SPECIFICATIONS FOR

Issued for Tender

Proposed Music Room

Renovations for

Lisgar School

Hamilton-Wentworth

District School Board

Issued For Tender
January 2025

M3-Plumbing and Drainage Plans
M4-HVAC Plans

Electrical produced by Suri and Associates Ltd.

E1-Electrical Legend Notes and Schedules
E2-First Floor Key Plan
E3-Power and Systems Plans
E4-Lighting Plans

1. GENERAL REQUIREMENTS

The rules and information that follow are for the protection of all persons using Hamilton-Wentworth District School Board's property. The Contractor must follow the directions. Failure to conduct work in a safe and healthy manner may result in removal of employees from Board property and/or termination of contract. The rules contained here will not cover all repair/renovation/construction work situations. The Contractor, however, must understand that the Board's intention is to carry out all work in a safe and healthy manner. Every Contractor and sub-contractor employed on site shall read all the instructions herein. Reference to the 'Board' or 'Client/Owner' herein means the Hamilton-Wentworth District School Board.

2. REPORT TO OFFICE

All Contractors entering schools MUST REPORT TO THE SCHOOL OFFICE AND SIGN IN Describe what you plan to do and how long it will take and sign out before they leave.

3. WORK SITE LOCATION

It is the responsibility of the contractors to provide appropriate and adequate rope, barricades, fencing, hoarding, warning signs, warning lights to clearly demark the site boarders and areas not to be used by usual occupants of the building or grounds. Without limiting the generality of the foregoing, the Contractor shall at all times erect and maintain adequate fencing around all excavations, pits, and in other places of danger. Sufficient barricades must be in place to prevent persons from potentially placing themselves in danger.

4. OPERATION OF VEHICLES ON BOARD PROPERTY

Trucks, etc., shall proceed with caution at 10 KPH maximum on school property. When children are playing, coming or going from school, etc., trucks and other vehicles will be stopped and remain stopped until all children enter the school or leave school grounds. All trucks must be equipped with an automatic warning beep or horn sound when backing up. If there are two people in the truck, one should get out and walk behind the truck while it is backing up, and act as a signaler.

The Contractor must provide a list of their mobile equipment requirements on site. Before entering Board property, the Owner/Client must have this list and the appropriate arrangements made for access onto Board grounds.

Construction vehicles used on Board property must not be loaded beyond their licensed capacity, and passengers must ride within the cab, except when backing up. Riding upon running boards, fenders, hoods, scraper blades, and buckets, or in boxes or other attachments is prohibited. Employees must not board nor jump off moving vehicles.

Signs shall be posted in prominent locations and in sufficient numbers to warn workers of a hazard on a project.

Construction vehicles must be left in designated areas and, when not in use, must not obstruct emergency vehicles or public ways.

Access to the construction site will be established by the Owner/Client prior to the start of construction.

5. **DISCOVERY OF UNKNOWN SUBSTANCE**

The hazardous substances locations listed in the current Designated Substances Report provided by the Owner may not be complete. If an unknown substance is discovered during a renovation/repair that may be asbestos, then notify the Owner immediately, and the material must not be disturbed until a sample is analyzed. Contact the Environmental Consultant for further action. Copy the Prime Consultant and Owner/Client.

6. **HAZARDOUS MATERIALS**

Work described within the Hazardous Materials specifications is required to be performed by a qualified Abatement Contractor on the HWDSB's prequalification list.

7. **ASBESTOS**

The Contractors are responsible to provide asbestos awareness training to their employees. All schools have lists of asbestos and its location in the school. It is available through the school office and should be checked before starting new work. If the job is a large renovation, the Contractor will have been provided with a more detailed pre-renovation asbestos survey. This also should be read before commencing new work.

8. **SILICA**

Silica: the general contractor and sub-trades are required to ensure all work is performed in accordance with the Silica on Construction Projects guideline, as published on the Province of Ontario's website.
https://www.ontario.ca/document/silica-construction-projects#

9. **LEAD**

Lead: the general contractor and sub-trades are required to ensure all work is performed in accordance with the Lead on Construction Projects guideline, as published on the Ministry of Labour, Immigration, Training and Skills Development website.
https://www.labour.gov.on.ca/english/hs/pubs/lead/

10. **MERCURY**

Mercury: the general contractor and sub-trades are required to ensure all work performed to remove and dispose of mercury-containing fluorescent lights and mercury-containing items (e.g. thermostats) is completed by workers who have been trained by a competent and qualified person.

11. **PCB**

PCBs: the general contractor and sub-trades are required to ensure all work performed to remove and dispose of PCB-containing ballasts is completed in strict accordance with federal regulations. Removal and handling of PCBs is to be performed by workers who have been trained by a competent and qualified person.

12. **TOOLS AND EQUIPMENT**

All vehicles, machinery, tools and equipment shall be inspected regularly and shall be maintained in a condition that does not endanger a worker. Equipment includes all guards and other safety devices. Gasoline engines are to be shut down and cold before refueling.

13. **PROPANE TANKS**

Propane tanks shall not be stored in school buildings overnight.

A qualified person with an Ontario Propane License will be the only one allowed to work on propane installations or to supervise the moving of these installations.

No storage area for propane at any time should be placed closer than three (3) meters to a source of ignition or fire, except as allowed under the regulations.

When cylinders are not in use, they must be protected from falling materials.

Cylinders must always be transported by some material handling device (not carried manually). When being transported in vehicles, the movement of cylinders should be prevented and the cylinders must have their gauges removed, and caps installed. Cylinders must never be hoisted with a rope or chain sling.

14. **OXYGEN AND ACETYLENE CYLINDERS**

Oxygen and acetylene cylinders must be chained in the vertical position or be strapped on a welding cart designed for the purpose. When not on a cart, the cylinder pressure gauge must be removed and the cylinder cap on. Full and empty tanks are to be stored in separate signed areas.

Cylinders must always be transported by some material handling device (not carried manually). When being transported in vehicles, the movement of cylinders should be prevented and the cylinders must have their gauges removed, and caps installed. Cylinders must never be hoisted with a rope or chain sling.

15. **FLAMMABLE LIQUIDS**

All oakum, rags, or other materials impregnated with paint thinners, etc., must be stored in an approved, labeled container and/or area.

Approved safety containers must be used for the storage and transportation of flammable materials. All containers must be appropriately labeled according to WHMIS Legislation.

Where flammable materials are being transported or transferred, they must be properly secured and ventilated.

16. **CONTROLLED PRODUCTS**

All controlled products must have the most recent WHMIS labels on the container brought to the school. One day's supply may be used without a label if used by one employee exclusively. Contractors must be able to show that they have attended a WHMIS training course.

Contractors must comply with all aspects of the Workplace Hazardous Materials Information System (Ontario Regulation 644/88).

Contractors must have all controlled products labeled according to WHMIS Legislations when the materials are brought onto Board property. Contractors must provide Workplace Labels for controlled products which do not have supplier labels on the containers.

A workplace label is not required where a material is decanted and the decanted material is used exclusively by the employee who decanted it, and that material is going to be used up during the shift in which it is filled.

Contractors must have copies of Safety Data Sheets (SDSs) for all controlled products they bring onto Board property readily available at the worksite. The Contractor must ensure that the information on the SDS is up to date (SDSs are valid for three (3) years from the date of production).

Any Board employee or any Contractor working for the Board may request, through the Facility Services Representative, a copy of any or all SDSs for controlled products used by the Contractor, if the controlled products are used or contained in an area where Board employees or other contractors may enter.

Contractors who use controlled products must ensure that their workers are properly trained in the safe use and handling of such products. Contractor's employees must be trained through the Infrastructure Health and Safety Association or Hamilton-Halton Construction Association programs for construction workers. In addition, contractors should review with their employees: fire hazard information, health hazard information, controls which should be in place, and protective equipment that should be used.

17. **NATURAL GAS PIPING**

Only persons with a gas-fitter's license are to tighten or loosen, install or remove a natural gas fitting, device, or pipe.

18. **SAFETY EQUIPMENT**

The Contractors are responsible for and obligated to have all employees wear such protective clothing and use such personal protective equipment and devices as are necessary to protect the worker against the hazards to which the worker may be exposed. Workers required to wear protective clothing or use personal protective equipment or devices shall be adequately instructed and trained by the contractor in the care and use of the clothing, equipment or devices before wearing or using them. Safety equipment shall include but not be limited to, safety boots, hard hats, safety glasses, goggles, gloves, respirators, hearing protection devices, safety belts, safety harness, and lifelines.

19. **FIRE EXTINGUISHERS**

The Contractors are responsible for providing fire extinguishers in the repair/renovations/construction areas at readily accessible and adequately marked locations. Contractors shall ensure that employees are able to use the extinguishers in a safe and proper manner. Fire extinguishers must be protected from physical damage or from freezing. After a fire extinguisher is used, it shall be refilled or replaced immediately. Every fire extinguisher shall be inspected for defects or deterioration, at least once a month by a competent worker who shall record the date of the inspection on a tag attached to it. Fire extinguishing equipment shall be of a suitable type and size to permit the evacuation of workers during a fire.

20. **SMOKING/VAPING**

Smoking and Vaping on school property is not permitted.

21. **ALCOHOL & DRUGS**

Consuming alcohol or drugs on Board property work sites is prohibited. Persons appearing to use alcohol or drugs may be removed from the site.

22. **HOUSEKEEPING**

If a form work tie, reinforcing steel, a nail or another object protruding from concrete or another surface may endanger a worker, the protrusion shall be removed or cut off at the surface or otherwise protected as soon as practicable. Materials must be laid down and piled, stored or moved in a manner that does not endanger a worker. Pieces of pipe, welding rod, and small round objects must be placed in refuse containers and not left on the floor.

23. **HYGIENE**

A reasonable supply of portable drinking water should be kept readily accessible at a project for the use of workers in accordance with the Regulations. The Contractor shall provide or arrange for the use of portable toilet and clean up facilities before work is started on a project. Such facilities to be reasonable accessible. Workers who use corrosive, poisonous or other substances likely to endanger their health shall be provided by the contractor with washing facilities with clean water, soap and individual towels.

24. **ELECTRICAL WIRING**

Only journey-persons electricians are to work on building electrical wiring, switches, etc., including temporary power tie-ins.

25. **LADDERS, SCAFFOLDS, SWING STAGES, VERTICAL MAN-LIFTS**

The Contractors are responsible for training their employees in inspecting, erecting, dismantling, and using scaffolds, ladders, swing stages, and vertical man-lifts per Working at Heights Standards O.Reg 297/13. A scaffold shall be designed by a professional engineer where required by the Regulations and every scaffold, suspended platform, suspended scaffold, elevating work platform or boatswain's chair shall meet the requirements of the Regulations of the OHSA.

When no figures are given, the drawings shall be followed to scale, but figures shall govern in all cases of difference. Larger scale drawings shall govern all smaller scale drawings.

The drawings and this specification shall be considered co-operative. All work necessary to the completion of the contract, whether shown on the plans and not described herein, or vice-versa, shall be considered a part of this contract and must be properly executed.

The Contractor will understand that the work herein described and shown on drawings shall be complete in every detail, notwithstanding every item necessarily involved is not particularly mentioned, and the Contractor will be held to provide all labour and materials necessary for the entire completion of the work intended to be described, and shall not avail himself of any manifestly unintentional error or omission, should such exist.

26. **LOCATION OF APPARATUS**

The location of apparatus, fixtures, outlets, etc., shown or specified shall be considered as only approximate. The actual location shall be as directed and as required to suit the conditions at the time of installation. Before installation of the apparatus, the Contractor shall consult the Board and ascertain the actual location required.

27. **MEASUREMENTS, ETC.**

Before ordering any material or doing any work, such Contractor shall verify all measurements at the building or as may be required for the proper fitting of their work and to make adjustable parts fit to fixed parts. They shall be responsible for the correctness of their figures, and properly correct without charge any work which does not fit, and furnish new work if necessary.

No extra charge will be allowed on account of the differences between the actual dimensions and the measurements indicated on the drawings. Any difference which may be found shall be submitted to the Board for consideration before proceeding with the work.

28. **CUTTING, PATCHING AND DIGGING**

The Contractor shall do all cutting, fitting or patching of their work that may be required to make its several parts come together properly and fit to it receive or be received by work of other Contractors, shown upon or reasonably implied by the contract documents, and he shall make good after them as the Board may direct.

All cutting of the various trades shall be done only by skilled mechanics and competent men of such trades, and all such cutting shall be made good by competent workmen of each trade only.

Any cost caused by ill-timed work shall be borne by the party responsible therefore.

The Contractor shall not endanger any existing work by cutting, digging or otherwise, and shall not cut or alter the work of another Contractor save with the consent of the Board.

29. **FURRING IN PIPES AND DUCTS**

The General Contractor shall be responsible for an acceptable job of furring in all pipes and ducts where shown on the plans or reasonably expected in finished rooms. Furring in shall be carried out in the material of the walls, adjacent to the pipes, such as metal stud, wood, masonry, etc.

30. **BROKEN GLASS**

The Contractor shall be held responsible for all damaged, broken or scratched glass in areas affected by their work, and at completion shall replace at their own expense all such glass.

31. **OWNER'S EQUIPMENT**

All equipment, fixtures, doors, hardware and all other items removed in the course of renovations, and not required for completion of the contract, shall be handed in to the Board. A list of these items (in duplicate) shall be prepared and signed by the Contractor’s and the Facility Services Department’s representatives.

32. **CLEANING UP**

In addition to the housekeeping requirements as set out under paragraph 16., if the work consists of renovation work in an existing school or Board building, the building must be cleaned of all such materials at the close of each day's work. Each sub-contractor shall clean their own work.

Upon completion of the work, all debris, surplus materials, tools and equipment shall be cleaned up and removed from the building and the site and the building left broom clean and the site in a

neat and tidy condition to the satisfaction of the Board. The Contractor shall clean all floors, glass, painted and stained woodwork, all hardware, fixtures, and equipment.

33. **GUARANTEES**

General

All work is to be guaranteed for a period of one (1) year after 100 percent completion of the work, during which time any imperfections which may develop in the workmanship or materials used or any work affected in making good such imperfections must be made good promptly by the Contractor without cost to the Board.

A warranty inspection is to be made just prior to the termination of the guarantee period to list all outstanding imperfections to be corrected by the contractor at no cost to the Board.

34. **ACCEPTANCE**

By reason of having submitted a tender on the work described herein, the general contractor does hereby acknowledge that they have read the specifications and do hereby accept these conditions and specifications as the instructions governing the work.

35. **UNIONS**

It is wholly the Contractor's and their Subcontractors responsibility to follow all Trade Union requirements for which they are signed. If conflicts, disputes, pickets or any other disturbances or lost time occurs, the Contractor must take the necessary steps expediently to resolve the matter. The Board and the Consultant will not be held liable for any cost of injunctions or lost time.

36. **MAINTANENCE MATERIALS**

Provide all maintenance materials to the School as outlined in each specification sections.

-End-

1.1 INTENT

.1 This section outlines the general conditions that shall be administered by the General Contractor. While the specification section establishes the requirements for each trade, the General (or Principal) Contractor shall directly supervise and administer all contract requirements to ensure the provision of materials, labour and equipment necessary to complete the work on time and to the quality specified. Reference to GC refers to General Conditions for Public and Invitational Tenders as amended by Supplementary General Conditions.

2.1 SCOPE OF WORK

.1 The general scope of work shall include, but not be limited to, the supply of labour, equipment, materials, and transportation to execute work in accordance with the drawings and specifications.

3.1 QUALIFICATION OF CONTRACTOR

.1 All work shall be done by a recognized established qualified and competent contractor. This contractor shall employ only skilled mechanics or installers who have been thoroughly trained or competent in carrying out the work specified in the contract.

.2 Where required by a manufacturer of specialty products, only contractors that are approved as applicators shall be utilized.

4.1 CONSTRUCTION SCHEDULE AND ON-SITE PROJECT DOCUMENTS

.1 Within receipt of the authorization letter to proceed by Owner, prepare and submit a detailed Construction Schedule, clearly showing the anticipated progress stages, start and finish date of each construction phase and date of final completion with-in 10 working days showing dates for the following:

a) Submission of material sample submittals (along with an itemized list of samples to be submitted)

b) Submission of shop drawings (along with an itemized list of shop drawings to be submitted)

c) Supply and installation of:

i) All new ceilings
ii) All new flooring
iii) All other Architectural work shown on drawings or specified herein
iv) All HVAC Equipment
v) All New Lighting
vi) Mechanical items in Sections 15
vii) Electrical items in Sections 16

.2 On approval of the Construction Schedule by the Owner, proceed to ensure completion of work within the scheduled time. Carry out work in a continuous manner. If at any time one phase falls behind schedule, take necessary measures to expedite subsequent phases to maintain or improve on completion date.

.3 Maintain at the job site, one copy each of following:

a) Contract Drawings (architectural, engineering and all related consulting drawings)
b) Specifications
c) Addenda
d) Reviewed shop drawings
e) Change Orders, Contemplated Change Orders and Change Directives/Notices
f) Site/Field Instructions
g) Other modifications to contract
h) Field test reports
i) Copy of approved Construction Schedule
j) Manufacturers' installation and application instructions.
k) List of Sub-contractors
l) Progress photographs
m) Record Set of Drawings (being progressively updated)
n) Minutes of Meetings
o) Building Permit

5.1 SPECIFICATIONS

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

.2 Whenever used in Specifications the following definitions shall apply:

a) SUPPLY - Procurement or fabrication of standard components not to special design of materials, equipment, or components, or performance of services to extent indicated. Where used with respect to materials, equipment, or components, term shall include delivery to
b) Site but is not intended to include installation of item, either temporary or final.
c) FABRICATE AND SUPPLY - Fabrication of materials, equipment or component, to special customized design to extent indicated including delivery to Site, assisting in form of supervision to those Section(s) installing materials, equipment or
d) component. Term does not include installation of item either temporary or final.
e) INSTALL - Placement of materials, equipment, or components, including receiving, unloading, transporting, storage, uncrating and installing, and performance of such testing and finish work as is compatible with degree of installation specified complete ready for use.
f) PROVIDE - To Supply and Install, compete and in place, including accessories, finishes, tests and services as required to render item so specified

complete ready for use.

g) COMMISSION - Startup and initial operation of equipment as required and/or as specified in respective Sections, to demonstrate satisfactory operation of components and entire system including calibration of any control instrumentation as required to maintain operations.

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

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

.5 Related Work', 'Related Divisions', 'Related Sections' etc.: Specification sections provided herein may note and/or itemize specific sections or divisions of related work. This information is provided for general reference only. In all circumstances, the actual scope of related work is to be as shown/required by the scope of work outlined in all of the Contract Documents (including the drawings) and in no way is to be limited to any information, provided, not provided and/or referenced in the Specification documents.

6.1 **TEMPORARY SERVICES**

.1 Refer to Owner's General Conditions.

.2 If necessary the Contractor shall provide, at their expense, the following temporary services for construction purposes from existing terminals, only in locations designated by the Owner:

Power: 110 volt electrical, 230 volt electrical (at available current) for temporary lighting and operation of power tools. Owner will pay for electricity rates. The contractor can use the power at the school, however **if additional power is required or temporary connections into existing panels are needed for specialized equipment (600V for terrazzo grinding equipment) The general contractor shall supply those connections or if 600V is not available within 200 feet (60m) of the work area then supply of a portable exterior quite diesel generator and cables shall be provided do such work at the general contractor's expense.**

.3 The Owner may discontinue such services at any time to serve emergency Owner's requirements and will accept no liability for any damage or delay resulting from such withdrawal of the service.

.4 **Telephone:** Provide and pay for temporary telephone service for use on site.

.5 The General (or Principal) Contractor is responsible for providing temporary services during the contract for all construction purposes.

7.1 TEMPORARY FACILITIES

.1 **Temporary Toilet Facilities:**

.1 General Contractor shall supply and maintain temporary toilet facilities on-site, **School Washroom Facilities are not to be used by Trades personal**.

.2 **Temporary Enclosures, Bracings, Scaffolding etc.:**

.1 Isolate work areas to protect other tenants and workers from injury, private and public property from damage, by providing guards, rails, hoardings, braces, shoring, underpinning, temporary covers, covered passageways, ramps, stairs, warning signs, visual, audible signals, and fire rated exit enclosures.

.2 Provide necessary protection without interfering with free, safe passage and maximum possible use of the premises by other tenants.

.3 Replace, repair or make good damage immediately.

.4 Ensure that no unauthorized personnel are allowed in the work areas.

.5 Erect all scaffolding independent of walls. Construct in a safe, secure and rigid manner. When not in use place in a position as not to hinder other trades or work. Remove promptly when work is complete.

.3 **Temporary Storage**:

.1 A construction storage area will be designated on site for the storage of construction materials. **Interior occupied areas shall not be used for construction storage.**

.2 Provide secure shipping style containers and/or suitable coverings for materials that are to remain dry.

.3 Deliver, store and maintain packaged materials and equipment with manufacturer's seals and labels intact.

.4 Prevent damage, adulteration, and soiling of material and equipment during delivery, handling and storage. Immediately remove rejected materials and equipment from site.

.5 Store and maintain material and equipment in accordance with manufacturer's and supplier's instructions.

.6 Do not load, or permit to be loaded, any part of the work with a weight or a force that will endanger the work.

.4 **Temporary Construction Office:**

.1 General Contractor shall supply and maintain temporary construction office on-site if they deem necessary, **School interior areas shall not be used for construction office**.

8.1 HEATING AND VENTILATION

.1 Pay for temporary heat and ventilation used during construction including cost of installation, fuel, operation, maintenance and removal of equipment. Use of direct-fired heaters discharging waste products into work areas will not be permitted unless prior approval is given by the Owner.

.2 Furnish and install temporary heat and ventilation in enclosed areas as required to:

.1 facilitate progress of work
.2 protect work and products against dampness and cold
.3 prevent moisture condensation on surfaces
.4 provide ambient temperature and humidity levels for storage, installation and curing of materials
.5 provide adequate ventilation to meet health regulations for safe working environment.

9.1 CONSIDERATION FOR OTHER OCCUPANTS

.1 Execute work to cause minimum interference to other occupants and their personal effects.

.2 Take reasonable measures to control noise during operations.

10.1 EXISTING SERVICES

.1 All work associated with existing services shall be done in accordance with applicable codes. Obtain and pay for any required permits or fees.

.2 Temporarily disconnect and remove existing services as may be necessary to gain access to the work. Upon completion, reinstall and re-connect services to original condition.

.3 Re-route any existing services which interfere with the work of this contract. Extend or modify any existing services as necessary to suit new conditions resulting from the work of this contract.

.4 Obtain the Owner's approval prior to making any modifications to the existing services.

.5 Before commencing work, establish location and extent of service lines in area of work and notify Owner of findings.

