBMD) and Foreign Device Registration (FDR).

B. OpenADR Interface

1. System shall provide an interface to OpenADR protocol Demand Response Automation Servers (DRAS) typically provided by local electrical utility.
2. OpenADR interface shall meet all of the requirements of Open ADR 2.0a Virtual End Nodes (VEN), including:
 - a. Programmable with the account information of the end-user's electrical utility DRAS account credentials.

2.5 Wired Networked Devices

- A. Wired Networked Wall Switches, Dimmers, Scene Controllers
 - 1. Wall switches & dimmers shall support the following device options:
 - a. Number of control zones: 1, 2 or 4
 - b. Control Types Supported: On/Off or On/Off/Dimming
 - 2. Scene controllers shall support the following device options:
 - a. Number of scenes: 1, 2 or 4
 - b. Control Types Supported:
 - 1) On/Off or On/Off/Dimming
 - 2) Preset Level Scene Type
 - 3) Reprogramming of other devices within daisy-chained zone so as to implement user selected lighting scene
 - 4) Selecting a lighting profile to be run by the system's upstream controller so as to implement a selected lighting profile across multiple zones
- B. Wired Networked Graphic Wall Stations
 - 1. Device shall have a full color touch screen.
 - 2. Device shall enable configuration of all switches, dimmers, and lighting preset scenes via password protected setup screens.
 - 3. Graphic wall stations shall support the following device options:
 - a. Number of control zones: Minimum of 16
 - b. Number of scenes: Minimum of 16
 - c. Optional password protection for setup screens.
- C. Wired Networked Auxiliary Input / Output (I/O) Devices
 - 1. Auxiliary Input/Output Devices shall be specified as an input or output device with the following options:
 - a. Contact closure input
 - 1) Input shall be programmable to support maintained or momentary inputs that can activate local or global scenes and profiles, ramp light level up or down, or toggle lights on/off.
 - b. 0-10V analog input
 - 1) Input shall be programmable to function as a daylight sensor.
 - c. RS-232/RS-485 digital input
 - 1) Input supports activation of up to 4 local or global scenes and profiles, and on/off/dimming control of up to 16 local control zones.
 - d. 0-10V dimming control output, capable of sinking a minimum of 20mA of current
 - 1) Output shall be programmable to support all standard sequence of operations supported by system.
- D. Wired Networked Occupancy and Photosensors
 - 1. Sensors shall utilize passive infrared (PIR) or passive dual technology (PDT) to detect both major and minor motion as defined by NEMA WD-7 standard.
 - 2. Sensing technologies that are acoustically passive, meaning they do not transmit sound waves of any frequency do not require additional commissioning. Ultrasonic or Microwave based sensing technologies may require commissioning due to the active nature of their technology, if factory required.
 - 3. Sensor programming parameter shall be available and configurable remotely from the software and locally via the device.
 - 4. Sensor mounting type shall match project design requirements as shown on plans.
 - a. Sensors shall have optional features for photosensor/daylight override, dimming control, and low temperature/high humidity operation.

2. The system shall support the following types of photocell-based control:
 - a. On/Off: The control zone is automatically turned off if the photocell reading exceeds the defined setpoint and automatically turned on if the photocell reading is below the defined setpoint. A time delay or adaptive setpoint adjustable behavior may be used to prevent the system from exhibiting nuisance on/off switching.
 - b. Continuous Dimming: The control zone automatically adjusts its dimming output in response to photocell readings, such that a minimum light level consisting of both electric light and daylight sources is maintained at the task. The photocell response shall be configurable to adjust the photocell setpoint and dimming rates.
- E. Wired Networked Wall Switch Sensors
 1. Wall switches sensors shall support the following device options:
 - a. User Input Control Types Supported: On/Off or On/Off/Dimming
 - b. Occupancy Sensing Technology: PIR only or Dual Tech
 - c. Daylight Sensing Option: Inhibit Photosensor
- F. Wired Networked Embedded Sensors
 1. Embedded sensors shall support the following device options:
 - a. Occupancy Sensing technology: PIR only or Dual Tech
 - b. Daylight Sensing Option: Occupancy only, Daylight only, or combination Occupancy/Daylight sensor
- G. Distributed System Power, Switching and Dimming Controls
 1. Devices shall incorporate one optional Class 1 relay, optional 0-10 VDC dimming output, and contribute low voltage Class 2 power to the rest of the system.
 2. Device programming parameters shall be available and configurable remotely from the software and locally via the device push-button.
 3. Device shall be plenum rated.
 4. Devices shall be UL Listed for load and load type as specified on the plans.
- H. Wired Networked Luminaires
 1. Networked luminaire shall have a factory installed mechanically integrated control device and carry a UL Listing as required.
 2. Networked LED luminaire shall provide low voltage power to other networked control devices.
 3. System shall be able to maintain constant lumen output over the specified life of the LED luminaire (also called lumen compensation) by automatically varying the dimming control signal to account for lumen depreciation.
 4. System shall be able to provide control of network luminaire intensity, in addition to correlated color temperature of specific LED luminaires.
 5. Controls manufacturer is responsible for primary troubleshooting and tech support of complete fixture.
- I. Wired Networked Relay and Dimming Panel
 1. Relay and dimming panel(s) shall be capable of providing the required amount of relay capacity, as required per panel schedules shown on drawings, with an equal number of individual 0-10V dimming outputs.
 2. Standard relays used shall have the following required properties:
 - a. Configurable in the field to operate with normally closed or normally open behavior.
 - b. Provides visual status of current state and manual override control of each relay.
 - c. Be individually programmable
 3. 0-10 dimming outputs shall support a minimum of 100mA sink current per output.
 4. Panel shall be UL924 listed for control of emergency lighting circuits.

5. Panel shall provide a contact closure input that acts as a panel override to activate the normally configured state of all relays (i.e., normally open or normally closed) in the panel.

2.6 Wireless Networked Devices

Wireless Networked Sensor Interface

1. The device shall be capable of broadcasting the following manual wall control commands: on, off, and adjust dim level.

Wireless Networked Light Controllers (No Sensor)

1. The wireless light controller shall be capable of providing continuous dimming and on/off control of one commercial light fixture including fluorescent, HID, induction and LEDs.
2. An external antenna attached to the luminaire shall not be allowed.
 - a. Each wireless light controller shall provide measurement capability of the amperage, voltage, wattage, and watt-hours of its controlled lighting.

Wireless Networked Digital Sensors

1. In addition to providing Wireless Networked Light Controllers functionality, also provides:
 - a. Integrated digital occupancy sensing and digital photocell sensor.
 - b. Sensor shall connect directly to the wireless light controller and shall be suitable for embedding into the enclosure of a luminaire.
 - c. Sensor shall have software-adjustable settings
 - d. Photocell shall be suitable for closed and open loop applications.

Wireless Network Communication Bridge

1. A communication bridge device shall be provided that interfaces with the System Controller via Owner's LAN connection and interfaces with wireless network.
2. Device shall be capable of communicating with a group of a minimum of 250 wireless networked devices and luminaires, so as to reduce the amount of communication bridges required in the system.

2.7 Devices

1. Provide occupancy sensors, power packs, switches, dimmers and all other lighting control components, devices, equipment and panels as specified on the drawings or in these specifications.

PART 3 – EXECUTION

3.1 Installation Requirements

A. Installation Procedures and Verification

1. The successful bidder shall review all required installation and pre-startup procedures with the manufacturer's representative through pre-construction meetings.
2. The successful bidder shall install and connect the networked lighting control system components according to the manufacturer's installation instructions, wiring diagrams, the project submittals and plans specifications.
3. The successful bidder shall be responsible for testing of all low voltage network cable included in the bid. Bidder is responsible for verification of the following minimum parameters:
 - a. Wire Map (continuity, pin termination, shorts and open connections, etc.)
 - b. Length

- c. Insertion Loss
- 4. During shop drawing submission, the Electrical Contractor in conjunction with the Manufacturer is responsible for preparing a full layout of all devices in all areas of work including wiring diagrams for each zone showing how everything will be wired. The wiring diagram is to be reviewed by the Manufacturer to ensure accuracy of the design. All device locations are to be as per the Manufacturer's recommendations and subject to change from the location shown on the drawing.
- B. Coordination with Owner's IT Network Infrastructure
 - 1. The successful bidder is required to coordinate with the owner's representative to secure all required network connections to the owner's IT network infrastructure.
 - a. The bidder shall provide to the owner's representative all network infrastructure requirements of the networked lighting control system.
 - b. The bidder shall provide, to the manufacturer's representative, all necessary contacts pertaining to the owner's IT infrastructure, to ensure that the system is properly connected and started up.
- C. Coordination with Mechanical Division
 - 1. The successful bidder shall provide all integration equipment detailed in Division 260943.
 - 2. The successful bidder to verify integration scope with the Mechanical Contractor prior to submittal phase and provide all necessary schedules to the Lighting Control manufacturer.
- D. Documentation and Deliverables
 - 1. The installing contractor shall be responsible for documenting installed location of all networked devices, including networked luminaires. This includes responsibility to provide as-built plan drawing showing device addresses corresponding to locations of installed equipment.
 - 2. The installing contractor is also responsible for the following additional documentation to the manufacturer's representative if visualization / graphical floorplan software is provided as part of bid package:
 - a. As-Built floor plan drawings showing wired network control zones outlined, in addition to device address locations required above. All documentation shall remain legible when reproducing/scanning drawing files for electronic submission.
 - b. As-Built electrical lighting drawings (reflected ceiling plan) in PDF and CAD format. Architectural floor plans shall be based on as-built conditions.
 - 1) CAD files shall have layers already turned on/off as desired to be shown in the graphical floorplan background images. The following CAD elements are recommended to be hidden to produce an ideal background graphical image:
 - Titleblock
 - Text- Inclusive of room names and numbers, fixture tags and drawings notes
 - Fixture wiring and homeruns
 - Control devices
 - Hatching or poché of light fixtures or architectural elements
 - 2) CAD files shall be of AutoCAD 2013 or earlier. Revit file overall floor plan views shall be exported to AutoCAD 2013.
- E. All low-voltage lighting control cabling shall be installed in conduit (in a closed conduit system). No free air running of cabling will be permitted.

3.2 System Startup

- A. Upon completion of installation by the installer, including completion of all required verification and documentation required by the manufacturer, the system shall be started up and programmed by an authorized representative of the manufacturer.
 - 1. Low voltage network cable testing shall be performed prior to system startup at the discretion of the manufacturer.
- B. System start-up and programming shall include:
 - 1. Verifying operational communication to all system devices.
 - 2. Programming the network devices into functional control zones to meet the required sequence of operation.
 - 3. Programming and verifying all sequence of operations.
 - 4. Customization of owner's software interfaces and applications.
- C. Initial start-up and programming is to occur on-site. Additional programming may occur on-site or remotely over the Internet as necessary.
- D. The Manufacturer shall include for, in their bid price, full testing and commissioning of the Lighting Control system on site, including training to the User Group.
- E. The Manufacturer in conjunction with the Electrical Contractor shall provide the Electrical Consultant a letter, signed and dated, confirming that the Lighting Control System has been supplied, installed, tested and confirmed to be in correct operation as intended and in compliance with ASHRAE 90.1 requirements for lighting controls.

3.3 Project Turnover

- A. System Documentation
 - 1. Submit software database file with desired device labels and notes completed.
- B. Owner Training
 - 1. Provisions for onsite training for owner and designated attendees to be included in submittal package.
- C. Provide three (3) spare power packs (nPP16D), one (1) spare nWV PDT 16 KIT switch, one (1) spare nWSX PDT LV GY, two (2) spare nPODM DX GY and one (1) spare nWV PDT 16 KIT parts to the Owner at the conclusion of the project.

END OF SECTION

1 GENERAL

1.1 REFERENCES

- .1 Conform to Section 26 05 00 – Common Work Results for Electrical.
- .2 These specifications describe the minimum functional requirements for modifications of existing complete electrically supervised, zoned, non-coded, single-stage, Fire Alarm System.
- .3 All work in conjunction with this installation shall meet the provisions of the Ontario Electrical Safety Code, Ontario Building Code, Underwriters Laboratories of Canada, and any applicable local codes.

1.2 QUALITY ASSURANCE

- .1 Each and all items of the fire alarm system shall be listed as the products of a single manufacturer under the appropriate category by the Underwriter's Laboratories of Canada and shall bear the 'U.L.C.' label.
- .2 Each and all items of the fire alarm system shall be covered by a one year parts and labour warranty covering defects resulting from faulty workmanship and materials. The warranty shall be deemed to begin on the date the system was accepted by the local authority having jurisdiction.

1.3 MATERIALS

- .1 All components shall be CSA and ULC listed and labelled, acceptable to the Ontario Fire Marshal and the local Fire Department and suitable for operation on service characteristics noted. System equipment and operation and installation shall comply with the National and Provincial Building Code; Canadian Underwriters Association Standards CUA-70 and CUA-72A, Canadian Electrical Code, and ULC Standard CAN/ULC-S527 and latest amendments of each.
- .2 The equipment furnished under this specification shall be the standard product of one manufacturer.
- .3 The components of the system shall be those of Notifier, whose catalogue references are given below. The tender must be based on the supply and installation of specified equipment.

1.4 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 26 05 00 – Common Work Results for Electrical.
- .2 Shop drawings shall include, without being limited to, the following drawings prepared specifically for this project:
 - .1 Information on Alarm Initiating and Signaling Devices complete with catalogue

- numbers and wiring information.
 - .2 Control Panel zoning.
 - .3 Graphic Panel for the existing and addition to the school
 - .4 As-built layouts marked on a set of building plans indicating panels, detectors, pull stations, signals, conduit routes, wiring information, junction boxes and pull boxes.
- .3 Upon completion of the installation and testing, submit to the Consultant copies of all shop drawings, diagrams, operating instructions and descriptive literature, assembled in loose leaf binders identified by Project name.

1.5 GENERAL

- .1 The existing fire alarm system serving the building is Notifier 640. Control Panel shall be relocated and system shall be modified to suit new zones. The manufacturer and contractor shall provide mandatory visit to site to verify existing panel and wiring conditions and include any alteration required for the proposed work. No extra will be considered in failure to do so. All new devices shall be compatible with fire alarm control panel and matched with existing. Provide isolator modules located on wall and below ceiling as required at fire zones and separation boundaries

2 PRODUCTS

2.1 DETECTORS – PHOTOELECTRIC SMOKE DETECTORS

- .1 Photoelectric detector shall utilize a light scattering type photoelectric smoke sensor to detect visible particulates produced by combustion. The integral microprocessor shall dynamically examine values from the sensor and initiate a system alarm based on the analysis of data.
- .2 The alarm set point shall be field selectable to any of five sensitivity settings ranging from 1.0% to 3.5% smoke obscuration per foot. The photo detector shall be suitable for operation in the following environment:
- a. Temperature: 32°F to 120°F (0°C to 49°C)
 - b. Humidity: 0-93% RH, non-condensing
 - c. Elevation: no limit

2.2 DUCT DETECTOR HOUSING

- .1 The photoelectric smoke detector shall be readily adaptable for use in air duct smoke detection applications, using a housing that mounts to the outside of the duct. When used for duct smoke detection, the smoke detectors will not forfeit any of the system functionality that they have when used as area smoke detectors.
- .2 The duct smoke detection housing shall allow the detector to sample and compensate for, variations in duct air velocity between 300 and 4,000 feet per minute.
- .3 Remote alarm LEDs and Remote Test Stations shall be supported by the duct smoke detector and provided where indicated.

**2.3 DETECTORS-COMBINATION FIXED TEMPERATURE/RATE OF RISE
DETECTOR**

- .1 Heat Detector shall have a solid state heat sensor, and shall transmit an alarm at a fixed temperature of 135° F (57°C) or due to a temperature Rate of Rise of 15°F/minute (9°C/minute). The detector shall continually monitor the temperature of the air in its surroundings to minimize thermal lag to the time required to process an alarm.
- .2 The heat detector shall be rated for ceiling installation at 70 ft (21.3m) centers and be suitable for wall mount applications.

2.4 DETETORS-FIXED TEMPERATURE HEAT DETECTOR

- .1 Heat detector shall have a solid-state heat sensor, and shall transmit an alarm at a fixed temperature of 135° F (57°C). Detector shall continually monitor the temperature of the air in its surroundings to minimize thermal lag to the time required to process an alarm.
- .2 Heat detector shall be rated for ceiling installation at 70 ft (21.3m) centers.

2.5 SIGNALLING DEVICES

- .1 Alarm signal from panel shall be set to "temporal" requirements, for speakers and strobes controlled separately. Provide a fire alarm speaker and combination fire alarm speaker/strobe device at each location as shown on the plans. Speakers shall match existing.

2.6 MANUAL STATION

- .1 All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
- .2 Manual stations shall be constructed of Lexan with clearly visible operating instructions provided on the cover. The word FIRE shall appear on the front of the stations in raised letters, 1.75 inches (44 mm) or larger.
- .3 All pull stations shall be c/w tamperproof plastic covers with battery operated local horn.

2.7 ANNUNCIATOR & GRAPHICS

- .1 Provide a new Passive Graphic at the Main Entrance as well as beside the Fire Alarm Control Panel. Passive Graphic shall include all existing details as well as those that reflect the deletion and addition of new zones as a result of this project.

2.8 WIRING

- .1 Provide wiring throughout the system for all alarm and signal devices as recommended by manufacturer and required by code. All wiring shall be installed in rigid/EMT conduit to suit

application.

3 EXECUTION

3.1 INSTALLATION

- .1 ULC and CSA standards and Ontario Electrical Code, shall establish installation requirements.
- .2 Conductors entering the control panel shall be identified and terminated on individual terminals.
- .3 Wiring for audible signal circuits shall be No. 14 AWG minimum. Voltage drop to any signal shall not exceed 10 percent. Wiring for detection circuits shall be No. 16 AWG minimum. Wire resistance shall not exceed 50 Ohms. Conductors shall be connected in accordance with manufacturer's wiring diagram and run in conduit throughout.
- .4 Wiring must be cut at each automatic and manual station and device, and connected to the four terminals provided on the unit. (These connections ensure supervision of the circuit. Looping of the wires under terminal screw is not permissible). All wiring shall be continuous between control panel, detectors, stations and signals.
- .5 Wiring to annunciators shall provide for all spare zones.
- .6 Wiring for standpipe system devices, flow switches and valve monitor switches, shall be provided under Division 16. Coordinate with Sprinkler Contractor to suit.
- .7 End-of-line devices, resistors and diodes for station and signal circuits shall be mounted in flush box, maximum of 6 feet above floor beyond last device on circuit.
- .8 Mount detectors on ceiling as per ULC-S524 standard unless otherwise specified herein, at the highest point where variations in ceiling height exist. Do not mount detectors on sides, undersides, or less than 12" (300 mm) from beams, joists, open web steel joists or any structure projecting below actual ceiling height.
- .9 Should interference from obstruction, lamp positions or heat radiating surfaces be encountered in locating any detector where shown, locate the detector as near as possible to the indicated position, clear of obstacles, to the satisfaction of the Consultant.
- .10 Identify signal circuit, box circuit, auxiliary circuit, wiring at fire alarm control panel, terminal boxes or elsewhere on completion of work.

3.2 TESTS

- .1 Retain the services of the equipment supplier to provide Special Commissioning "Verification, Inspection and Certification" and to supervise the connection, initial test and adjustment of the system including existing equipment.

- .2 Verification procedure shall comply with CAN/ULC-S537-97 latest revision, and shall include providing proper functioning and connection of each device and function of the systems. Furnish upon completion of the work, a letter from the manufacturer as evidence that such tests and instruction have been performed to their satisfaction, and additionally to indicate that:
 1. System complies with manufacturer's installation recommendations, ULC requirements, and specified operation.
 2. Installation is acceptable for Warranty.
 3. Completed system complies with regulations concerning supervision of functions, signals, stations, and automatic detectors.
 4. Test completed systems for Building Approval Authority. Advise Authority when "Verification" is to be performed.
- .3 Contractor shall include for as many verifications as necessary to facilitate project schedule.

3.3 SHOP DRAWING & DOCUMENTS

- .1 Prepare maintenance schedule. Contractor to correct shop drawings to provide "as-installed" record.
- .2 Shop Drawings for the Fire Alarm System shall include copies of documents to substantiate ULC listing for all items, identified by catalogue number.

3.4 INSPECTION CERTIFICATION

- .1 Retain services of the manufacturer to perform tests and provide the following documents:
 1. A copy of the inspection Technician's report showing location of each device, and certifying the test results of each device.
 2. A Certificate of Verification confirming that the inspection has been completed and showing the conditions upon which such inspection and certification have been rendered.
 3. Proof of liability insurance for the inspection.
 4. Submit copies of Inspection and Verification Certificates to Building Authority Fire Department Fire Prevention Division.
 5. Audibility level plots throughout the building on Floor Plan.

END OF SECTION

1 GENERAL

1.1 RELATED INSTRUCTIONS

- .1 Conform to Section 26 05 00 – Common Work Results for Electrical.
- .2 Conform with applicable requirements governing installation of Section 16050, Basic Materials & Methods.

1.2 WORK INCLUDED

- .1 Work includes, but is not limited to:

Provide empty conduit system c/w pull wire, PVC end bushing, and backbox to accessible ceiling space for equipment wiring in the building:
 1. Voice/Data system
 2. P.A. System
 3. Security System
- .2 Coordinate work to ensure compatibility of conduit provisions before installation.

2 PRODUCTS

2.1 OUTLETS

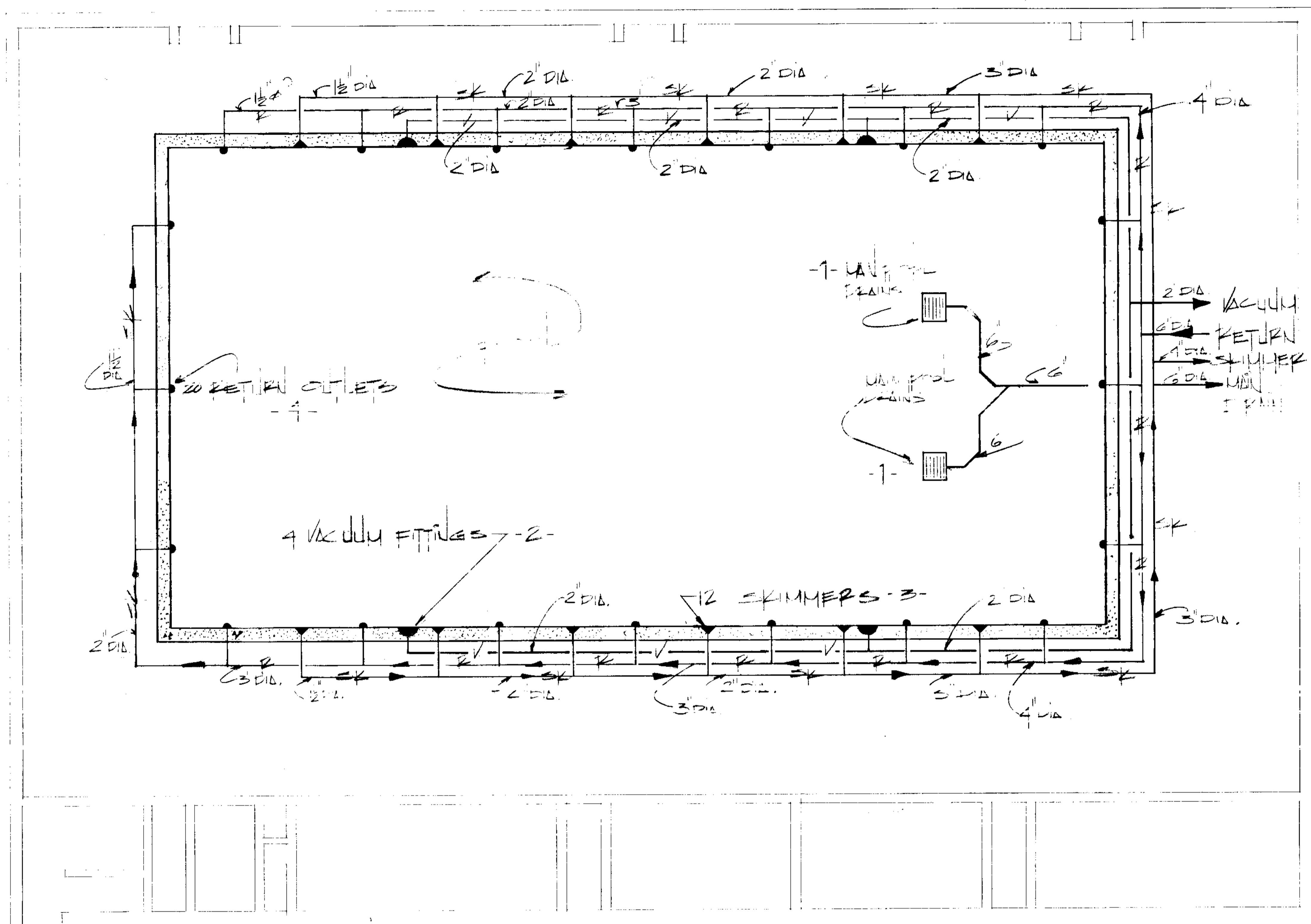
- .1 Outlets shall be as specified under "Outlet Boxes". Provide backbox for each outlet noted on drawings.