.6 Where unknown services are encountered, immediately advise Owner and confirm findings in writing.

11.1 FIRE SAFETY REQUIREMENTS

.1 Refer to General Conditions and in addition, comply with the Ontario Fire Code, by:

.1 Shutting off and capping abandoned service lines.

.2 Maintaining and protecting continuing service lines.

.3 Providing fire watches as required.

.4 Management of combustible salvage, waste and rubbish.

.5 Protecting persons and properties.

.6 Maintaining operable fire detection and protection equipment.

.7 Maintaining fire fighters' access.

.8 Providing temporary fire extinguishing equipment.

.9 Maintaining existing and temporary fire exits.

12.1 CONTRACTOR'S USE OF SITE

.1 Limited to areas for work and outside office and storage as directed by the Owner.

.2 Do not unreasonably encumber site with materials or equipment.

.3 Do not obstruct entrances, stairs or fire exits.

.4 Maintain free access route for fire, ambulance and garbage trucks.

.5 The placement of refuse bin will be allowed in an area agreed to with the Owner.

.6 Make good damage to paving, grass, walkways, curbs, trees, planting beds, etc. caused due to the work of this Contract.

.7 No On-Site Parking will be provided by the Owner. Off-Site parking on Municipal Streets must be reviewed and approved by the local Municipality.

.8 Existing millwork, cabinets, countertops, loose or fixed furniture, equipment or other similar permanent surfaces to remain or be relocated shall not be used for construction work surfaces or storage. The general Contractor and or Subcontractor shall provide their own temporary storage and work surfaces.

13.1 CUTTING, FITTING. HOT WORK AND PATCHING

.1 All cutting and patching by General Contractor.

.2 Inspect and locate existing conditions including elements subject to damage or movement.

.3 Obtain the Engineer's and Owner's approval before doing any hot work, cutting, boring or sleeving load bearing members.

.4 Where work connects with existing and where existing work is altered, cut, patch and make good to match existing.

14.1 LAYOUT OF WORK

.1 Be responsible for layout of all parts of the work in accordance with lines, levels, elevations and measurements shown on the drawings. Errors resulting from failure to verify figures or the proper layout of any element of the installation shall be rectified without additional cost.

15.1 STANDARDS

.1 The specification refers to national and international standards, such as CGA, CGSB, CSA, ULC, ASTM, etc. Be familiar and comply with or exceed the requirements of these standards. Failure to comply may result in rejection of the work and the need to replace or repair at no additional cost.

.2 In case of conflict or discrepancy, the more stringent requirements shall apply.

16.1 CODES

.1 Comply with the most recent versions of: The building Code Act, as amended; The Ontario Building Code and all supplements, as amended and all other Regulations and By-Laws of the authorities having jurisdiction an amendments thereto. All after are referred to 'Code'. Where Code or Contract Documents do not cover a particular requirement then conform to the National Building Code of Canada and all supplements.

.2 In case of conflict or discrepancy, the more stringent requirements shall apply.

17.1 SHOP DRAWINGS, SAMPLES, CONTROL PANELS

.1 Throughout the specifications, requirements are listed for the submission of drawings, samples and control panels or unit materials. The General (or Principal) Contractor is responsible for the submission and receipt of acceptances and approvals to ensure unnecessary work delays.

.2 Adjustments made on shop drawings by the Owner or Owner's Consultant are not intended to change the Contract Price.

.3 Please note shop drawings are only reviewed by the consultants for the sole purpose of ascertaining conformance with the general design concept only. The review shall not mean that the consultants approve the detail design inherent in the shop drawings, responsibility for which shall remain with the Contractor submitting the same, and such review shall not relieve the Contractor of their responsibilities for errors or omissions in the shop drawings or their responsibility for meeting all requirements of the contract documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for coordination of the work of all subtrades.

18.1 INSPECTION AND TESTING

.1 Make arrangements for, and pay for, required inspections or tests specified or as required by governing authorities.

.2 Submit 2 copies of inspection and test reports promptly to the Owner.

.3 Allow sufficient time and access for the Owner or the Owner's Consultant to inspect the work or analyze test results.

.4 Do not proceed until written approval of inspection or testing is issued by the Owner.

19.1 HEALTH AND SAFETY

.1 Abide by the provisions of all Acts, Regulations pertaining to health and safety including Occupational Health and Safety Act R.S.O. 1986 Chapter 304 and Amendments, Ontario Regulation 214/91 and Amendments, Workplace Hazardous Materials Information System (W.H.M.I.S.) regulation, Ontario Regulation 644/88.

.2 Maintain on site a list of all hazardous materials (as required by WHMIS Regulation) proposed for use on site together with current Material Safety Data Sheet (MSDS). Supply the Owner with a current copy of the list and MSDS sheets.

.3 Label all hazardous materials according to the requirements of WHMIS.

.4 The Contractor shall have written spill response procedures and material on-site to respond to pollutants and contaminants into the natural environment in excess of levels permitted in regulations or to cause or likely to cause an adverse effect.

.5 The Contractor shall post all appropriate job site signs, notices, instructions and safety requirements in English and/or graphic symbols for the duration of the work.

19.1 CO-ORDINATION

.1 Examine requirements of materials, labour and equipment standards for the work of this contract.

.2 Ensure that where the work of one trade is to be built-in or is to be incorporated into or is dependent on the work of another trade, provide material, labour and equipment so as to avoid work delays.

.3 Ensure that installations, individually and collectively fully comply with contract requirements.

.4 The Architect or Engineer’s may issue additional drawings to help with execution of the work, however these drawings are issued for clarification only and shall have the same meaning and intent as the Contract Documents and shall be included in the Contract Documents.

20.1 **SUBSTITUTIONS AND APPROVED EQUALS**

.1 **All Tenders are to be base strictly upon the items and suppliers specified in/on the Contract Documents. Refer to HWDSB General Information Section, 3.15 Substitutions (1,2,3) for Contractor suggested alternate suppliers or materials.**

.2 Approved alternate supplier and materials may be approved by the Consultants and Owner after the Contract is awarded but only due to the following circumstances; Suppliers or materials are no longer available or cannot be ordered and/or produced with-in the Owner's timeframes for project completion including but no limited to interim dates for project phases; the proposed alternate supplier and material meets the same quality and performance

standards as specified and will result in a credit amount to the Contract value. Any approved substitutions shall result in no extra costs to the Owner.

.3 The Owner also reserves the right not to accept or allow any substitutions to Suppliers or Products specified in the Contract Documents if they do not meet the Owner's standards of quality, and performance.

21.1 **CLEANING AND DISPOSAL**

.1 Provide on-site dump containers in location approved by Owner, for collection of waste materials and rubbish.

.2 Maintain premises free from debris and waste material on a daily basis. Remove all waste materials from site. Do not burn or bury materials on site and do not dispose of materials into storm or sanitary sewers.

.3 Dispose of all recyclable waste materials at recycling storage/handling facilities, where such facilities exist within 70 kilometers of site.

.4 Co-ordinate and supervise the completion operations of each trade. Provide a clean-up team to carry out the final clean-up of finished surfaces as required for immediate use after acceptance.

.5 During Final Cleaning of all exposed to view surfaces. Remove all grease, dust, stains, labels, protection materials, fingerprints, from all finished exposed to view surfaces including all glass and mirrors, use cleaning products that are recommended by the manufactures and approved by the owner. Clean all finished flooring according to manufacturer's instruction. Clean and seal all rubber cove base material. Clean all light fixtures, reflectors and lenses complete. Broom clean and power wash, if necessary all existing exterior paved surfaces and rake clean all other surfaces of the grounds effected by the work operations. Remove all debris and surplus materials from concealed accessible spaces. Replace any broken or scratched glass or mirrors. Repair any new damaged quartz surfaces. Replace with new final filters all mechanical equipment operated during construction. Clean all work with appropriate apparatus and cleaning materials in accordance with applicable specification sections and manufacturer's recommendations. Upon completion of final

cleaning, remove all equipment, tools, materials and debris from building and site ready for occupancy by Owner.

22.1 **AS-BUILT DRAWINGS AND CLOSEOUT DOCUMENTS**

.1 The Contractor shall have on-site (2) sets of drawings for recording progressive recording of any items deviating from the drawings, including but not limited to change orders, site instructions, hidden or unknown conditions, underground utility locations, field changes in dimensions and details, locations of existing structural, mechanical and electrical building systems and related components not otherwise shown on drawings. etc. not otherwise shown on the drawings

These changes shall be recorded in red ink or pencil and upon completion shall reflect ‘as-built conditions.

.2 At the completion of the work and before final acceptance the General Contractor shall transfer all as-built on-site hand marked up information and supply Architectural, Structural, Mechanical and Electrical as-built drawings of the work in the latest autocad format. Digital record autocad files will be supplied to the General Contractor by the Consultants. At no cost to the Consultants or Owner.

.3 Some trades must maintain records and provide as-built, operating and maintenance information for 'as-built' drawings, digital files, operating and maintenance manuals. Throughout the progress of the work, ensure that these are properly recorded. Assemble and forward the required information, timed to prevent delay in final acceptance.

.4 Submit a set of drawings to the Consultants for review. Make any necessary changes and then submit (1) digital autocad files on USB Drive or on downloadable format for presentation to the Owner.

.5 Submit (1) digital files on USB Drive of Operating and Maintenance documents, with Title sheet labeled ‘Operating and Maintenance Data Manual’ Organize into tabbed sections parallel to project specification layout for presentation to the Owner. All information to be neatly typed in English. Include but not limited to the following: Any equipment which includes an extended warranty will be listed in a separate section at the beginning of the manual, clearly labelled and including the vendor contact information, description of the equipment or material and the warranty period. Maintenance instructions for finished surface and material; copy of hardware schedule, paint colour formulas, and interior and exterior colour and finish schedules; description, operation, and maintenance instructions all equipment and systems, including complete list of equipment parts. Indicate name plate information such as; make, model, serial number, size and capacity etc.; names, addresses and phone numbers of Sub-Contractors and Suppliers. Also refer to Owner’s Front End Documents.

.6 The General Contractor, Mechanical Contractor and Electrical Contractor, shall each note a $2,500.00 hold back amount in their progress draws to cover final submission of all as-built drawings, Operation and Maintenance Manuals. Holdback values will be released upon final Consultant review and approval of documents for presentation to the Owner.

.7 See section below for Guarantees and Warranties

23.1 **CONSTRUCTION MEETINGS AND MINUTES**

.1 The General Contractor shall conduct all construction meetings on a bi-weekly basis or as determined by the Consultant and shall record and distribute all minutes of those meetings in a timely manner no longer than 72 hours after the meeting. Up to date construction time schedules shall be presented at the beginning of the work and on a monthly basis after.

24.1 **ALLOWANCES**

.1 Expend Cash Allowances only as directed and authorized by the Architect and confirm in writing. Supply detailed and itemized costs for all Allowances in writing for the Architect's review and approval prior to proceeding with the work.

.2 Unexpended amount(s) of cash allowances may be reallocated to other cash allowances at the sole discretion of the Architect.

.3 Refer to Owner's General Conditions for applicable Overhead and Profit mark-up. Note Overhead and Profit mark-up is not allowed on the carried cash allowance, however if the cash allowance expenditure exceeds the carried sum then Overhead and Profit will be allowed on the amount(s) over.

25.1 **GUARANTEES, WARRANTIES AND BONDS**

.1 Expedite the preparation and submission of warranties, particularly extended period warranties, as specified.

.2 Provide warranties that are fully executed and notarized.

.3 Include the following: Name and Address of project(s): Guarantee and Warranty commencement date (certificate or report of final Completion); duration of Guarantee and Warranty; clear indication and description of what is being covered and what remedial action will be taken if Guarantee and/or Warranty needs to be invoked by Owner: and signage and seal of General Contractor.

.4 This information shall be included with-in the Closeout Documents.

-End-

REVISED

Hazardous Building Materials Assessment (Pre-construction)

Exterior Doors & Music Room
Lisgar Elementary School
110 Anson Avenue, Hamilton, Ontario

Prepared for:

Hamilton-Wentworth District School Board
20 Education Court
Hamilton, Ontario, L9A 0B9

November 21, 2024

Pinchin File: 336572.012

Issued to:	**Hamilton-Wentworth District School Board**
Issued on:	**November 21, 2024**
Pinchin File:	**336572.012**
Issuing Office:	**Hamilton, ON**

Author: Justin Appleby, ADip.T.(Arch)
Senior Project Technologist
289.925.3875
jappleby@pinchin.com

Project Manager: Jessica Cozzitorto, C.Tech.
Team Leader
289.678.0692
jcozzitorto@pinchin.com

Reviewer: Leslie Heywood, BEng Mgt
Senior Project Manager
289.237.4294
lheywood@pinchin.com

EXECUTIVE SUMMARY

Hamilton-Wentworth District School Board (Client) retained Pinchin Ltd. (Pinchin) to conduct a hazardous building materials assessment at Lisgar Elementary School located at 110 Anson Avenue, Hamilton, Ontario. Pinchin performed the assessment on September 25, 2024.

The objective of the assessment was to identify specified hazardous building materials in preparation for renovation activities. The proposed work as identified by the Client includes renovations to the Music Room and exit doors.

The results of this assessment are intended for use with a properly developed scope of work or 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:

- Vermiculite
- Ceiling tiles and mastic
- Vinyl floor tiles and mastic
- Gold sink mastic
- Siporex mortar

Lead:

- Lead is present in paints and coatings.
- Batteries of emergency lights contain solid lead.

Silica: Crystalline silica is present in concrete and other materials such as masonry, and ceramic tiles.

Mercury: Mercury vapour is present in lamp tubes.

Polychlorinated Biphenyls (PCBs): Based on the date of construction, PCBs may be present in light ballasts.

Mould and Water Damage: Visible mould and water damage was not observed.

SUMMARY OF RECOMMENDATIONS

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

1. 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.
2. Prepare a scope of work or specifications and safe work procedures for the hazardous materials removal required for the planned work.
3. 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.
4. Remove and properly dispose of asbestos-containing materials prior to demolition or renovation activities.
5. 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 December 31, 2025.
6. Recycle mercury-containing lamp tubes when removed from service.
7. Follow appropriate safe work procedures when handling or disturbing asbestos, lead, silica, and mould.

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.

TABLE OF CONTENTS

APPENDICES

1.0 INTRODUCTION AND SCOPE

Hamilton-Wentworth District School Board (Client) retained Pinchin Ltd. (Pinchin) to conduct a hazardous building materials assessment at Lisgar Elementary School located at 110 Anson Avenue, Hamilton, Ontario.

Pinchin performed the assessment on September 25, 2024. The surveyor was unaccompanied during the assessment. The assessed area was unoccupied at the time of the assessment.

The objective of the assessment was to identify specified hazardous building materials in preparation for demolition activities.

The results of this assessment are intended for use with a properly developed scope of work or performance specification.

1.1 Scope of Assessment

The **assessed area** is limited to the portion(s) of the building to be 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 structure(s) 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

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.

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 not conducted to investigate for loose fill vermiculite insulation. Sampling of roofing materials was not conducted.

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

3.0 BACKGROUND INFORMATION

3.1 Building Description

Description Item	Details
Use	Elementary School
Number of Floors	The building is 1 storey.
Total Area	The assessed area is 2,050 square feet.
Year of Construction	The building was constructed in 1963 with an addition in 1966. The portion of the building assessed was constructed in 1963.
Structure	Structural steel and concrete
Exterior Cladding	Masonry and brick
HVAC	Forced air and radiant heating
Roof	Built-up
Flooring	Vinyl floor tiles, terrazzo and concrete
Interior Walls	Masonry and brick
Ceilings	Not found

3.2 Existing Reports

Pinchin previously prepared the following reports, which have been reviewed as part of this assessment:

- *Findings Letter, Dated February 16, 2022. Prepared by Pinchin, File No. 303983.002.*

- *Hazardous Building Materials Assessment, Dated June 24, 2021. Prepared by Pinchin, File No. 286531.023.*

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.

Previous findings are present in the HMIS data but are not applicable to the current project and have not been discussed below.

4.1 Asbestos

4.1.1 Pipe Insulation

Pipes in the assessed area 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.

4.1.2 Duct Insulation and Mastic

Ducts were not found during this assessment.

4.1.3 Mechanical Equipment Insulation

Mechanical equipment (e.g., furnace, hot water tanks, boilers) is either uninsulated or insulated with non-asbestos fibreglass.

4.1.4 Vermiculite

Vermiculite, containing asbestos, was previously found as insulation in the exterior wall of the Storage Room (Location 6772, sample 0001A).

All other concrete block walls are presumed to have vermiculite insulation.

4.1.5 Acoustic Ceiling Tiles

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

Description	Sample Location	Sample Number, Date Code or Material Composition	Asbestos (Tile / Adhesive)	Photo
12”x12” glue-on, pinhole with fissures	Previously sampled	N/A	Amosite / Presumed	

4.1.6 Drywall Joint Compound

Asbestos in drywall joint compound was banned in Canada in 1980. Drywall joint compound in the Storage Room (Location 6772, photo 1) was installed on or after 2018 and is presumed to contain no asbestos.

Photo 1

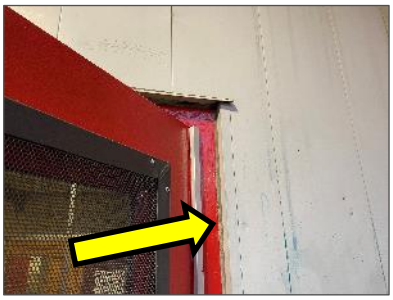
4.1.7 Vinyl Floor Tiles

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 grey fleck	Music Room (Location 6773)	S0009A-C	None detected / None detected	
9”x9” white with grey streaks and various colours	Science Room (Location 6771)	S0010A-C	Chrysotile / Chrysotile	
12”x12” blue	Storage Room (Location 6772)	S0011A-C	None detected / None detected	

4.1.8 Sealants and 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, black butyl sealant between window frames on doors	Vestibule (Location 6789) Vestibule (Location 7763)	S0012A-C	None detected	
Caulking, dark grey around exterior doors	Vestibule (Location 6789) Vestibule (Location 7763)	S0014A-C	None detected	

4.1.9 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 siporex	Previously sampled	N/A	Chrysotile	

Description	Sample Location (Location #)	Sample Number	Asbestos	Photo
Paint on concrete block	Music Room (Location 6773) Science Room (Location 6771)	S0004A-E	None detected	
Gold sink mastic	Music Room (Location 6773)	S0008A-C	Chrysotile	
Terrazzo	Vestibule (Location 6789) Vestibule (Location 7763)	S0013A-C	None detected	

4.1.10 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:

- Electrical components
- Mechanical packing, ropes, and gaskets
- Fire resistant doors
- Metal clad finishes (Galbestos)
- 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
L0003	Yellow, on concrete block	Music Room (Location 6773)	<0.00045	
L0004	White, on structural steel	Music Room (Location 6773)	0.024	
L0005	Blue, on metal door	Science Room (Location 6771)	<0.0030	
L0006	Red, on metal door	Vestibule (Location 6789)	<0.0013	

Sample Number	Colour, Substrate Description	Sample Location	Lead (%)	Photo
L0007	Brown, on structural steel	Exterior (Location 1)	0.16	

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.

Results above 0.009% (90 mg/kg) are considered lead-containing.

4.2.2 Lead Products and Applications

Lead products were not found during the assessment.

4.2.3 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
- Lead shielding

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

- Stone
- Refractory or ceramic materials
- Asphalt

4.4 Mercury

4.4.1 Lamps

Mercury vapour is present in fluorescent lamp tubes.

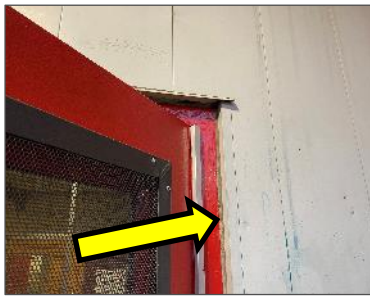
4.4.2 Mercury-Containing Devices

Mercury-containing devices were not found during the assessment.

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, dark grey around exterior doors	Vestibule (Location 6789)	P0002	<0.2	

The material is a non-PCB solid based on the threshold (50 mg/kg).

4.5.2 Lighting Ballasts

Based on date of construction light ballasts 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 growth and water damage was not found during the assessment.

5.0 RECOMMENDATIONS

5.1 General

1. Prepare scope of work or 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.
2. 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.
3. Conduct further investigation of the following items, areas, or locations, which were not completed during this assessment:
    a. Any items listed as exclusions in this report, prior to disturbance.
4. Provide this report and the detailed plans and specifications to the contractor prior to bidding or commencing work.
5. Retain a qualified consultant to specify, observe and document the successful removal of hazardous materials.
6. Update the asbestos inventory upon completion of the abatement and removal of asbestos-containing materials and any other relevant findings.

5.2 Remedial Work

Remedial work is not recommended.

5.3 Building Renovation Work

The following recommendations are made regarding renovations involving the hazardous materials identified.

5.3.1 Asbestos

Remove asbestos-containing materials (ACM) prior to renovation, alteration, or maintenance if ACM may be disturbed by the work. 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.

5.3.2 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.

Lead-containing items should be recycled when taken out of service.

5.3.3 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.

5.3.4 Mercury

Do not break lamps. Recycle and reclaim mercury from fluorescent lamps when taken out of service. Mercury is classified as a hazardous waste and must be disposed of in accordance with applicable regulations.