3 EXECUTION

3.1 INSTALLATION - CONDUITS

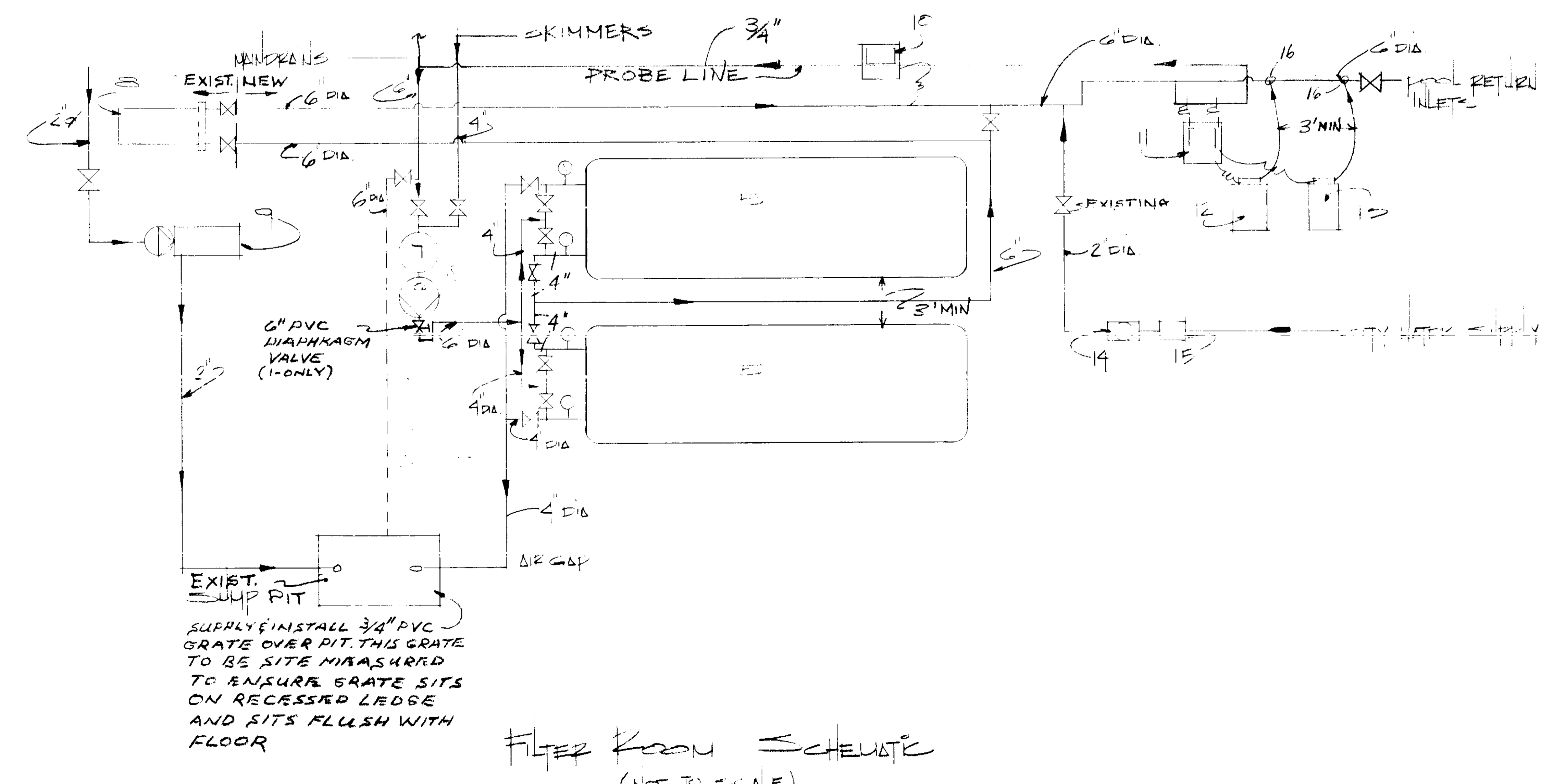
- .1 Conduit shall be 19 mm (3/4") trade size minimum, with PVC end bushings and shall be cleared and free from water. Provide pull wires installed continuously from outlet and fastened at each box.
- .2 Provide 2 x 2" sleeve c/w PVC bushing from each classroom etc. to corridor with accessible ceiling space in order to facilitate low voltage wiring by others. Div 16 will be responsible to provide fire stopping inside and outside the sleeves upon low voltage cable run is completed.
- .3 Conduit shall not have more than two 90 degree or equivalent bends and 30 metres between outlets or pull boxes, and bending radius shall not be less than 10 times the conduit diameter. Conduit ends to be identified with paint.

END OF SECTION



SCALE = 1/8" = 1'-0"

NOTES:
 TOTAL GALLONS: 152,000 GAL (575,350 L)
 FLOW RATE: 640 USGPM (2422 L/Min)
 TURNOVER RATE: 4 HOURS
 SAND FILTER: 100\"/>



- EQUIPMENT LIST
- 1 MAIN DRAIN, 18\"/>
 - 2 VACUUM FITTINGS, WICOR, 2\"/>
 - 3 SKIMMERS, WICOR 8050-1473 3/4\"/>
 - 4 RETURN INLETS, WICOR, 842A
 - 5 SAND FILTERS, WICOR GH25, 100\"/>
 - 6 CIRCULATING PUMP, ARMSTRONG 4300 C.O.G.10 575 V/3/60
 - 7 STRAINER, MER-MADE 3\"/>
 - 8 HEAT EXCHANGER (EXISTING)
 - 9 VACUUM PUMP, WICOR 1/2\"/>
 - 10 FLOW METER, SIGMET 3\"/>
 - 11 CHEMICAL CONTROLLER, CHEMTROL (EXISTING)
 - 12 CHLORINE FEED PUMP + RESERVOIR, LMI (EXISTING)
 - 13 ACID FEED PUMP + RESERVOIR, LMI (EXISTING)
 - 14 WATER METER, KENT 2\"/>
 - 15 BACK FLOW PREVENTER, WATTS, 909, 2\"/>
 - 16 CORPORATION STOPS

OCT. 22/92 - MISC. REVISIONS



PROJECT TITLE:
 GLENFOREST POOL

DRAWING TITLE:
 POOL FILTRATION
 PLANT

SCALE: AS NOTED

DATE: 11/5/92

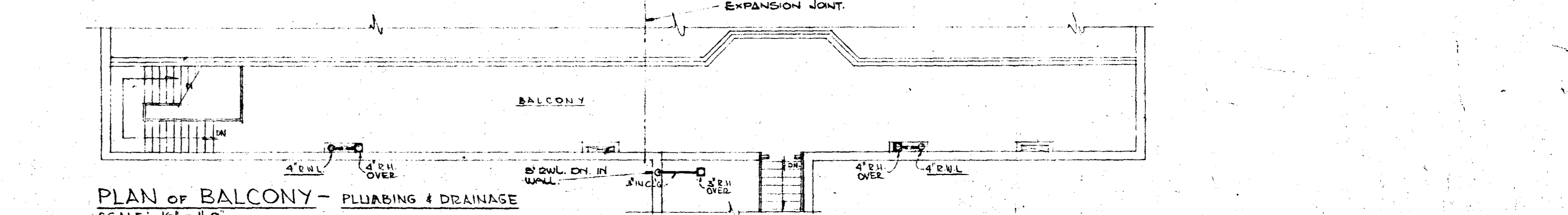
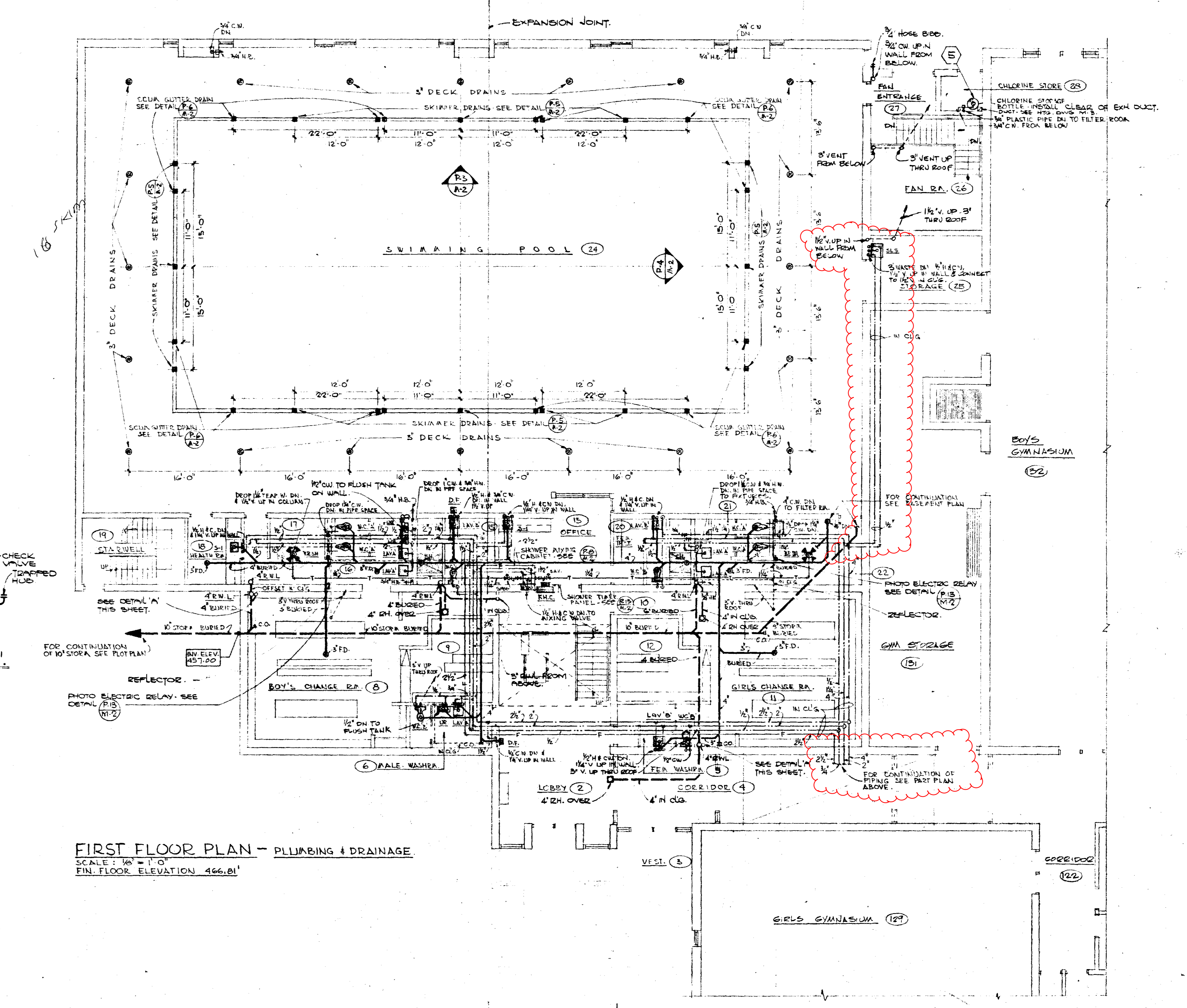
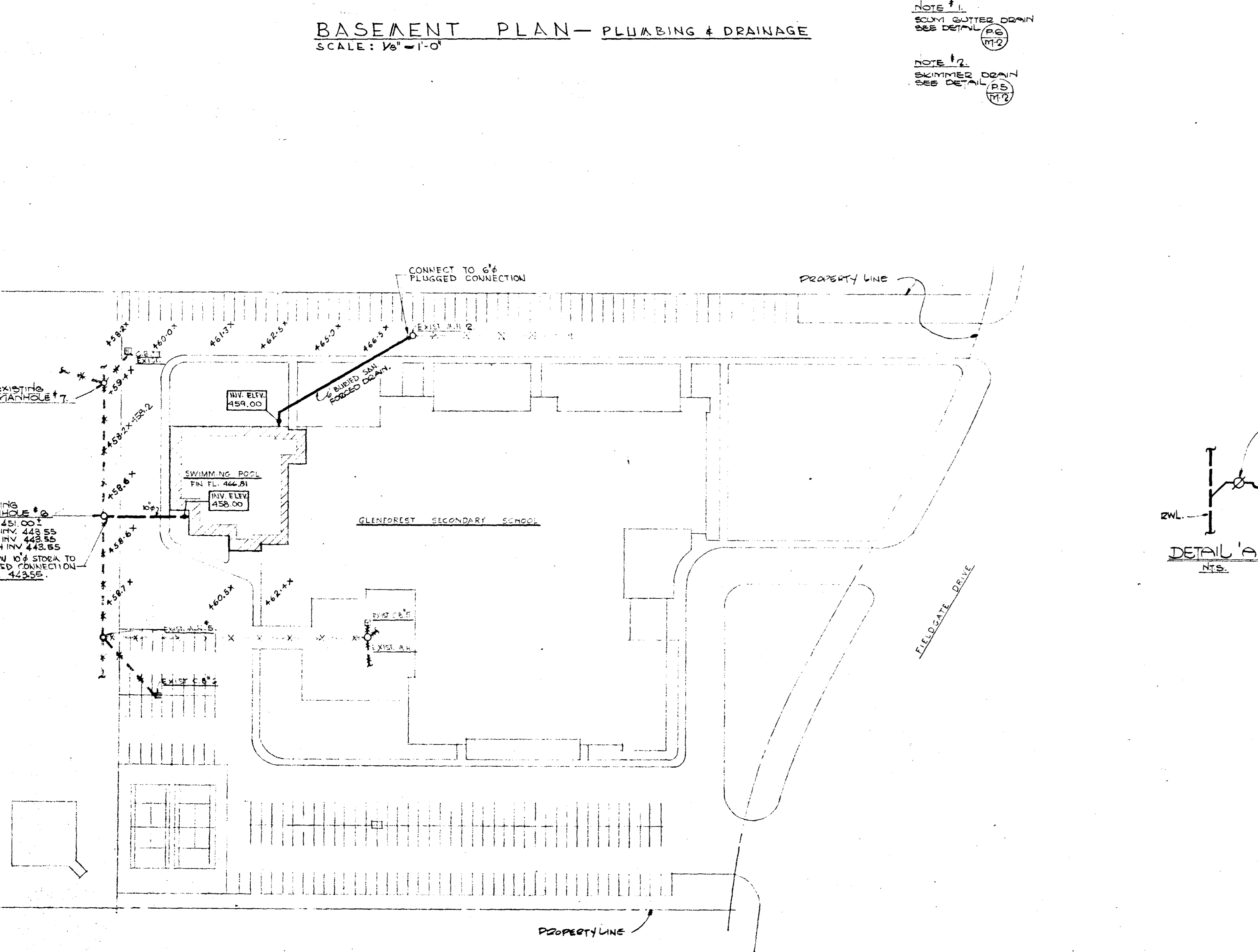
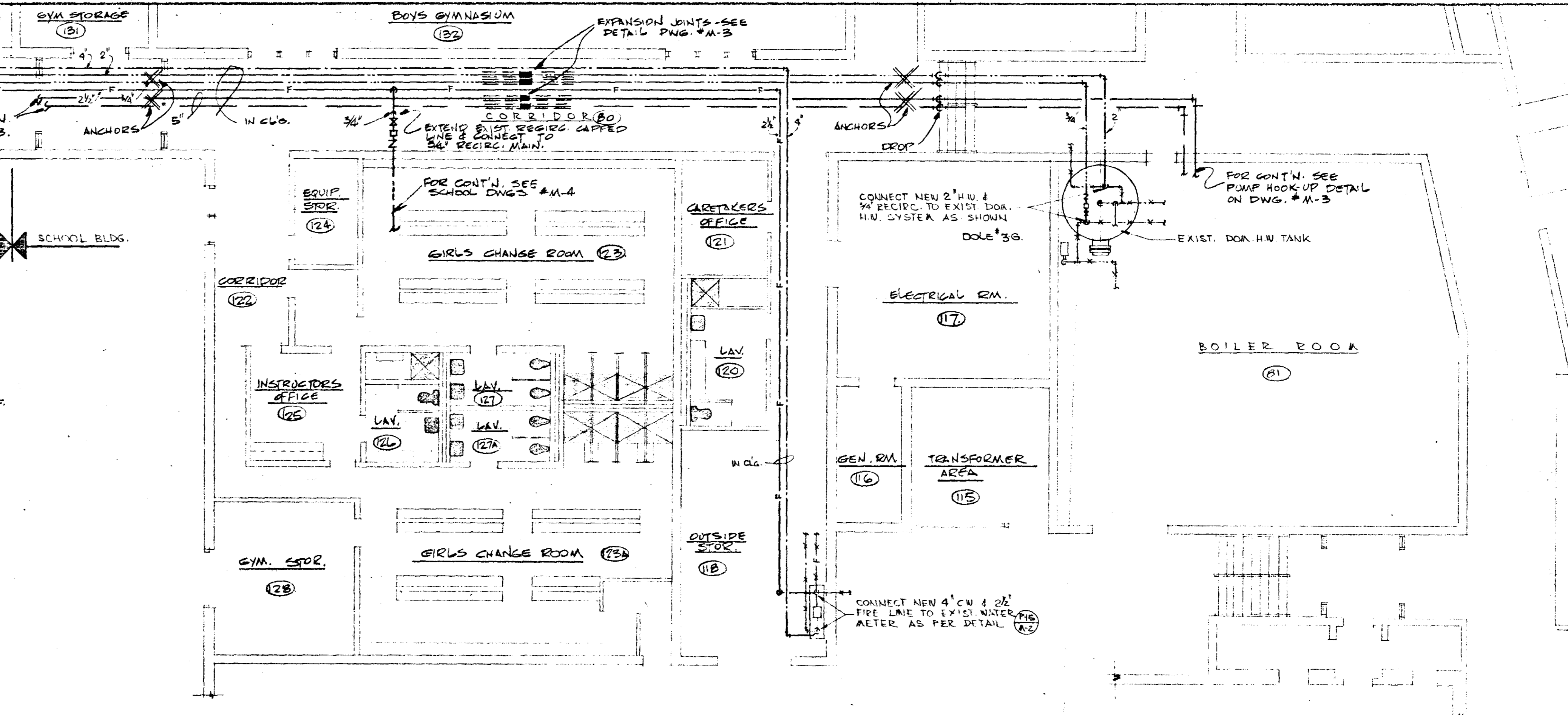
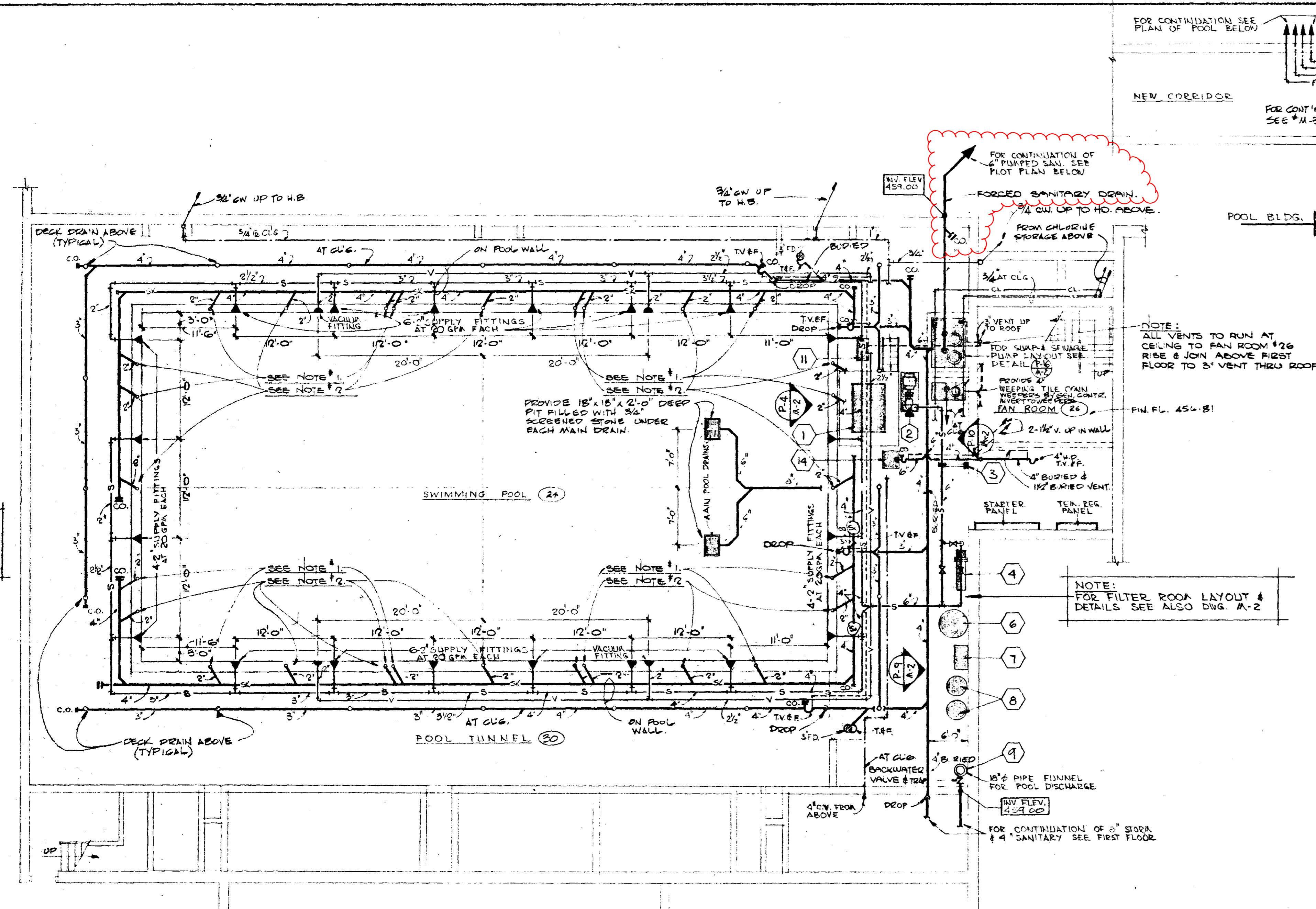
DRAWN BY:
 E. PATTERSON
 CHECKED BY:
 E. PATTERSON

2111/012

BEFORE COMMENCING WORK
 THIS SUB-CONTRACTOR SHALL VERIFY LOCATION OF ALL PIPES, DUCTS AND EQUIPMENT OF HIS AND ALL OTHER TRADES TO PREVENT INTERFERENCE. REMOVAL OR RELOCATION OF ANY SUCH WORK INTERFERING WITH THE WORK OF OTHER TRADES SHALL BE THIS SUB-CONTRACTOR'S RESPONSIBILITY UNLESS OTHERWISE APPROVED IN WRITING.