5.3.5 PCBs

Prior to renovation, 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

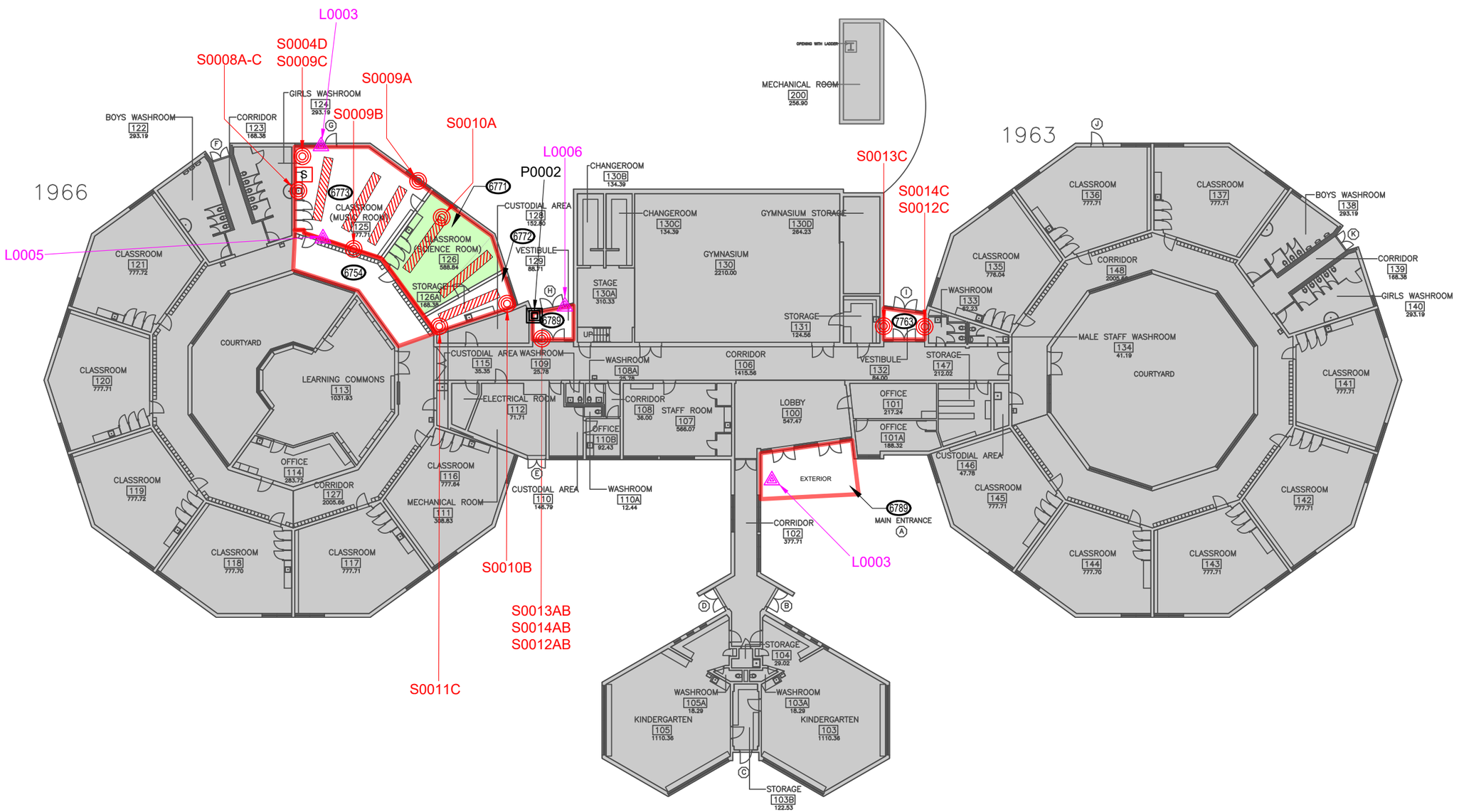
The following legislation and documents were referenced in completing the assessment and this report:

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.

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. Mould Guidelines for the Canadian Construction Industry, Standard Construction Document CCA 82 – 2004 (Revised 2018), Canadian Construction Association.

APPENDIX I

Drawings



N

LEGEND

- PINCHIN LOCATION NUMBER
- ASSESSED AREA
- OUTSIDE ASSESSMENT SCOPE
- ASBESTOS BULK SAMPLE
- LEAD BULK SAMPLE
- PCB BULK SAMPLE

ASBESTOS-CONTAINING MATERIALS:

- ACOUSTIC CEILING TILES
- GOLD SINK MASTIC
- VINYL FLOOR TILES & MASTIC

FOR CLARITY, THE FOLLOWING ASBESTOS-CONTAINING MATERIALS, ARE PRESENT IN THE ASSESSED AREA, BUT HAVE NOT BEEN HATCHED ON THE DRAWING:

- VERMICULITE
- MORTAR SIPOREX

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.

PINCHIN

PROJECT NAME:
HAZARDOUS BUILDING MATERIALS ASSESSMENT

CLIENT NAME:
HAMILTON-WENTWORTH DISTRICT SCHOOL BOARD

PROJECT LOCATION:
LISGAR ELEMENTARY SCHOOL
110 ANSON AVENUE,
HAMILTON, ONTARIO

FIGURE NAME:
FLOOR PLAN

PROJECT NUMBER:	SCALE:
336572.012	NOT TO SCALE
DRAWN BY: WB	REVIEWED BY: JA
DATE: OCTOBER 2024	FIGURE NUMBER: 1 OF 1

APPENDIX II-A

Asbestos Analytical Certificates

Your Project #: 336572.012
Your C.O.C. #: N/A

Attention: Justin Appleby

Pinchin Ltd
151 York Boulevard
Suite 200
Hamilton, ON
CANADA L8R 3M2

Report Date: 2024/10/04
Report #: R8348650
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C4U6424
Received: 2024/10/01, 09:30

Sample Matrix: Bulk
Samples Received: 23

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Asbestos by PLM - 0.5 RDL (1)	23	N/A	2024/10/04	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, EPA, APHA or the Quebec Ministry of Environment.

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 #: 336572.012
Your C.O.C. #: N/A

Attention: Justin Appleby

Pinchin Ltd
151 York Boulevard
Suite 200
Hamilton, ON
CANADA L8R 3M2

Report Date: 2024/10/04
Report #: R8348650
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C4U6424

Received: 2024/10/01, 09:30

When Asbestos data is reported with other data, this report contains data that are not covered by the NVLAP accreditation.

Encryption Key

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 #: C4U6424
Report Date: 2024/10/04

Pinchin Ltd
Client Project #: 336572.012
Sampler Initials: JC

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0004D WALL,PAINT,CONCRETE BLOCK,LOC:6773,MUSIC ROOM

Bureau Veritas ID: AEKV37 — Date Analyzed: 2024/10/04

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
Layer 1	100	Non-homogeneous yellow/white/grey paint/cementitious material	Not Detected		Non-Fibrous

S0004E WALL,PAINT,CONCRETE BLOCK,LOC:6771,SCIENCE ROOM

Bureau Veritas ID: AEKV38 — Date Analyzed: 2024/10/04

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
Layer 1	100	Non-homogeneous yellow/white/grey paint/cementitious material	Not Detected		Non-Fibrous

S0008A SINK,MASTIC, GOLD,LOC:6773,MUSIC ROOM

Bureau Veritas ID: AEKV39 — Date Analyzed: 2024/10/04

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
Layer 1	100	Homogeneous black mastic	**Chrysotile** 3%		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 #: C4U6424
Report Date: 2024/10/04

Pinchin Ltd
Client Project #: 336572.012
Sampler Initials: JC

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0008B SINK,MASTIC, GOLD,LOC:6773,MUSIC ROOM

Bureau Veritas ID: AEKV40 — Date Analyzed: 2024/10/04

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
Layer 1			N/A		

Comment: Not Analyzed - Positive Stop

S0008C SINK,MASTIC, GOLD,LOC:6773,MUSIC ROOM

Bureau Veritas ID: AEKV41 — Date Analyzed: 2024/10/04

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
Layer 1			N/A		

Comment: Not Analyzed - Positive Stop

S0009A FLOOR,VINYL FLOOR TILE AND MASTIC,12X12 WHITE WITH GREY FLECK,LOC:6773,MUSIC ROOM

Bureau Veritas ID: AEKV42 — Date Analyzed: 2024/10/04

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
Layer 1	95	Homogeneous off-white 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 #: C4U6424
Report Date: 2024/10/04

Pinchin Ltd
Client Project #: 336572.012
Sampler Initials: JC

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0009B FLOOR,VINYL FLOOR TILE AND MASTIC,12X12 WHITE WITH GREY FLECK,LOC:6773,MUSIC ROOM

Bureau Veritas ID: AEKV43 Date Analyzed: 2024/10/04

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
Layer 1	95	Homogeneous off-white vinyl floor tile	Not Detected		Non-Fibrous
Layer 2	5	Homogeneous black mastic	Not Detected		Non-Fibrous

S0009C FLOOR,VINYL FLOOR TILE AND MASTIC,12X12 WHITE WITH GREY FLECK,LOC:6773,MUSIC ROOM

Bureau Veritas ID: AEKV44 Date Analyzed: 2024/10/04

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
Layer 1	95	Homogeneous off-white 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 #: C4U6424
Report Date: 2024/10/04

Pinchin Ltd
Client Project #: 336572.012
Sampler Initials: JC

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0010A FLOOR,VINYL FLOOR TILE AND MASTIC,9X9 WHITE WITH GREY STREAKS AND VARIOUS COLOURS,LOC:6771,SCIENCE ROOM

Bureau Veritas ID: AEKV45 — Date Analyzed: 2024/10/04

	P.O.B	Sample Morphology	Asbestos		Other Fibres	Particulate
Layer 1	95	Homogeneous grey vinyl floor tile	**Chrysotile**	1%		Non-Fibrous
Layer 2	5	Homogeneous black mastic	**Chrysotile**	3%		Non-Fibrous

S0010B FLOOR,VINYL FLOOR TILE AND MASTIC,9X9 WHITE WITH GREY STREAKS AND VARIOUS COLOURS,LOC:6771,SCIENCE ROOM

Bureau Veritas ID: AEKV46 — Date Analyzed: 2024/10/04

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
Layer 1			N/A		
	Comment:	Not Analyzed - Positive Stop			

S0010C FLOOR,VINYL FLOOR TILE AND MASTIC,9X9 WHITE WITH GREY STREAKS AND VARIOUS COLOURS,LOC:6771,SCIENCE ROOM

Bureau Veritas ID: AEKV47 — Date Analyzed: 2024/10/04

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
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 #: C4U6424
Report Date: 2024/10/04

Pinchin Ltd
Client Project #: 336572.012
Sampler Initials: JC

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0011A FLOOR,VINYL FLOOR TILE AND MASTIC,12X12 BLUE,LOC:6772,STORAGE

Bureau Veritas ID: AEKV48 Date Analyzed: 2024/10/04

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
Layer 1	95	Homogeneous blue vinyl floor tile	Not Detected		Non-Fibrous
Layer 2	5	Homogeneous black mastic	Not Detected		Non-Fibrous

S0011B FLOOR,VINYL FLOOR TILE AND MASTIC,12X12 BLUE,LOC:6772,STORAGE

Bureau Veritas ID: AEKV49 Date Analyzed: 2024/10/04

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
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 #: C4U6424
Report Date: 2024/10/04

Pinchin Ltd
Client Project #: 336572.012
Sampler Initials: JC

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0011C FLOOR,VINYL FLOOR TILE AND MASTIC,12X12 BLUE,LOC:6772,STORAGE

Bureau Veritas ID: AEKV50 — Date Analyzed: 2024/10/04

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
Layer 1	95	Homogeneous blue vinyl floor tile	Not Detected		Non-Fibrous
Layer 2	5	Homogeneous black mastic	Not Detected		Non-Fibrous

S0012A CAULKING,BUTYL,LOC:6789,VESTIBULE

Bureau Veritas ID: AEKV51 — Date Analyzed: 2024/10/04

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
Layer 1	100	Homogeneous grey caulking	Not Detected		Non-Fibrous

S0012B CAULKING,BUTYL,LOC:6789,VESTIBULE

Bureau Veritas ID: AEKV52 — Date Analyzed: 2024/10/04

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
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 #: C4U6424
Report Date: 2024/10/04

Pinchin Ltd
Client Project #: 336572.012
Sampler Initials: JC

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0012C CAULKING,BUTYL,LOC:7763,VESTIBULE

Bureau Veritas ID: AEKV53 Date Analyzed: 2024/10/04

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
Layer 1	100	Homogeneous grey caulking	Not Detected		Non-Fibrous

S0013A FLOOR,TERRAZZO,LOC:6789,VESTIBULE

Bureau Veritas ID: AEKV54 Date Analyzed: 2024/10/04

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
Layer 1	90	Homogeneous beige terrazzo flooring	Not Detected		Non-Fibrous
Layer 2	10	Homogeneous grey cementitious material	Not Detected		Non-Fibrous

S0013B FLOOR,TERRAZZO,LOC:6789,VESTIBULE

Bureau Veritas ID: AEKV55 Date Analyzed: 2024/10/04

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
Layer 1	90	Homogeneous beige terrazzo flooring	Not Detected		Non-Fibrous
Layer 2	10	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 #: C4U6424
Report Date: 2024/10/04

Pinchin Ltd
Client Project #: 336572.012
Sampler Initials: JC

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0013C FLOOR,TERRAZZO,LOC:7763,VESTIBULE

Bureau Veritas ID: AEKV56 — Date Analyzed: 2024/10/04

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
Layer 1	90	Homogeneous beige terrazzo flooring	Not Detected		Non-Fibrous
Layer 2	10	Homogeneous grey cementitious material	Not Detected		Non-Fibrous

S0014A DOOR,CAULKING,DARK GREY,LOC:6789,VESTIBULE

Bureau Veritas ID: AEKV57 — Date Analyzed: 2024/10/04

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
Layer 1	100	Homogeneous grey caulking	Not Detected		Non-Fibrous

S0014B DOOR,CAULKING,DARK GREY,LOC:6789,VESTIBULE

Bureau Veritas ID: AEKV58 — Date Analyzed: 2024/10/04

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
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 #: C4U6424
Report Date: 2024/10/04

Pinchin Ltd
Client Project #: 336572.012
Sampler Initials: JC

Asbestos Analytical Results

EPA/600R-93/116 by Polarized Light Microscopy

S0014C DOOR,CAULKING,DARK GREY,LOC:7763,VESTIBULE

Bureau Veritas ID: AEKV59 Date Analyzed: 2024/10/04

	P.O.B	Sample Morphology	Asbestos	Other Fibres	Particulate
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

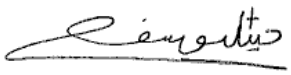
GENERAL COMMENTS

Results relate only to the items tested.

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:



Dina Yousif, 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 Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

C4U6424
2024/10/01 09:30

NONT-2024-10-024

Analyzed by:
Reviewed by:
Report Sent by:

Pinchin Ltd. - Asbestos Laboratory
Internal Asbestos Bulk Sample Chain of Custody

Special Instructions:

Client Name:	Hamilton-Wentworth District School Board		**Project Address:**	ON		
Portfolio/Building No:	Lisgar School		**Pinchin File:**	336572.012		
Submitted by:	Justin Appleby		**Email:**	jappleby@pinchin.com		
CC Results to:	Jessica Cozzitorto		**CC Email:**	jcozzitorto@pinchin.com		
Date Submitted:	September 26 2024		**Required by:**	October	4	2024
# of Samples:	23		**Priority:**	5 Day Turnaround		
Year of Building Construction (*Mandatory, Years ONLY*):			1963			
Do NOT Stop on Positive (Sample Numbers):						
Pinchin Group Company (*Mandatory Field*):			Pinchin			
HMIS2 Building Reference #:			139690/202482391071915			
To be Completed by Lab Personnel Only:						
Lab Reference #:	SEP 2 7 2024		**Time:** 09:30	24 hour clock		
Received by:			**Date:** 2024/10/0	Month	Day	Year
Name(s) of Analyst(s):	SUGAN SALVAM					

Sample Prefix	Sample No.	Sample Suffix	Sample Description/Location (Mandatory)
S	0004	D	Wall,Paint,Concrete Block,Loc:6773,Music Room
S	0004	E	Wall,Paint,Concrete Block,Loc:6771,Science Room
S	0008	A	Sink,Mastic, Gold,Loc:6773,Music Room
S	0008	B	Sink,Mastic, Gold,Loc:6773,Music Room
S	0008	C	Sink,Mastic, Gold,Loc:6773,Music Room
S	0009	A	Floor,Vinyl Floor Tile And Mastic,12x12 White With Grey Fleck,Loc:6773,Music Room

Sample Prefix	Sample No.	Sample Suffix	Sample Description/Location (Mandatory)
S	0009	B	Floor,Vinyl Floor Tile And Mastic,12x12 White With Grey Fleck,Loc:6773,Music Room
S	0009	C	Floor,Vinyl Floor Tile And Mastic,12x12 White With Grey Fleck,Loc:6773,Music Room
S	0010	A	Floor,Vinyl Floor Tile And Mastic,9x9 White With Grey Streaks And Various Colours,Loc:6771,Science Room
S	0010	B	Floor,Vinyl Floor Tile And Mastic,9x9 White With Grey Streaks And Various Colours,Loc:6771,Science Room
S	0010	C	Floor,Vinyl Floor Tile And Mastic,9x9 White With Grey Streaks And Various Colours,Loc:6771,Science Room
S	0011	A	Floor,Vinyl Floor Tile And Mastic,12x12 Blue,Loc:6772,Storage
S	0011	B	Floor,Vinyl Floor Tile And Mastic,12x12 Blue,Loc:6772,Storage
S	0011	C	Floor,Vinyl Floor Tile And Mastic,12x12 Blue,Loc:6772,Storage
S	0012	A	Caulking,Butyl,Loc:6789,Vestibule
S	0012	B	Caulking,Butyl,Loc:6789,Vestibule
S	0012	C	Caulking,Butyl,Loc:7763,Vestibule
S	0013	A	Floor,Terrazzo,Loc:6789,Vestibule
S	0013	B	Floor,Terrazzo,Loc:6789,Vestibule
S	0013	C	Floor,Terrazzo,Loc:7763,Vestibule
S	0014	A	Door,Caulking,Dark Grey,Loc:6789,Vestibule

Sample Prefix	Sample No.	Sample Suffix	Sample Description/Location (Mandatory)
S	0014	B	Door,Caulking,Dark Grey,Loc:6789,Vestibule
S	0014	C	Door,Caulking,Dark Grey,Loc:7763,Vestibule

Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 40 CFR, Part 763, Subpart E, App.E

NVLAP TESTING NVLAP LAB CODE 200664-0

Lab ID # 173190

Customer: Pinchin Ltd.
6-875 Main St West
Suite 200
Hamilton, Ontario L8S 4P9

Attn: Cody Kool
Damian Palus

Project: 286531.023; HWDSB Lisgar

Lab Order ID: 71968080
Analysis ID: 71968080_PLM
Date Received: 6/18/2021
Date Reported: 6/21/2021

Sample ID *Lab Sample ID*	Description *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes Treatment
S0001B *71968080PLM_1*	Tar inside duct, Mechanical Room 200, above Storage 130D (HWDSB Location 776	**None Detected**	**50% Fiber Glass**	**50% Other**	Black Fibrous Homogeneous Ashed
S0001C *71968080PLM_2*	Tar inside duct, Mechanical Room 200, above Storage 130D (HWDSB Location 776	**None Detected**	**50% Fiber Glass**	**50% Other**	Black Fibrous Homogeneous Ashed
S0002B *71968080PLM_3*	Tar outside duct, Mechanical Room 200, above Storage 130D (HWDSB Location 776	**None Detected**	**50% Cellulose**	**50% Other**	Black Fibrous Homogeneous Dissolved
S0002C *71968080PLM_4*	Tar outside duct, Mechanical Room 200, above Storage 130D (HWDSB Location 776	**None Detected**		**100% Other**	Black Fibrous Homogeneous Dissolved
S0003A *71968080PLM_5*	Grey caulking around duct and register, Mechanical Room 200, above Storage 130D (HW	**4% Chrysotile**		**96% Other**	Gray Non Fibrous Homogeneous Dissolved
S0003B *71968080PLM_6*	Grey caulking around duct and register, Mechanical Room 200, above Storage 130D (HW	**Not Analyzed**			
S0003C *71968080PLM_7*	Grey caulking around duct and register, Exterior (Location 1)	**Not Analyzed**			
S0004A *71968080PLM_8*	White paint on concrete block walls, Gymnasium 130 (HWDSB Location 7760)	**None Detected**		**100% Other**	White Non Fibrous Homogeneous Dissolved

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommend that analysis of floor tiles, vermiculite, and/or heterogeneous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. government. Analytical uncertainty available upon request. Scientific Analytical Institute participates in the NVLAP Proficiency Testing program. Unless otherwise noted blank sample correction was not performed. Estimated MDL is 0.1%.

Charmel Dozier (19)

Analyst

Approved Signatory

P-F-002 r15 1/16/2021

Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 40 CFR, Part 763, Subpart E, App.E

NVLAP TESTING NVLAP LAB CODE 200664-0

AIHA ACCREDITED LABS.ORG Lab ID # 173190

Customer: Pinchin Ltd.
6-875 Main St West
Suite 200
Hamilton, Ontario L8S 4P9

Attn: Cody Kool
Damian Palus

Project: 286531.023; HWDSB Lisgar

Lab Order ID: 71968080
Analysis ID: 71968080_PLM
Date Received: 6/18/2021
Date Reported: 6/21/2021

Sample ID *Lab Sample ID*	Description *Lab Notes*	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes Treatment
S0004B *71968080PLM_9*	White paint on concrete block walls, Gymnasium 130 (HWDSB Location 7760)	**None Detected**		**100% Other**	White Non Fibrous Homogeneous Dissolved
S0004C *71968080PLM_10*	White paint on concrete block walls, Gymnasium 130 (HWDSB Location 7760)	**None Detected**		**100% Other**	White Non Fibrous Homogeneous Dissolved
S0005A *71968080PLM_11*	White caulking around duct regsiter, Exterior (Location 1)	**None Detected**		**100% Other**	White Non Fibrous Homogeneous Dissolved
S0005B *71968080PLM_12*	White caulking around duct regsiter, Exterior (Location 1)	**None Detected**		**100% Other**	White Non Fibrous Homogeneous Dissolved
S0005C *71968080PLM_13*	White caulking around duct regsiter, Exterior (Location 1)	**None Detected**		**100% Other**	White Non Fibrous Homogeneous Dissolved
S0006A *71968080PLM_14*	Grey caulking on metal roof flashing, Roof (Location 2)	**None Detected**		**100% Other**	Gray Non Fibrous Homogeneous Dissolved
S0006B *71968080PLM_15*	Grey caulking on metal roof flashing, Roof (Location 2)	**None Detected**		**100% Other**	Gray Non Fibrous Homogeneous Dissolved
S0006C *71968080PLM_16*	Grey caulking on metal roof flashing, Roof (Location 2)	**None Detected**		**100% Other**	Gray Non Fibrous Homogeneous Dissolved

Disclaimer: Due to the nature of the EPA 600 method, asbestos may not be detected in samples containing low levels of asbestos. We strongly recommend that analysis of floor tiles, vermiculite, and/or heterogeneous soil samples be conducted by TEM for confirmation of "None Detected" by PLM. This report relates only to the samples tested and may not be reproduced, except in full, without the written approval of SAI. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. government. Analytical uncertainty available upon request. Scientific Analytical Institute participates in the NVLAP Proficiency Testing program. Unless otherwise noted blank sample correction was not performed. Estimated MDL is 0.1%.

Charmel Dozier (19)

Analyst

Approved Signatory

P-F-002 r15 1/16/2021

Bulk Asbestos Analysis

By Polarized Light Microscopy
EPA Method: 600/R-93/116 and 40 CFR, Part 763, Subpart E, App.E

NVLAP TESTING
NVLAP LAB CODE 200664-0

Lab ID # 173190

Customer: Pinchin Ltd.
6-875 Main St West
Suite 200
Hamilton, Ontario L8S 4P9

Project: 286531.023; HWDSB Lisgar

Attn: Cody Kool
Damian Palus

Lab Order ID: 71968080
Analysis ID: 71968080_PLM
Date Received: 6/18/2021
Date Reported: 6/21/2021

Sample ID	Description	Asbestos	Fibrous Components	Non-Fibrous Components	Attributes
Lab Sample ID	*Lab Notes*				Treatment
S0007A	Grey and black coating, Roof (Location 2)	None Detected	3% Cellulose	97% Other	Silver, Black Non Fibrous Homogeneous
71968080PLM_17					Dissolved
S0007B	Grey and black coating, Roof (Location 2)	None Detected	3% Cellulose	97% Other	Silver, Black Non Fibrous Homogeneous
71968080PLM_18					Dissolved
S0007C	Grey and black coating, Roof (Location 2)	None Detected	3% Cellulose	97% Other	Silver, Black Non Fibrous Homogeneous
71968080PLM_19					Dissolved

Charmel Dozier (19)

Analyst

Approved Signatory

71968080

Client:	Pinchin Ltd.
Contact:	Cody Kool; Damian Palus
Address:	5-875 Main St W, Hamilton, ON
Phone:	289.339.3840
Fax:	905.577.6207
Email:	ckool@pinchin.com dpalus@pinchin.com
Project:	286531.023; HWDSB Lisgar
Client Notes:	Stop positive on all samples. Perform ashing on third vinyl floor tile if first two are ND.
P.O. #.	286531.023; HWDSB Lisgar
Date Submitted:	6/17/2021 0:00
Analysis:	PLM BULK EPA 600
TurnAroundTime:	Rush - 1 day

Instructions:

Use Column "B" for your contact info

To See an Example Click the bottom Example Tab.

Enter samples between "<<" and ">>"
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.

Version 1-15-2012

Invoice to:

~~Contact name here~~ Accounts Payable
Email address here ap@pinchin.com

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)
<<			
S0001B		Tar inside duct, Mechanical Room 200, above Storage 130D (HWDSB Location 7761)	
S0001C		Tar inside duct, Mechanical Room 200, above Storage 130D (HWDSB Location 7761)	
S0002B		Tar outside duct, Mechanical Room 200, above Storage 130D (HWDSB Location 7761)	
S0002C		Tar outside duct, Mechanical Room 200, above Storage 130D (HWDSB Location 7761)	
S0003A		Grey caulking around duct and register, Mechanical Room 200, above Storage 130D (HWDSE	
S0003B		Grey caulking around duct and register, Mechanical Room 200, above Storage 130D (HWDSE	
S0003C		Grey caulking around duct and register, Exterior (Location 1)	
S0004A		White paint on concrete block walls, Gymnasium 130 (HWDSB Location 7760)	
S0004B		White paint on concrete block walls, Gymnasium 130 (HWDSB Location 7760)	
S0004C		White paint on concrete block walls, Gymnasium 130 (HWDSB Location 7760)	
S0005A		White caulking around duct regsiter, Exterior (Location 1)	
S0005B		White caulking around duct regsiter, Exterior (Location 1)	
S0005C		White caulking around duct regsiter, Exterior (Location 1)	
S0006A		Grey caulking on metal roof flashing, Roof (Location 2)	

Accepted ☑

Rejected ☐

6/18

7196808O

S0006B	Grey caulking on metal roof flashing, Roof (Location 2)
S0006C	Grey caulking on metal roof flashing, Roof (Location 2)
S0007A	Grey and black coating, Roof (Location 2)
S0007B	Grey and black coating, Roof (Location 2)
S0007C	Grey and black coating, Roof (Location 2)

Pinchin Ltd. Asbestos Laboratory
Certificate of Analysis

Project Name:	**WO 525664**		
Project No.:	**0203540.000**		
Prepared For:	**A. Coric / M. Maiorana / J. Cozzitorto**		
Lab Reference No.:	**b264985**		
Analyst(s):	**N. Barinque**		
Date Received:	**January 18, 2022**	**# Samples submitted:**	**1**
Date Analyzed:	**January 24, 2022**	**# Phases analyzed:**	**1**

Method of Analysis:

EPA 600/R-93/116 - Method for the Determination of Asbestos in Bulk Building Materials dated July, 1993

Bulk samples are checked visually and scanned under a stereomicroscope. Slides are prepared and observed under a Polarized Light Microscope (PLM) at magnifications of 40X, 100X or 400X as appropriate. Asbestos fibres are identified by a combination of morphology, colour, refractive index, extinction, sign of elongation, birefringence and dispersion staining colours. A visual estimate is made of the percentage of asbestos present. A reported concentration of less than (<) the regulatory threshold indicates the presence of confirmed asbestos in trace quantities, limited to only a few fibres or fibre bundles in an entire sample. This method complies with provincial regulatory requirements where applicable. Multiple phases within a sample are analyzed and reported separately.

All bulk samples submitted to this laboratory for asbestos analysis are retained for a minimum of three months. Samples may be retrieved, upon request, for re-examination at any time during that period.

The Pinchin Ltd. Mississauga asbestos laboratory is accredited by the National Institute of Standards and Technology, National Voluntary Laboratory Accreditation Program (NVLAP Lab Code 101270-0) for the 'EPA – 40 CFR Appendix E to Subpart E of Part 763, Interim Method of the Determination of Asbestos in Bulk Insulation Samples,' and the 'EPA 600/R-93/116: Method for the Determination of Asbestos in Bulk Building Materials'; and meets all requirements of ISO/IEC 17025:2017.

This report relates only to the items tested.

Pinchin Ltd. Asbestos Laboratory
Certificate of Analysis

Project Name: **WO 525664**
Project No.: **0203540.000**
Prepared For: **A. Coric / M. Maiorana / J. Cozzitorto**

Lab Reference No.: **b264985**
Date Analyzed: **January 24, 2022**

BULK SAMPLE ANALYSIS

SAMPLE IDENTIFICATION	SAMPLE DESCRIPTION	% COMPOSITION (VISUAL ESTIMATE)	
		ASBESTOS	OTHER
0001A Room 126A - Loc 6772 - Vermiculite	Homogeneous, grey, beige and brown, loose particulate, micaceous material.	Libby Amphibole Asbestos Confirmed	Vermiculite > 75%
Comments:	This sample originated from Libby Montana (a mine known to be contaminated with amphibole asbestos and is sold under the brand name Zonolite) and was confirmed in our laboratory to contain asbestos fibres. The laboratory does not report a percentage due to the variable asbestos content of the vermiculite from bag to bag or even between sampling locations in the same installation. The overall percentage of asbestos in Libby Vermiculite has been shown to range up to 6% (Atkinson et al. 1982; Amandus et al. 1987). Pinchin recommends that once the material is confirmed to be Libby Zonolite, it be treated as an asbestos containing material (>0.1% asbestos).		

Reviewed by: **Reporting Analyst:**

Analyzed by: NF 22-01-24

Reviewed by:

Report Sent by:

Instructions:

Pinchin Ltd. - Asbestos Laboratory
Internal Asbestos Bulk Sample Chain of Custody

Client Name:				**Project Address:**			
Portfolio/Building No:	WO 525664			**Pinchin File:**	203540		
Submitted by:	Angela Coric			**Email:**	acoric@pinchin.com		
CC Results to:	Michael Maiorana and Jessica Cozzitorto			**CC Email:**	mmaiorana@pinchin.com; jcozzitorto@pinchin.com		
Invoice to:	Accounts Payable			**Invoice Email:**	ap@pinchin.com		
Date Submitted:	January	14	2022	**Required by:**	January	21	2022
# of Samples:	1			**Priority:**	5 Day Turnaround		
Year of Building Construction (*Mandatory Field*):							
Do NOT Stop on Positive (Sample Numbers):							
Pinchin Group Company (*Mandatory Field*):				Pinchin			

To be Completed by Lab Personnel Only:						
Lab Reference #:	b264985 2B		**Time:**	24 hour clock		
Received by:	JAN 18 2022		**Date:**	Month	Day	2021
Name(s) of Analyst(s):						

Sample Prefix	Sample No.	Sample Suffix	Sample Description/Location (Mandatory)
	0001	A	Room 126A - Loc 6772 - Vermiculite Libby Cont.

APPENDIX II-B

Lead Analytical Certificates

Your Project #: 336572.012
Your C.O.C. #: N/A

Attention: Jessica Cozzitorto

Pinchin Ltd
151 York Boulevard
Suite 200
Hamilton, ON
CANADA L8R 3M2

Report Date: 2024/10/11
Report #: R8357766
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C4U6857
Received: 2024/10/01, 09:30

Sample Matrix: Bulk
Samples Received: 5

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Analytical Method
Metals in Paint	1	2024/10/10	2024/10/10	CAM SOP-00408	EPA 6010D m
Metals in Paint	2	2024/10/02	2024/10/03	CAM SOP-00408	EPA 6010D m
Metals in Paint	2	2024/10/03	2024/10/04	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, EPA, APHA or the Quebec Ministry of Environment.

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.

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 #: 336572.012
Your C.O.C. #: N/A

Attention: Jessica Cozzitorto

Pinchin Ltd
151 York Boulevard
Suite 200
Hamilton, ON
CANADA L8R 3M2

Report Date: 2024/10/11
Report #: R8357766
Version: 1 - Final

CERTIFICATE OF ANALYSIS

BUREAU VERITAS JOB #: C4U6857
Received: 2024/10/01, 09:30

Encryption Key

Please direct all questions regarding this Certificate of Analysis to:
Nilushi Mahathantila, Project Manager
Email: Nilushi.Mahathantila@bureauveritas.com
Phone# (905) 817-5700

==========

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 #: C4U6857
Report Date: 2024/10/11

Pinchin Ltd
Client Project #: 336572.012
Sampler Initials: JA

ELEMENTS BY ATOMIC SPECTROSCOPY (BULK)

Bureau Veritas ID		AELR85			AELR86		
Sampling Date		2024/09/25 19:00			2024/09/25 19:00		
COC Number		N/A			N/A		
	UNITS	L0003,YELLOW CONCRETE BLOCK,LOC:6773,MUSIC ROOM	RDL	QC Batch	L0004,WHITE,LOC:6773,MUSIC ROOM	RDL	QC Batch
Metals							
Lead (Pb)	%	<0.00045	0.00045	9677330	0.024	0.00010	9693738

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Bureau Veritas ID		AELR87		AELR88		
Sampling Date		2024/09/25 19:00		2024/09/25 19:00		
COC Number		N/A		N/A		
	UNITS	L0005,BLUE,LOC:6771,SCIENCE ROOM	RDL	L0006,RED,LOC:6789,VESTIBULE	RDL	QC Batch
Metals						
Lead (Pb)	%	<0.0030	0.0030	<0.0013	0.0013	9679972

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Bureau Veritas ID		AELR89		
Sampling Date		2024/09/25 19:00		
COC Number		N/A		
	UNITS	L0007,BROWN ON COLUMNS,LOC:1,EXTERIOR	RDL	QC Batch
Metals				
Lead (Pb)	%	0.16	0.00086	9677330

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

GENERAL COMMENTS

Metal 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 AELR89 [L0007,BROWN ON COLUMNS,LOC:1,EXTERIOR] : Metal 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.

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

Bureau Veritas Job #: C4U6857
Report Date: 2024/10/11

Pinchin Ltd
Client Project #: 336572.012
Sampler Initials: JA

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
9677330	JOH	Matrix Spike	Lead (Pb)	2024/10/03		83	%	75 - 125
9677330	JOH	QC Standard	Lead (Pb)	2024/10/03		101	%	75 - 125
9677330	JOH	Method Blank	Lead (Pb)	2024/10/03	<0.00010		%	
9677330	JOH	RPD	Lead (Pb)	2024/10/03	1.3		%	35
9679972	JOH	Matrix Spike	Lead (Pb)	2024/10/04		93	%	75 - 125
9679972	JOH	QC Standard	Lead (Pb)	2024/10/04		104	%	75 - 125
9679972	JOH	Method Blank	Lead (Pb)	2024/10/04	<0.00010		%	
9679972	JOH	RPD	Lead (Pb)	2024/10/04	9.6		%	35
9693738	JGC	Matrix Spike	Lead (Pb)	2024/10/10		79	%	75 - 125
9693738	JGC	QC Standard	Lead (Pb)	2024/10/10		93	%	75 - 125
9693738	JGC	Method Blank	Lead (Pb)	2024/10/10	<0.00010		%	
9693738	JGC	RPD	Lead (Pb)	2024/10/10	9.5		%	35

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 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by:

Louise Harding, 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 Rodney Major, General Manager responsible for Ontario Environmental laboratory operations.

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

C4U6857
2024/10/01 09:30

BUREAU VERITAS

6740 Campobello Road, Mississauga, Ontario L5N 2L8
Phone: 905-817-5700 Fax: 905-817-5779 Toll Free: 800-563-6266
CAM FCD-01191/6

CHAIN OF CUSTODY RECORD

Invoice Information	Report Information (if differs from invoice)	Project Information (where applicable)	Turnaround Time (TAT) Required
Company Name: Pinchin Ltd.	Company Name:	Quotation #:	[X] Regular TAT (5-7 days) Most analyses
Contact Name: Justin Appleby / Jessica Cozzitorto	Contact Name:	P.O. #/ AFE#:	PLEASE PROVIDE ADVANCE NOTICE FOR RUSH PROJECTS
Address:	Address:	Project #: 336572.012	Rush TAT (Surcharges will be applied)
Phone: Fax:	Phone: Fax:	Site Location:	[ ] 1 Day [ ] 2 Days [ ] 3-4 Days
Email: jappleby@pinchin.com / jcozzitorto@pinchin.com	Email:	Site #:	Date Required:
MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BUREAU VERITAS DRINKING WATER CHAIN OF CUSTODY		Site Location Province: ____ ON Sampled By:	Rush Confirmation #:

Regulation 153	Other Regulations
[ ] Table 1 [ ] Res/Park [ ] Med/ Fine	[ ] CCME [ ] Sanitary Sewer Bylaw
[ ] Table 2 [ ] Ind/Comm [ ] Coarse	[ ] MISA [ ] Storm Sewer Bylaw
[ ] Table 3 [ ] Agri/ Other	[ ] PWQO Region ____
[ ] Table ____	[ ] Other (Specify) ____
FOR RSC (PLEASE CIRCLE) Y / N	[ ] REG 558 (MIN. 3 DAY TAT REQUIRED)
	[ ] REG 406 Table ____

Include Criteria on Certificate of Analysis: Y / N

SAMPLES MUST BE KEPT COOL (< 10 °C) FROM TIME OF SAMPLING UNTIL DELIVERY TO BUREAU VERITAS

Analysis Requested

LABORATORY USE ONLY

CUSTODY SEAL Y / N (Present / Intact) — COOLER TEMPERATURES

COOLING MEDIA PRESENT: Y / N

SAMPLE IDENTIFICATION	DATE SAMPLED (YYYY/MM/DD)	TIME SAMPLED (HH:MM)	MATRIX	# OF CONTAINERS SUBMITTED	FIELD FILTERED (CIRCLE) Metals / Hg / CrVI	BTEX/ PHC F1	PHCs F2 - F4	VOCs	REG 153 METALS & INORGANICS	REG 153 ICPMS METALS	REG 153 METALS (Hg, Cr VI, ICPMS Metals, HWS - B)	Lead (Pb) in Paints	PCBs	HOLD- DO NOT ANALYZE	COOLER TEMPERATURES	COMMENTS
L0003, Yellow Concrete Block,Loc:6773,Music Room	(2024/09/25)	7:00PM	BULK									X			N/A	
L0004, White,Loc:6773,Music Room	(2024/09/25)	7:00PM	BULK									X				
L0005, Blue,Loc:6771,Science Room	(2024/09/25)	7:00PM	BULK									X				
L0006, Red,Loc:6789,Vestibule	(2024/09/25)	7:00PM	BULK									X				
L0007, Brown On Columns,Loc:1,Exterior	(2024/09/25)	7:00PM	BULK									X				

NONT-2024-10-032

RELINQUISHED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	RECEIVED BY: (Signature/Print)	DATE: (YYYY/MM/DD)	TIME: (HH:MM)	BV JOB #
Justin Appleby	2024/09/26	3:00pm	SUGAM SAINI	2024/10/01	09:30	

APPENDIX II-C

PCB Analytical Certificates

AEVITAS INC. (AYR)
ANALYTICAL CHEMISTRY DEPARTMENT
75 WANLESS COURT, AYR, ONTARIO, N0B 1E0, CANADA
WWW.AEVITAS.CA

Certificate of Analysis

Justin Appleby

Pinchin Ltd. (Hamilton)
151 York Blvd., Suite 200, Hamilton, ON L8R 3L4

Date of Issue: Oct 04, 2024

Report Description: ***1 solid sample was submitted for the following chemical analysis***

Project Name:	N/A	**Date Sampled:**	Sep 21, 2024
Project No.:	336572.012	**Date Tested:**	Oct 03, 2024
Site Location:	N/A	**Sampled by:**	Justin A

Report Number: 24-1228

No.	Analyte	Result	Units	MDL	Comments	Technique / Test Method
1	*Sample ID.:* ***P0002 Caulking, Dark Grey Around Doors, Loc:6789, Vestibule***					
	PCBs in Solid	**<0.2**	mg/Kg	0.2		LAB-M06 (EPA 3550C/8082A modified)

Results apply to the sample(s) as received.

Approved By:

Son C.H. Le, *(Chem.)*
Lab Manager
Phone: (519) 740-1333 Ext.: 1030
Fax: (519) 740-2320
Email: SonLe@aevitas.ca

The Analytical Chemistry Laboratory of Aevitas Inc. (Ayr) is accredited for specific tests in accordance with the recognized International Standard ISO/IEC 17025:2017, by the Canadian Association for Laboratory Accreditation (CALA) Inc. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017). The laboratory quality management system of Aevitas Inc. (Ayr) also operates in accordance with the principles of ISO 9001.

All Analytical data is subject to uncertainty which, may vary with sample matrices, sample preparation techniques and instrumental parameters. As a general guideline, uncertainty may be expressed as approximately +/- 50% of the reported value at or near the Method Detection Limit (MDL) and +/-10% or less, of the reported result that is greater than 10 times the MDL. Method Detection Limits are defined as approximately 3 times the standard deviation value (at 99% confidence level), which is obtained from replicate analysis of a low-level standard as per the Ontario MOE - MISA Protocol for the Sampling and Analysis of Industrial / Municipal Wastewater (2016). MDL determination is based on undiluted samples with relatively low matrix interferences. Where dilutions are required, the reported MDL value will be scaled proportionally.

All testing procedures follow strict guidelines and quality assurance / quality control (QA/QC) protocols. QA/QC data is available for review at any time upon client's request.

APPENDIX III
Methodology

1.0 GENERAL

An investigation 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 investigation 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, or a material that has already become crushed, pulverized, or powdered.

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 of select materials 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
BC	0.5%[1]	0.5%
Alberta	Any Amount[2]	Any Amount[2]
Saskatchewan	>0.5%[1]	>1%
Manitoba	0.1%[1]	1%
Ontario	**0.5%**	**0.5%**
Nova Scotia	0.5%[1]	0.5%
New Brunswick, Prince Edward Island, Newfound and Labrador	1%	1%
Yukon, Nunavut, Northwest Territories	1%	1%
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.

Asbestos materials were evaluated in order to make recommendations regarding any remedial work. The priority for remedial action was based on several factors:

- Friability (friable or non-friable)
- Condition (good, fair, poor, debris)
- Accessibility (ranking from accessible to all building users to inaccessible)
- Visibility (whether the material is obscured by other building components)
- Efficiency of the work (for example, if damaged ACM is being removed in an area, it may be most practical to remove all ACM in the area even if it is in good condition)

[1] Or any amount if vermiculite
[2] The Government of Alberta in their guideline document entitled the “Alberta Asbestos Abatement Manual” (August 2019), defines an Asbestos-Containing Material as a product or building material that contains asbestos in any quantity or percentage.

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 were 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)
British Columbia**	0.009	90
Alberta	0.009	90
Saskatchewan	0.009	90
Manitoba	0.009	90
Ontario	**0.1**	**1,000**
Nova Scotia	0.009	90
New Brunswick	0.009	90
Prince Edward Island	0.009	90
Newfoundland	0.009	90
Yukon	0.009	90
Nunavut, Northwest Territories	0.1	1,000
Federal	0.009	90

* If there is a conflict between federal and provincial criteria, the more stringent will apply.

** WorkSafe BC health and safety regulations do not numerically define what would be considered a lead-containing paint or coating. In general, paints containing lead >0.009% may require work procedures if disturbed.

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 were identified by visual 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.