PLUMBING LEGEND

—	SANITARY DRAIN
—	STORM DRAIN
—	VENT LINE
—	COLD WATER LINE
—	HOT WATER LINE
—	REGULATION LINE
—	FIRE LINE
—	TEMPERED WATER LINE
—	CLEANOUT
—	HOSE BIB
—	FLOOR DRAIN
—	HUB DRAIN
—	ROOF HOPPER
—	PIPE ANCHOR
—	EXPANSION JOINT & GUIDE
—	WATE VALVE
—	CHECK VALVE
—	GLOBE VALVE
—	UNION
—	SPRINGER
—	RAN/WATER LEADER
—	BACKWATER VALVE
—	FIRE HOSE CABINET
—	TRAP VENT & FLUSH
—	SHOWER HEAD
—	OPEN SHOWER & YOLKE
—	AREA DRAIN
—	CATCH BASIN
—	MANHOLE
—	CAPT. IRON
—	EXISTING GRADE
—	FINISHED GRADE
—	INVEST. ELEVATION OF PIPE
—	SURVEY LINE
—	VACUUM LINE
—	SUPPLY LINE
—	VACUUM FITTING
—	DECK DRAIN ABOVE
—	SUPPLY FITTING
—	SEWERING DRAIN
—	GAS CHLORINE LINE



REVISED NOV. 1968
 TO INCLUDE APPENDIX #1 AND NOTICE OF CHANGE #2.

H. E. ROSE
 ARCHITECT

GLENFLOREST SWIMMING POOL
 FOR THE CONTRACTOR OF THE TOWN OF MISSISSAUGA, ONT.

PLOT PLAN, BASEMENT PLAN, FIRST FLOOR PLAN
 PLUMBING & DRAINAGE

SCALE: AS NOTED

DATE: AUG. 68

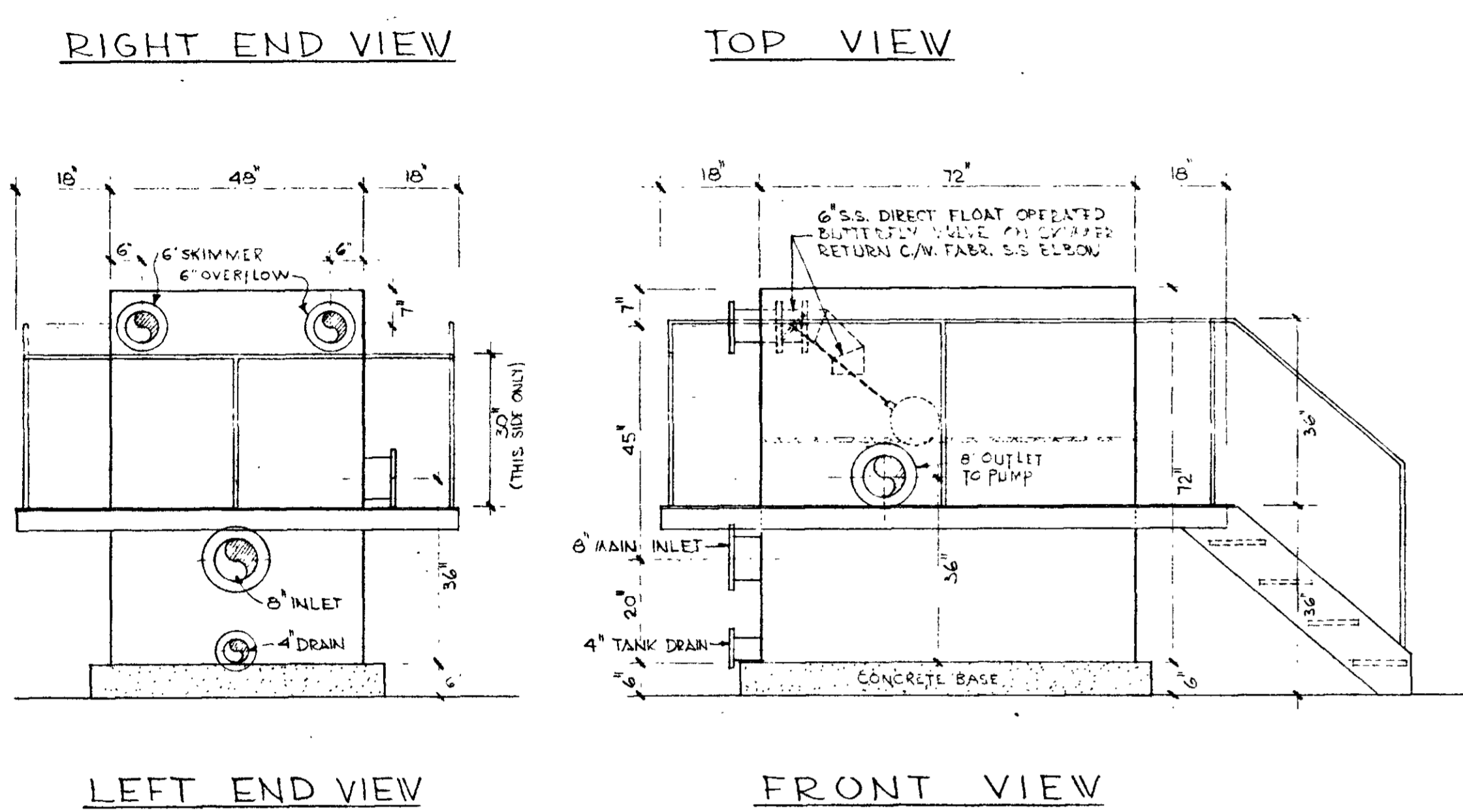
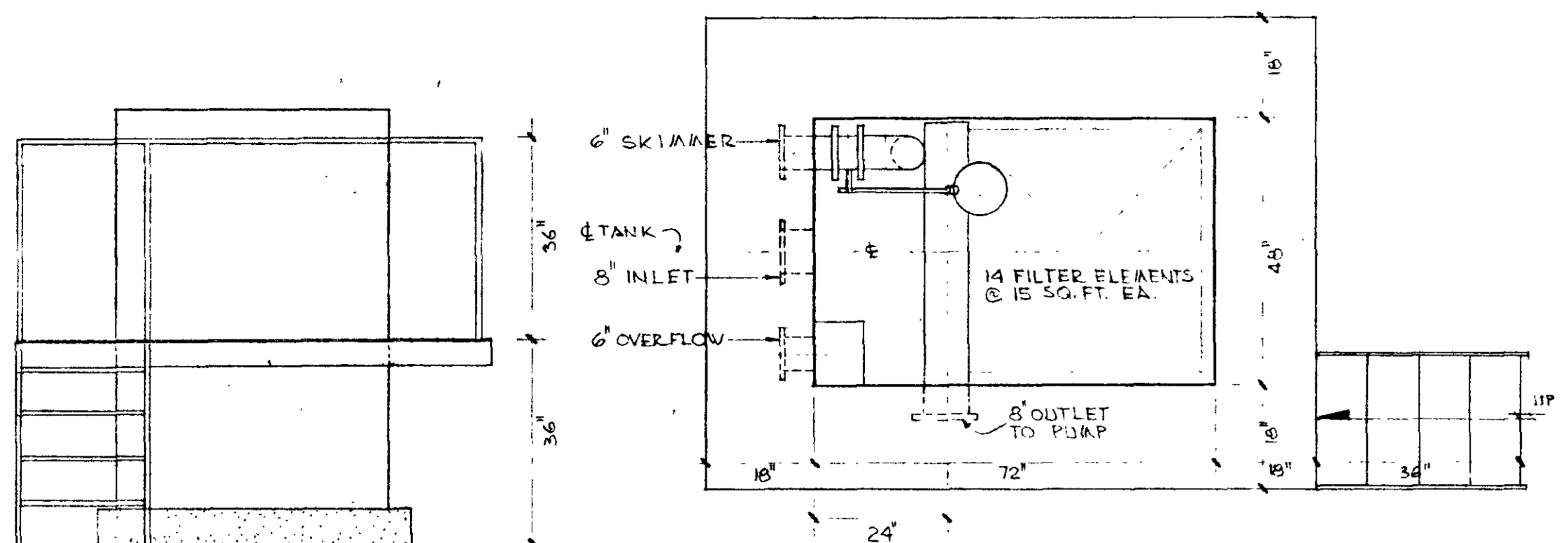
DRAWN BY: F.H.

CHECKED BY: TDG

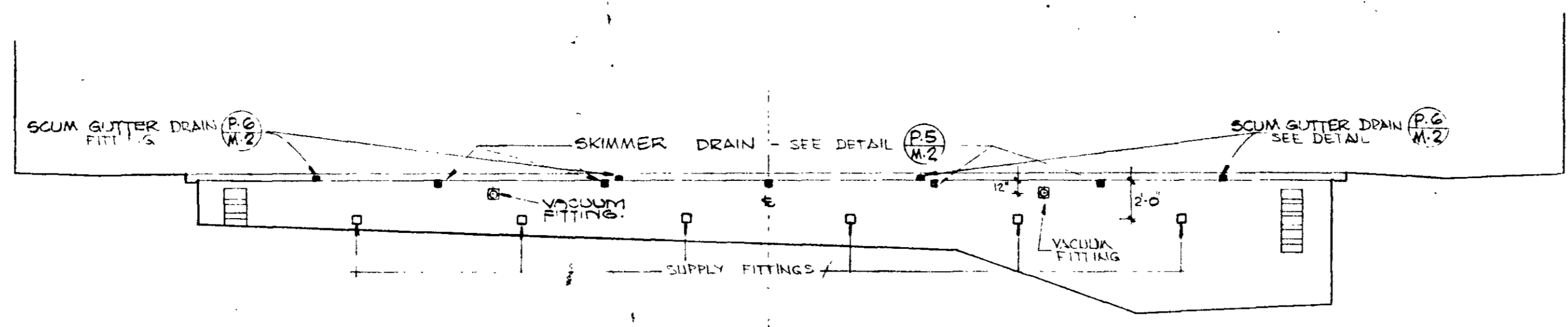
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JOB No. **68818**

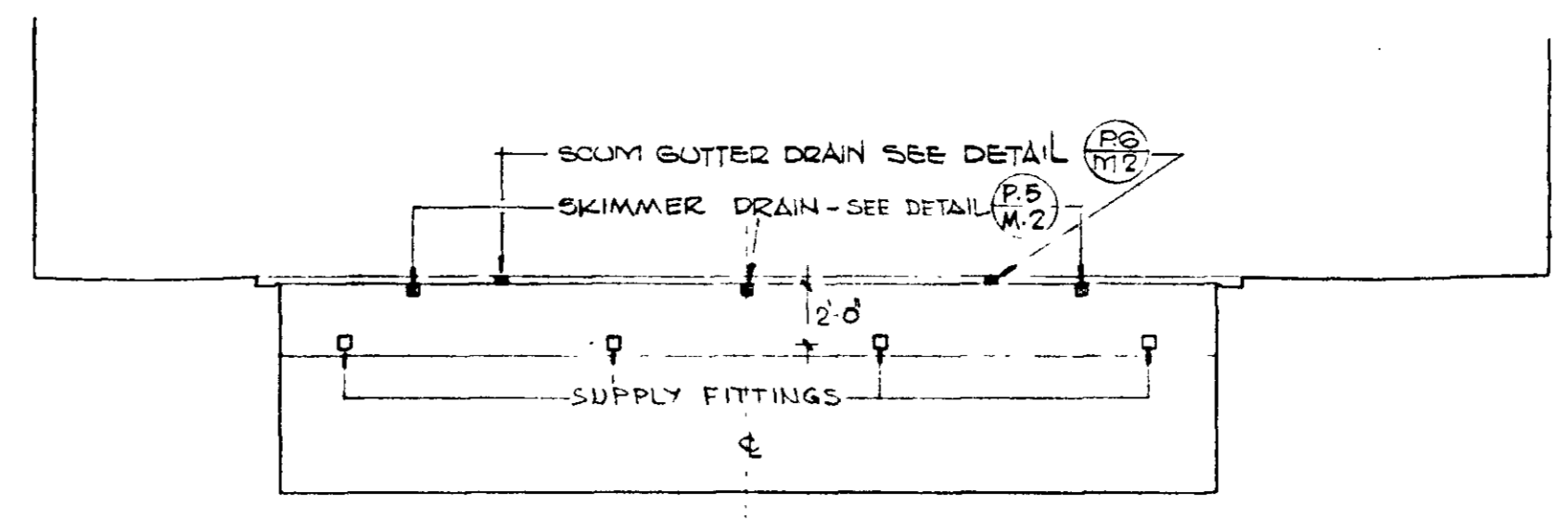
HANKS, IRWIN & PEARSON
 ARCHITECTS
 2248 BLOOR ST. W. TORONTO, ONTARIO



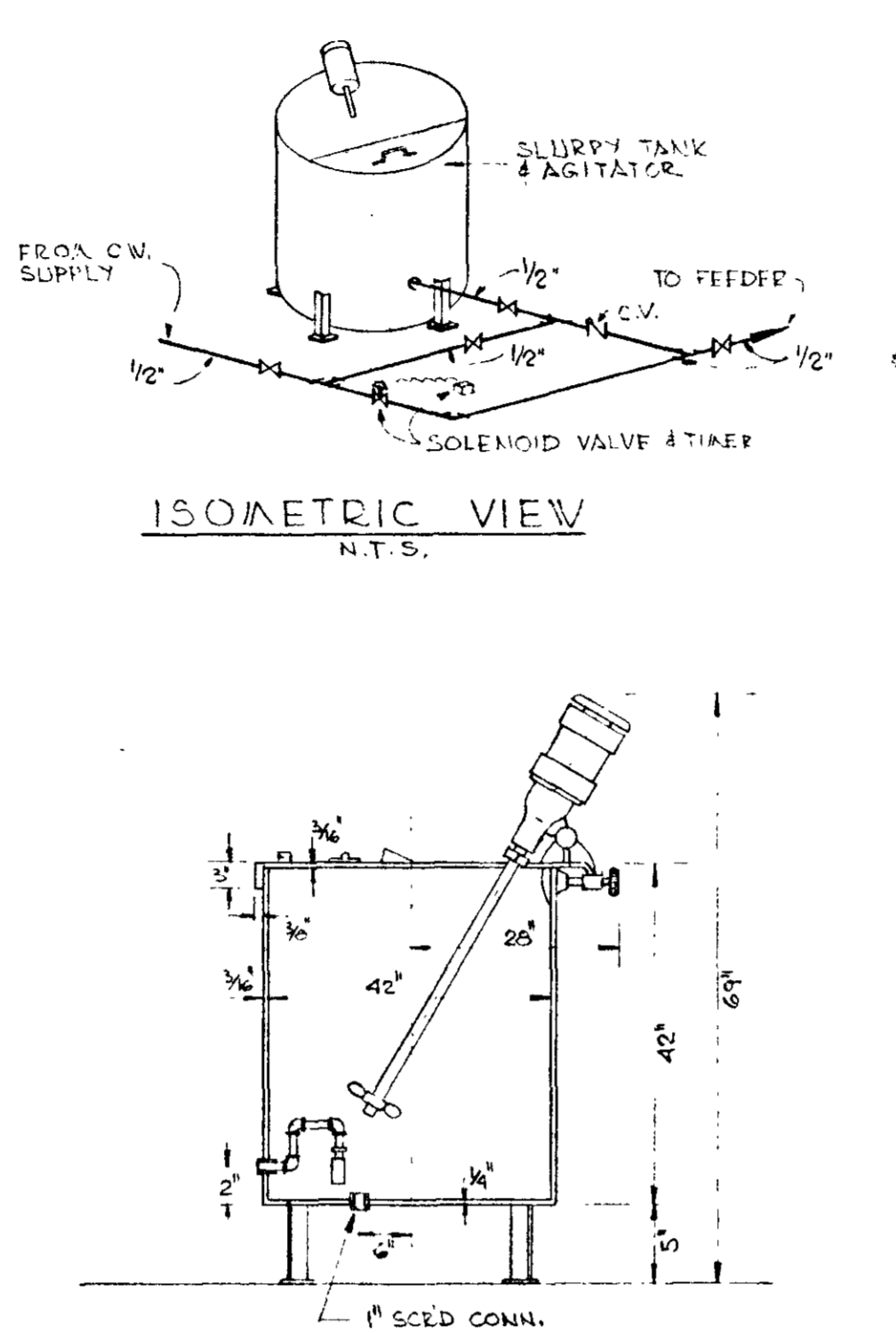
P-1
A-2 VACUUM FILTER TANK
SCALE: 1/2" = 1'-0"



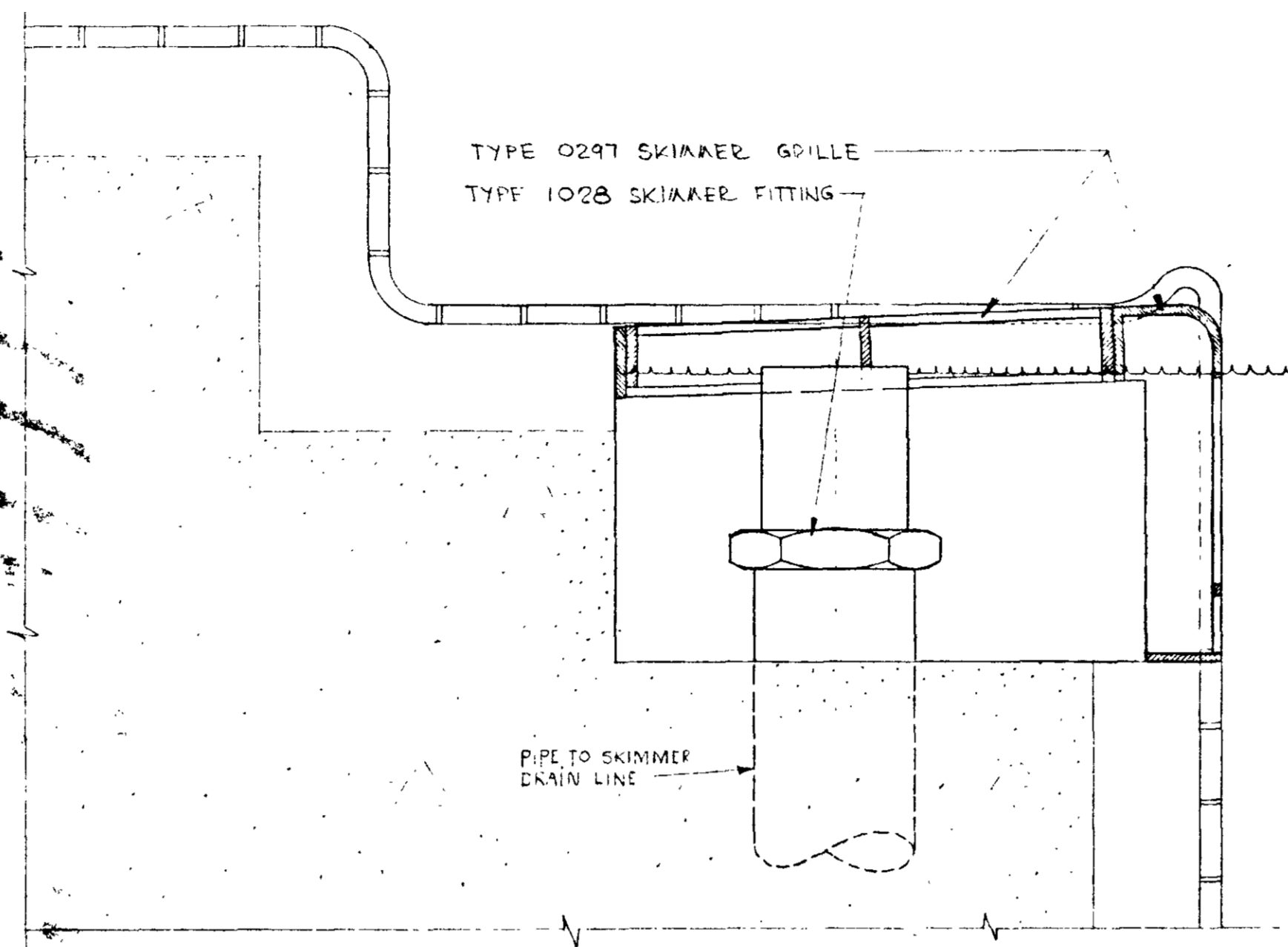
P-2
A-2 LONGITUDINAL ELEVATION THRU POOL
SCALE: 1/8" = 1'-0"



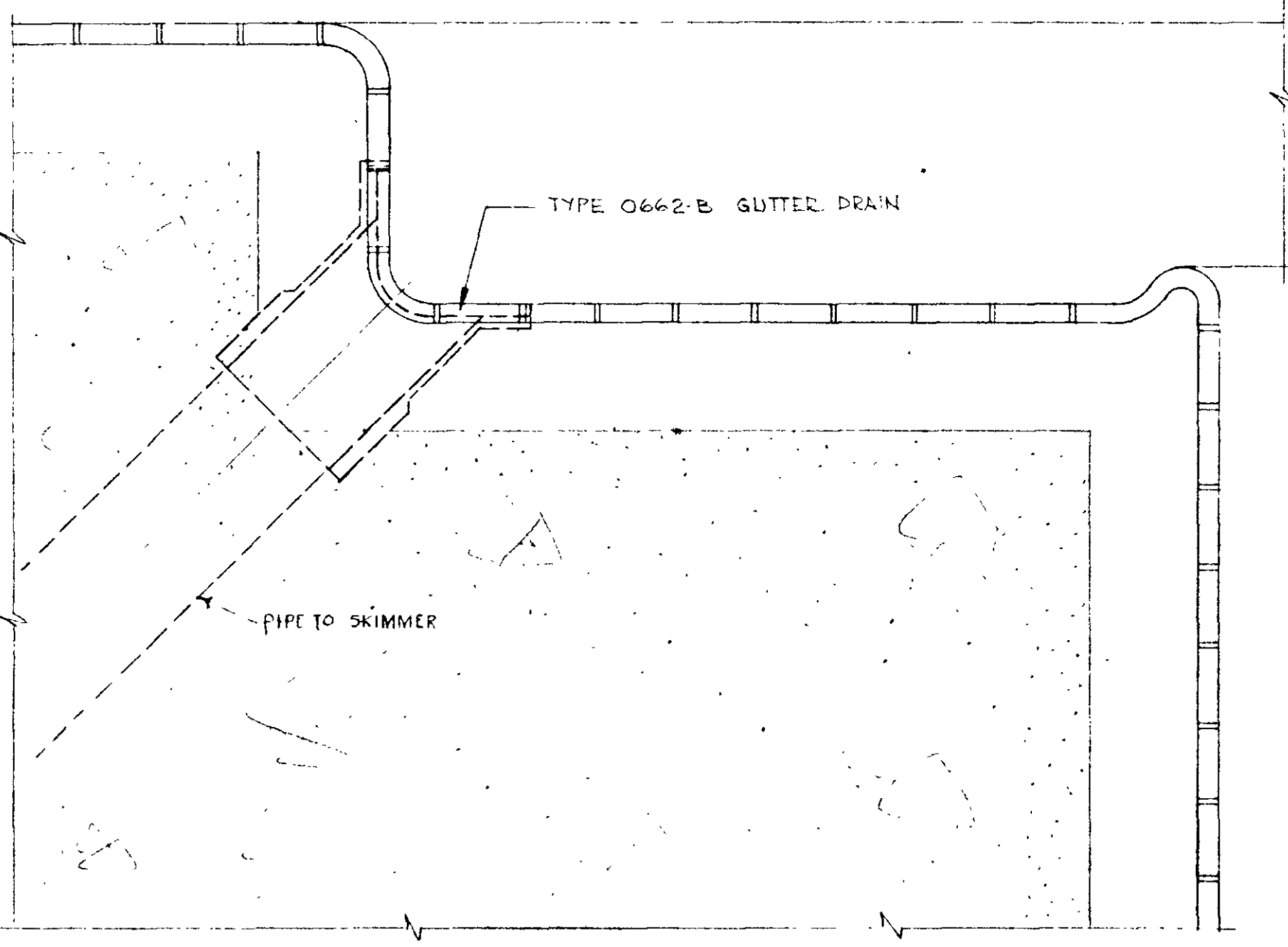
P-4
A-2 END ELEVATION THRU DEEP END OF POOL
SCALE: 1/8" = 1'-0"



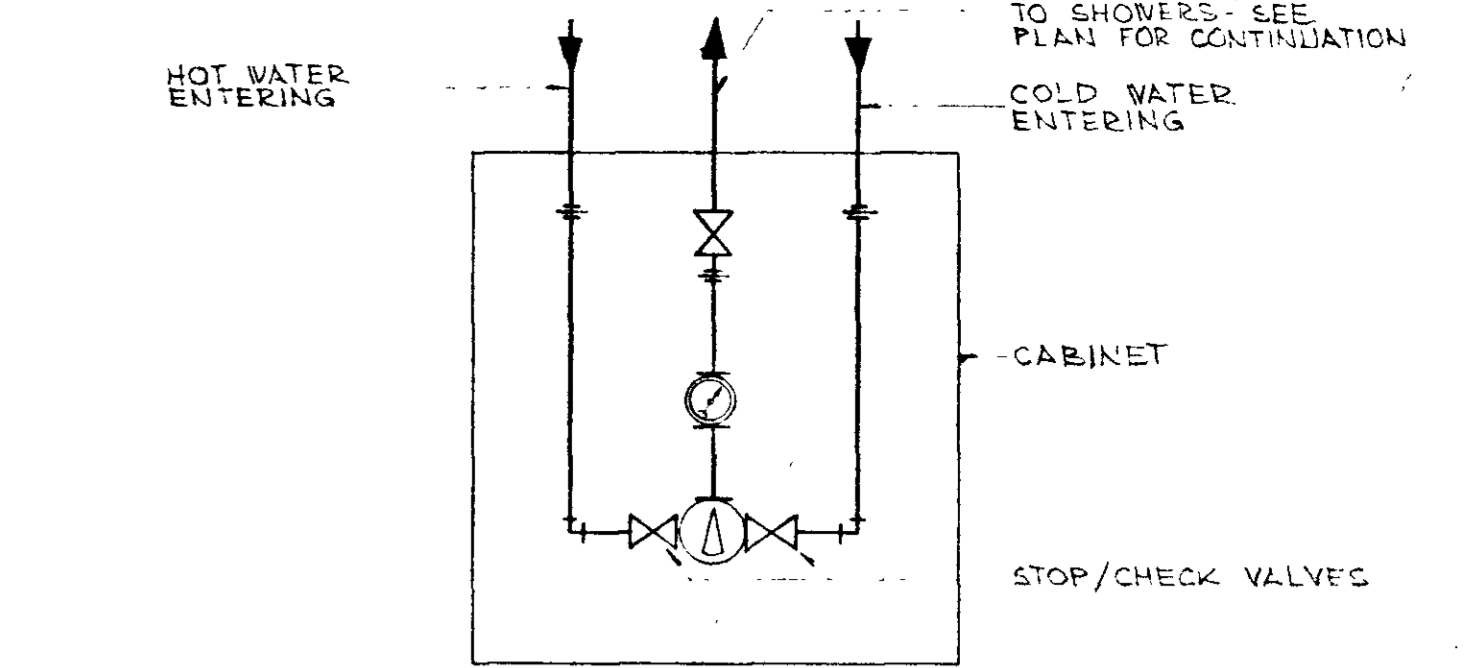
P-7
A-2 SLURRY MIXING TANK/AGITATOR
N.T.S.



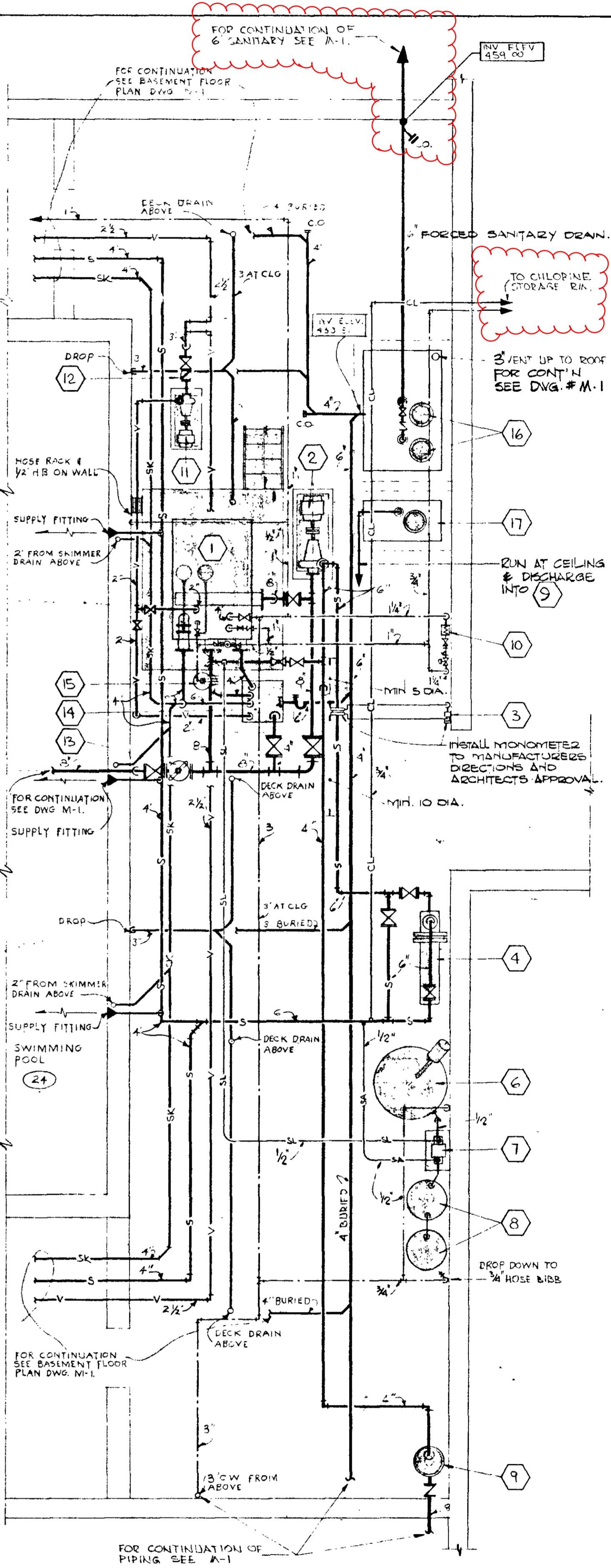
P-5
A-2 GUTTER SKIMMER DRAIN
SCALE: 1" = 2" (HALF FULL SCALE)



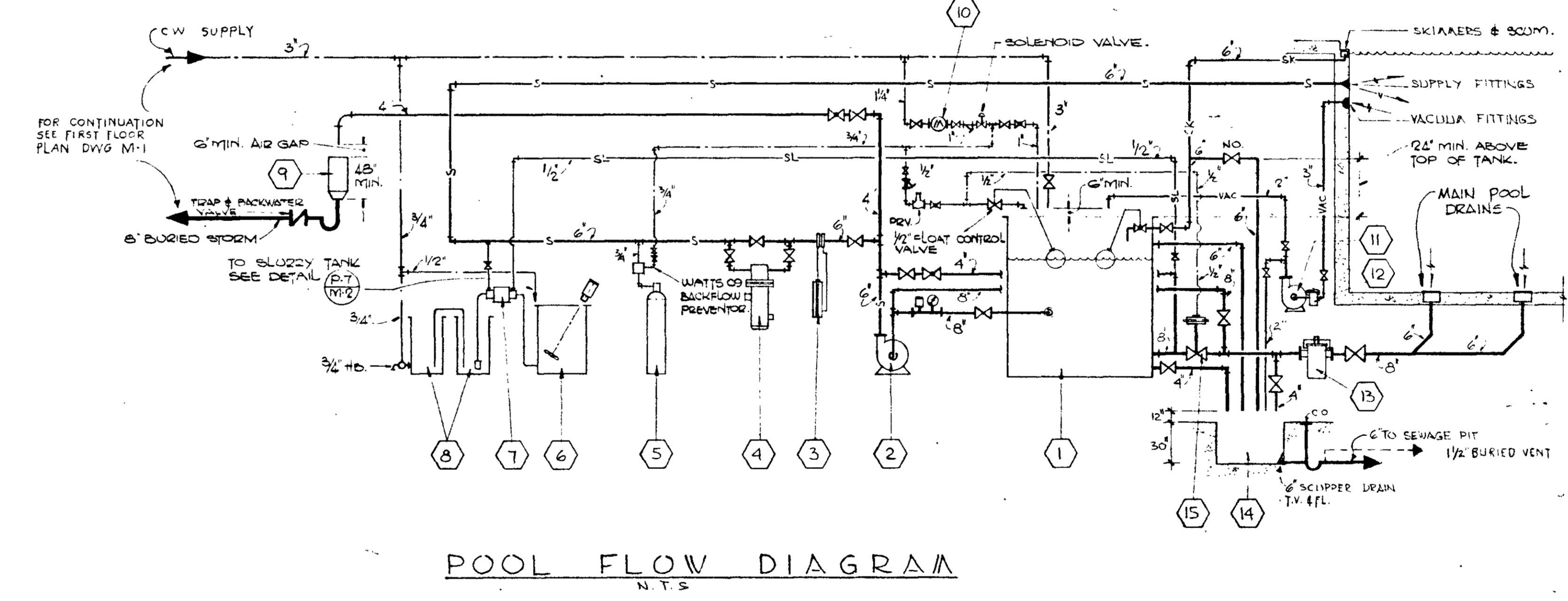
P-6
A-2 SCUM GUTTER DRAIN
SCALE: 1" = 2" (HALF FULL SCALE)



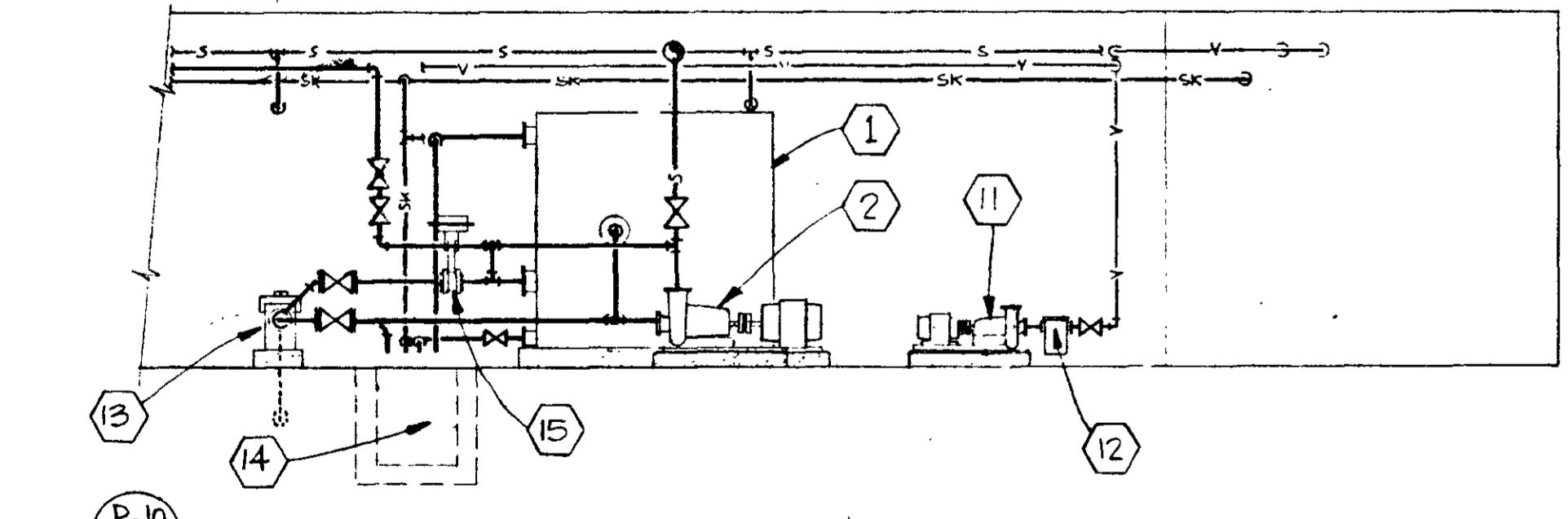
P-8
A-2 SHOWER MIXING VALVE DETAIL
N.T.S.



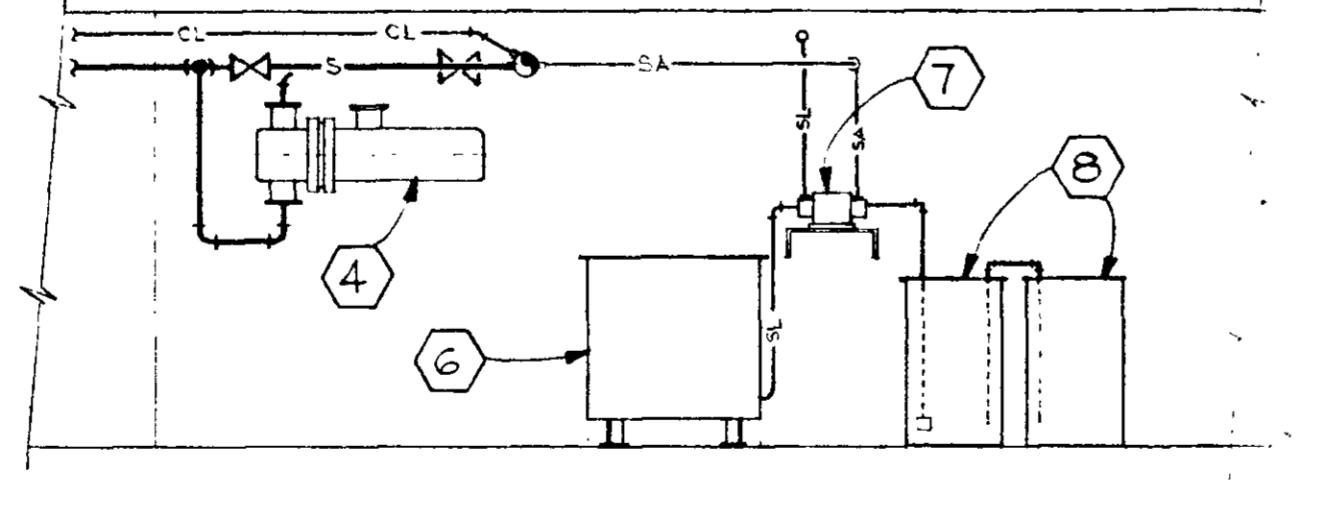
PLAN OF FILTER ROOM
SCALE: 1/4" = 1'-0"



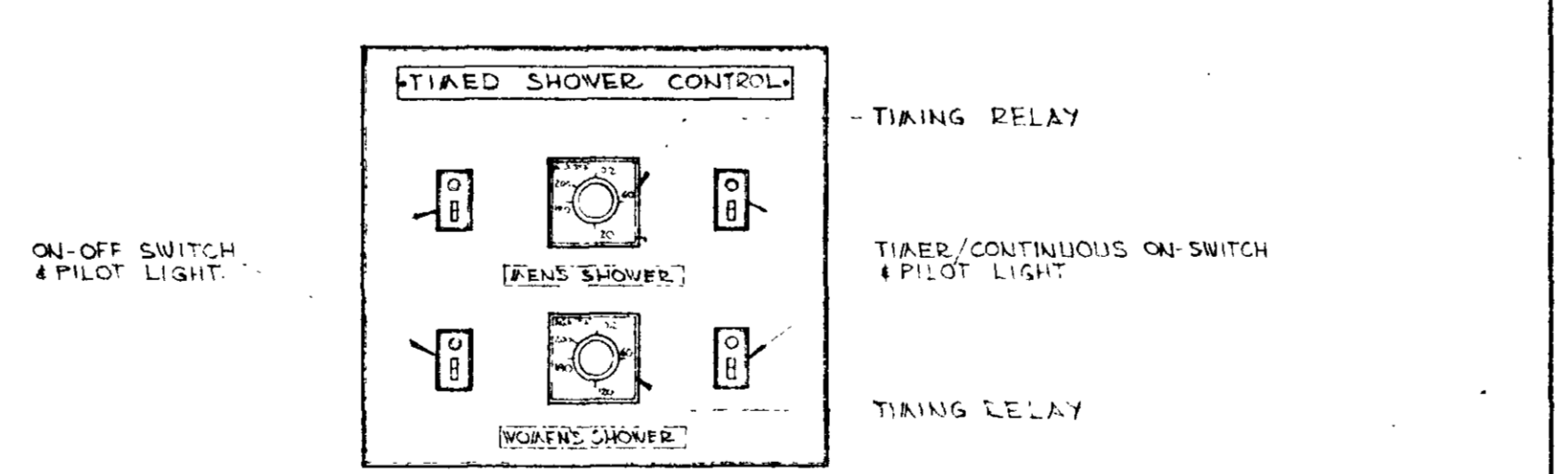
POOL FLOW DIAGRAM
N.T.S.



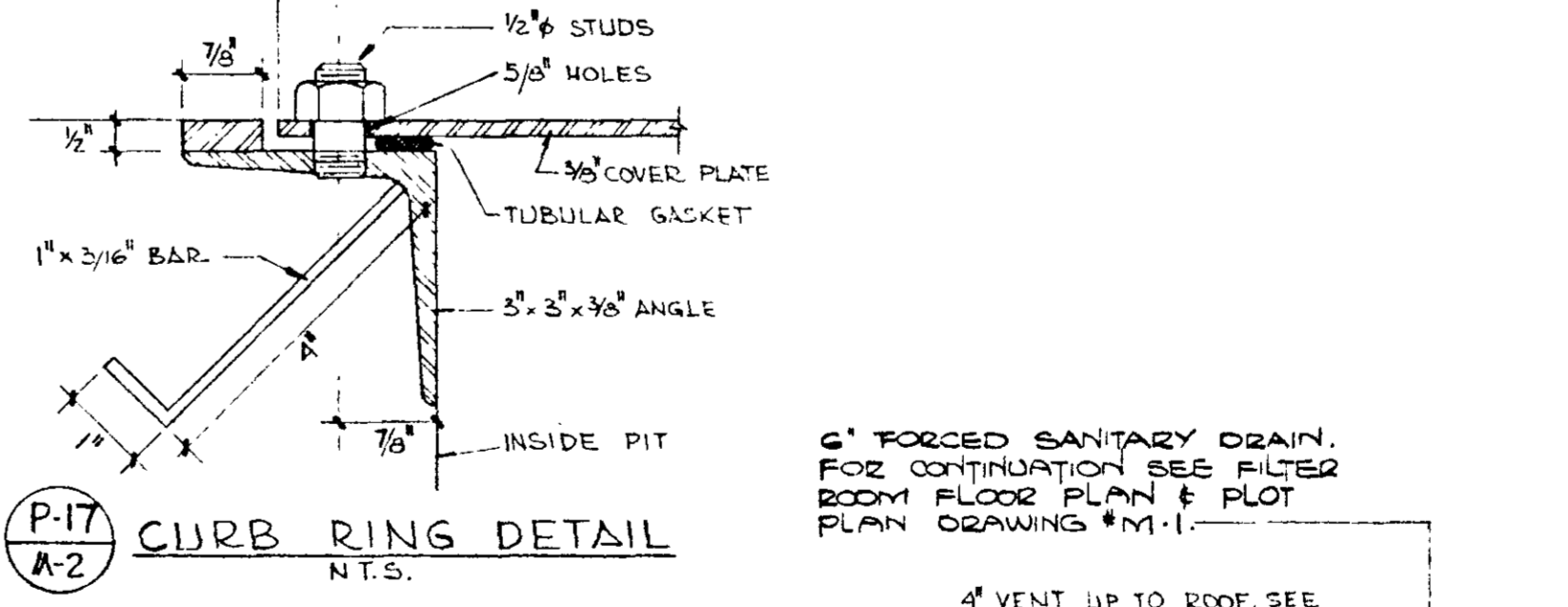
P-10
A-2 NORTH ELEVATION - FILTER RM.
SCALE: 1/4" = 1'-0"



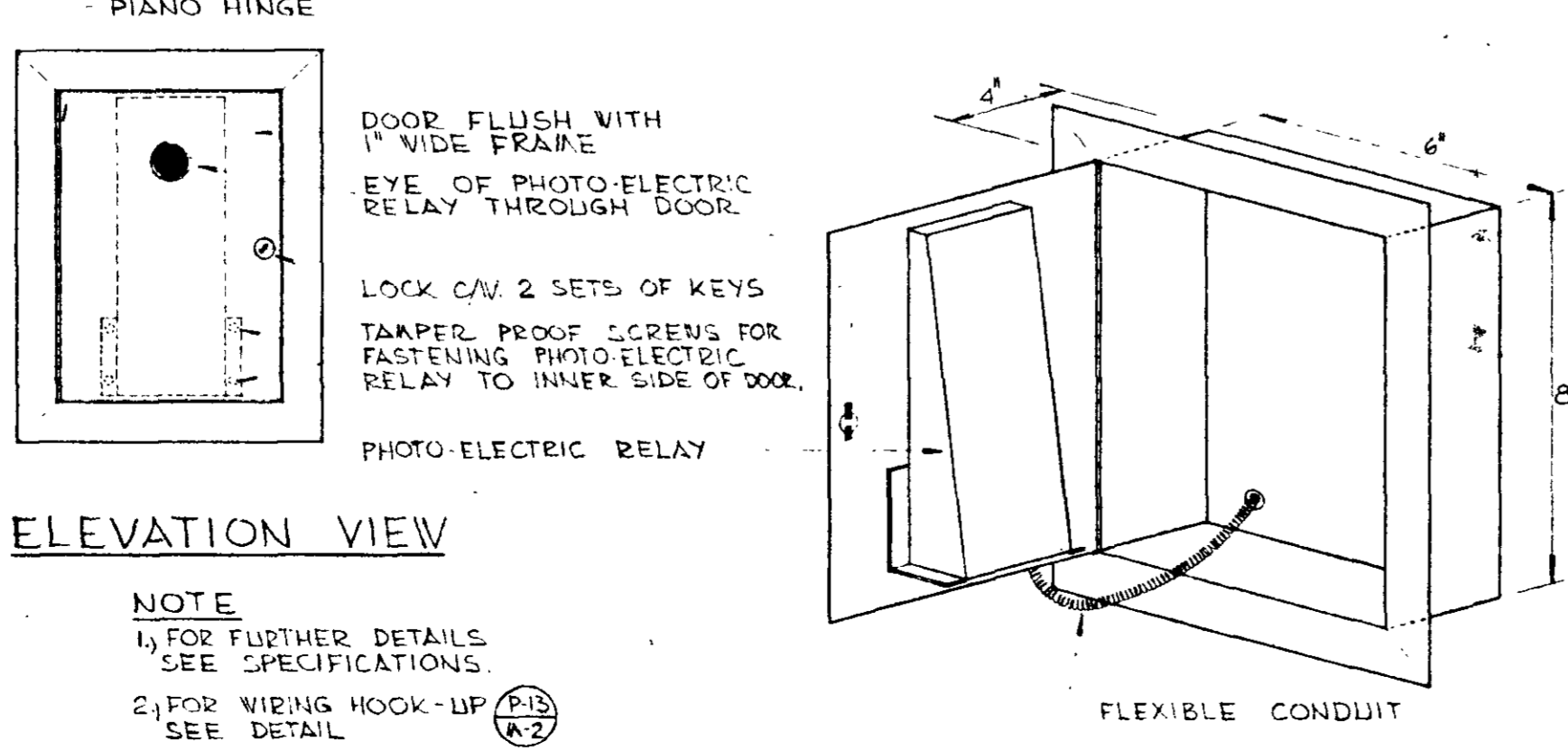
P-9
A-2 SOUTH ELEVATION - FILTER ROOM
SCALE: 1/4" = 1'-0"



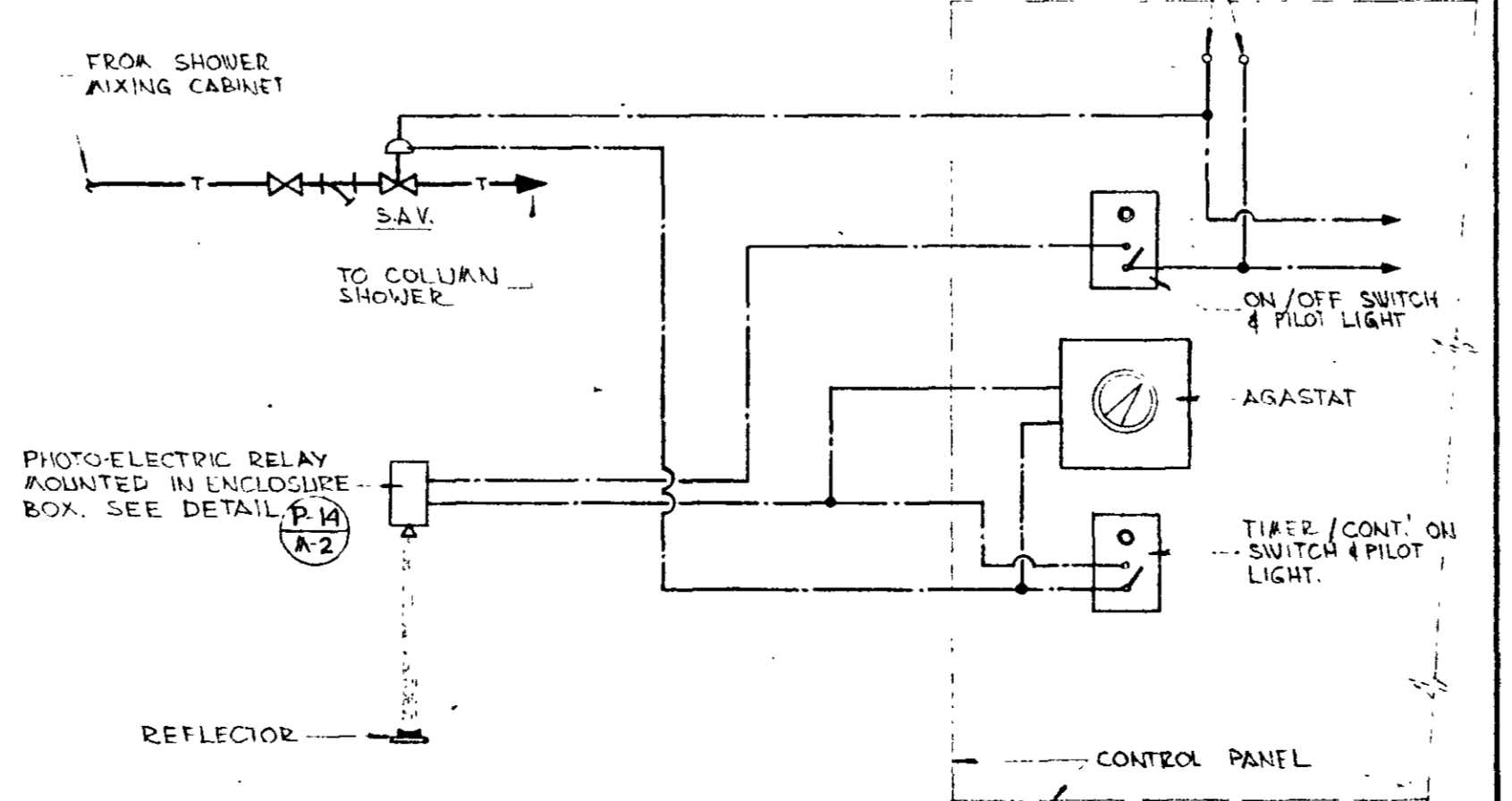
ELEVATION OF CONTROL PANEL
N.T.S.