APPENDIX IV

Location Summary Report

HMIS
HAZARDOUS MATERIALS INVENTORY SYSTEM

LOCATIONS LIST

PINCHIN
1.855.PINCHIN www.pinchin.com

Client:Hamilton-Wentworth District School Board **Site: 110 Anson Avenue, Hamilton, ON**
Building Name: Lisgar School
Survey Date: **Last Re-Assessment:**
Building Phases: A: 1963 , B: 1966

Location No.	Name or Description	Area ft²	Floor No.	Bldg. Phase	Notes
1	Exterior	0	E		
6771	Science Room, room no. 126	500	1	A	
6772	Storage Room, room no. 126A	125	1	A	
6773	Music Room, room no. 125	625	1	A	
6784	Corridor, room no. 127	600	1	A	
6789	Vestibule, room no. 129	100	1	A	
7763	Vestibule, room no. 132	100	1	A	

APPENDIX V

Hazardous Materials Summary Report / Sample Log

HMIS
HAZARDOUS MATERIALS INVENTORY SYSTEM

HAZARDOUS MATERIALS SUMMARY / SAMPLE LOG

PINCHIN
1.855.PINCHIN www.pinchin.com

Client:Hamilton-Wentworth District School Board **Site: 110 Anson Avenue, Hamilton, ON** **Building Name: Lisgar School** **Survey Date:**

HAZMAT	Sample No	System/Component/Material/Sample Description	Locations	Bldg. Phase	LF	SF	EA	%	Type	Positive	Friability
Asbestos	S0004 DE	Wall | | Paint | White On Block Walls	6771,6772,6773,6784	A	0	0	0	100	None Detected	No	
Asbestos	S0005 ABC	Other | | Caulking | White On Register	1		30	0	0	0	None Detected	No	
Asbestos	S0008 ABC	Other | Sink | Mastic, Gold |	6773	A	0	0	1	0	Chrysotile	Yes	NF
Asbestos	S0009 ABC	Floor | | Vinyl Floor Tile And Mastic | 12x12 White With Grey Fleck	6773	A	0	0	0	0	None Detected	No	
Asbestos	S0010 ABC	Floor | | Vinyl Floor Tile And Mastic | 9x9 White With Grey Streaks And Various Colours	6771	A	0	500	0	0	Chrysotile	Yes	NF
Asbestos	S0011 ABC	Floor | | Vinyl Floor Tile And Mastic | 12x12 Blue	6772	A	0	125	0	0	None Detected	No	
Asbestos	S0012 ABC	Other | | Caulking |	6789,7763	A	20	0	0	0	None Detected	No	
Asbestos	S0013 ABC	Floor | | Terrazzo |	6784,6789,7763	A	0	800	0	0	None Detected	No	
Asbestos	S0014 ABC	Other | Door | Caulking | Dark Grey	6789,7763	A	40	0	0	0	None Detected	No	
Asbestos	V9000	Ceiling | Acoustic Tile | Ceiling Tiles (glue-on) | 12x12 Pinhole With Fissures	6771,6772,6773	A	0	216	0	0	Confirmed Asbestos	Yes	PF
Asbestos	V9000	Structure | | Mortar | Siporex	6771,6772,6773,6784,6789,7763	A	0	0	0	100	Confirmed Asbestos	Yes	NF
Asbestos	V9000	Wall | | Vermiculite |	6772	A	0	0	0	0	Confirmed Asbestos	Yes	F
Asbestos	V9500	Wall | | Vermiculite |	6771,6773,6784,6789,7763	A	0	0	0	0	Presumed Asbestos	Yes	F
Asbestos	V0000	Wall | | Drywall And Joint Compound |	6771,6772	A	0	200	0	0	Non Asbestos	No	
Paint	L0003	Wall | Masonry | Yellow Concrete Block	6771,6772,6773	A	0	600	0	0		No	-
Paint	L0004	Structure | Metal | White	6771,6772,6773,6784,6789,7763	A	0	0	0	100	Lead (Low)	Yes	-
Paint	L0005	Other | Metal | Blue	6771,6772,6773,6784	A	0	0	6	0		No	-
Paint	L0006	Other | Metal | Red	6789,7763	A	0	0	4	0		No	-
Paint	L0007	Structure | Metal | Brown On Columns	1		0	0	0	100	Lead (High)	Yes	-
Lead Product	V9500	Batteries In Emer. Lights	6784	A	0	0	1	0	Presumed Lead Product	Yes	-
PCB	P0002	Caulking | Dark Grey Around Doors	6789,7763	A	40	0	0	0	-	No	-
PCB	V9500	Light Ballasts	6771,6772,6773,6784,6789,7763	A	0	0	0	100	Presumed PCB	Yes	-
Hg	V9500	Light Fixture	6771,6772,6773,6784,6789,7763	A	0	0	0	100	Presumed Hg	Yes	-

Legend:

Sample number	
S####	Asbestos sample collected
L####	Paint sample collected
P####	PCB sample collected
M####	Mould sample collected
V####	Material visually similar to numbered sample collected
V0000	Known non Hazardous Material
V9000	Material is visually identified as Hazardous Material
V9500	Material is presumed to be Hazardous Material
[Loc. No.]	Abated Material

Units	
SF	Square feet
LF	Linear feet
EA	Each
%	Percentage

NF	Non Friable material.
F	Friable material
PF	Potentially Friable material

APPENDIX VI

HMIS All Data Report

Client: Hamilton-Wentworth District School Board **Site: 110 Anson Avenue, Hamilton, ON** **Building Name: Lisgar School**
Location: #1 : Exterior **Floor: E** **Room #:** **Area (sqft): 0**
Survey Date: 2024-09-23 **Last Re-Assessment:**

ASBESTOS																
System	Component	Material	Item	Covering	A*	V*	AP*	Good	Fair	Poor	Unit	Sample	Asbestos Type	Amount	Hazard	Friable
Ceiling	Soffit	Concrete (precast)			C	Y										
Duct	Not Found															
Floor		Concrete (poured), Asphalt			A	Y										
Mechanical Equipment	Not Found															
Other		Caulking, Grey on register			C	Y		10			LF	S0003C	[None]	0.5-5%	[Abated]	
Other		Caulking, White on register			C	Y		30			LF	S0005ABC	None Detected	N.D.	None	
Piping	Not Found															
Structure	Beam	Metal			C	Y										
Wall		Masonry			A	Y										

Client: Hamilton-Wentworth District School Board **Site: 110 Anson Avenue, Hamilton, ON** **Building Name: Lisgar School**
Location: #1 : Exterior **Floor: E** **Room #:** **Area (sqft): 0**
Survey Date: 2024-09-23 **Last Re-Assessment:**

PAINT								
System	Item	Good	Poor	Unit	Sample	Sample Description	Amount	Hazard
Structure[1]	Metal	100		%	L0007	Brown on columns	Pb: 0.16 %	Lead (High)

1 - Front entrance

Client: Hamilton-Wentworth District School Board **Site: 110 Anson Avenue, Hamilton, ON** **Building Name: Lisgar School**
Location: #6771 : Science Room **Floor: 1** **Room #: 126** **Area (sqft): 500**
Survey Date: 2024-09-26 **Last Re-Assessment:**

ASBESTOS																
System	Component	Material	Item	Covering	A*	V*	AP*	Good	Fair	Poor	Unit	Sample	Asbestos Type	Amount	Hazard	Friable
Ceiling	Acoustic Tile	Ceiling tiles (glue-on), 12x12 pinhole with fissures			C	Y		72(7)			SF	V9000	Confirmed Asbestos		Confirmed Asbestos	PF
Duct		Not Insulated			C	Y										
Floor		Vinyl Floor Tile and Mastic, 9x9 white with Grey streaks and various colours			A	Y		500(7)			SF	S0010ABC	Chrysotile	0.5-5%	Confirmed Asbestos	NF
Mechanical Equipment	Fan Unit	Metal			C	Y										
Other	Sink	Not Insulated			A	Y										
Piping		Fibreglass			A	Y										
Piping		Not Insulated			C	Y										
Structure		Mortar, Siporex			C	Y		100(7)			%	V9000	Confirmed Asbestos		Confirmed Asbestos	NF
Structure	Beam	Wood			C	Y										
Structure	Beam	Metal			C	Y										
Structure	Deck	Concrete (precast)			C	Y										
Structure	Deck	Metal			C	Y										
Wall[1]		Drywall and joint compound			A	Y						V0000	Non-Asbestos		None	
Wall		Masonry			A	Y										
Wall		Paint, Concrete block			A	Y		100			%	V0004	None Detected	N.D.	None	
Wall		Paint, Concrete block			A	Y		100			%	S0004E	None Detected	N.D.	None	
Wall		Vermiculite			D	N						V9500	Presumed Asbestos		Presumed Asbestos	F

1 - Installed after 2018

Client: Hamilton-Wentworth District School Board **Site: 110 Anson Avenue, Hamilton, ON** **Building Name: Lisgar School**
Location: #6771 : Science Room **Floor: 1** **Room #: 126** **Area (sqft): 500**
Survey Date: 2024-09-26 **Last Re-Assessment:**

PAINT								
System	Item	Good	Poor	Unit	Sample	Sample Description	Amount	Hazard
Wall	Masonry	200		SF	V0003	Yellow concrete block	Pb: <0.00045 %	No
Structure	Metal	100		%	V0004	White	Pb: 0.024 %	Lead (Low)
Other[1]	Metal	1		EA	L0005	Blue	Pb: <0.0030 %	No

1 - Door

Client: Hamilton-Wentworth District School Board **Site: 110 Anson Avenue, Hamilton, ON** **Building Name: Lisgar School**
Location: #6771 : Science Room **Floor: 1** **Room #: 126** **Area (sqft): 500**
Survey Date: 2024-09-26 **Last Re-Assessment:**

MERCURY				
Component	Quantity	Unit	Sample	Hazard
Light Fixture	100	%	V9500	Presumed

Client: Hamilton-Wentworth District School Board **Site: 110 Anson Avenue, Hamilton, ON** **Building Name: Lisgar School**
Location: #6771 : Science Room **Floor: 1** **Room #: 126** **Area (sqft): 500**
Survey Date: 2024-09-26 **Last Re-Assessment:**

PCB						
Component	**Quantity**	**Unit**	**Sample**	**Sample Description**	**Amount**	**PCB**
Light Ballasts	100	%	V9500			Presumed

Client: Hamilton-Wentworth District School Board **Site: 110 Anson Avenue, Hamilton, ON** **Building Name: Lisgar School**
Location: #6772 : Storage Room **Floor: 1** **Room #: 126A** **Area (sqft): 125**
Survey Date: 2024-09-26 **Last Re-Assessment:**

ASBESTOS																
System	Component	Material	Item	Covering	A*	V*	AP*	Good	Fair	Poor	Unit	Sample	Asbestos Type	Amount	Hazard	Friable
Ceiling	Acoustic Tile	Ceiling tiles (glue-on), 12x12 pinhole with fissures			C	Y		72(7)			SF	V9000	Confirmed Asbestos		Confirmed Asbestos	PF
Duct		Not Insulated			C	Y										
Floor		Vinyl Floor Tile and Mastic, 12x12 blue			A	Y		125			SF	S0011ABC	None Detected	N.D.	None	
Mechanical Equipment	Fan Unit	Metal			C	Y										
Piping		Fibreglass			A	Y										
Piping		Not Insulated			C	Y										
Structure		Mortar, Siporex			C	Y		100(7)			%	V9000	Confirmed Asbestos		Confirmed Asbestos	NF
Structure	Beam	Wood			C	Y										
Structure	Beam	Metal			C	Y										
Structure	Deck	Concrete (precast)			C	Y										
Structure	Deck	Metal			C	Y										
Wall[1]		Drywall and joint compound			A	Y		200			SF	V0000	Non-Asbestos		None	
Wall		Masonry			A	Y										
Wall		Paint, Concrete block			A	Y		100			%	V0004	None Detected	N.D.	None	
Wall		Paint, Concrete block			A	Y		100			%	V0004	None Detected	N.D.	None	
Wall		Vermiculite			A	Y						V9000	Confirmed Asbestos		Confirmed Asbestos	F
Wall		Vermiculite Investigation			A	Y										

1 - Installed after 2018

Client: Hamilton-Wentworth District School Board **Site: 110 Anson Avenue, Hamilton, ON** **Building Name: Lisgar School**
Location: #6772 : Storage Room **Floor: 1** **Room #: 126A** **Area (sqft): 125**
Survey Date: 2024-09-26 **Last Re-Assessment:**

PAINT								
System	Item	Good	Poor	Unit	Sample	Sample Description	Amount	Hazard
Wall	Masonry	200		SF	V0003	Yellow concrete block	Pb: <0.00045 %	No
Structure	Metal	100		%	V0004	White	Pb: 0.024 %	Lead (Low)
Other[1]	Metal	1		EA	V0005	Blue	Pb: <0.0030 %	No

1 - Door

Client: Hamilton-Wentworth District School Board **Site: 110 Anson Avenue, Hamilton, ON** **Building Name: Lisgar School**
Location: #6772 : Storage Room **Floor: 1** **Room #: 126A** **Area (sqft): 125**
Survey Date: 2024-09-26 **Last Re-Assessment:**

MERCURY				
Component	Quantity	Unit	Sample	Hazard
Light Fixture	100	%	V9500	Presumed

Client: Hamilton-Wentworth District School Board **Site: 110 Anson Avenue, Hamilton, ON** **Building Name: Lisgar School**
Location: #6772 : Storage Room **Floor: 1** **Room #: 126A** **Area (sqft): 125**
Survey Date: 2024-09-26 **Last Re-Assessment:**

PCB						
Component	**Quantity**	**Unit**	**Sample**	**Sample Description**	**Amount**	**PCB**
Light Ballasts	100	%	V9500			Presumed

Client: Hamilton-Wentworth District School Board **Site: 110 Anson Avenue, Hamilton, ON** **Building Name: Lisgar School**
Location: #6773 : Music Room **Floor: 1** **Room #: 125** **Area (sqft): 625**
Survey Date: 2024-09-26 **Last Re-Assessment:**

ASBESTOS																
System	Component	Material	Item	Covering	A*	V*	AP*	Good	Fair	Poor	Unit	Sample	Asbestos Type	Amount	Hazard	Friable
Ceiling	Acoustic Tile	Ceiling tiles (glue-on), 12x12 pinhole with fissures			C	Y		72(7)			SF	V9000	Confirmed Asbestos		Confirmed Asbestos	PF
Duct		Not Insulated			C	Y										
Floor		Vinyl Floor Tile and Mastic, 12x12 white with grey fleck			A	Y					SF	S0009ABC	None Detected	N.D.	None	
Mechanical Equipment	Fan Unit	Metal			C	Y										
Other	Sink	Mastic, Gold			A	Y		1(7)			EA	S0008ABC	Chrysotile	0.5-5%	Confirmed Asbestos	NF
Piping		Fibreglass			A	Y										
Piping		Not Insulated			C	Y										
Structure		Mortar, Siporex			C	Y		100(7)			%	V9000	Confirmed Asbestos		Confirmed Asbestos	NF
Structure	Beam	Wood			C	Y										
Structure	Beam	Metal			C	Y										
Structure	Deck	Concrete (precast)			C	Y										
Structure	Deck	Metal			C	Y										
Wall		Masonry			A	Y										
Wall		Paint, Concrete block			A	Y		100			%	S0004D	None Detected	N.D.	None	
Wall		Vermiculite			D	N						V9500	Presumed Asbestos		Presumed Asbestos	F

Client: Hamilton-Wentworth District School Board **Site: 110 Anson Avenue, Hamilton, ON** **Building Name: Lisgar School**
Location: #6773 : Music Room **Floor: 1** **Room #: 125** **Area (sqft): 625**
Survey Date: 2024-09-26 **Last Re-Assessment:**

PAINT								
System	Item	Good	Poor	Unit	Sample	Sample Description	Amount	Hazard
Wall	Masonry	200		SF	L0003	Yellow concrete block	Pb: <0.00045 %	No
Structure	Metal	100		%	L0004	White	Pb: 0.024 %	Lead (Low)
Other[1]	Metal	1		EA	V0005	Blue	Pb: <0.0030 %	No

1 - Door

Client: Hamilton-Wentworth District School Board **Site: 110 Anson Avenue, Hamilton, ON** **Building Name: Lisgar School**
Location: #6773 : Music Room **Floor: 1** **Room #: 125** **Area (sqft): 625**
Survey Date: 2024-09-26 **Last Re-Assessment:**

MERCURY				
Component	Quantity	Unit	Sample	Hazard
Light Fixture	100	%	V9500	Presumed

Client: Hamilton-Wentworth District School Board **Site: 110 Anson Avenue, Hamilton, ON** **Building Name: Lisgar School**
Location: #6773 : Music Room **Floor: 1** **Room #: 125** **Area (sqft): 625**

Survey Date: 2024-09-26 **Last Re-Assessment:**

PCB						
Component	**Quantity**	**Unit**	**Sample**	**Sample Description**	**Amount**	**PCB**
Light Ballasts	100	%	V9500			Presumed

Client: Hamilton-Wentworth District School Board **Site: 110 Anson Avenue, Hamilton, ON** **Building Name: Lisgar School**
Location: #6784 : Corridor **Floor: 1** **Room #: 127** **Area (sqft): 600**
Survey Date: 2024-09-26 **Last Re-Assessment:**

ASBESTOS																
System	Component	Material	Item	Covering	A*	V*	AP*	Good	Fair	Poor	Unit	Sample	Asbestos Type	Amount	Hazard	Friable
Duct		Not Insulated			C	Y										
Floor		Terrazzo			A	Y		600			SF	V0013	None Detected	N.D.	None	
Piping	Not Found															
Structure		Mortar, Siporex			C	Y		100(7)			%	V9000	Confirmed Asbestos		Confirmed Asbestos	NF
Structure	Beam	Wood			C	Y										
Structure	Beam	Metal			C	Y										
Structure	Deck	Concrete (precast)			C	Y										
Structure	Deck	Metal			C	Y										
Wall		Masonry			A	Y										
Wall		Metal			A	Y										
Wall		Paint, Concrete block			A	Y		100			%	V0004	None Detected	N.D.	None	
Wall		Vermiculite			D	N						V9500	Presumed Asbestos		Presumed Asbestos	F

Client: Hamilton-Wentworth District School Board **Site: 110 Anson Avenue, Hamilton, ON** **Building Name: Lisgar School**
Location: #6784 : Corridor **Floor: 1** **Room #: 127** **Area (sqft): 600**
Survey Date: 2024-09-26 **Last Re-Assessment:**

PAINT								
System	Item	Good	Poor	Unit	Sample	Sample Description	Amount	Hazard
Structure	Metal	100		%	V0004	White	Pb: 0.024 %	Lead (Low)
Other[1]	Metal	3		EA	V0005	Blue	Pb: <0.0030 %	No

1 - Door

Client: Hamilton-Wentworth District School Board **Site: 110 Anson Avenue, Hamilton, ON** **Building Name: Lisgar School**
Location: #6784 : Corridor **Floor: 1** **Room #: 127** **Area (sqft): 600**
Survey Date: 2024-09-26 **Last Re-Assessment:**

PB PRODUCTS				
Component	Quantity	Unit	Sample	Hazard
Batteries In Emer. Lights	1	EA	V9500	Presumed

Client: Hamilton-Wentworth District School Board **Site: 110 Anson Avenue, Hamilton, ON** **Building Name: Lisgar School**
Location: #6784 : Corridor **Floor: 1** **Room #: 127** **Area (sqft): 600**
Survey Date: 2024-09-26 **Last Re-Assessment:**

MERCURY				
Component	Quantity	Unit	Sample	Hazard
Light Fixture	100	%	V9500	Presumed

Client: Hamilton-Wentworth District School Board **Site: 110 Anson Avenue, Hamilton, ON** **Building Name: Lisgar School**
Location: #6784 : Corridor **Floor: 1** **Room #: 127** **Area (sqft): 600**

Survey Date: 2024-09-26 **Last Re-Assessment:**

PCB						
Component	**Quantity**	**Unit**	**Sample**	**Sample Description**	**Amount**	**PCB**
Light Ballasts	100	%	V9500			Presumed

Client: Hamilton-Wentworth District School Board **Site: 110 Anson Avenue, Hamilton, ON** **Building Name: Lisgar School**
Location: #6789 : Vestibule **Floor: 1** **Room #: 129** **Area (sqft): 100**
Survey Date: 2024-09-26 **Last Re-Assessment:**

ASBESTOS															
System	Component	Material	Item	Covering	A*	V*	AP*	Good	Fair	Poor	Unit	Sample	Asbestos Type	Amount	Hazard	Friable
Duct		Not Insulated			C	Y										
Floor		Terrazzo			A	Y		100			SF	S0013AB	None Detected	N.D.	None	
Other		Caulking, Butyl			A	Y		10			LF	S0012AB	None Detected	N.D.	None	
Other	Door	Caulking, Dark grey			A	Y		20			LF	S0014AB	None Detected	N.D.	None	
Piping	Not Found															
Structure		Mortar, Siporex			C	Y		100(7)			%	V9000	Confirmed Asbestos		Confirmed Asbestos	NF
Structure	Beam	Wood			C	Y										
Structure	Beam	Metal			C	Y										
Structure	Deck	Concrete (precast)			C	Y										
Structure	Deck	Metal			C	Y										
Wall		Masonry, Brick			A	Y										
Wall		Metal			A	Y										
Wall		Vermiculite			D	N						V9500	Presumed Asbestos		Presumed Asbestos	F

Client: Hamilton-Wentworth District School Board **Site: 110 Anson Avenue, Hamilton, ON** **Building Name: Lisgar School**
Location: #6789 : Vestibule **Floor: 1** **Room #: 129** **Area (sqft): 100**
Survey Date: 2024-09-26 **Last Re-Assessment:**

PAINT								
System	Item	Good	Poor	Unit	Sample	Sample Description	Amount	Hazard
Structure	Metal	100		%	V0004	White	Pb: 0.024 %	Lead (Low)
Other[1]	Metal	2		EA	L0006	Red	Pb: <0.0013 %	No

1 - Door

Client: Hamilton-Wentworth District School Board **Site: 110 Anson Avenue, Hamilton, ON** **Building Name: Lisgar School**
Location: #6789 : Vestibule **Floor: 1** **Room #: 129** **Area (sqft): 100**
Survey Date: 2024-09-26 **Last Re-Assessment:**

MERCURY				
Component	Quantity	Unit	Sample	Hazard
Light Fixture	100	%	V9500	Presumed

Client: Hamilton-Wentworth District School Board **Site: 110 Anson Avenue, Hamilton, ON** **Building Name: Lisgar School**
Location: #6789 : Vestibule **Floor: 1** **Room #: 129** **Area (sqft): 100**
Survey Date: 2024-09-26 **Last Re-Assessment:**

PCB						
Component	Quantity	Unit	Sample	Sample Description	Amount	PCB
Light Ballasts	100	%	V9500			Presumed
Caulking	20	LF	P0002	Dark grey around doors	<0.2 mg/kg	No

Client: Hamilton-Wentworth District School Board **Site: 110 Anson Avenue, Hamilton, ON** **Building Name: Lisgar School**
Location: #7763 : Vestibule **Floor: 1** **Room #: 132** **Area (sqft): 100**
Survey Date: 2024-09-26 **Last Re-Assessment:**

ASBESTOS															
System	Component	Material	Item	Covering	A*	V*	AP*	Good	Fair	Poor	Unit	Sample	Asbestos Type	Amount	Hazard	Friable
Duct		Not Insulated			C	Y										
Floor		Terrazzo			A	Y		100			SF	S0013C	None Detected	N.D.	None	
Other		Caulking, Butyl			A	Y		10			LF	S0012C	None Detected	N.D.	None	
Other	Door	Caulking, Dark grey			A	Y		20			LF	S0014C	None Detected	N.D.	None	
Piping	Not Found															
Structure		Mortar, Siporex			C	Y		100(7)			%	V9000	Confirmed Asbestos		Confirmed Asbestos	NF
Structure	Beam	Wood			C	Y										
Structure	Beam	Metal			C	Y										
Structure	Deck	Concrete (precast)			C	Y										
Structure	Deck	Metal			C	Y										
Wall		Masonry, Brick			A	Y										
Wall		Metal			A	Y										
Wall		Vermiculite			D	N						V9500	Presumed Asbestos		Presumed Asbestos	F

Client: Hamilton-Wentworth District School Board **Site: 110 Anson Avenue, Hamilton, ON** **Building Name: Lisgar School**
Location: #7763 : Vestibule **Floor: 1** **Room #: 132** **Area (sqft): 100**
Survey Date: 2024-09-26 **Last Re-Assessment:**

PAINT								
System	Item	Good	Poor	Unit	Sample	Sample Description	Amount	Hazard
Structure	Metal	100		%	V0004	White	Pb: 0.024 %	Lead (Low)
Other[1]	Metal	2		EA	V0006	Red	Pb: <0.0013 %	No

1 - Door

Client: Hamilton-Wentworth District School Board **Site: 110 Anson Avenue, Hamilton, ON** **Building Name: Lisgar School**
Location: #7763 : Vestibule **Floor: 1** **Room #: 132** **Area (sqft): 100**
Survey Date: 2024-09-26 **Last Re-Assessment:**

MERCURY				
Component	Quantity	Unit	Sample	Hazard
Light Fixture	100	%	V9500	Presumed

Client: Hamilton-Wentworth District School Board **Site: 110 Anson Avenue, Hamilton, ON** **Building Name: Lisgar School**
Location: #7763 : Vestibule **Floor: 1** **Room #: 132** **Area (sqft): 100**
Survey Date: 2024-09-26 **Last Re-Assessment:**

PCB						
Component	Quantity	Unit	Sample	Sample Description	Amount	PCB
Light Ballasts	100	%	V9500			Presumed
Caulking	20	LF	V0002	Dark grey around doors	<0.2 mg/kg	No

Legend:

Sample number	
S####	Asbestos sample collected
L####	Paint sample collected
P####	PCB sample collected
M####	Mould sample collected
V####	Material is visually identified to be identical to S####
V0000	Known non hazardous material
V9000	Material visually identified as a Hazardous Material
V9500	Material is presumed to be a hazardous material

Units	
SF	Square feet
LF	Linear feet
EA	Each
%	Percentage
LF	Linear feet

Other	
A	Access
V	Visible
AP	Air Plenum
F	Friable material
NF	Non Friable material
PF	Potentially Friable material
Pb	Lead
Hg	Mercury
As	Arsenic
Cr	Chromium

Access	
A	Accessible to all building occupants
B	Accessible to maintenance and operations staff without a ladder
C	Accessible to maintenance and operations staff with a ladder. Also rarely entered, locked areas
D	Not normally accessible

Condition	
Good	No visible damage or deterioration
Fair	Minor, repairable damage, cracking, delamination or deterioration
Poor	Irreparable damage or deterioration with exposed and missing material

Visible	
Y	The material is visible when standing on the floor of the room, without the removal or opening of other building components (e.g. ceiling tiles or access panels).
N	The material is not visible to view when standing on the floor of the room and requires the removal of a building component (e.g. ceilings tiles or access panels) to view and access. Includes rarely entered crawlspaces, attic spaces, etc. Observations will be limited to the extent visible from the access points.
L	The material is partially visible to view when standing on the floor of the room and requires the removal of a building component (e.g. ceiling system or access panels) to view completely and access. Includes partially viewed access points to crawlspaces, attic spaces, etc. without entering. Observations are limited to the extent visible from the access points.