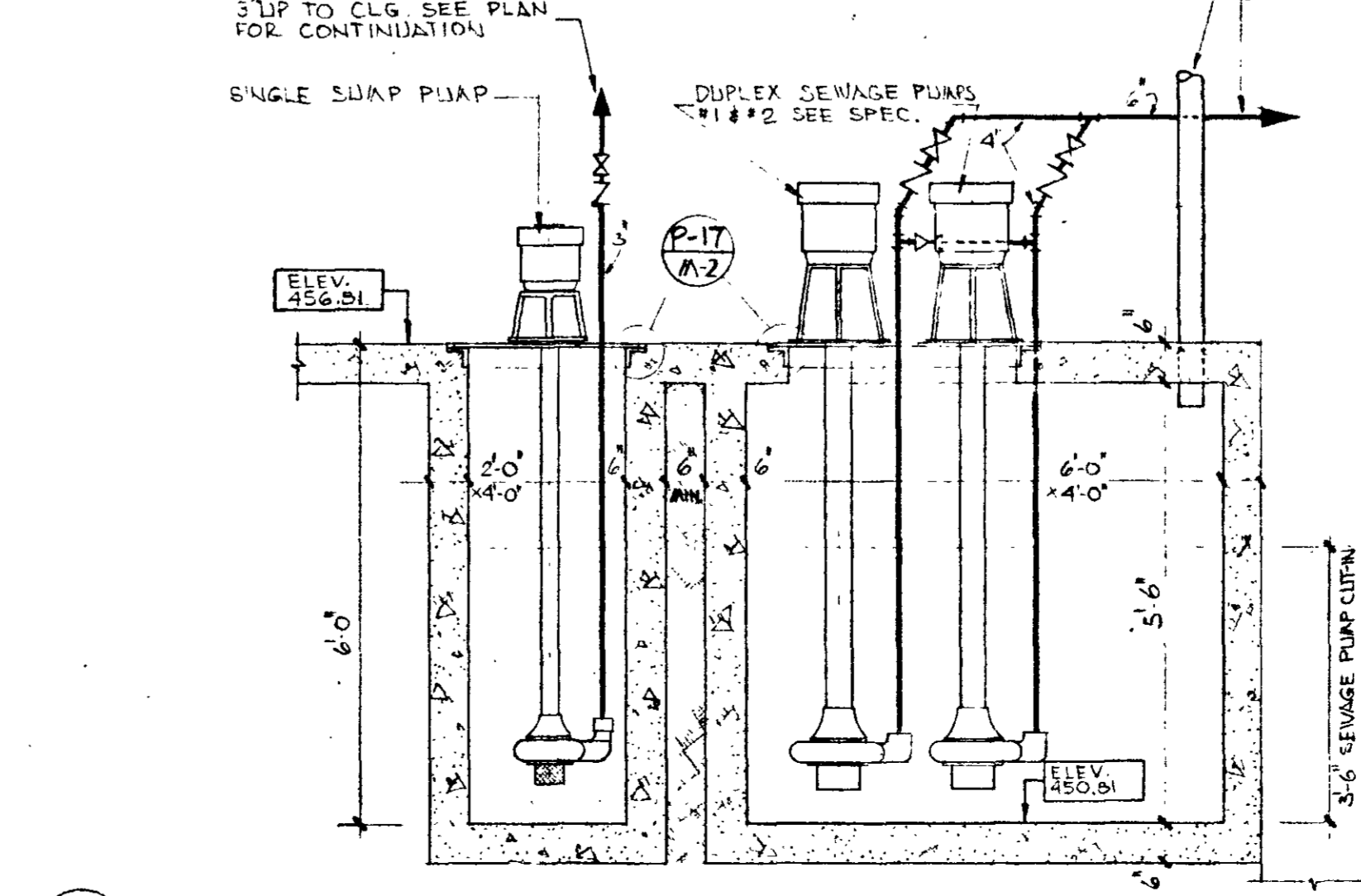
P-17
A-2 CURB RING DETAIL
N.T.S.



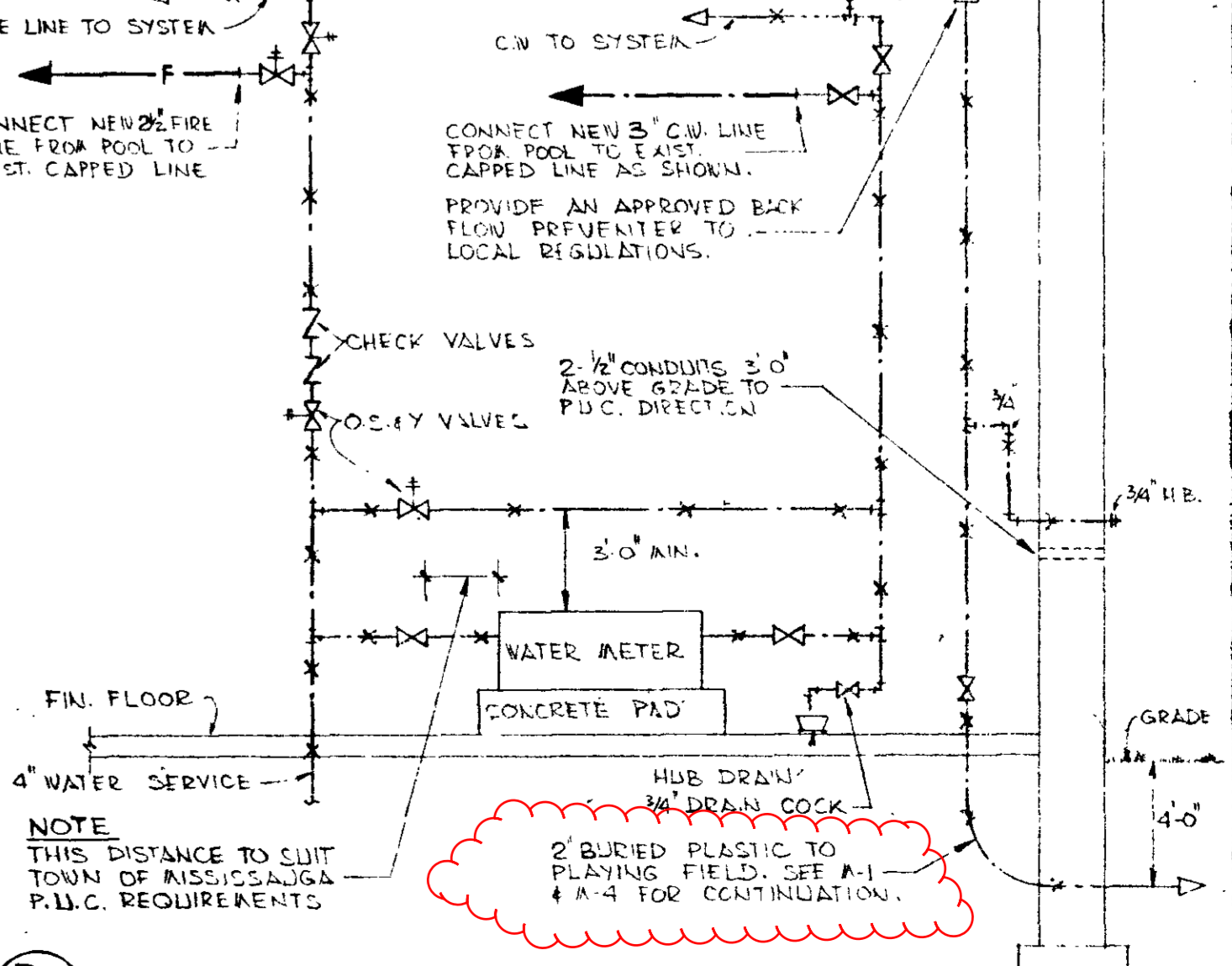
P-14
A-2 DETAIL OF ENCLOSURE BOX FOR PHOTO-ELECTRIC RELAY
N.T.S.



P-12
A-2 TYPICAL TIMED SHOWER CONTROL
N.T.S.



P-16
A-2 PIPING DETAIL OF SUMP & SEWAGE PUMPS
SCALE: 1/2" = 1'-0"



P-15
A-2 WATER METER ASSEMBLY DETAIL
N.T.S.

BEFORE COMME
THIS SUB-CONTRACTOR SHALL
LOCATION OF ALL F
TRADES TO PREVEN
REMOVAL OR RELOCA
WORK INTERFERING
OTHER TRADES SH
CONTRACTOR'S DESK
OTHERWISE APPROVE

POOL EQU
1 FILTER TANK
2 CIRCULATING P
3 FLOW MANDRA
4 POOL HEATER
5 GAS CHLORIN
6 SLURRY CHE
7 CHEMICAL FI
8 SODA ASH ST
9 1/2" FUNNEL F
10 1" VALVE FITES
11 VACUUM PUMP
12 STRAINER
13 STRAINER
14 SUMP PIT
15 DIAPHRAM CON
16 SEWAGE PUMP
17 SUMP PUMP

GENERAL NOTE:
1. FLOWING SUB-CONTRACTOR SHALL
IN EXACT LOCATION OF
WATER C FOR MECHANICAL EQUIP
HEATING SUB-CONTRACTOR
LOCATION OF ALL FIX
ACCESS DOORS, ETC. SH
ARCHITECT BEFORE ROL

REVISION NOV. 11
TO INCLUDE ADDING
NOTICE OF CHANGE

E. ROSE
REGISTERED PROFESSIONAL ARCHITECT
59-67

GLENFEST SWIMMING POOL
FOR THE COMPLETION
OF THE SERVICE OF WORK

POOL ELEVATIONS
AND DETAILS
PLUMBING & DRAINAGE

SCALE
AS NOTED

DATE
AUG/68

DRAWN BY
F.H.

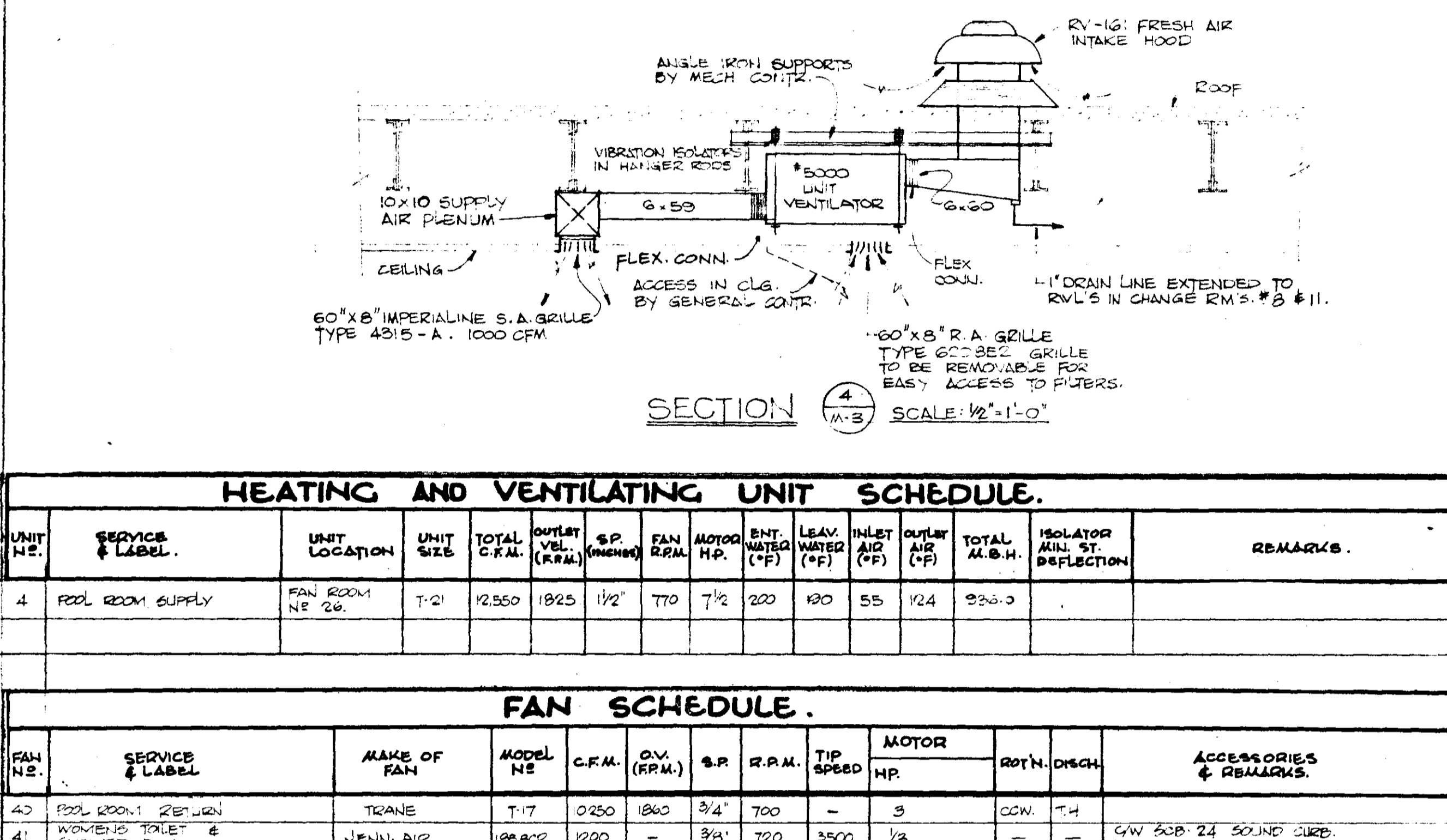
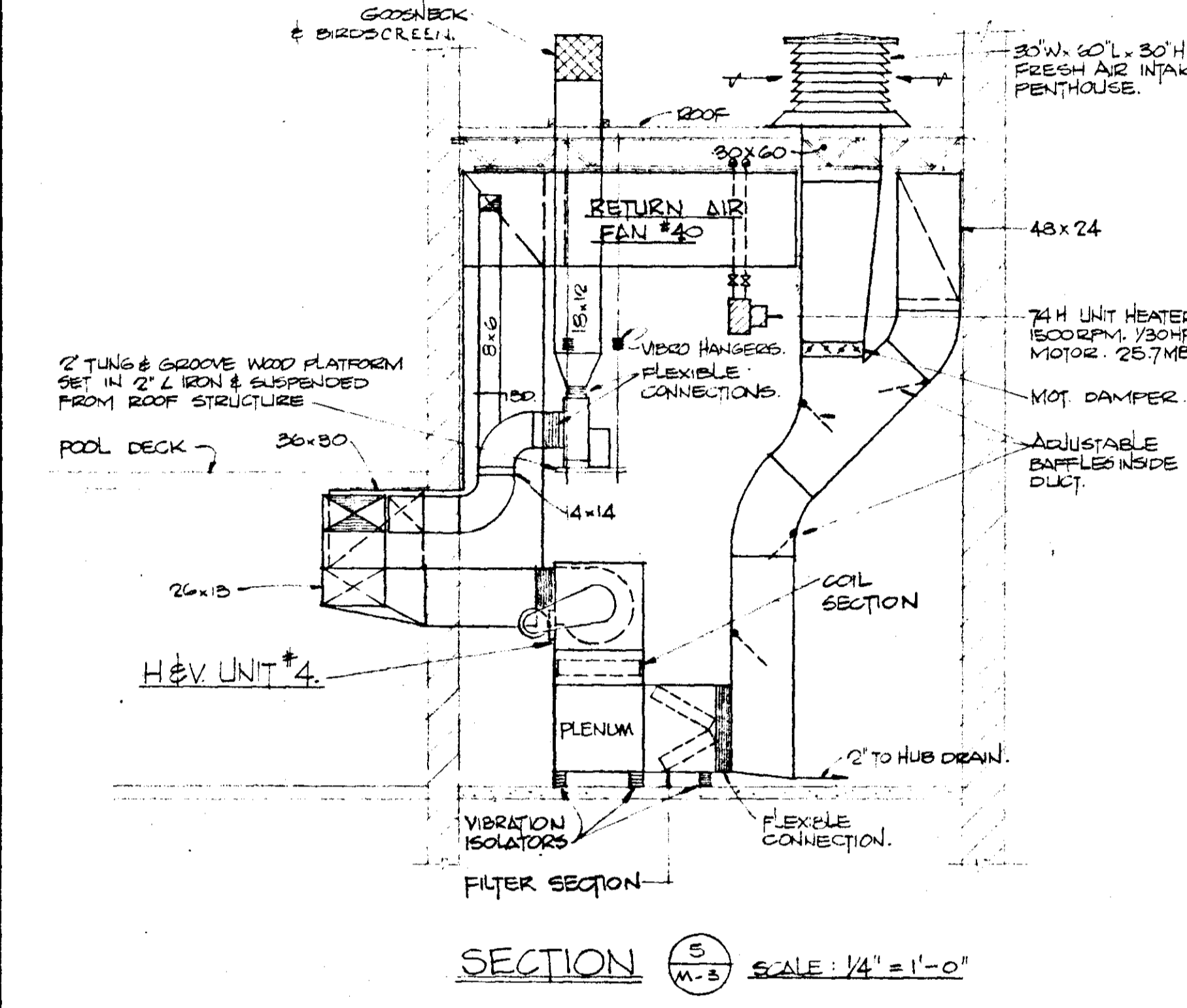
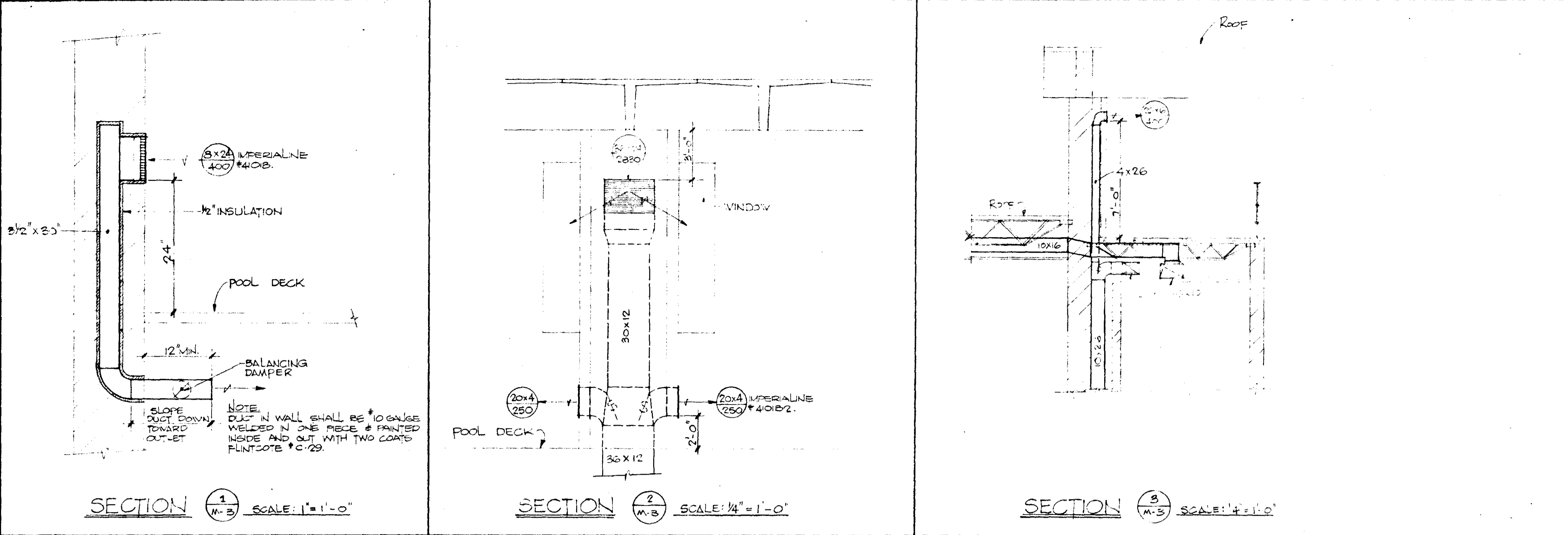
CHECKED BY
T.G.

SHEET NO.
10

JOB NO.
6887

HANKS, IRWIN
ARCHITECTS
2848 BLOOR ST. W. TORONTO

BEFORE COMMENCEMENT OF THIS SUB CONTRACTOR SHALL LOCATE ALL PIPING TRADES TO PREVENT REMOVAL OR RELOCATION WORK INTERFERING WITH OTHER TRADES SHALL CONTRACTORS RESPOND OTHERWISE APPROVED



HEATING AND VENTILATING UNIT SCHEDULE.

UNIT NO.	SERVICE & LABEL	UNIT LOCATION	UNIT SIZE	TOTAL CFM	WATER FLOW (GPM)	WATER PRESS. (PSI)	FAN RPM	MOTOR HP	ENT. WGT. (LBS)	LEAK WGT. (LBS)	INLET WGT. (LBS)	OUTLET WGT. (LBS)	TOTAL A.W.B.	INSULATOR R-1	REMARKS
4	POOL ROOM SUPPLY	FAN ROOM NO. 24	1'-2"	12500	1825	1 1/2"	770	7 1/2	220	100	55	124	220-0		

FAN SCHEDULE.