Air Plenum	
Yes or No	The material is in a return air plenum or in a direct airstream or there is evidence of air erosion (e.g. duct for heating or cooling blowing directly on or across an ACM). This field is only completed where Air Plenum consideration is required by regulation.

Colour Coding	
	The material is a hazardous material, either by analytical results or by visible identification.
	The material is presumed to be a hazardous material, based on visual appearance, and was not sampled due to limited access or the non-destructive nature of sampling.

Action					
(1)	Clean up of ACM Debris	(2)	Precautions for Access Which may Disturb ACM Debris	(3)	ACM removal
(4)	Precautions for Work Which may Disturb ACM in Poor Condition	(5)	Proactive ACM removal (Minimum repair required for fair condition)	(6)	ACM repair

(7) Management program and surveillance

2090 Shirley Drive Kitchener Ontario N2B 0A3
Phone: (519) 578.1000 Toll Free: (800) 265.8959 Fax: (519) 578.3262

Schedule of Finish Hardware

ARCHITECT/DESIGNER: RICHARD G. BUTTERWORTH ARCHITECT INC.
127 JUDITH CRESCENT
ANCASTER ON L9G 1L3
PHONE - 905.304.0241
FAX -

CONTRACTOR:

PHONE -
FAX -

PROJECT: LISGAR PUBLIC SCHOOL
110 ANSON AVENUE
HAMILTON ON L8T 2X6
RR--24105

PROJECT CONSULTANT: ROBERT ROWARTH, AHC

PREPARED: December 09, 2024

REVISED: December 09, 2024 ORIGINAL

Scan to check out our website

www.knells.ca

Hardware Finishes

Finish	Description
32D	STAINLESS STEEL METAL, SATIN
630	SATIN STAINLESS STEEL
689	POWDER COAT, ALUMINUM
ALUMINUM	ALUMINUM
C.A.	CLEAR ANODIZED
C32D	STAINLESS STEEL, SATIN
CLEAR	CLEAR ANODIZED
SP28	LACQUER SPRAYED ALUMINUM
US32D	STAINLESS STEEL - SATIN

KNELL'S DOOR AND HARDWARE

2090 SHIRLEY DRIVE

KITCHENER ON N2B 0A3

Tel: 519-578-1000 Fax: 519-578-3262

LISGAR PUBLIC SCHOOL

Control No.6990

RR--24105

Submitted By: ROBERT ROWARTH, AHC

December 09, 2024

Manufacturers

Abbreviation	Name
BHI	BEST Hinges
GAL	GALLERY
IVE	IVES
KNC	KN CROWDER
LCN	LCN
SCH	SCHLAGE
VON	VON DUPRIN

HARDWARE SCHEDULE - CODE # RR--24105

LISGAR PUBLIC SCHOOL

110 ANSON AVENUE

Heading # 01

1 PR DOORS D6 EXTERIOR FROM VESTIBULE — 90º LHR,RHR

3-0/3-0 x 7-0 x 1 3/4 HMD Door/ HMF Frame — NON-RTD Door/NON-RTD Frame

6	HINGE, 4 1/2, HVY WT	FBB199NRP 4-1/2 X 4	32D	BHI
1	MULLION	KR4954 X 7-6	SP28	VON
1	MORTISE CYLINDER	20-001 X 114	630	SCH
		FOR MULLION		
2	RIM EXIT DEVICE	XP98EO X 909 X 3-0	US32D	VON
2	ANTI-VANDAL PULL	VR914-DT	US32D	IVE
2	CLOSER, PARALLEL ARM	4040XP.SHCUSH.689.SRT	689	LCN
2	KICK PLATE	GSH 80A X 2-SIDED TAPE X 8 X 34.5	C32D	GAL
2	WEATHER STRIPPING	W-20N X 17-2	CLEAR	KNC
		INSTALL WEATHRSTRIP BEFORE INSTALLING CLOSERS		
2	DOOR SWEEP	W-24S X 36	C.A.	KNC
2	THRESHOLD	CT-10 X 36	ALUMINUM	KNC

Heading # 02

1 PR DOORS D7 EXTERIOR FROM VESTIBULE — 90º LHR,RHR

3-0/3-0 x 7-0 x 1 3/4 HMD Door/ HMF Frame — NON-RTD Door/NON-RTD Frame

6	HINGE, 4 1/2, HVY WT	FBB199NRP 4-1/2 X 4	32D	BHI
1	MULLION	KR4954 X 7-6	SP28	VON
1	MORTISE CYLINDER	20-001 X 114	630	SCH
		FOR MULLION		
2	RIM EXIT DEVICE	XP98EO X 909 X 3-0	US32D	VON
2	ANTI-VANDAL PULL	VR914-DT	US32D	IVE
2	CLOSER, PARALLEL ARM	4040XP.SHCUSH.689.SRT	689	LCN
2	KICK PLATE	GSH 80A X 2-SIDED TAPE X 8 X 34.5	C32D	GAL
2	WEATHER STRIPPING	W-20N X 17-2	CLEAR	KNC
		INSTALL WEATHRSTRIP BEFORE INSTALLING CLOSERS		
2	DOOR SWEEP	W-24S X 36	C.A.	KNC
2	THRESHOLD	CT-10 X 36	ALUMINUM	KNC
1	ELECTRIC STRIKE	9500-12/24D-630	630	ES-CD
		MOUNT ON RHR LEAF		

NOTE:: RE-USE EXISTING CARD READER.

Appendix A – Construction School Specific Information Sheet Sample

In addition to the terms and conditions of the Contract Documents, the Contractor shall follow the protocols of the Construction Site Specific Information Sheet, sample provided below.
A completed version of this document, with site specific content, will be provided to the Contractor at the pre-construction meeting.

HWDSB

Capital Projects
Facility Services

Construction School Specific Information Sheet

1. School Information:

School Name:	Insert School Name
Bell Times	
Morning (School Entry)**:**	0:00 AM
Afternoon (School Dismissal):	0:00 PM
Aftercare Program Dismissal:	6:00 PM
Caretaking Phone Number:	000-000-0000
***After-Hours Emergency Number:**	905-667-3079
****Caretaking Hours**	
September to June	6:00 AM – 10:00 PM
December Holiday Break	6:00 AM – 2:00 PM
March Break	6:00 AM – 2:00 PM
July to August	6:00 AM – 2:00 PM
Saturday / Sunday	CLOSED
Account Code:	HP0000
Security Panel Code:	0000

*Please call the After-Hours Emergency Number noted above if issues arise outside of Caretaking Hours. These would include unanticipated interruption of services, issues with building or room access, fire alarm or security concerns, etc.

**Caretaker hours are not guaranteed. Please confirm with the HWDSB project supervisor prior to any work taking place, and then on a weekly basis throughout the duration of the project.

2. School Entry for afterhours, school holidays or closures:

Please follow these steps upon entry to the building outside of caretaker hours and on school holidays or closures:

1. Call API Alarm Inc. at 1-877-787-5237 and notify them in advance of the day(s) and time(s) that access to the building will be required. They will require the HP code noted above.
2. Disarm the security panel when arriving.
3. Arm the security panel when leaving.
4. Call API to verify that the building is armed and secure.

Failure to follow this procedure outside of caretaker hours and on school holidays or closures will result in an automatic dispatch of a security guard to the building to verify who has entered/exited the building. Security costs associated with the dispatch of a security guard for failing to follow the procedure will be expensed to the contractor responsible for the incident.

3. Protocol for Work Impacting Fire Alarm System or Devices

The contractor is to follow this procedure when the fire alarm system is impacted.

A. References and Definitions:

Fire Alarm Control and Testing Service Provider: Hamilton Fire Control

Fire Alarm and Security System Monitoring Service Provider: API Alarm Inc.

Fire Watch: An hourly patrol of areas that are not protected/monitored by the fire alarm system. These include but are not limited to, a disconnected device, a covered device, a bypassed device, or device in trouble. The general contractor is responsible for fire watch in all construction areas. Caretaking staff are responsible for fire watch in all other areas of the school. Fire watch is to be recorded in a Fire Watch Log.

Fire Watch Log: The general contractor is to document and maintain a written log confirming fire watch has been conducted hourly. This log is to remain on site for the duration of the project. This written log is maintained separate from the caretaking fire watch log. The caretaking log is digitally recorded within the Boards asset management system (eBase).

B. Mandatory Pre-Construction Site Meeting with Hamilton Fire Control

1. Contractor to request a meeting prior to mobilization with Michael Fleet from Hamilton Fire Control (HFC), the project supervisor from HWDSB, the facility operation supervisor from HWDSB and the head caretaker to review any work that will affect the fire alarm system. This can be coordinated by the project supervisor upon request.

   Contact: Michael Fleet - Hamilton Fire Control
   Phone: (905) 527-7042
   Email: michael@hamiltonfirecontrol.ca

2. Contractor to minute the meeting and submit to the project supervisor and Michael Fleet from HFC for review within 48 hours of the site-walk-through.

C. Mandatory Construction Protocol if the Fire Alarm System is Impacted

1. Contractor to follow procedures discussed and documented from the pre-construction site meeting with Hamilton Fire Control.

2. If devices are impacted during occupied hours:
   - Per the Fire Safety Plan, contractor to notify API that they'll be on Fire Watch (in the area of the impacted devices only). API will not take any action; the notification is for information purposes only.
   - Contractor to either take the device offline or protect/cover it. Fire watch (in the area of the impacted device only) is required in either of these scenarios. If the alarm goes off during work, all occupants, including contractors, are to evacuate the building and the fire department will be dispatched.

   If hot work is taking place, prior to the above-noted steps:
   - Contractors are required to advise HWDSB at least 24 hours before any hot work is scheduled to take place.
   - The contractor is required to provide a hot work permit to HWDSB at the same time.

3. If devices are impacted outside of occupied hours, and the contractor is the only party in the building:
   - The same protocol above is to be followed.

4. If the system or specific devices will not be operational while the school is completely vacant (i.e. overnight or on a weekend when no Work is taking place):
   - No action required.

The system is to be bypassed (device(s) or full system). The system is NOT to be put on test. The only time the system will be put on test and the school will be on Fire Watch is if the system is being tested.

In the event a fire alarm device is activated, all occupants of the school, including contractors, must evacuate the school. The fire department will be dispatched. The contractor will be responsible for all fire department costs resulting from construction.

4. Please follow these steps for planning any service (electrical, gas, water) shutdowns:

A. Internal Localized System/Service Shutdowns:

1. Localized shutdowns **require minimum 3 days' notice** to HWDSB project supervisor for coordination with the school facility and staff.

2. Shutdowns must be completed outside of school bell times/operational hours which vary by facility and must be scheduled for evenings after 6:00 PM, weekends or board holidays.
3. If a shutdown will impact the security system, the contractor shall contact API Alarm Inc. at 1-877-787-5237 and notify them in advance of the day(s) and time(s) of the shutdown.
4. If a shutdown impacts the fire alarm system, the contractor shall follow the Fire Alarm Bypass Protocol, section 4 above.
5. If required, the contractor is to coordinate with Board vendor/s to be on site to ensure boilers, roof top units, heat pumps, etc. are functioning properly after service disruption has concluded.

    - Chamberlain Building Services Inc - info@chbs.ca, 905-664-1914 or
    - Union Boiler Company Limited - info@unionboiler.com, 905-528-7977

6. Process will vary based on services shutdown and ability to localize shutdown.

B. Complete School System/Service Shutdowns:

1. Complete building shutdowns **require minimum 5 days' notice** to HWDSB project supervisor.
2. Shutdowns must be completed outside of school bell times/operational hours which vary by facility and must be scheduled for evenings after 6:00 PM, weekends or board holidays.
3. Contractor to contact API Alarm Inc. at 1-877-787-5237 and notify them in advance of the day(s) and time(s) of shutdown.
4. During the shutdown, the contractor is responsible for following Fire Alarm Bypass Protocol, section 4 above.
5. The contractor is to coordinate with Board vendor/s to be on site to ensure boilers, roof top units, heat pumps, etc. are functioning properly after service disruption has concluded.

    - Chamberlain Building Services Inc - info@chbs.ca, 905-664-1914 or
    - Union Boiler Company Limited - info@unionboiler.com, 905-528-7977

6. HWDSB project supervisor will coordinate with other HWDSB departments to ensure all systems (IIT, security, communications) are up and running after service disruption has concluded.
7. If required, HWDSB project supervisor will coordinate with City of Hamilton staff if site has shared facilities such as recreation centre, community centre, pool or library, etc.
8. Process will vary based on service shutdown.

C. Heating and Cooling System Shutdowns:

1. Heating and cooling system shutdowns **require minimum 5 days' notice** to HWDSB project supervisor

2. Shutdowns must be completed outside of school bell times/operational hours which vary by facility and must be scheduled for evenings after 6:00 PM, weekends or board holidays.
3. The contractor is to coordinate with Board vendor/s to be on site to ensure boilers, roof top units, heat pumps, etc. are functioning properly after service disruption has concluded.

    - Chamberlain Building Services Inc - info@chbs.ca, 905-664-1914 or
    - Union Boiler Company Limited - info@unionboiler.com, 905-528-7977

4. If the boiler system is drained, the contractor upon refilling the system, is responsible for coordinating Board approved chemical treatment vendor to treat water.

    - Aquarian Chemicals Inc - info@aquarianchemicals.com, 905-825-3711

5. Process will vary based on services shutdown and ability to localize shutdown.

D. Asbestos Abatement and Designated Substance Related Work:

1. Designated substance related work **requires minimum 5 days' notice** to HWDSB project supervisor.
2. Designated substance related work in occupied areas must be completed outside of school bell times/operational hours which vary by facility and must be scheduled for evenings after 6:00 PM, weekends or board holidays.

PART 1 - GENERAL

1.1 Scope

.1 Comply with Division 1: General Requirements.

.2 Provide materials, labour and equipment for demolition work shown on the drawings, described herein, or as necessary to complete the work.

.3 Before commencing demolition, contact utilities and authorities having jurisdiction. Carry out disconnections and cappings to their requirements employing tradesmen licensed for this work. Pay inspection and service fees.

.4 This includes co-ordinating the disconnection and capping of services, as follows:
- .1 Sanitary Sewers
- .2 Storm sewers
- .3 Water service
- .4 Electric power connections
- .5 Telephone connections
- .6 Cable TV connections
- .7 Gas service

1.2 Related Work Under Other Sections

None

1.3 Standards

.1 To Ontario Fire Code, Part 8, Demolition, including:
- .1 Shutting off and capping services
- .2 Providing fire watches as required
- .3 Management of combustible salvage, waste and rubbish
- .4 Protection of persons and properties
- .5 Maintenance of operable fire protection equipment
- .6 Maintenance of fire fighters access
- .7 Provision of fire extinguishing equipment
- .8 Maintenance of existing and/or temporary exits

.2 To CSA-S350-M1980 'Code of Practice for Safety in Demolition of Structures', the Ontario Occupational Health and Safety Act, WHMIS and regulations of authorities having jurisdiction.

1.4 Recording Existing Conditions

.1 After determining demolition methods, determine area of possible vibration. Carefully inspect beyond those adjacent areas. List potential damage spots [i.e. existing cracks, exposed glass, etc.] and photograph each for record purposes before starting work.

1.5 **Protection**

.1 Fully protect adjacent property and ensure free safe passage at all times.

.2 Provide necessary hoardings, braces, shoring, underpinning, railings, temporary covers, covered passageways, ramps, warning signs, visual and audible signals, as required to prevent movement, settlement or collapse of any adjacent services, sidewalks, driveways, trees, building or building parts.

.3 Protect the public and others at all times. Be liable for any damage and replace, repair, or make good immediately.

.4 Where sheet, trowelled or sprayed-on asbestos is being disturbed, provide protective equipment and use protective measures required by the Ontario Occupational Health and Safety Act, latest regulations and owner's requirements see instructions to bidder's.

PART 2 - PRODUCTS

N/A

PART 3 - EXECUTION

3.1 **Standards**

.1 Carry out demolition and reconstruction operations in accordance with the Canadian Construction Safety Code. Obtain and pay for any special permits. Do not use explosives or smashing type of mechanical wrecking devices without the Architect's written approval.

3.2 **Preparation**

.1 **Salvage Items:**

.1 Carefully remove the following materials and equipment; store and protect as directed by the Owner.

.1 See Drawings.

.2 Stack whole reusable items separately and clear of demolition operations. The Architect retains ownership of these items until inspected. Dispose of these items as directed by the Architect. Remove materials declared surplus from site and deliver balance as directed.

.3 Dispose of demolished, broken and non-reusable materials immediately from the site of operations. Remove contaminated and dangerous materials from the site immediately and dispose in a safe manner to minimize all dangers at the site or at disposal locations.

.4 Disconnect, cap and seal electrical, telephone, cable TV, sewage, drainage, water and gas lines in accordance with the rules and regulations of the authorities having jurisdiction; employ tradesmen licensed to carry out this work.

.5 Clearly paint, mark and post warning signs on lines to remain in service and promptly repair any damage to maintain active service.

3.3 Demolition Operations

.1 Carry out demolition work shown on the drawings in a systematic manner from roof to final grade as necessary to accommodate remedial, reconstruction or new work. Ensure work is supervised by an experienced, competent foreman at all times. Work on each floor level must be complete before commencing work on the supporting structure. If any part of the work becomes unstable, temporarily shore and support to prevent collapse.

.2 Demolish foundations and piers, to a minimum of 150 mm (6") below finish floor slab and make good floor slab flush with existing finished slab.

.3 Small pieces of concrete and masonry may not be used to back fill. Do not use organic or metallic materials for back fill.

.4 At the end of each days work, leave site in a safe condition so that no part is in danger of collapse. Do not stack salvaged materials or debris liable to overload any part of the structure.

.5 Minimize dust during demolition. Keep dust dampened at all times.

.6 Withdraw or flatten projecting nails as work proceeds.

.7 Do not sell or burn materials on site.

.8 Remove organic, metallic, contaminated or dangerous materials from the site and ensure safe disposal.

3.4 Completion

.1 Remove debris daily; use approved transport vehicles only to their safe load capacity and clean away spillage immediately. On completion, clean exposed surfaces and adjacent areas ready for reconstruction operations. Remove tools, equipment, trash, dust and dirt from the site of operations and leave in a broom-clean condition.

3.5 Existing Asbestos:

.1 Follow Section 028100 Abatement Specifications from Pinchin found in Division 1 General Conditions

-END-

PART 1 GENERAL

1.1 General and Related Work

.1 Read this Section in conjunction with all drawings and all other Sections so as to comply with the requirements of the General Conditions of the Contract.

.2 Related work specified elsewhere:

.1 Section 02 82 00.01 Asbestos Abatement – Type 1 Procedures

.2 Section 02 82 00.02 Asbestos Abatement – Type 2 Procedures

.3 Site Conditions identifies all known hazardous building materials within the Project Area. The information provided is for general reference only. It is recommended each Contractor confirm existing conditions on site prior to tender close.

.1 The specification fulfils the requirements of Section 30 of the Ontario Occupational Health and Safety Act.

.2 The specification fulfils the requirements of the Section 10 of Ontario Regulation 278/05.

.4 The Outline of Work identifies the location, condition and quantities of hazardous building materials to be removed as part of this project.

.1 It is the intent that work prescribed this Section will result in the removal of all hazardous materials as outlined and the decontamination of all surfaces or materials which may have been or become contaminated by hazardous materials either during or prior to work of this Contract.

1.2 Site Conditions

.1 Refer to the report entitled “Revised Hazardous Building Materials Assessment (Pre-construction), Exterior Doors and Music Room, Lisgar Elementary School, 110 Anson Avenue, Hamilton, Ontario”, dated November 21, 2024, prepared by Pinchin Ltd., file number 336572.012.

.1 Vermiculite insulation, containing asbestos, was previously identified within the perimeter radiator in Storage Room 126A. The origin of the vermiculite was not identified; however, it is presumed that vermiculite insulation will be present inside exterior wall cavities and radiators and millwork at the exterior walls.

1.3 Outline of Work

.1 Coordinate the following items with the Owner’s Project Manager and the Construction Manager, which are to be included in the abatement contractor’s scope of work, including but not limited to: electrical isolations, GFI connection, water connections, HVAC and exhaust ventilation system isolation, bin placement, schedule, disconnects, etc.

.2 Refer to the Contract Drawings for the extent of construction work and the Work Areas.