FAN NO.	SERVICE & LABEL	MAKE OF FAN	MODEL NO.	C.E.M.	Q.V. (RPM)	Q.P.	R.P.M.	TIP SPEED	MOTOR HP	RTN. DICH.	ACCESSORIES & REMARKS
40	POOL ROOM SUPPLY	TRANE	T-17	0.250	840	3/4"	700	—	3	CGW	TH
41	WOMEN'S TOILET & SHOWER EXH.	JENN. AIR	BB202	1200	—	9/8"	720	3500	3/8	—	GW 500 2 1/2" SOUND CURB
42	MEN'S TOILET & SHOWER EXH.	JENN. AIR	BB202	1200	—	9/8"	720	3700	3/8	—	GW 500 2 1/2" SOUND CURB
43	POOL EQUIPMENT EXH.	TRANE	18 B1	1500	9.40	3/8"	1800	—	1/4	CGW	1.8 TATS 2 1/2" EXH. & 2 1/2" 3/8" BASE.
44	EMERGENCY EXH.	JENN. AIR	T10W	155	—	1/8"	1600	—	1/2	—	—

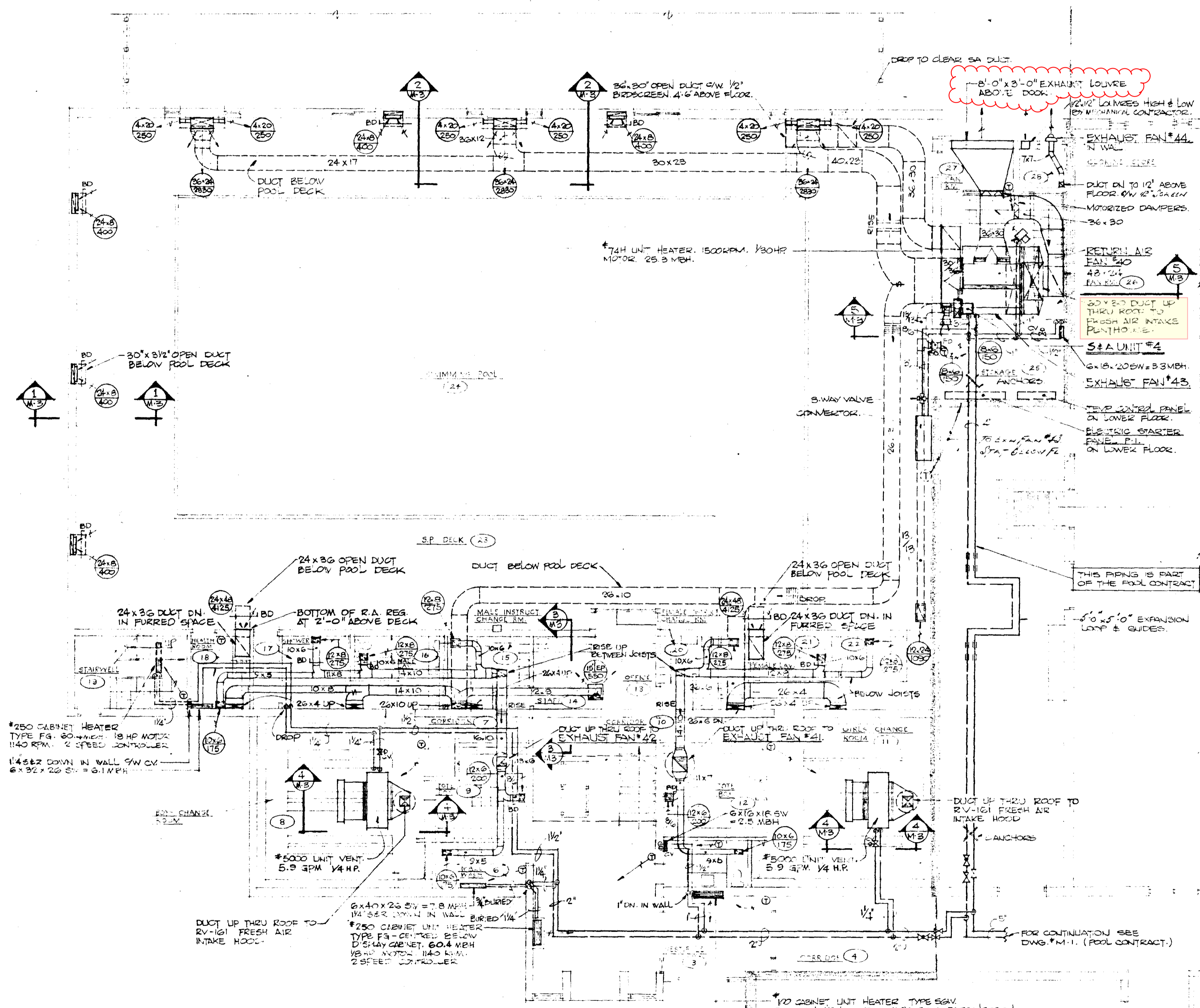
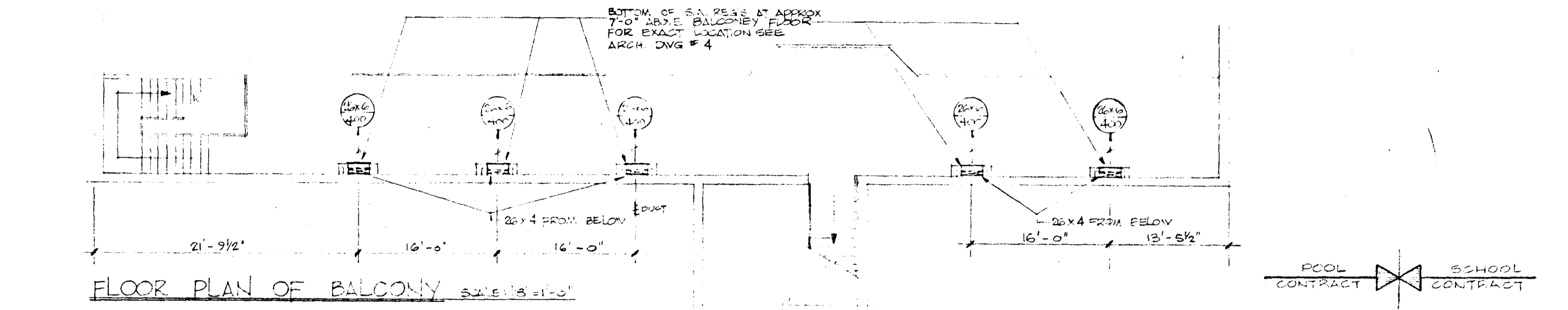
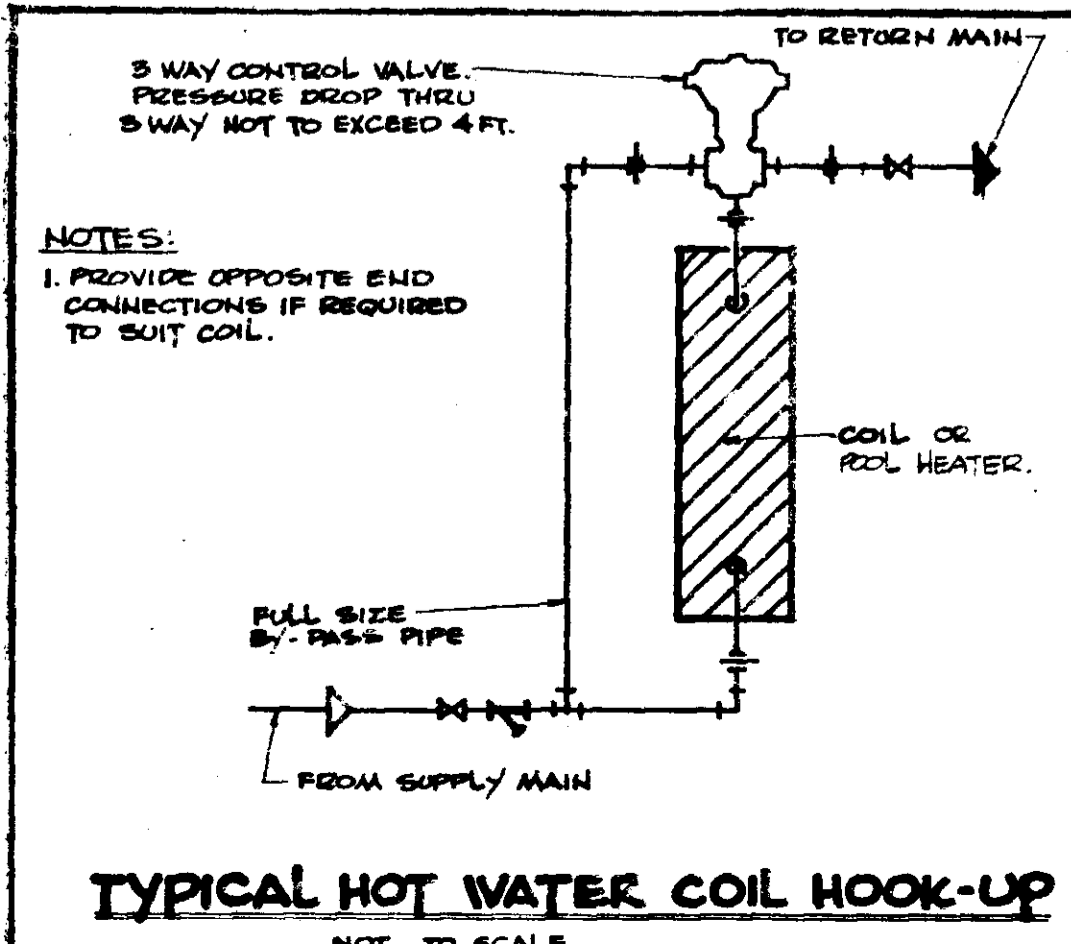
M.E. EQUIPMENT STARTER & ELECTRIC

NO.	DESCRIPTION	UNIT	STARTER TYPE	PHASE	VOLTS	AMPS	HP	WIRE SIZE	CONDUIT	TERMINALS	REMARKS
1	POOL ROOM SUPPLY AIR FAN NO. 2	3	MAGNETIC	3	240	12	3	10	1/2"	3	WIRE TO START FROM 120 VOLT MAIN SWITCH IN "POOL ROOM"
2	POOL ROOM RETURN AIR FAN NO. 40	3	MAGNETIC	3	240	12	3	10	1/2"	3	INTERLOCK TO START WITH SUPPLY AIR UNIT NO. 4
3	WOMEN'S TOILET & SHOWER EXH. FAN NO. 41	1	MANUAL	1	120	1	1/2	10	1/2"	1	INTERLOCK TO START WITH SUPPLY AIR UNIT NO. 4
4	MEN'S TOILET & SHOWER EXH. FAN NO. 42	1	MANUAL	1	120	1	1/2	10	1/2"	1	INTERLOCK TO START WITH SUPPLY AIR UNIT NO. 4
5	POOL EQUIPMENT EXH. FAN NO. 43	1	MANUAL	1	120	1	1/2	10	1/2"	1	WIRE TO 120 VOLT ROOM THERMOSTAT WITH SWIRLAGE
6	EMERGENCY EXH. FAN NO. 44	1	MAGNETIC	1	120	1	1/2	10	1/2"	1	WIRE TO 120 VOLT SOLENOID VALVE IN GYM SWIRLAGE
7	WOMEN'S TOILET & SHOWER EXH. FAN NO. 41	1	MANUAL	1	120	1	1/2	10	1/2"	1	WIRE FROM 120 VOLT VACUUM SWITCH TO THE GYM ALARM PANEL
8	MEN'S TOILET & SHOWER EXH. FAN NO. 42	1	MANUAL	1	120	1	1/2	10	1/2"	1	WIRE FROM 120 VOLT THERMISTOR TO 120 VOLT GYM SWIRLAGE VALVE
9	POOL EQUIPMENT EXH. FAN NO. 43	1	MANUAL	1	120	1	1/2	10	1/2"	1	WIRE FROM CONTROL PANEL TO EACH MOTOR AND 120 VOLT TO EACH FAN UNIT
10	EMERGENCY EXH. FAN NO. 44	1	MAGNETIC	1	120	1	1/2	10	1/2"	1	WIRE TO START FROM 120 VOLT MAIN SWITCH IN "POOL ROOM"
11	TEMP. CONTROL SYSTEM CONTROL PANEL	1	MANUAL	1	120	1	1/2	10	1/2"	1	SELECT 5 1/2" VOLT 120 VOLT OUTLET ADJACENT TO CONTROL PANEL
12	TEMP. CONTROL SYSTEM CONTROL PANEL	1	MANUAL	1	120	1	1/2	10	1/2"	1	SELECT 5 1/2" VOLT 120 VOLT OUTLET ADJACENT TO CONTROL PANEL
13	POOL EQUIPMENT EXH. FAN NO. 43	1	MANUAL	1	120	1	1/2	10	1/2"	1	WIRE FROM CONTROL PANEL TO EACH MOTOR AND 120 VOLT TO EACH FAN UNIT
14	EMERGENCY EXH. FAN NO. 44	1	MAGNETIC	1	120	1	1/2	10	1/2"	1	WIRE FROM CONTROL PANEL TO EACH MOTOR AND 120 VOLT TO EACH FAN UNIT

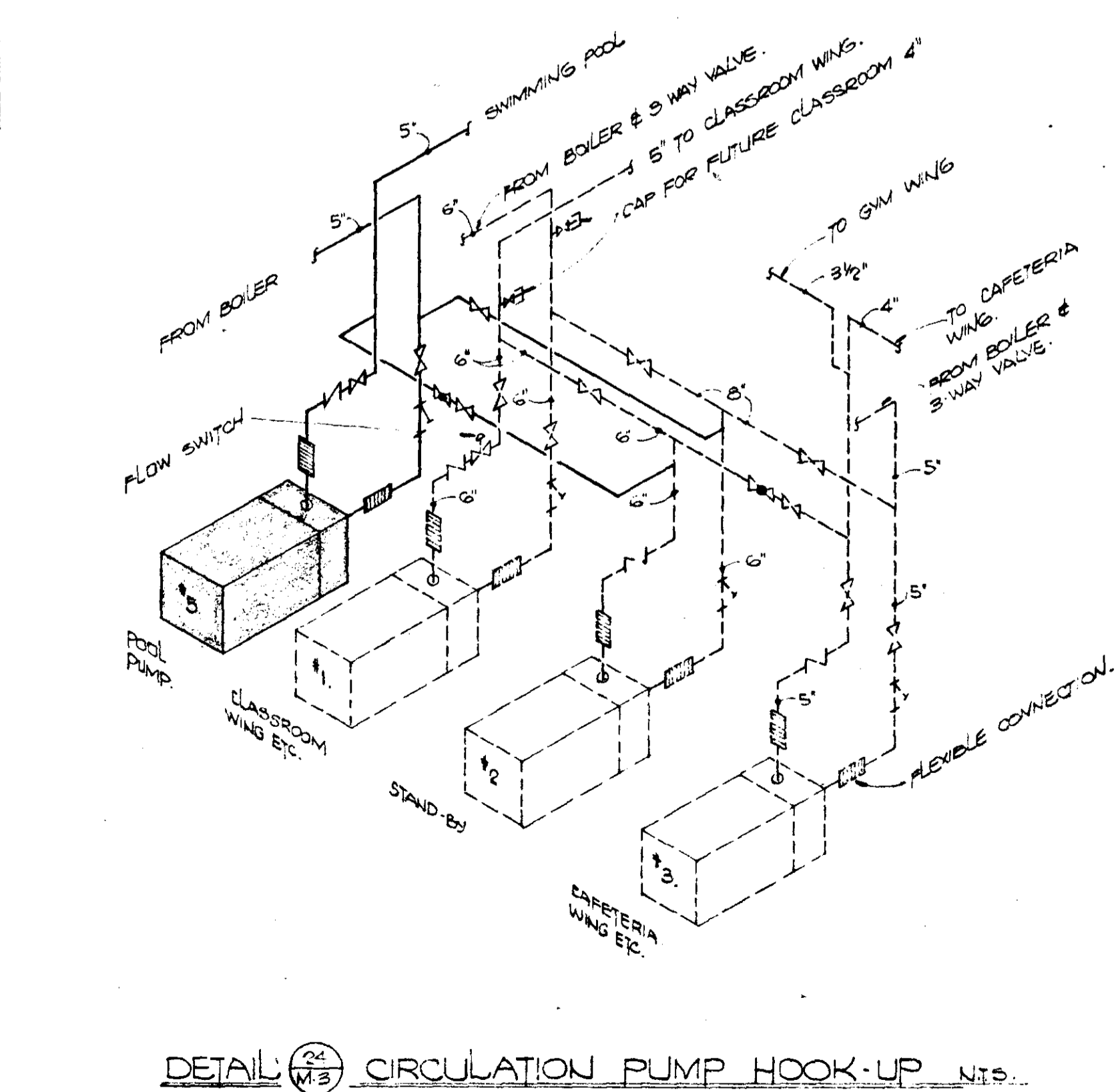
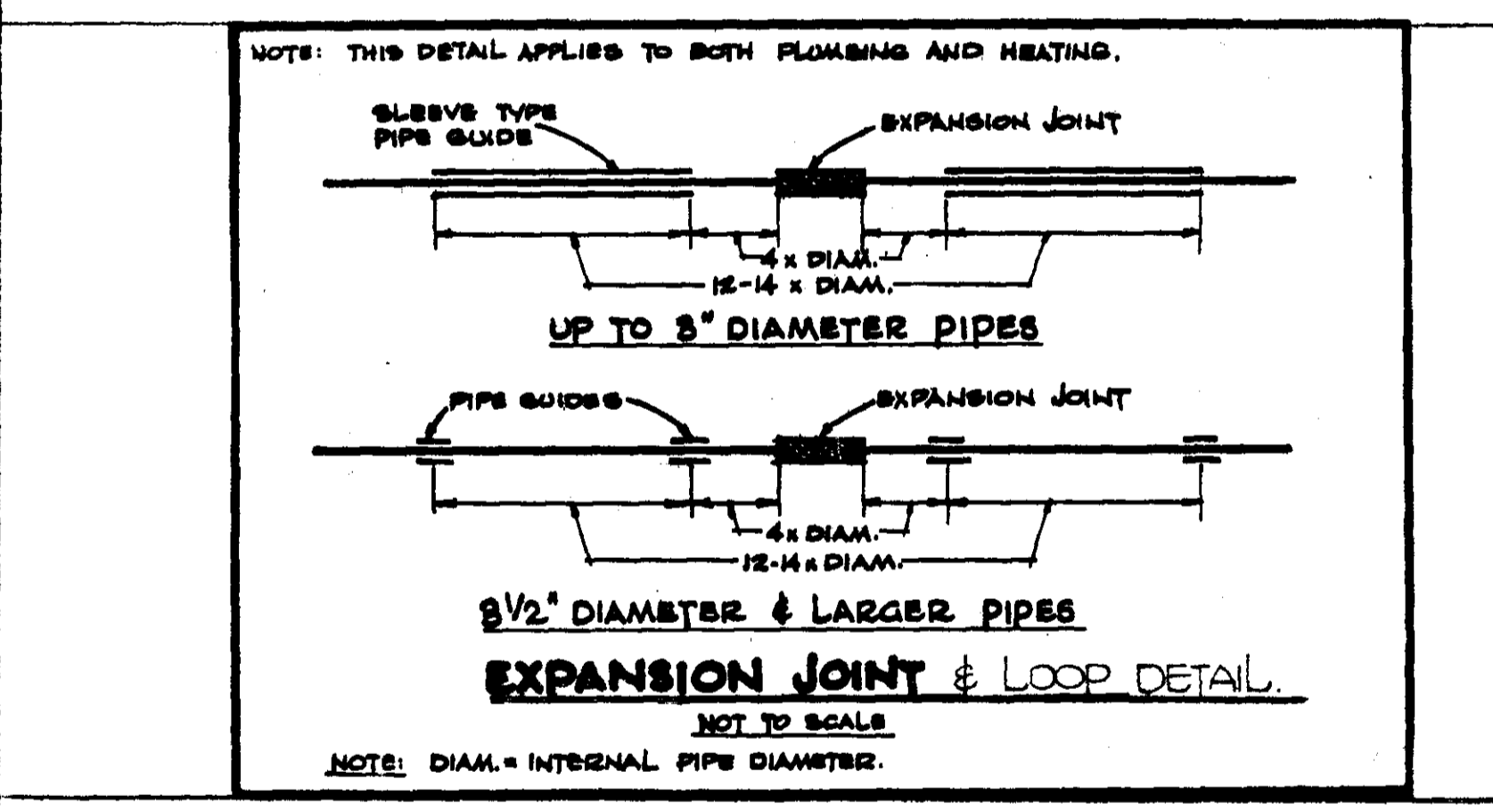
CIRCULATING PUMP SCHEDULE.

PUMP NO.	SYSTEM SERVED AND PUMP MAKE, MODEL & SIZE	Q.V. (GPM)	HEAD (FT)	MOTOR HP
B	SWIMMING POOL	241	38	5

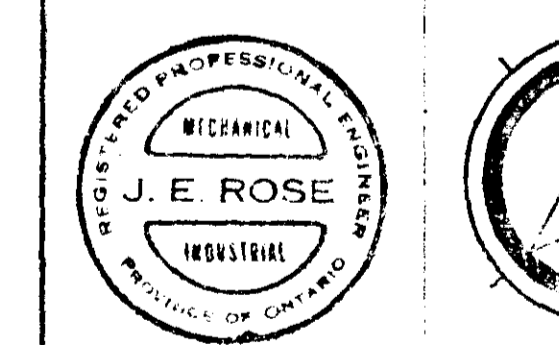
NOTES:
 1. LABELS ON SA. UNITS AND ALL PIPING SHALL BE AS NOTED IN THEIR RESPECTIVE SCHEDULES.
 2. INTERLOCKS FIRE FREEZE SAFETY SWITCHES BY TEMPERATURE CONTROL TO STOP THE SYSTEM.
 3. ALL POWER WIRING TO THREE PHASE EQUIPMENT IN GYM ROOM AND FAN ROOM BY MECH. ENR. SEE SPEC.
 4. PROVIDE SWITCHING BELONGS FOR SINGLE PHASE MOTORS WITH MANUAL STARTERS WHERE INTERLOCKED OR WIRING TO OTHER EQUIPMENT. SEE SPEC. WIRING FROM STARTER PANEL TO ALL FROM EXHAUST FANS WILL BE DONE BY ELECTRICIAN TO BE MOUNTED STARTER TO SAME.