.3 Install Hoarding Walls between Abatement Work Areas and Occupied Areas as required.

.4 Using Type 1 procedures prescribed in the Section identified in Related Work, remove and dispose of the sink with asbestos-containing sink mastic.

.5 Using Type 2 procedures (with a full enclosure) prescribed in the Section identified in Related Work, perform the following work:

.1 Remove all interior and exterior door frames where scheduled to be removed, where asbestos-containing vermiculite is present.

.2 Remove millwork where attached to concrete block walls and where present at exterior walls and scheduled for removal.

.3 Create openings in concrete block walls as required for electrical/mechanical penetrations.

.4 Clean up all accessible vermiculite and seal up all openings with spray foam.

.6 Follow mercury procedures when removing all light fixtures and fluorescent light tubes. Place all light fixtures into containers to avoid breakage.

.7 Following Polychlorinated Biphenyls (PCB) procedures, remove and dispose of PCB-containing ballasts.

.8 Refer to Specification Sections identified in the Related Work for specified personnel protective measures for the safe handling, removal, clean-up, enclosure, or repair of hazardous materials in each phase or work area.

.9 Protect surfaces, building fabrics and items remaining within the Abatement Work Area.

.10 Without disturbing hazardous materials, perform removals where required, prior to abatement work.

.1 Maximize waste diversion by use of resale of building materials, or recycling.

.11 Isolate the Abatement Work Area from adjoining Occupied and Non-Occupied Areas whether present at an interior or exterior location.

.12 Maintain emergency and fire exits from Abatement Work Area, or establish alternative exits satisfactory to Provincial Fire Marshall and local authorities having jurisdiction. Maintain extra routes from occupied areas. Place emergency exit signs at locations to clearly mark exit route. Seal emergency exit doors so as not to impede use of door during emergency evacuation.

.13 Remove, clean, store and replace at completion of work, non-operating mechanical and electrical equipment, ducts, building components, materials or items removed to accommodate asbestos removal.

.14 Remove and dispose of as appropriate waste, building components, materials and items contaminated by hazardous materials that cannot be effectively cleaned.

.15 Encapsulate remaining hazardous materials at locations where removal is deemed impractical by the Abatement Consultant.

.16 Encapsulation will not be permitted where removal of building materials or structures scheduled for demolition will facilitate access to the asbestos materials in question.

.17 Final clean work area to remove visible signs of asbestos and other hazardous materials, other debris or settled dust.

.18 Apply lock-down agent to exposed surfaces throughout the work area and to surfaces from which any hazardous materials have been removed.

.1 Do not apply lock-down to materials which would be damaged by its application.

.19 Unless otherwise specified, the handling, removal, clean-up or repair of hazardous materials or surfaces contaminated with hazardous materials is to be performed following wet removal techniques.

1.4 Schedule

.1 Provide necessary manpower, supervision, equipment and materials to maintain and complete the project on schedule.

.2 Work Hours:

.1 Coordinate all work, scheduling and phasing with the Owner.

.2 Duration for which HVAC systems may remain shutdown to accommodate quiet hours work will vary in accordance with outside weather conditions and internal demand. Duration of quiet hours work will have to be scheduled accordingly and in consultation with the Abatement Consultant and Owner.

.3 Provide 48 hours written notice to the Abatement Consultant of any request to work outside normal working hours. Obtain written approval before proceeding.

1.5 Definitions

.1 Abatement Consultant: Owner's Representative providing inspection and air monitoring.

.2 Abatement Contractor: Contractor or sub-contractor performing work of this section.

.3 Abatement Work Area: Area where work takes place which will, or may, disturb hazardous materials.

.4 Amended Water: Water with wetting agent added for the purpose of reducing surface tension to allow thorough wetting of materials.

.5 Asbestos: Any of the fibrous silicates defined in Regulation 278/05 including: actinolite, amosite, anthophyllite, chrysotile, crocidolite and tremolite.

.6 Asbestos-Containing Material (ACM): Material identified under Site Conditions including any debris, overspray, fallen material and settled dust.

.7 Authorized Visitors: Building Owner, Abatement Consultant, or designated representative, and persons representing regulatory agencies.

.8 Competent Worker: A worker who is qualified because of knowledge, training and experience to perform the work, is familiar with Regulation 278/05 and the Occupational Health and Safety Act, and has knowledge of the potential or actual danger to health and safety in the work.

.9 Contaminated Waste: Material identified under Site Conditions, including fallen material, settled dust, other debris and materials or equipment deemed to be contaminated by the Abatement Consultant.

.10 Curtained Doorway: Doorway consisting of two (2) overlapping flaps of rip-proof polyethylene arranged to permit ingress and egress from one room to another while permitting minimal air movement between rooms.

.11 DOP Test: A testing method used to determine the integrity of the Negative Pressure unit or vacuum using a Dispersed Oil Particulate (DOP) or Poly Alpha Olefin (PAO) HEPA filter leak test. This test is to be conducted on site where units are to be installed. Refer to the Environmental Abatement Council of Ontario (EACO) DOP/PAO Testing Guideline 2013 or ANSI/ASME N510-2007.

.12 Fitting: Individual segments or pieces of a mechanical service line which may include but is not limited to the hangers, tees, elbows, joints, valves, unions, etc.

.13 Friable Material: Material that when dry can be crumbled, pulverized or powdered by hand pressure and includes such material that is crumbled, pulverized or powdered.

.14 HEPA: High Efficiency Particulate Aerosol filter that is at least 99.97 percent efficient in collecting a 0.3 micrometre aerosol.

.15 Milestone Inspection: Inspection of the Abatement Work Area at a defined point in the abatement operation.

.16 Negative Pressure: A reduced pressure within the Abatement Work Area (> 0.02 inches of water column) established by extracting air directly from Abatement Work Area and discharging it to exterior of building.

.17 Non-Friable Material: Material that when dry cannot be crumbled, pulverized or powdered by hand pressure.

.18 Occupied Area: Any area of the building or adjoining space outside the Abatement Work Area.

.19 Personnel: All Contractor's employees, sub-contractors employees, supervisors.

.20 PCM: Phase Contrast Microscopy.

.21 Remove: Remove means remove and dispose of (as applicable type of waste) unless followed by other instruction (e.g. remove and turn over to Owner).

.22 TEM: Transmission Electron Microscopy.

1.6 Regulations and Guidelines

.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.

.2 Where regulations are not present, follow accepted industry standards and applicable Guideline documents.

.3 Regulations and Guidelines include but are not limited to the following:

.1 Ministry of Labour Occupational Health and Safety Act Regulations for Construction Projects including Revised Statutes of Ontario 1990, Chapter 0.1 and Ontario Regulation 278/05.

.2 Ministry of the Environment and Climate Change Regulation for the disposal of waste, including R.R.O. 1990, Reg. 347 as amended.

.3 PCB Regulations, SOR 2008-273 and R.R.O. 1990, Reg 362.

.4 Regulation 490/09 Designated Substances.

.5 Environmental Abatement Council of Canada (EACC), Lead Guideline For Construction, Renovation, Maintenance or Repair, October 2014.

.6 Ministry of Labour, Guideline, Silica on Construction Projects, 2011.

1.7 Quality Assurance

.1 Removal and handling of hazardous materials is to be performed by persons trained in the methods, procedures and industry practices for Abatement.

.2 Ensure work proceeds to schedule, meeting all requirements of this Specification.

.3 Complete work so that at no time airborne dust, visible debris, or water runoff contaminate areas outside the Abatement Work Area.

.4 Any contamination of surrounding area (indicated by visual inspection or air monitoring) shall necessitate the clean-up of affected area, and in the same manner applicable to an Abatement Work Area at no cost to the Owner.

.5 All work involving electrical, mechanical, carpentry, glazing, etc., shall be performed by licensed persons experienced and qualified for the work required.

1.8 Supervision

.1 Provide on site for each work shift, a Shift Superintendent(s), who has authority regarding all aspects related to manpower, equipment and production.

.2 At all times during work, the Shift Superintendent(s) must be on site. 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 three (3) working days of a written request from the Owner. Owner reserves the right to request replacement of supervisory personnel without explanation.

.4 Do not replace supervisory personnel without written approval from the Owner.

1.9 Instruction and Training

.1 Instruction and training must be provided by a competent person.

.2 All workers completing Type 1, 2 or 3 asbestos abatement must be trained in compliance with Section 19 of O.Reg. 278/05.

.1 For Type 3 asbestos abatement, workers must be trained and certified per Section 20 of O.Reg. 278/05.

1.10 Notification

.1 Before commencing work, notify orally and in writing, an inspector at the office of the Ontario Ministry of Labour nearest the project site, where required.

.2 Inform all trades on site of the presence and location of hazardous materials identified in the Contract documents.

.3 Notify the Owner or Owner's Representative, the Joint Occupational Health and Safety Committee and the Provincial Ministry of Labour, if suspected asbestos-containing materials not identified in the contract documents are discovered during the course of the work. Stop work in these areas immediately.

.4 Notify Sanitary Landfill site as per O.Reg. 347/90 as amended.

1.11 Submittals

.1 Submit prior to starting work:

.1 Provincial Workers' Compensation Board Clearance Certificate.

.2 Insurance certificates.

.3 Copy of Company Health and Safety Policy and applicable programs.

.4 Ministry of Labour Notice of Project form.

.5 Copy of Certificate of Approval for disposal of hazardous materials waste and location of landfill.

.6 Pre-removal damage survey of the Abatement Work Area(s), waste transport routes, and bin storage areas

.2 Submit the following information regarding personnel prior to starting work:

.1 Proof in the form of a certificate that workers have been certified under the Ministry of Training, Colleges and Universities course 253W.

.2 Proof in the form of a certificate that supervisory personnel have attended a training course on asbestos removal or are certified as supervisors under the Ministry of Training, Colleges and Universities course 253S.

.3 Written statement that personnel have had instruction on hazards of exposure to hazardous materials identified within this scope, the use of respirator, protective clothing, worker and waste decontamination procedures, and all aspects of work procedures and protective measures.

.4 WHMIS training certificates for all personnel.

.5 Certificate proving that each worker on site has been fit tested for the respirator appropriate for the work being performed.

.3 Submit the following information regarding HEPA filtered devices prior to construction of enclosure or asbestos abatement:

.1 Performance data on HEPA filtered vacuums including DOP tests no more than 3 months old.

.2 Performance data on negative air units including DOP tests which must be no more than 3 months old if the unit is vented outdoors or which must be performed on site immediately prior to initial usage and when HEPA filters are changed if the unit is vented indoors.

.3 DOP tests to be performed by an independent testing company.

.1 DOP testing company is required to submit a detailed technical report of testing protocol, including Introduction, Methodology, Results, Conclusions, and Recommendations, including results of the Air-Aerosol Mixing Uniformity test as per ASME N510-1989 (1995).

.2 DOP testing company must also provide calibration certificates from an independent calibration firm or from the manufacturer of the testing equipment for both the aerosol photometer and the pressure gauge on the aerosol generator dated within 1 calendar year from the on-site testing date.

.3 DOP testing company must also provide the National Sanitation Foundation (NSF) certification name and number of the on-site technician

performing the testing.

.4 Proof of calibration of DOP testing equipment.

.4 Submit the following prior to isolating the work area:

.1 Safety Data Sheets for chemicals or material used in the course of the Abatement Project.

.5 Submit the following upon completion of the work.

.1 Manifests, waybills, bills of ladings etc. as applicable for each type of waste.

1.12 Inspection

.1 From commencement of work until completion of clean-up operations, the Abatement Consultant is empowered by the Owner to inspect for compliance with the requirements of governing authorities, adherence to specified procedures and materials, and to inspect for final cleanliness and completion.

.2 The Abatement Consultant is empowered by the Owner to order a shutdown of work when leakage of asbestos from the controlled work area has occurred or is likely to occur.

.3 Any deviation from the requirements of the Specifications or governing authorities that is not approved in writing may result in a stoppage of work, at no cost to the Owner.

.4 Additional labour or materials expended by the Contractor to rectify unsatisfactory conditions and to provide performance to the level specified shall be at no additional cost to the Owner.

.5 Inspection and air monitoring performed as a result of Contractor's failure to perform satisfactorily regarding quality, safety, or schedule, shall be back-charged to the Contractor.

.6 Facilitate inspection and provide access as necessary. Make good work disturbed by inspection and testing at no cost to the Owner.

.7 Refer to the Sections identified in Related Work for specified milestone inspections which are to take place at defined points throughout the abatement operation specific to each phase or work area.

.8 Provide 24 hours written notice to the Abatement Consultant of any request for scheduling of milestone inspections or transportation of waste through Occupied Areas.

.9 The following Milestone Inspections may take place, at the Owner's cost, as outlined in each related specification section:

.1 Milestone Inspection - Clean Site Preparation

.1 Inspection of preparations and set-up prior to contaminated work in the Abatement Work Area.

.2 Milestone Inspection – Bulk Removal Inspection

.1 Inspection during asbestos removal, monitoring removal methods, site deficiencies, performing occupied air monitoring, etc.

.3 Milestone Inspection - Visual Clearance

.1 Inspection of Abatement Work Area after completion of all abatement, but prior to application of lock-down agents or dismantling of enclosure.

.10 Refer to the Sections identified in Related Work for specified milestone inspections which are to take place at defined points throughout the abatement operation specific to each phase or work area.

.11 Do not proceed with next phase of work until written approval of each milestone is received from the Abatement Consultant.

1.13 Air Monitoring - Asbestos

.1 Air monitoring will be performed using Phase Contrast Microscopy (PCM) following the National Institute for Occupational Safety and Health Method 7400.

.2 Co-operate in the collection of air samples, including providing workers to wear sample pumps for up to full-shift periods. Contractor will be responsible for the cost of testing equipment repairs or resampling resulting from the actions of the Contractor's forces.

.3 Results of PCM samples at or exceeding 0.05 fibres per cubic centimeter of air (fibre/cc) or greater, outside an Abatement Work Area, will indicate asbestos contamination of these areas. Respond as follows:

.1 Suspend work within the adjoining Abatement Work Area until written authorization to resume work has been received from the Abatement Consultant.

.2 Isolate and clean area in the same manner applicable to the Abatement Work Area.

.3 Maintain work area isolation, and repeat clean-up operations until visual inspection and air monitoring results are at a level equal to that specified.

.4 At the discretion of the Abatement Consultant provide additional negative air units at locations specified in response to elevated fibre levels being detected in the Clean Change Room or Occupied Areas.

.4 Results of PCM samples at or greater than 0.01 fibres per cubic centimeter of air (fibre/cc), collected within the Abatement Work Area enclosure after the site has passed a visual inspection, and an acceptable coat of lock-down agent has been applied, will indicate asbestos contamination of these areas. Respond as follows:

.1 Maintain work area isolation and re-clean entire work area. Then apply another acceptable coat of lock-down agent to exposed surfaces throughout the work area.

.2 Repeat above measures until visually inspected and air monitoring results are at a level equal to that specified.

.3 Alternate to items above, the Asbestos Abatement Contractor can pay for analysis of PCM samples by Transmission Electron Microscopy (TEM) at NVLAP accredited laboratory.

.1 Enclosure to remain sealed, with negative pressure maintained, and subject to required daily inspections until TEM results are received.

.5 Additional labour or materials expended by the Contractor to rectify unsatisfactory conditions and to provide performance to the level specified shall be at no additional cost to the Owner.

.6 Cost of additional inspection and sampling performed as a result of elevated fibre levels in areas outside the Abatement Work Area or from within the work area following completion of work, will be back-charged to the Contractor.

1.14 Worker Protection

.1 Instruct workers before allowing entry to the Abatement Work Area. Instruction shall include training in use of respirators, dress, showering, entry and exiting from an Abatement Work Area, and all other aspects of work procedures and protective measures.

.2 Workers shall not eat, drink, chew gum or tobacco, vape or smoke in the Abatement Work Area.

.3 Workers shall be fully protected at all times when possibility of disturbance of hazardous materials exists.

.4 Provide soap, towels and facilities for washing of hands and face, which shall be used by all personnel when leaving the Abatement Work Area.

.5 Respiratory Protection

.1 Refer to each particular Section of the Specification for specified type of respiratory equipment specific to each phase or work area.

.2 Respirators shall be:

.1 Certified by the National Institute of Occupational Safety and Health (NIOSH) or other testing agency acceptable to the Ministry of Labour.
.2 Fitted so that there is an effective seal between the respirator and the worker’s face. Ensure that no person required to enter an Abatement Work Area has facial hair which affects the seal between respirator and face.
.3 Assigned to a worker for their exclusive use.
.4 Maintained in accordance with manufacturer’s specifications.
.5 Cleaned, disinfected and inspected by a competent person after use on each shift, or more often if required.
.6 Repaired or have damaged or deteriorated parts replaced.
.7 Stored in a clean and sanitary location.
.8 Provided with new filters as necessary, according to manufacturer's

instructions.

.9 Worn by personnel who have been fit checked by qualitative or quantitative fit-testing.

.10 Instruction on proper use of respirators must be provided by a competent person as defined by the Occupational Health and Safety Act.

.3 Provide protective clothing, to all personnel which:

.1 Is made of a material that does not readily retain nor permit penetration of asbestos fibres or lead/silica dust.

.2 Consists of head covering and full body covering that fits snugly at the ankles, wrists and neck.

.3 Once coveralls are worn, treat and dispose of as contaminated waste.

.4 Is replaced or repaired if torn or ripped.

.4 Use hard hats, safety footwear and other protective equipment and apparel required by applicable construction safety regulations.

1.15 Visitor Protection

.1 Provide clean protective clothing and equipment to Authorized Visitors.

.2 Instruct Authorized Visitors in the use of protective clothing and Abatement Work Area entry and exit procedures.

.3 Authorized visitors are required to be fit tested on respirators, prior to entering Abatement Work Area.

.1 Respirator worn must be compliant with Section 13 and Table 2 of O.Reg. 278/05.

1.16 Signage

.1 Asbestos Abatement Signs: Post signs at access points to the Abatement Work Area, stating at minimum, the following:

.1 There is an asbestos dust hazard.

.2 Access to the work area is restricted to persons wearing protective clothing and equipment.

.2 Vehicles, Bins and Asbestos Waste Containers: Post signs on both sides of every vehicle used for the transportation of asbestos waste and on every asbestos waste container. Signs must display thereon in large, easily legible letters that contrast in colour with the background the word “CAUTION” in letters not less than ten centimetres in height and the words:

.1 CONTAINS ASBESTOS FIBRES

.2 Avoid Creating Dust and Spillage

.3 Asbestos May be Harmful To Your Health

.4 Wear Approved Protective Equipment.

.3 Place placards in accordance with Transportation of Dangerous Goods Act.

1.17 Waste and Material Handling

.1 Waste bins must be placed on grade or in receiving.

.2 All bins for hazardous materials must be covered and locked when waste transfer is not being performed.

.3 Ensure redundant non-ACM, rubble, debris, etc. removed during contaminated work are treated, packaged, transported and disposed of as appropriate waste.

.4 Clean, wash and apply Post Removal Sealant to metal waste prior to removal from Abatement Work Area. Recycle metals.

.5 Clean, wash and apply Post Removal Sealant to non-porous materials prior to disposal as clean waste. Obtain prior written approval from the Abatement Consultant for each individual type of material.

.6 Clean and wash equipment prior to removal from Abatement Work Area if removed prior to completion.

.7 Place all equipment, tools and unused materials that cannot be cleaned in Abatement Waste Containers.

.8 As work progresses, and at regular intervals, transport the sealed and labelled waste containers from the Abatement Work Area to waste bin.

.9 Place items in bins according to waste classification. Place asbestos waste, metals, non-asbestos waste, etc. in separate bins.

.10 Removal of waste containers and decontaminated tools and materials from the Abatement Work Area shall be performed as follows:

.1 Remove any visible contamination from the surface of non-porous or cleanable waste being removed from the Abatement Work Area. If the item can be cleaned, remove it from the site as clean waste.

.2 Place waste or item in Waste Container and seal closed.

.3 Wet wipe outside of Waste Container.

.4 Within Decontamination Facility, Transfer Room or at the perimeter of the Abatement Work Area, place in second Waste Container. Seal closed.

.5 Remove waste containers and transport to appropriate bin.

.11 Transport waste and materials via the predetermined routes and exits. Arrange waste transfer route with Owner. Use a closed, covered cart to transport through Occupied Areas.

.12 Provide workers transporting waste with means to access full personal protective equipment and all tools required to properly clean up spilled material in the case of a rupture of a Waste Container.

.13 Pick-up and drop off of garbage bin shall be at pre-approved times, and must not interfere with the Owners operations.

.14 Transport hazardous waste to landfill or waste transfer station licensed by the provincial Ministry of the Environment.

.15 Cooperate with the provincial Ministry of the Environment inspectors and immediately carry out instructions for remedial work at dump to maintain environment, at no additional cost to the Owner.

1.18 Re-establishment of Objects and Systems

.1 Re-establish objects and items relocated by the Contractor's workforce to facilitate work.

.2 Re-establish electrical, communication, HVAC and other services previously disconnected or otherwise isolated to accommodate work by this Section.

.3 Make good at completion of work, all damage not identified in pre-removal survey.

PART 2 PRODUCTS AND FACILITIES

2.1 Materials and Equipment

.1 Refer to the Sections identified in Related Work for specified materials, equipment or facilities specific to each phase or work area.

.2 Materials and equipment must be in good condition and free of debris and fibrous materials. Disposable items must be of new materials only.

.3 Airless Sprayer: AC powered pressure washer that allows wetting agent to mix with water, uses no air or compressed air, and has a nozzle to regulate power and pressure.

.4 Amended Water: Water with wetting agent added for purpose of reducing surface tension to allow thorough wetting of materials.

.5 Asbestos Waste Container: A container acceptable to disposal site, Ministry of the Environment, and Ministry of Labour, comprised of the following:

.1 Dust tight.

.2 Suitable for the type of waste.

.3 Impervious to asbestos.

.4 Identified as asbestos waste.

.6 Discharge Ducting: Polyethylene Tubing. Reinforced with wire. Diameter to equal negative pressure machine discharge. Not to be longer than required, or so long that negative pressure is compromised.

.7 HEPA Filtered Negative Pressure Machine: Portable air handling system which extracts air directly from the Abatement Work Area and discharges the air to the exterior of the building. Equipped as follows:

.1 Prefilter and HEPA filter. Air must pass HEPA filter before discharge.

.2 Pressure differential gauge to monitor filter loading.

.3 Auto shut off and warning system for HEPA filter failure.

.4 Separate hold down clamps to retain HEPA filter in place during change of prefilter.

.8 HEPA Vacuum: Vacuum with necessary fittings, tools and attachments. Discharged air must pass through a HEPA filter.