FLOOR PLAN SCALE: 1/8" = 1'-0"
NOTE:
 THE FOLLOWING FIRE DAMPERS HAVE BEEN DELETED:
 5 - IN 20x4 DUCTS IN BALCONY WHERE PIPING THRU WALL.
 4 - IN DUCTS PASSING THRU WALL FROM FAN ROOM #26 TO POOL AREA.
 12 - IN DUCTS PASSING THRU POOL DECK FROM TUNNEL BELOW.
 2 - IN 18x10 & 14x10 DUCTS PASSING THRU WALL FROM CHANGE AREA TO INSTRUCTOR ROOM.
 23 TOTAL



REVISED NOV. 1 TO INCLUDE ADDITIONAL NOTICE OF CHANGE



GLENVIEW SWIMMING POOL
 22 THE ROADWAY
 GLENVIEW, ILL. 60040

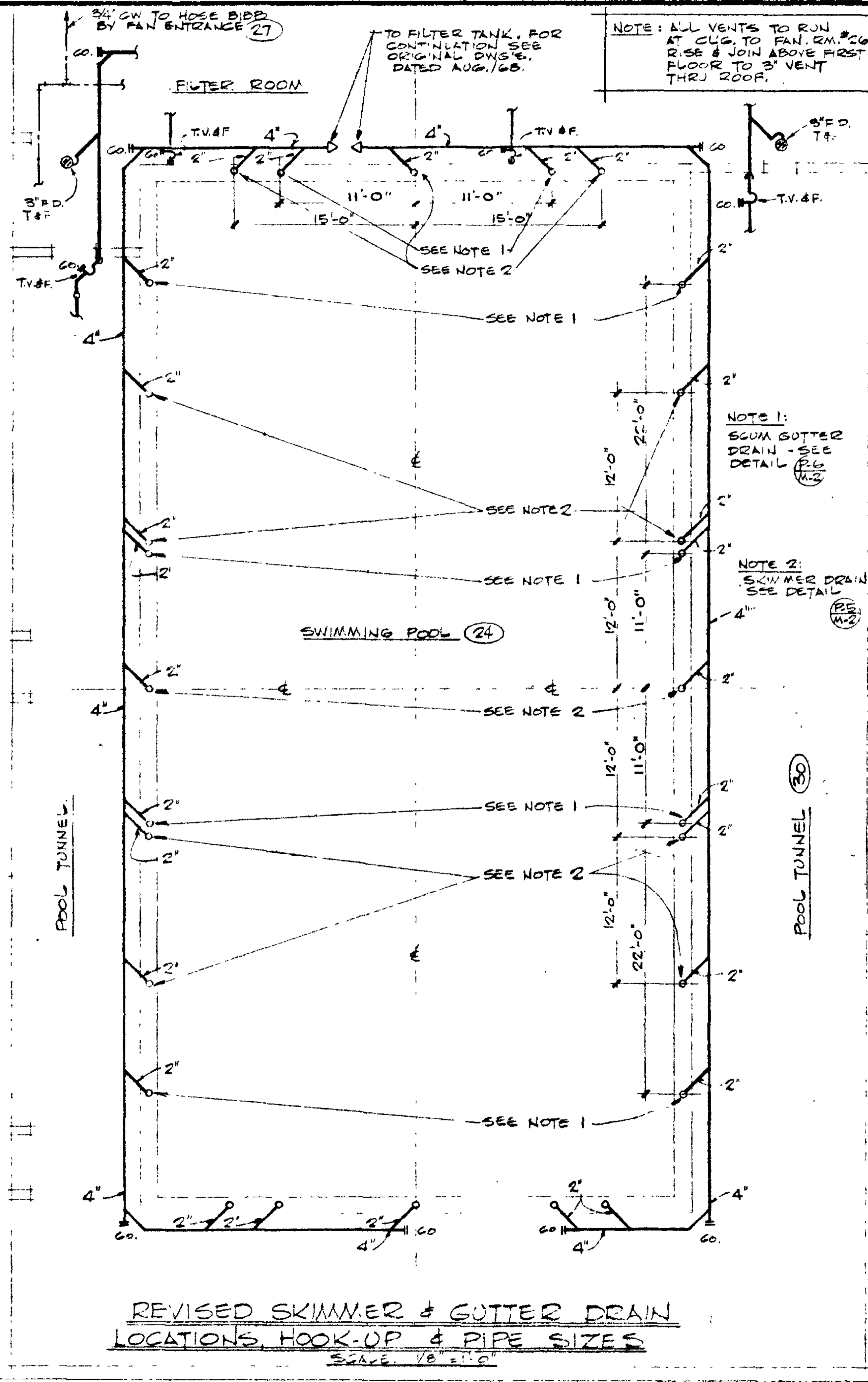
FLOOR PLAN, DETAILS & SCHEDULE
 HEATING, VENTILATING & AIR CONDITIONING

SCALE	AS NOTED
DATE	1968
DESIGNER	J.E. ROSE
DRAWN BY	J.E. ROSE
CHECKED BY	J.E. ROSE
DATE	11/1/68
BY	J.E. ROSE

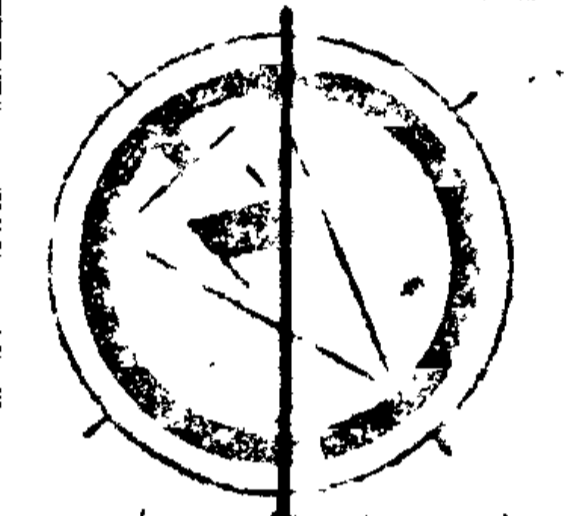
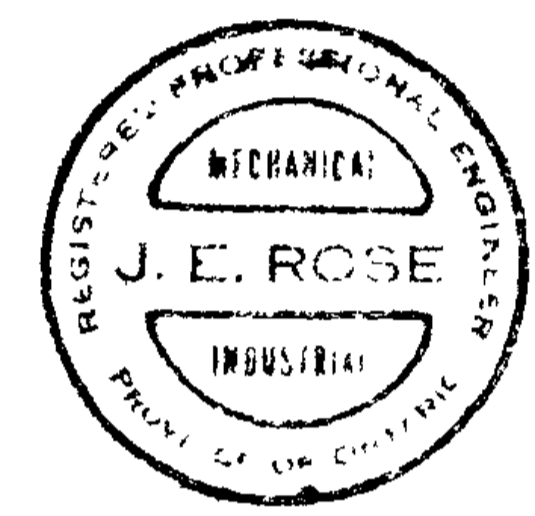
HANKS, IRWIN & PE

PLUMBING LEGEND

	SANITARY DRAIN
	STORM DRAIN
	VENT LINE
	COLD WATER LINE
	HOT WATER LINE
	RECIRCULATION LINE
	FIRE LINE
	TEMPERED WATER LINE
	CLEANOUT
	HOSE BIBB
	FLOOR DRAIN
	HUB DRAIN
	ROOF HOPPER
	PIPE ANCHOR
	EXPANSION JOINT & GUIDES
	GATE VALVE
	CHECK VALVE
	GLOBE VALVE
	UNION
	STRAINER
	RAINWATER LEADER
	BACKWATER VALVE
	FIREHOSE CABINET
	TRAP, VENT & FLUSH
	SHOWER HEAD
	OPEN STEM & YOKE
	AREA DRAIN
	CATCH BASIN
	MANHOLE
	CAST IRON
	EXISTING GRADE
	FINISHED GRADE
	INVERT ELEVATION OF PIPE
	SLURRY LINE
	VACUUM LINE
	SUPPLY LINE
	VACUUM FITTING
	DECK DRAIN ABOVE
	SUPPLY FITTING
	SKIMMER DRAIN
	GAS CHLORINE LINE



REVISED SKIMMER & GUTTER DRAIN LOCATIONS, HOOK-UP & PIPE SIZES
SCALE: 1/8" = 1'-0"



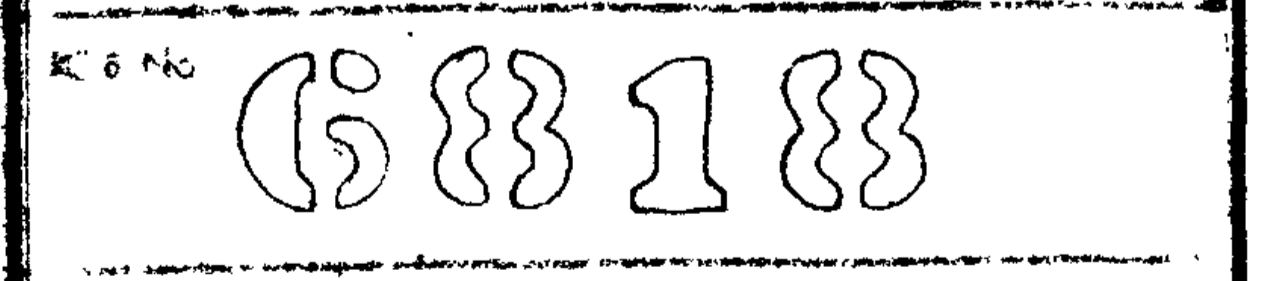
GLENFOREST SWIMMING POOL
FOR THE CORPORATION
OF THE TOWN OF MISSISSAUGA, ONT.

PLUMBING LEGEND FOR
POOL AND PART BASEMENT
PLAN SHOWING DRAINAGE
REVISIONS.

DATE: SEPT 19/68
DRAWN BY: BES



DRAWN BY: T.G.
SHEET NO: MRP-1



HANKS IRWIN & FLARSON
ARCHITECTS
2248 BLOOR ST. W. TORONTO ONT. M6H 1P5

2061 R019

- 1 General
- 1.1 **SECTION INCLUDES**
 - .1 Labour, Products, equipment and services necessary for earthwork Work in accordance with the Contract Documents.
- 1.2 **REFERENCES**
 - .1 ASTM D698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort.
 - .2 ASTM D4253, Test Method for Maximum Index Density and Unit Weight of Soil Using a Vibratory Table.
 - .3 OPSS, Ontario Provincial Standard Specification.
- 1.3 **SUBMITTALS**
 - .1 Reports:
 - .1 Submit written laboratory test reports.
 - .2 Submit written field inspection and test report results after each inspection.
 - .2 Submit dewatering methods 30 days in advance for review by Consultant. If well point system is required, Engineer shall design system and supervise installation.
 - .3 Submit to Consultant details of locations where surplus soils and other materials are to be disposed of or reused. Include each disposal/reuse Site and type of surplus soil or other material, location of the disposal/reuse Site, operator's name and business address, type of license under which Site operates, and criteria used by Site to access suitability of surplus material for disposal.
 - .4 Submit to Consultant, within 48 hours of a load of surplus soil or other material leaving the Site, a daily register recording the time and place of disposal/reuse of each load signed by a representative of the disposal site. Such documentation must be submitted before payment for excavation will be made.
- 1.4 **QUALITY ASSURANCE**
 - .1 Have shop drawings signed and sealed by a Professional Engineer licensed in Province of Ontario and having experience in design and inspection of shoring, bracing, underpinning and dewatering (if required) required to complete Work.
- 1.5 **SITE CONDITIONS**
 - .1 Geotechnical conditions: For information on subsurface conditions refer to document in accordance with Authorities having Jurisdiction

- .2 Cultural heritage resources: If Cultural Heritage Resources (such as archaeological sites, artifacts, building and structural remains, and/or human burials) are encountered during performance of Work, contact Consultant immediately and suspend Work in immediate area until assessment has been completed by Ministry of Culture, Tourism and Recreation. Perform required measures to mitigate negative impacts on found resources to acceptance of Consultant.

1.6 PROTECTION

- .1 Existing buried utilities and structures:
 - .1 Size, depth and location of known existing utilities and structures are indicated for guidance only. Completeness and accuracy is not guaranteed.
 - .2 Prior to commencing any excavation Work, have authorities stake out utility locations to prevent disturbance during Work.
 - .3 Confirm locations of buried utilities by careful test excavations. Hand dig test excavations as necessary.
 - .4 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered. Obtain permission of Consultant before moving or otherwise disturbing utilities or structures.
- .2 Existing buildings and surface features:
 - .1 Conduct with Consultant, a condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks and paving, survey bench marks and monuments which may be affected by Work.
 - .2 Protect existing buildings and surface features which may be affected by Work from damage while Work is in progress and repair damage resulting from Work.
 - .3 Where excavation necessitates root or branch cutting, perform Work in accordance with Authorities having Jurisdiction.
 - .4 Confirm with Consultant, condition Survey of buildings and structures undertaken by Consultant.
- .3 Temporarily cover local existing catch basins and maintenance holes to prevent entry of earth or debris. Ensure adequate surface drainage in affected area is maintained.
- .4 Protect Work or work of other Contracts in progress or completed and protect existing properties, stored Products, services, utilities, trees, landscaping and natural features from damage.
- .5 Protect excavations against flooding and damage and install and maintain appropriate warning devices during construction and during time when Work is closed down for any cause.
- .6 Protect bottom of excavations that will support foundations, slabs, pavements etc. from frost or freezing.
- .7 Keep access roads clear of debris and dirt resulting from Work of this Section to acceptance of Authorities having jurisdiction.

- .8 Shoring, bracing and underpinning: Comply with local regulations, authorities having jurisdictions and requirements specified.

2 Products

2.1 **MATERIALS**

- .1 Select fill: Subject to approval of Consultant consisting of reusable fill excavated from Site or imported fill that is free of organic matter, rubble and material other than soil. Maximum particle size of half thickness of lift specified, moisture content at time of placing 2% maximum over its optimum moisture content and is either non plastic or has a plasticity index of 25% maximum.
- .2 Granular A fill: Imported Granular A fill, free of organic matter and, in accordance with OPSS 1010.
- .3 Granular B Fill: Imported Granular B fill free of organic matter and in accordance with OPSS 1010.
- .4 Engineered fill: Clean, hard, durable crushed rock or stone, free of shale, clay, organic material, recycled material or any other deleterious substance. Engineered fill shall be in accordance with OPSS 1010 Granular B Type II. Moisture content shall be within 2% of Optimum Moisture Content in accordance with ASTM D698.
- .5 Clear Stone fill: 19 mm clear stone in accordance with OPSS 1004, free of organic material.
- .6 Unshrinkable fill: 0.7 MPa cement stabilized backfill conforming to requirements of CAN/CSA A23.1/A23.2-M.
- .7 Dewatering equipment: Equip submersible pumps with filters and/or screens to prevent ground loss. Maintain filters in good operating condition.

3 Execution

3.1 **EXAMINATION**

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 **LINES AND ELEVATIONS**

- .1 Establish lines and elevations from Control Points shown on Contract Drawings.
- .2 Have lines and elevations established by Registered Ontario Land Surveyor or qualified Civil Engineer registered in Province of Ontario.
- .3 Protect and maintain Control Points and Bench Marks as long as they are required.

3.3 **STRIPPING**

- .1 Do not handle topsoil while in wet or frozen condition or in manner in which soil composition is adversely affected.
- .2 Strip topsoil from working area in locations shown.
- .3 Strip topsoil to depths indicated. Avoid mixing topsoil with subsoil.
- .4 Stockpile topsoil in locations directed by Consultant. Stockpile to height not exceeding 2 m. Remove excess topsoil from Site.

3.4 **REMOVAL OF WATER**

- .1 Obtain letter of conditional approval from Authorities having Jurisdiction to dispose of ground water into sewer drainage system. Apply for and pay for water disposal permit.
- .2 Keep excavations and trenches free of water throughout construction period.
- .3 Groundwater removal:
 - .1 Lower groundwater level and maintain at depth below lowest point of excavation to ensure a dry stable surface.
 - .2 Dewater to prevent loss of soil and maintain stability of sides and bottom of excavation and of adjacent structures.
 - .3 Dispose of water in conformance with applicable by-laws and in a manner not detrimental to public and private property, or portion of Work completed or under construction.
 - .4 Supply and install flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to sewers, water courses or drainage areas in accordance with authorities having jurisdiction. Perform testing on settlement tank discharge to confirm that effluent meets sewer bylaw requirements. Locate tanks to acceptable area determined by Consultant.
 - .5 Should method of dewatering fail to achieve conditions specified above, Consultant reserves right to revise methods and procedures at no cost to Owner.
- .4 Surface water removal:
 - .1 Remove surface run-off in a manner that will prevent loss of soil and maintain stability of sides and bottom of excavation. Obtain Consultant's approval of dewatering method to be used.
 - .2 Discharge surface water into existing storm drainage system to acceptance of Consultant and local authorities.
- .5 Do not obstruct flow of surface drainage or natural water courses.

3.5 **EXCAVATION**

- .1 Remove concrete, masonry, paving, demolished foundations and rubble and other obstructions encountered during excavation Work.
- .2 Do not disturb soil within drip line of trees or shrubs that are to remain. If excavating through roots, excavate by hand and cut roots with sharp axe or saw in a manner acceptable to authorities having jurisdiction.
- .3 Excavate to required lines and grades shown on Contract Drawings with allowance for subsequent Work including shoring, bracing and formwork. Make excavation clean and clear of loose material and true to size.
- .4 Protect stockpiles of fill against contamination and moisture absorption.
- .5 Do not undermine adjacent structures. Where it is necessary to have footings at different levels, found upper footing below imaginary 10-horizontal-to-7 vertical line, or as otherwise indicated, drawn up from base of lower footing. Protect adjacent foundations from frost.
- .6 Have excavations in excess of 1200 mm in depth conform to requirements of Occupational Health and Safety Act, and Regulations for Construction Projects.
- .7 Do not expose shale at subgrade elevation to drying cycles and in any case, following inspection, cover with minimum 50 mm of lean concrete within 4 hours after exposure.
- .8 Fill excavations for foundations which are, through error, carried below elevation shown or approved depth, with 15 MPa concrete, or as directed by Consultant.
- .9 Trim, and remove loose material, debris and organic material from excavations. Where material at bottom of excavation is disturbed, remove disturbed material and re-compact to density equal to or better than undisturbed soil or backfill with lean concrete as directed by Consultant.
- .10 When excavations are complete, prior to commencement of subsequent Work, request Consultant for inspection of excavation Work.

3.6 **TRENCHING**

- .1 Excavate trenches to lines and grades indicated and to a depth of 75 mm minimum below invert elevation and slope established for pipe, and backfill to invert elevation of pipe with specified granular material.
- .2 Unless otherwise authorized by Consultant, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation. Remove unsuitable material from trench bottom to extent and depth as directed by Consultant.
- .3 Backfill over-excavation with granular material and compact.

- .4 If unstable soil conditions are encountered, excavate trenches to depth directed by Consultant and backfill to correct elevation with backfill material.
- .5 Remove loose material from bottom of trenches to ensure granular material is placed against undisturbed soil.
- .6 Compact bedding and grade as required for even and uniform support on each length of pipe.
- .7 Where excavating is required adjacent to and parallel with and below any footing, submit excavation and backfill procedures to Consultant for review prior to start of excavating.
- .8 Keep width of trenches to a minimum to ensure minimum span for pipe to be supported.
- .9 Make excavations for fire hydrants of sufficient size and depth to accommodate a minimum 0.75 m³ of crushed stone. Hand place stone and tamp around and below hydrant elbow to ensure proper drainage of hydrant.

3.7 EXCAVATED MATERIAL DISPOSAL

- .1 Except for material to be used as select fill, immediately remove and dispose of excavated material from Site.
- .2 Remove and dispose of construction rubble, abandoned gas, water and sewer pipes, valves, valve boxes and fittings, maintenance holes, frames and covers and other material which may be encountered during excavation but not indicated on Contract Drawings.

3.8 ENGINEERED FILL

- .1 Provide engineered fill below foundations in accordance with recommendations contained in the geotechnical report. The engineered fill at footing level must extend horizontally 1.2 m beyond edge of footings beyond which point the sides of the engineered fill zone may be sloped at 1 vertical to 1 horizontal.
- .2 Place engineered fill in layers not exceeding 200 mm in the uncompacted state. Compact each layer to a minimum of 100% Standard Proctor Density in accordance with Section ASTM D698.
- .3 Use mechanical compaction equipment that is appropriate for the material being placed.
- .4 Provide a minimum of 24 hours notice to the inspection and testing company to arrange for compaction testing for each layer of fill.
- .5 Do not place next lift of fill until previous lift has been tested and found to be adequately compacted in accordance with the specified level of compaction.

- .6 Confirm elevations of top of engineered fill layer upon completion of placement and compaction.
- .7 Protect surface of engineered fill from any disturbance.
- .8 Do not place fill during period of freezing ambient temperature.
- .9 Remove and replace fill until compaction test reports by the testing agency are satisfactory to the Consultant.

3.9 **BACKFILLING**

- .1 Do not proceed with backfilling operations until walls, slabs, waterproofing and below grade Work has been inspected and accepted by Consultant.
- .2 Backfill areas which are free from debris, snow, ice, water and frozen ground.
- .3 Do not use backfill material which is frozen or contains ice, snow or debris.
- .4 Do not backfill on or against any membrane or protection board covered waterproofing with jagged rock or other sharp objects which might damage waterproofing.
- .5 Limit vertical drop of backfill material to 2000 mm.
- .6 Use only rubber-tired vehicles over roof of structure during backfilling, maximum tire pressure 70 kPa. Metal-tracked vehicles will not be allowed on roofs for compaction purposes.
- .7 To avoid pockets and voids, remove sheathing and shoring materials that require removal, as backfilling progresses.
- .8 Prior to backfilling or placing concrete on exposed soil subgrade, proof roll subgrade to identify soft or loose areas. Proceed with placing backfill or concrete only after inconsistencies identified by above procedure have been reworked and compacted or excavated, backfilled and compacted as required to eliminate such conditions to acceptance of Consultant.
- .9 Place backfill material, grade and compact to levels shown on Contract Drawings.
- .10 Place backfill materials in uniform layers 200 mm maximum loose thickness unless specified otherwise.
- .11 Ensure each layer is compacted, and accepted by Consultant, before placing succeeding layers.
- .12 Unless otherwise indicated, use specified granular material from bottom of trench to 300 mm above top of pipe or 150 mm above top of electrical conduits. Hand place in 150 mm layers and compact carefully to ensure proper backfilling and compaction around bottom quadrants and sides of pipe.

- .13 For backfill from 300 mm above top of pipe or 150 mm above electrical conduits to sub-grade level, use select fill unless otherwise noted. Compact either by hand or by machine.
- .14 Do not backfill trenches until piping, conduits and cables therein have been inspected, tested, and approved by inspection authorities having jurisdiction and Consultant.
- .15 Prior to backfilling of trenches, remove wood block or wedges used to prevent movement of piping during tests.
- .16 Where there is a common boundary between select fill and granular fill or unshrinkable fill, place select fill after granular fill has been compacted. Place and compact fill around free standing structures evenly on all sides of structure simultaneously in layers sloping away from structure.
- .17 During backfilling, take care to avoid displacing or damaging Utilities Work and Services.
- .18 Notify Consultant prior to commencement of backfilling and compacting operations.

3.10 **COMPACTION**

- .1 Compaction densities for select fill, granular fill, and sand fill materials will be determined by ASTM D698. Compaction densities for clear stone and pea gravel will be determined by ASTM D4253.
- .2 Add water if necessary to obtain required densities. Correct irregularities or depressions that may develop during compaction by removing or adding material to form a smooth and uniform surface.
- .3 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
- .4 If material is excessively moist, aerate by scarifying with suitable equipment until moisture content is corrected.
- .5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers acceptable to Consultant.
- .6 Compact backfill materials in accordance with Geotechnical Report providing the following as a minimum:
 - .1 Imported fill: 98% standard Proctor maximum dry density (SPMDD).
 - .2 Under slabs, walks and pavements: 100% (SPMDD).
 - .3 All other areas: 95% (SPMDD).

3.11 **GRADING**

- .1 Prior to placing fill over existing ground, scarify surface to depth of 150 mm. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.

- .2 Place material only on clean unfrozen surface, properly shaped and compacted and free from snow and ice. Ensure no frozen material is used in placing.
- .3 Grade as necessary to bring Work areas to required elevations. Supply additional material required to obtain new grade levels. Place and compact as specified.
- .4 Grade drainage ditches to elevations indicated on Contract Drawings.
- .5 Maintain positive drainage.
- .6 Grade materials using methods which do not lead to segregation or degradation of aggregate.
- .7 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .8 Remove and replace that portion of layer in which material becomes segregated during spreading.
- .9 Slope grade away from buildings 1:50 minimum.
- .10 Make graded areas smooth to profile, free of debris, with local excavations and depressions filled and compacted.
- .11 Do not disturb soil within branch spread of trees and shrubs remaining.
- .12 Cultivate entire area which is to receive topsoil to a depth of 100 mm. Repeat cultivation in those areas where equipment used for hauling and spreading has compacted soil.
- .13 Remove surface debris, roots, vegetation, branches and stones in excess of 50 mm in diameter.

3.12 **RESTORATION**

- .1 Upon completion of Work, remove surplus materials and debris, trim slopes, and correct defects as directed by Consultant.
- .2 Clean and reinstate areas affected to acceptance of Consultant.

END OF SECTION

- 1 General
- 1.1 **SECTION INCLUDES**
 - .1 Labour, Products, equipment, tools, and services necessary for asphaltic concrete paving Work in accordance with the Contract Documents.
- 1.2 **REFERENCES**
 - .1 ASTM D698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort.
 - .2 ASTM D1559, Test Method for Resistance to Plastic flow of Bituminous Mixtures Using Marshall Apparatus.
 - .3 CAN/CGSB 1.74, Alkyd Traffic Paint.
- 1.3 **SUBMITTALS**
 - .1 Shop drawings: Submit shop drawings in accordance with Section 01 33 00 indicating sections, materials, dimensions, and relation to adjacent construction.
 - .2 Reports:
 - .1 Submit written mix designs for each type of asphalt concrete for acceptance.
 - .2 8 weeks prior to commencing Work test materials for conformance with requirements of Specifications. Submit written test report verifying compliance 4 weeks minimum prior to commencing Work.
 - .3 Submit written field inspection and test reports.
 - .4 Submit certification that testing laboratory is accredited for asphalt mix design through the Canadian Council of Independent Laboratories (CCIL).
- 1.4 **SITE CONDITIONS**
 - .1 Do not install Work of this Section outside of following environmental ranges without Consultant's and Product manufacturer's written acceptance:
 - .1 Air and surface temperature: Minimum 2°C for binder course and minimum 7°C for surface course.
 - .2 Precipitation: None within 24 hours prior to placement.
- 2 Products
- 2.1 **MATERIALS**
 - .1 Granular base and sub-base material: Granular "A" OPSS 1010, crushed or screened stone or gravel.

- .2 Asphalt materials:
 - .1 Binder course: Hot mixed, hot laid asphalt consisting of a course-graded binder mix with a maximum aggregate size of 26.5 mm.
 - .2 Surface course: Hot mixed, hot laid asphalt consisting of a dense-graded mix with a maximum aggregate size of 16 mm.
 - .3 Tack and primer coat: Slow setting anionic emulsified asphalt.
- .3 Traffic paint: CAN/CGSB 1.74, new pavement markings, white or yellow as selected by Consultant.

2.2 MIXES

- .1 Do not change mix without prior approval of Consultant.

2.3 SOURCE QUALITY CONTROL

- .1 Source approval:
 - .1 Inform Consultant of proposed source of Products and afford access for sampling and testing of quality of Products at least 4 weeks prior to commencing production.
 - .2 Ensure that source of Products to be incorporated into Work or stockpiled is acceptable to Consultant.
 - .3 Submit laboratory test results for samples of specified Products to be supplied by this Section. Include in laboratory test results those tests required to demonstrate that Product meets requirements of this Section.
 - .4 If Products from proposed source do not meet, or cannot reasonably be processed to meet specified requirements, locate an alternative source or demonstrate that Products source in questions can be processed to meet specified requirements.
 - .5 Should a change of Products source be proposed during Work, advise Consultant 14 days in advance of proposed change to allow sampling and testing.
 - .6 Acceptance of Product at source does not preclude future rejection if it is subsequently found to lack uniformity, or if it fails to conform to requirements specified, or if its field performance is found to be unacceptable. Remove and dispose rejected material.
- .2 Production sampling:
 - .1 Products may be subject to continual sampling by Consultant during production.
 - .2 Afford Consultant ready access to source and processed Products for sampling and testing.
 - .3 If Products fail to meet Specifications, bear cost of additional sampling and testing of aggregates and fill.
 - .4 Supply necessary personnel and equipment to permit adequate investigation and sampling. Advise Consultant at least 14 days in advance of use of Products, to allow sufficient time for sampling and testing.

3 Execution

3.1 **EXAMINATION**

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 **CUTTING AND TRENCHING**

- .1 Break out and remove existing asphalt pavement within confines of Work as shown on Contract Drawings.
- .2 Square up adjacent surfaces to remain in place by saw cutting or other methods acceptable to Consultant to avoid damage to remaining pavement.
- .3 Protect underlying granular materials.

3.3 **SCARIFYING AND RESHAPING**

- .1 Scarify asphalt pavement to depth and extent as indicated.
- .2 Blade and trim pulverized pavement material to elevation and cross section dimensions as indicated Consultant.
- .3 Where deficiency of pulverized material exists, add and blend in new granular base material as directed by Consultant. Do not use frozen material.
- .4 Reshape surface to be within 10 mm of specified grade, but not uniformly high or low.
- .5 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.4 **COMPACTING**

- .1 Compact to density not less than 100% maximum dry density in accordance with ASTM D698.
- .2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
- .3 Apply water as necessary during compacting.
- .4 In areas not accessible to compaction equipment, compact to specified density, with mechanical tampers approved by Consultant.

3.5 ASPHALT PRIMER

- .1 Do not apply primer when air temperature is less than 5°C or when rain is forecast within 2 hours.
- .2 If asphalt primer fails to cure within 24 hours, spread sand blotter material in amounts required to absorb excess material. Sweep and remove excess blotter material.

3.6 EQUIPMENT

- .1 Pavers: mechanical grade controlled self-powered pavers capable of spreading mix within specified tolerances, true to line, grade and crown indicated.
- .2 Rollers: sufficient number of rollers of type and weight to obtain specified density of compacted mix.
- .3 Vibratory rollers:
 - .1 Minimum drum diameter: 750 mm.
 - .2 Maximum amplitude of vibration (machine setting): 0.5 mm for lifts less than 40 mm thick.
- .4 Haul trucks: of sufficient number and of adequate size, speed and condition to ensure orderly and continuous operation and as follows.
- .5 Suitable hand tools.

3.7 ASPHALT PAVING

- .1 Provide asphalt surface to match existing in type and thickness.
- .2 Place asphalt mix only when base or previous course is dry and air temperature is above 5°C.
- .3 Place asphalt concrete in compacted layers not exceeding 50 mm per lift.
- .4 Minimum 135°C mix temperature required when spreading.
- .5 Maximum 160°C mix temperature permitted at any time.
- .6 Compact each course with roller as soon as it can support roller weight without undue cracking or displacement.
- .7 Compact paving to density not less than 97% of density obtained with Marshall specimens prepared in accordance with ASTM D1559. Roll until roller marks are eliminated.
- .8 Keep roller speed slow enough to avoid mix displacement and do not stop roller on fresh pavement.

- .9 Moisten roller wheels with water to prevent pick up of material.
- .10 Compact mix with hot tampers or other equipment approved by Consultant, in areas inaccessible to roller.
- .11 Finish surface to be within 5 mm of design elevation and with no irregularities greater than 10 mm in 4.5 m.
- .12 Repair areas showing checking, rippling or segregation as directed by Consultant.

3.8 **JOINTS**

- .1 Remove surplus material from surface of previously laid strip. Do not deposit on surface of freshly laid strip.
- .2 Paint contact surfaces of existing structures such as catchbasins, manholes, curbs or gutters with tack coat prior to placing adjacent pavement.
- .3 For cold joints, cut back to full depth vertical face and tack face with hot asphalt.
- .4 For longitudinal joints, overlap previously laid strip with spreader by 25 to 50 mm.

3.9 **PAVEMENT MARKINGS**

- .1 Spray paint parking zone lines and other pavement markings indicated, included, but not limited to, hash marks for no parking areas, direction arrows and handicap parking symbols.
- .2 Use suitable compressor type striping machine. Use templates for symbols, arrows, lettering.
- .3 Unless otherwise indicated, paint lines 125 mm wide.
- .4 Paint lines straight, or uniformly curved, with well defined edges and full paint coverage in all locations.

3.10 **PROTECTION**

- .1 Keep vehicular traffic off newly paved areas until paving surface temperature has cooled below 38°C. Do not permit stationary loads on pavement until 24 hours after placement.

END OF SECTION

1.1. General Requirements

- 1.1.1. The work described in this Section shall include furnishing all equipment, labour, materials and services to supply and install fine grading and growing media (soil), as shown on the drawings as specified herein and in conformance with the standard noted herein.
- 1.1.2. The conditions of the Contract Division 1 apply to this section in full, as if repeated herein.
- 1.1.3. All depths of materials indicated on the drawings and in these specifications refer to minimum required depth of materials, after compacting, rolling or settling.
 - 1.2.1. Canadian Landscape Standard – Growing Medium.
 - 1.2.2. Agriculture and Agri-Food Canada, The Canadian System of Soil Classification.
 - 1.2.3. Canadian Council of Ministers of the Environment, PN1340, Guidelines for Compost Quality.

1.3. QUALITY ASSURANCE

- 1.3.1. Topsoil shall be site or imported to the site. Provide topsoil sample and test from source shall be submitted for approval by the Consultant. Identify the supplier and the location of the topsoil.
- 1.3.2. Test imported topsoil for N.P.K, minor elements, acidity (pH), organic matter content, clay/ silt / sand / gravel composition or texture, and fertilizer requirements. Comply with fertilizer recommendations in the topsoil reports required.
- 1.3.3. Inspection and testing of growing media (soil) will be carried out by testing laboratory approved by Owner and paid for by the Contractor through Cash Allowance.
- 1.3.4. Test imported topsoil for atrazine. Use only topsoil with less than .05ppm.
- 1.3.5. Provide results prior to sodding. If tests do not comply the contractor shall augment the soil as required and retest the mix until acceptable. At no additional charge.
- 1.3.6. Contractor shall pay for all retesting costs, as well as any remedial additives and action required to conform to the soil profile specified.
- 1.3.7. The Contractor shall provide delivery slips on which the following shall be recorded: supplier, serial number of slip, date, truck number, Contractor,

project, growing media (soil) composition and volume of growing media (soil) delivered to site.

2. PRODUCTS

2.1. IMPORTED GROWING MEDIA (SOIL):

- 2.1.1. The texture classification for these growing media (soil) by Canadian system of soil classification is “loamy sand” to “sandy loam”. The growing media (soil) accommodate a wide selection of plants: they create a balance between good drainage and water retention and are suited to moderate, normal maintenance practices.
- 2.1.2. Based on Canadian Landscape Standard, the properties of growing media (soil) shall be as follows:

Type 1 – Standard Mix	
Soil particle size distribution	
Total sand (0.05 – 2 mm)	50 – 75%
Silt	20 – 40% (Total SSC will sum 100%)
Clay	5 – 20%
Gravel (2 – 75 mm)	>/+/< 5%
Chemical analysis (1)	pH: 6.0 – 7.8 (1)
Plant Available Nutrient Levels (ppm)	
Phosphorous	10 – 60
Phosphorous	80 – 250
Calcium	< 5000
Magnesium	100 – 300
Soluble salt	< 1.5 mmhos/cm
Percent organic matter (dry weight)	4 – 6%
Infiltration/Permeability/Hydraulic	
Conductivity	50 –75 mm/hr at 85% Proctor density

2.2 SOIL AMENDMENTS

2.2.1 Fertilizer:

- 2.2.1.1 Fertility: major soil nutrients present in following amounts:
- 2.2.1.2 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.
- 2.2.1.3 Phosphorus (P): 40 to 50 micrograms of phosphate per gram of topsoil.
- 2.2.1.4 Potassium (K): 75 to 110 micrograms of potassium per gram of topsoil.
- 2.2.1.5 Calcium, magnesium, sulphur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.
- 2.2.1.6 Ph value: less than 7.5

2.2.2 Peatmoss:

- 2.2.2.1 Derived from partially decomposed species of Sphagnum Mosses.

- 2.2.2.2 Elastic and homogeneous, brown in colour.
- 2.2.2.3 Free of wood and deleterious material which could prohibit growth.
- 2.2.2.4 Shredded particle minimum size: 5 mm.

- 2.2.3 Sand: washed coarse silica sand, medium to coarse textured.

- 2.2.4 Organic matter: compost Category A, B in accordance with CCME PN1340, unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.

- 2.2.5 Use composts meeting Category B requirements for land fill reclamation and large scale industrial applications.

- 2.2.6 Limestone:
 - 2.2.6.1 Ground agricultural limestone.
 - 2.2.6.2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.

- 2.2.7 Fertilizer: industry accepted standard medium containing nitrogen, phosphorous, potassium and other micro-nutrients suitable to specific plant species or application or defined by soil test.

3 EXECUTION

3.1 PREPARATION

- 3.1.1 Grade native or sub-grade soils, eliminating uneven areas and low spots, ensuring positive drainage. Dispose of removed materials as directed by the Consultant.
- 3.1.2 After rough grading, scarify and cultivate entire area that is to receive growing media (soil) to a depth of 50mm. Repeat cultivation in those areas where equipment used for hauling and spreading has compacted soil.
- 3.1.3 Remove surface debris, roots, vegetation branches and stones in excess of 50 mm in diameter.
- 3.1.4 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.

3.2 GROWING MEDIA (SOIL) SPREADING

- 3.2.1 Spread growing media (soil) after Consultant has approved sub-grade and growing media (soil) mix.
- 3.2.2 Spread growing media (soil) with adequate moisture in uniform layers over approved, unfrozen sub-grade, where seeding or sodding are indicated. Refer to Section 32 90 00 – Planting, for soil requirements in other planting areas.
- 3.2.3 Spread growing media (soil) as indicated to following minimum depths after settlement
- 3.2.4 150mm for sodded areas.

3.3 WEED CONTROL

- 3.3.1 Allow weed seeds in spread soil to germinate.
- 3.3.2 Eradicate first growth of weeds by hand or through mechanical methods only.

3.4 FINISH GRADING

- 3.4.1 Fine grade and loosen growing media. Eliminate rough spots and low areas to ensure positive drainage. Prepare loose friable bed by means of cultivation and subsequent raking.
- 3.4.2 Roll to consolidate growing media for areas to be seeded or sodded leaving surface smooth, uniform, firm against deep foot printing, and with fine loose texture to approval of Consultant.

3.5 SURPLUS MATERIAL

- 3.5.1 Dispose of all surplus materials legally off-site.

END OF SECTION

- 1 General
- 1.1 **SECTION INCLUDES**
 - .1 Labour, Products, equipment and services necessary for sodding Work in accordance with the Contract Documents.
- 1.2 **SITE CONDITIONS**
 - .1 Install warning signs and other means of protecting sodded areas as required and directed by Consultant to protect sod from damage by traffic.
 - .2 Do not perform Work under adverse field conditions such as frozen soil, excessively wet or dry soil or soil covered with snow, ice or standing water.
 - .3 Obtain approval of sub-grade from Consultant before commencing work.
- 1.3 **SCHEDULING**
 - .1 Schedule sod laying to coincide with preparation of topsoil surface.
 - .2 Schedule to complete sodding in one area before proceeding to next area.
- 1.4 **DELIVERY, STORAGE AND HANDLING**
 - .1 Deliver sod to site within 24 hours of harvesting.
 - .2 Do not store on site more than 36 hours before installation. Keep sod moist until placement.
 - .3 Make materials available for inspection upon arrival on site or at source when requested. Remove rejected material immediately from site.
- 1.5 **MAINTENANCE**
 - .1 Perform following operations from time of installation for minimum of 60 days or until acceptance by Consultant.
 - .1 Water, fertilize, weed, replace sod, roll to remove depressions and establish root contact, mow, and trim sod.
 - .2 Repair and resod dead or bare spots to allow establishment of sod prior to acceptance.
 - .3 Cut grass to 40 mm whenever it reaches height of 60 mm. Remove clippings as directed by Consultant.
 - .4 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100 mm.
 - .5 Maintain sodded areas weed and disease free. Chemicals for weed and disease control applied strictly to manufacturer's recommendation, with pesticides handled by licensed personnel and full responsibility taken by Contractor for use and repair of all damage resulting from use.

.6 Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.

.2 Repair depressions, humps, erosion, washouts or sinkages in finished grades, occurring or developing in Work during maintenance period.

1.6 **WARRANTY**

.1 Warranty all sodded areas for one (1) year from date of Substantial Performance.

.2 During warranty period, replace sod that has failed as result of faulty materials, workmanship and/or erosion.

.3 An additional one (1) month warranty will apply to re-sodded areas.

2 Products

2.1 **MATERIALS**

.1 Sod: Number One Turfgrass Nursery Sod, especially sown and cultivated in nursery fields as turfgrass crop in accordance with N.S.G.A Classification.

.1 Certified No.1 grade cultivate turf grass sod grown from seed mixture containing 90% to 95% by weight of Kentucky blue grass cultivars and 5% to 10% by weight of creeping red, chewings or hard fescue cultivars.

.2 Cut sod shall be 25 mm minimum to 38 mm maximum thickness.

.2 Wooden pegs: 17 x 17 x 250 mm SPF (spruce, pine, fir).

.3 Water: Free of impurities that would inhibit germination and growth.

.4 Fertilizer:

.1 In accordance with Canada Fertilizers Act and Fertilizers Regulations.

.2 Type A: Complete commercial organic fertilizer with minimum 65% insoluble nitrogen. Ratio 1:4:4.

.3 Type B: Complete commercial organic fertilizer, slow release, with maximum 35% water soluble nitrogen. Ratio 2:1:1.

.4 Bonemeal: finely ground with min analysis of 20% P205.

.5 Use Lime where soil analysis indicates pH<6.0.

2.2 **SOURCE QUALITY CONTROL**

.1 Obtain approval for sod source from Consultant.

.2 When proposed source of sod is approved, use no other source without written authorization.

3 Execution

3.1 EXAMINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 PREPARATION

- .1 Verify that grades are correct. If discrepancies occur, notify Consultant in writing and do not commence Work until instructed by Consultant.
- .2 Fine grade surfaces free of humps and hollows to smooth, even grade, and to contours and elevations indicated, tolerance shall be ± 8 mm, surface to drain naturally.
- .3 Remove and dispose of weeds, debris, stones 50 mm in diameter and larger, soil contaminated by oil, gasoline and other deleterious materials, off Site at location acceptable to Consultant
- .4 Cultivate fine grade acceptable to Consultant to 25 mm depth immediately prior to sodding.

3.3 SOD INSTALLATION

- .1 Lay sod within 36 hours of being lifted.
- .2 Handle sod so as to prevent breaking or tearing.
- .3 Lay sod sections in rows, longitudinally, along contours of slopes, joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.
- .4 Roll sod for contact between sod and soil. Do not use heavy roller to correct irregularities in grade.
- .5 Water sod immediately after installation with sufficient amount to saturate sod and upper 150 mm of topsoil.

3.4 SOD INSTALLATION ON SLOPES

- .1 Lay and secure geotextile fabric in areas indicated, in accordance with manufacturer's instructions.
- .2 Cover geotextile with thin layer of topsoil.
- .3 Commence laying sod at bottom of slope.
- .4 Lay sod sections perpendicular to slopes greater than 3:1.

- .5 On slopes from 1.75:1 to 3:1, peg every sod in bottom three rows and in every third row above.
- .6 Peg sod to following pattern:
 - .1 100 mm below top edge at 200 mm on centre for first sod sections along top of slopes.
 - .2 4 pegs per square metre minimum.
 - .3 6 pegs per square metre minimum in drainage structures. Adjust pattern as directed by Consultant.
 - .4 Drive pegs flush with soil surface of sod sections.

3.5 FERTILIZING PROGRAM

- .1 Prior to sodding add fertilizer to topsoil.
- .2 Spread Type A fertilizer uniformly over entire area of topsoil, at least one week prior to sodding, at manufacturer's recommended rate of application.
- .3 Mix fertilizer thoroughly to full depth of topsoil.
- .4 Fertilize sodded areas with Type B fertilizer one month after sodding, spread evenly at manufacturer's recommended rate of application.

3.6 CLEANING

- .1 Daily, and on completion of sodding operations, remove surplus materials from Site.
- .2 Clean pavement of accumulation of earth or surplus materials resulting from Work.

3.7 PROTECTION AFTER COMPLETION

- .1 Assume full responsibility for protection of all sodded areas for a minimum 6 months period.
- .2 Erect and maintain protective barriers and signs until removal after Final acceptance.
- .3 Remedy all damages, wash outs and eroded areas resulting from weather or improper protection.
- .4 Report in writing to the Consultant all damages resulting from vandalism or other causes beyond Contractor's control.

3.8 ACCEPTANCE

- .1 Sodding installed during period from March 1st to August 15th will be reviewed for acceptance September 30th. Sodding installed August 16th to October 30th will be reviewed for acceptance on May 15th of following year.

- .2 Sodded areas will be accepted by Consultant if:
 - .1 Sodded areas are established.
 - .2 Sod is free of bare and dead spots and without weeds.
 - .3 No surface soil is visible when grass has been cut to height of 40 mm.
 - .4 Sodded areas have been cut minimum 2 times, and within 24 h prior to acceptance.
 - .5 Fertilizing in accordance with fertilizer program has been carried out at least once.

END OF SECTION

1 General

1.1 **SECTION INCLUDES**

.1 Labour, Products, equipment and services necessary for foundation drainage Work in accordance with the Contract Documents.

1.2 **REFERENCES**

.1 ASTM D3350, Standard Specification for Polyethylene Plastics Pipe and Fittings Materials.

.2 ASTM F449, Standard Practice for Subsurface Installation of Corrugated Polyethylene Pipe for Agricultural Drainage or Water Table Control.

.3 ASTM F667, Standard Specification for 3 through 24 in. Corrugated Polyethylene Pipe and Fittings.

1.3 **SUBMITTALS**

.1 Product data:

.1 Submit manufacturer's Product data in accordance with Section 01 33 00 indicating:

.1 Performance criteria, compliance with appropriate reference standard(s), characteristics, and limitations.

.2 Product transportation, storage, handling and installation requirements.

.2 Samples:

.1 Submit following samples in accordance with Section 01 33 00:

.1 Two 300 x 300 mm samples of drainage board.

.2 Two 300 mm long samples of perimeter drainage and/or pipe.

2 Products

2.1 **MATERIALS**

.1 Perimeter drainage:

.1 ASTM D3350 and ASTM F667, 100 mm diameter HDPE, perforated with fittings prewrapped with filter cloth by Ideal Pipe or approved alternative.

.2 Perimeter drainage system to be complete with accessories as required for complete installation including but not limited to corner guard pieces and outlet pipe connections.

- .2 Drainage board: Three-dimensional dimpled core and geotextile fabric complete with adhesive or fasteners as required for installation. 'Miradrain 6000' by Carlisle Coatings and Waterproofing, 'DMX Drain 15S' by DMX Plastics Limited, 'Henry DB6000' by Henry, 'TREMDrain 6000' by Tremco Inc. or 'Mel-Drain 5035' by W. R. Meadows.
- .3 Under slab drainage:
 - .1 ASTM D3350 and ASTM F667, 100 mm diameter HDPE, unperforated with fittings, and perforated with fittings prewrapped with filter cloth by Ideal Pipe or approved alternative.
 - .2 Under slab drainage system to be complete with accessories as required for complete installation including but not limited to corner guard pieces and outlet pipe connections.
- .4 Drainage pipe: ASTM D3350 and ASTM F667, 100 mm diameter HDPE by Ideal Pipe or approved alternative, unperforated with fittings, and perforated with fittings prewrapped with filter cloth in locations as indicated on drawings or as specified herein.
- .5 Clean outs: 100 mm HDPE outlets, tees, extension pipes, reducers, flush plugs, etc. suitable for use with drainage pipe as manufactured by Canon Inc, Ideal Pipe, or approved alterative.
- .6 Foundation drainage Pipe Fill: 19 mm clear stone in accordance with OPSS 1004.
- .7 Granular fill: Free draining, sharp, hard, durable, granular material conforming to OPSS 1010, Type A.
- .8 Filter cloth: 'Terrafix 270R' by Terrafix Geosynthetics Inc. or approved alternative.

3 Execution

3.1 EXAMINATION

- .1 Verify condition and dimensions of previously installed Work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.2 PREPARATION

- .1 Verify substrate surfaces are solid, free from surface water, frozen matter, dust, oil, grease, scaling or laitance, projections and any other foreign matter detrimental to installation.

3.3 INSTALLATION

- .1 Install perimeter drainage around perimeter of basement and elevator pits and where indicated on Drawings.

- .2 Install drainage board in accordance with ASTM F449 and manufacturer's recommendations. Drainage board shall extend full height of foundation wall to top of footing where indicated on Drawings. Install drainage board after installation of waterproofing membrane is complete. Position panel with flat side against wall and filter fabric toward soil/drainage side and attach to foundation wall using manufacturer approved fastening system.
- .3 Install underslab drainage on positive grade with perforations on underside and joined with snap couplings with slot at bottom, invert minimum 200 mm below underside of floor slab. Seat each end of pipe firmly in couplings and connect to free draining frost free outlet. Install drainage pipe in accordance with ASTM F449.
- .4 Provide unperforated drainage pipe between perforated drainage pipe and drain connection installed by Division 22 and 23.
- .5 Install drainage pipe on a bed of foundation drainage fill, minimum 100 mm deep where pipe is not placed over footing, and surround with same fill 150 mm thick at sides and over top of pipe and for under floor drainage extend fill to under side of slab.
- .6 Provide cleanouts on non-perforated pipe at all changes of direction and in pipe runs greater than 15 metres. Provide flush cleanouts where indicated.
- .7 Cover foundation drainage fill with filter cloth. Cover filter cloth with sand 300 mm thick at top and sides.

END OF SECTION