.9 Hose: Leak-proof, minimum busting strength of 500 PSI or greater if required, abrasion resistant covering, reinforcing, and machined-brass couplings. Maintained and tested. Hose to be temperature resistant if it is to carry domestic hot water.

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

.11 Post Removal Sealant (or Lockdown): Sealant that when applied to surfaces serves the function of trapping residual asbestos fibres or other dust. Product must have flame spread and smoke development ratings both less than 50. Product shall leave no stain when dry. Post Removal Sealant shall be compatible with replacement insulation or fireproofing where required and capable of withstanding service temperature of substrate. Apply to manufacturer's instructions.

.12 Protective Clothing: Disposable coveralls complete with head covering and full body covering that fits snugly at the ankles, wrists and neck.

.13 Rip-Proof Polyethylene Sheeting: 8 mil (0.20 mm) fabric made up from 5 mil (0.13 mm) weave and two (2) layers of 1.5 mil (0.05 mm) poly laminate or approved equal. In sheet size to minimize on-site seams and overlaps.

.14 Sprayer: Garden type portable manual sprayer or water hose with spray attachment if suitable.

.15 Tape: Duct tape or tape suitable for sealing polyethylene to surfaces under both dry and wet conditions in the presence of Amended Water.

.16 Wetting Agent: Non-sudsing surfactant added to water to reduce surface tension and increase wetting ability.

PART 3 EXECUTION

.1 Refer to the Sections identified in Related Work for specified procedures for work area preparation, maintenance, site dismantlement, application of lock-down agent and all other procedures for the safe handling, removal and clean-up of hazardous materials specific to each phase or work area.

END OF SECTION

\\pinchin.com\ham\Job\336000s\0336572.000 HAMILTON-WENT,Various2024Pr,ASB,CONS\0336572.012 HWDSB,LisgarES,ExtDoor&MusicRm,HAZ,ASSMT\Deliverables\Specs\336572.012 02 81 00 General Provisions Lisgar HWDSB Nov 22 2024.docx

PART 1 GENERAL

1.1 General and Related Work

.1 Read this Section in conjunction with all drawings and all other Sections so as to comply with the requirements of the General Conditions of the Contract.

.2 Requirements specified elsewhere:

.1 Section 02 81 00 Hazardous Materials – General Provisions

1.2 Outline of Work

.1 Refer to Section 02 81 00 Hazardous Materials – General Provisions for the Outline of Work.

.2 The intent of this Section is to provide safe work practices and procedures to govern the handling, removal, clean-up and disposal of asbestos-containing materials following Type 1 or Low Risk procedures, and Pinchin and Owner specific requirements.

1.3 Personal Protection

.1 Protect all personnel at all times when possibility of disturbance of ACM exists.

.1 Provide non-powered half-face respirators with P100 high efficiency (HEPA) cartridge filters when requested by personnel.

.2 When requested by personnel, provide protective clothing.

.2 Provide protective clothing, to all personnel entering the Abatement Work Area.

.3 Wear hard hats, safety shoes and other personal protective equipment required by applicable construction safety regulations.

1.4 Inspections

.1 Refer to Section 02 81 00 – General Provisions.

.2 The following Milestone Inspections are to be scheduled:

.1 Milestone Inspection - Clean Site Preparation

.2 Milestone Inspection – Bulk Removal Inspection

.3 Milestone Inspection - Visual Clearance

PART 2 PRODUCTS AND FACILITIES

.1 Refer to Section 02 81 00.

PART 3 EXECUTION

3.1 Site Preparation

.1 Remove stored or non-fixed items from the Abatement Work Area including but not limited to equipment, furniture, waste etc. Store in area provided by Owner.

.2 Moving of equipment, tools, supplies, and stored materials that can be performed without disturbing ACM will be performed by others.

.3 Remove visible dust and friable material from all surfaces in the work area including those to be worked on, using HEPA Vacuums or wet wiping.

.4 Install polyethylene drop sheets below areas of work.

.5 Install polyethylene sheeting on openings in walls and floors (as required) and seal.

.6 Install signage in clearly visible locations and in sufficient numbers to adequately warn of an asbestos dust hazard.

.7 Isolate, at panel, and disconnect existing power supply to Abatement Work Area. Power supply to remaining areas of building must not be disrupted during work of this section.

.1 Lock-out/tag-out power at electrical panels.

.2 Mark/tag any items within or passing through the Abatement Work Area that are to remain live including but not limited to cable, conduit, wire, fixtures, equipment panels, etc.

.8 Provide power from ground fault interrupt circuits.

.9 Shut down HVAC systems serving the Abatement Work Area.

.1 Install polyethylene sheeting over openings in ducts and diffusers and seal.

.2 HVAC to remaining areas of building must not be disrupted during work of this section.

.3 System shall remain inoperative until completion of work, unless ducts can be effectively capped.

.4 Perform work at scheduled times after shutting down HVAC systems affecting the Abatement Work Area.

.10 Provide amended water for wetting ACM, and adequate method of wetting (garden sprayers, airless sprayers, etc).

.11 Without disturbing asbestos-containing materials, remove and dispose of non-hazardous materials as clean waste prior to asbestos removal work, where possible.

3.2 Maintenance of Abatement Work Area

.1 Inspect polyethylene sheeting and ensure it is effectively sealed and taped. Repair damage and remedy defects immediately.

.2 Inspect electrical panels and ensure locks and tags are on panels prior to entering the Abatement Work Area.

.3 Maintain Abatement Work Area in tidy condition.

.4 Remove any standing water on polyethylene/floor at the end of every shift.

.5 Turn off water supply to any hoses and reduce pressure in hose, prior to leaving the Abatement Work Area at end of shift.

3.3 Asbestos Removal - General

.1 Do not use powered tools or non-hand held tools.

.2 Do not use compressed air to clean or remove dust or debris.

.3 Do not break, cut, drill, abrade, grind, sand or vibrate ACM if it cannot be wetted. Type 2 procedures would be required if the material cannot be wetted due to hazard or damage.

.4 Wet ACM prior to work and keep ACM wet throughout the removal process.

.5 Frequently and at regular intervals during the work, clean up dust and waste using HEPA vacuums and/or wet sweeping or mopping.

.6 Frequently and at regular intervals, place all waste in asbestos waste containers.

.7 Immediately upon completion of work, clean area with HEPA vacuum and/or wet sweeping or mopping.

3.4 Asbestos Removal - Removal of Sink

.1 Wet all material to be disturbed.

.2 Undo fasteners if necessary to remove material.

.3 Break material only if unavoidable, and wet material if broken during work.

.4 Use only non-powered hand-held tools to remove ACM.

.5 Place removed ACM directly into an asbestos waste container.

3.5 Abatement Work Area Dismantling

.1 Wash or HEPA vacuum equipment and tools used in contaminated Abatement Work Area to remove all asbestos contamination, or place in Asbestos Waste Containers prior to being removed from Abatement Work Area.

.2 Place tools and equipment used in contaminated work site but not cleaned in polyethylene bags prior to removal from Abatement Work Area.

.3 Clean polyethylene sheeting and drop sheets which with HEPA vacuum or wet cleaning methods at completion of work.

.4 Wet drop sheets and polyethylene sheeting.

.5 Carefully roll polyethylene sheeting and drop sheets toward the centre. As polyethylene is rolled away, immediately remove visible debris beneath with a HEPA vacuum.

.6 Remove remaining polyethylene sheeting and tape.

.7 Place polyethylene sheeting, drop sheets, tape, disposal clothing and other contaminated waste in asbestos waste containers, wet wipe and place in second asbestos waste container.

3.6 Waste and Material Handling

.1 Refer to Section 02 81 00.

END OF SECTION

\\pinchin.com\ham\Job\336000s\0336572.000 HAMILTON-WENT,Various2024Pr,ASB,CONS\0336572.012 HWDSB,LisgarES,ExtDoor&MusicRm,HAZ,ASSMT\Deliverables\Specs\336572.012 02 82 00.01 Type 1 Precautions Lisgar HWDSB Nov 22 2024.docx

PART 1 GENERAL

1.1 General and Related Work

.1 Read this Section in conjunction with all drawings and all other Sections so as to comply with the requirements of the General Conditions of the Contract.

.2 Requirements specified elsewhere:

.1 Section 02 81 00 Hazardous Materials – General Provisions

1.2 Outline of Work

.1 Refer to Section 02 81 00 Hazardous Materials – General Provisions for the Outline of Work.

.2 The intent of this Section is to provide safe work practices and procedures to govern the handling, removal, clean-up and disposal of asbestos-containing materials following Type 2 or Moderate Risk procedures, and Pinchin and Owner specific requirements.

1.3 Personal Protection

.1 Protect all personnel at all times when possibility of disturbance of ACM exists.

.2 Provide the following minimum respiratory protection to all personnel:

.1 Full face respirators with P100 high efficiency (HEPA) cartridge filters, for:

.1 Removal of all or part of a ceiling if asbestos is likely lying on the surface.

.2 Use of a HEPA filtered power tool on non-friable ACM if the material is not wetted.

.2 Non-powered half-face respirators with P100 high efficiency (HEPA) cartridge filters.

.3 Provide protective clothing, to all personnel entering the Abatement Work Area.

.4 Wear hard hats, safety shoes and other personal protective equipment required by applicable construction safety regulations.

1.4 Inspections

.1 Refer to Section 02 81 00 – General Provisions.

.2 The following Milestone Inspections are to be scheduled:

.1 Milestone Inspection - Clean Site Preparation

.2 Milestone Inspection – Bulk Removal Inspection

.3 Milestone Inspection - Visual Clearance

PART 2 PRODUCTS AND FACILITIES

.1 Refer to Section 02 81 00.

2.2 Hoarding Walls

.1 Type A Hoarding Wall: One layer of rip-proof polyethylene sheeting installed floor to ceiling, secured with telescopic poles, clips, or other suitable methods.

.2 Type B Hoarding Wall: 38 mm x 89 mm wood or metal studs at 400 mm o/c with continuous sill and top plate, covered with one layer of rip-proof polyethylene sheeting on each side of wall.

.3 Windows: Install sufficient transparent windows area in hoarding walls to allow observation of entire work area from outside the enclosure where existing solid walls do not make up the perimeter.

2.3 Transfer Room

.1 Transfer Room to be generally 2000 mm x 2000 mm x 2200 mm high. Increase size accordingly to accommodate number of workers.

.2 Install walls as follows:

.1 Install 38 x 89 mm wood framing at 610 mm o/c with continuous top and sill plates.

.2 Install one layer rip-proof polyethylene sheeting on interior walls of Transfer Room.

.3 Install one layer of rip-proof polyethylene sheeting over one layer of 6 mil polyethylene sheeting beneath entire Transfer Room.

.4 Install one layer rip-proof polyethylene sheeting over roof.

.5 Turn 600 mm of polyethylene down the sides over polyethylene on the perimeter walls.

.6 Install a fire extinguisher, mount to wall.

2.4 Curtained Doorways

.1 Construct as follows:

.1 Install two flap doors, full width and height of door opening at all doors to Abatement Work Area and both ends of Transfer Room.

.2 Construct each flap door of two layers of polyethylene sheeting with all edges reinforced with tape. Use wood strapping to securely fasten flap doors to head and alternate jambs.

.3 Install weights attached to bottom edge of each door flap.

.4 Provide direction arrows on flaps to indicate opening.

PART 3 EXECUTION

3.1 Site Preparation - General

.1 Remove stored or non-fixed items from the Abatement Work Area including but not limited to equipment, furniture, waste etc. Store in area provided by Owner.

.2 Moving of equipment, tools, supplies, and stored materials that can be performed without disturbing ACM will be performed by others.

.3 Remove visible dust and friable material from all surfaces in the work area including those to be worked on, using HEPA Vacuums or wet wiping.

.4 Isolate, at panel, and disconnect existing power supply to Abatement Work Area. Power supply to remaining areas of building must not be disrupted during work of this section.

.1 Lock-out/tag-out power at electrical panels.

.2 Mark/tag any items within or passing through the Abatement Work Area that are to remain live including but not limited to cable, conduit, wire, fixtures, equipment panels, etc.

.5 Provide power from ground fault interrupt circuits.

.6 Shut down HVAC systems serving the Abatement Work Area.

.1 Install polyethylene sheeting over openings in ducts and diffusers and seal.

.2 HVAC to remaining areas of building must not be disrupted during work of this section.

.3 System shall remain inoperative until completion of work, unless ducts can be effectively capped.

.4 Perform work at scheduled times after shutting down HVAC systems affecting the Abatement Work Area.

.7 Provide amended water for wetting ACM, and adequate method of wetting (garden sprayers, airless sprayers, etc).

3.2 Site Preparation –Enclosure Required

.1 Install polyethylene enclosure complete with Windows at Abatement Work Areas for the following work:

.1 Removal of friable asbestos-containing materials (less than 1 square metre).

.2 Removal of a false ceiling (or part of) where asbestos-containing material is presumed or known to be present on the surface.

.2 Install Transfer Room where duration of work is to last longer than one 8 hour shift.

.3 Seal openings in floor using tape, polyethylene, etc. Floor openings are to be sealed independently prior to installation of floor polyethylene.

.1 Install polyethylene sheeting on floors of Abatement Work Area. Cover floors first so that polyethylene on walls is overlapped by at least 305 mm.

.4 Construct Hoarding Walls between Abatement Work Area perimeter and occupied areas, as required.

.5 Install polyethylene sheeting at openings in walls (as required) and seal.

.6 Install 6 mil polyethylene sheeting on walls within the Abatement Work Area., including existing walls that make up, or are within, the Abatement Work Area.

.7 Provide a completely sealed polyethylene top for free standing enclosures.

.8 Extend to underside of ceiling system, enclosures for access into ceilings. Enclosure may be supported from the ceiling system if ceiling can support the polyethylene.

.9 Install Curtained Doorways.

.10 Install one layer of 6 mil polyethylene sheeting so as to protect all equipment and finishes in the Abatement Work Area that may be damaged. Items to remain include but are not limited to:

.1 Millwork.

.2 Doors.

.3 Bulkheads.

.4 Electrical Equipment.

.5 Mechanical Equipment.

.11 Install temporary lighting in enclosure to a level that will provide for safe and efficient use of work area - minimum 550 LUX.

.12 Establish negative pressure in Abatement Work Areas as follows:

.1 Provide sufficient HEPA filtered negative pressure machines to exchange a

volume of air equivalent to that of the Abatement Work Area a minimum of every 20 minutes.

.2 Provide additional HEPA filtered negative pressure machines as required to ensure air flow from Occupied Area into Abatement Work Area.

.3 Arrange negative air units to maximize the distance between units and decontamination facilities.

.4 Provide weighted flaps in perimeter Hoarding Walls as necessary to provide make-up air.

.5 Operate HEPA filtered negative pressure machines continuously from first disturbance of ACM until completion of dismantling.

.6 Replace prefilters to maintain specified flow rate.

.7 Replace HEPA filter as required to maintain flow rate and integrity of unit.

.8 Discharge HEPA filtered negative air machines as follows:

.1 To building exterior.

.1 Remove existing glazing where necessary and replace with a 19 mm plywood panel.

.2 Install panel securely in window frame so that it cannot be pushed into the building and make weather-tight with caulking.

.3 For each negative pressure unit, provide a 300 mm diameter, screened, duct opening through panel.

.4 Direct discharge away from building access points.

.5 Reinstall glazing to match existing upon completion of work.

.13 Place required tools to complete the abatement with the Abatement Work Area.

.14 Install Signage in clearly visible locations and in sufficient numbers to adequately warn of an asbestos dust hazard.

3.3 Maintenance of Abatement Work Area

.1 Inspect polyethylene sheeting and ensure it is effectively sealed and taped. Repair damage and remedy defects immediately.

.2 Inspect electrical panels and ensure locks and tags are on panels prior to entering the Abatement Work Area.

.3 Inspect HEPA filtered negative pressure machines including discharge ducting at the beginning and end of each working period. Inspection must be performed by competent person.

.4 Maintain Abatement Work Area in tidy condition.

.5 Remove standing water on polyethylene/floor at the end of every shift.

.6 Turn off water supply to any hoses and reduce pressure in hose, prior to leaving the Abatement Work Area at end of shift.

3.4 Asbestos Removal - General

.1 Do not use compressed air to clean or remove dust or debris.

.2 Frequently and at regular intervals during the work, clean up dust and waste using HEPA vacuums and/or wet sweeping or mopping.

.3 Frequently and at regular intervals, place all waste in asbestos waste containers.

.4 Immediately upon completion of work, clean area with HEPA vacuum and/or wet sweeping or mopping.

3.5 Removal of Door Frames where Asbestos-Containing Vermiculite is Present in Concrete Block Wall Cavities

.1 Construct an enclosure around Abatement Work Area and use the procedures described above under *Site Preparation –Enclosure Required*.

.2 Remove door frames.

.3 Wet wipe door frames and dispose of as clean waste.

.4 Clean up any vermiculite that may become dislodged by the door frame removal and seal openings with spray foam.

.5 Wet clean or HEPA vacuum Abatement Work Area, including any surfaces not covered with polyethylene sheeting. Any materials or equipment removed to access ACM that are to be reused, must be vacuumed prior to reinstatement.

3.6 Removal of Millwork from Block Walls where Asbestos-Containing Vermiculite is Present in Concrete Block Wall Cavities

.1 Construct an enclosure around Abatement Work Area and use the procedures described above under *Site Preparation –Enclosure Required*.

.2 Remove millwork using non-powered hand tools. If power tools are used, they must be equipped with a HEPA filtered dust collection device.

.3 Clean up any vermiculite that may become dislodged and seal openings with spray foam.

.4 Wet clean or HEPA vacuum Abatement Work Area, including any surfaces not covered with polyethylene sheeting. Any materials or equipment removed to access ACM that are to be reused, must be vacuumed prior to reinstatement.

3.7 Removal of Block Walls for Mechanical/Electrical Penetrations where Asbestos-Containing Vermiculite is Present in Concrete Block Wall Cavities

.1 Construct an enclosure around Abatement Work Area and use the procedures described above under *Site Preparation –Enclosure Required*.

.2 Remove block wall to extent required for openings/penetrations using non-powered hand tools. If power tools are used, they must be equipped with a HEPA filtered dust collection device.

.3 Clean up any vermiculite that may become dislodged and seal openings with spray foam.

.4 Wet clean or HEPA vacuum Abatement Work Area, including any surfaces not covered with polyethylene sheeting. Any materials or equipment removed to access ACM that are to be reused, must be vacuumed prior to reinstatement.

3.8 Application of Post Removal Sealant

.1 Apply one coat of Post Removal Sealant with an airless sprayer, in accordance with Manufacturer's Instructions, to cover all surfaces on all items in the Abatement Work Area, including but not limited to polyethylene, ACM substrate, structural steel, and surfaces scheduled for demolition.

.2 Do not apply post removal sealant to materials that will be damaged by its application.

3.9 Abatement Work Area Dismantling

.1 Wash or HEPA vacuum equipment and tools used in contaminated Abatement Work

Area to remove all asbestos contamination, or place in Asbestos Waste Containers prior to being removed from Abatement Work Area.

.2 Place tools and equipment used in contaminated work site but not cleaned in polyethylene bags prior to removal from Abatement Work Area.

.3 Clean polyethylene sheeting and drop sheets which with HEPA vacuum or wet cleaning methods at completion of work.

.4 Wet drop sheets and polyethylene sheeting.

.5 Carefully roll polyethylene sheeting and drop sheets toward the centre of enclosure. As polyethylene is rolled away, immediately remove visible debris beneath with a HEPA vacuum.

.6 Remove remaining polyethylene sheeting and tape, and dispose of as asbestos waste.

.7 Place polyethylene sheeting, drop sheets, tape, disposal clothing and other contaminated waste in asbestos waste containers, wet wipe and place in second asbestos waste container.

.8 Remove remaining site isolation, seals, tape, etc.

.9 Remove Transfer Room.

.10 Remove seals, tape, Signage etc.

.11 Immediately upon shutting down negative air units, seal air inlet grill and exhaust vent with polyethylene and tape.

.12 Seal openings in HEPA vacuums.

.13 Remove and dispose of the pre-filters from HEPA filtered negative pressure machines as asbestos waste.

.14 Remove HEPA filtered negative pressure machines and discharge ducting or HEPA vacuums.

.15 Remove temporary lights.

.16 Place contaminated materials including polyethylene sheeting, drop sheets, seals, tape, disposable coveralls, and other contaminated waste in asbestos waste containers.

3.10 Waste and Material Handling

.1 Refer to Section 02 81 00.

3.11 Re-Establishment of Items

.1 Upon completion of work:

.1 Move items that were removed from Abatement Work Area prior to work, back into same location within Abatement Work Area.

.2 Remove and disconnect tags and locks from electrical panels and re-energize equipment and items.

.3 Remove negative air discharge panel and reinstall glazing to match existing.

.4 Reinstall ducts removed to perform cleaning of ducts or to access ACM.

.5 Clean, mop and vacuum Abatement Work Area and area beneath Decontamination Facilities.

.6 Enable building air handling systems.

END OF SECTION

PART 1 - GENERAL

1.1 Scope

.1 Comply with Division 1: General Requirements.

.2 Provide materials, labour and equipment for installation of unit masonry, reinforcing and other components as shown on the drawings, described herein, or as necessary to complete the work.

1.2 Related Work Under Other Sections

None

1.3 Applicable Codes and Standards

.1 Technical Builders Bulletins, Section 20 'Above Grade Masonry'.
.2 Ontario Building Code 'Plain and Reinforced Masonry'.
.3 CAN3-S304-M84 'Masonry Design for Buildings'.
.4 CAN3-A370-M84 'Connectors for Masonry'.
.5 CAN3-A371-M84 'Masonry Construction for Buildings'.
.6 CAN/CSA-A405-M87 and Brick Institute of Americas Standards "Design and Construction of Masonry Chimneys and Fireplaces"

.7 ULC fire-rated assemblage requirements.

1.4 Co-ordination and Co-operation:

.1 Co-ordinate and co-operate with all other trades to ensure satisfactory and expeditious completion of the work.

1.5 Inspections and Tests

.1 Inspect previously prepared bearing surfaces. Reject unsatisfactory surfaces upon which masonry depends. Commencement of work implies acceptance of the bearing surface.

.2 If suppliers or manufacturers cannot provide an acceptable recent independent test report [i.e. within the last three [3] years] attesting to the materials specification, obtain and pay for the required tests.

.3 The Architect shall be the sole judge as to acceptability of work. If any work is rejected, promptly remove from site and replace with proper materials and workmanship as required. Pay for any tests required to determine cause of failures.

1.6 Delivery Storage and Handling

.1 Handle and store mortar materials to CAN3-S304-M84 in a dry state with manufacturer’s seals and labels intact.

.2 Stack units, strapped to delivery pallets, clear of ground and under clean and dry weathertight cover.

1.7 Protection

.1 Protect stored materials against damage. Remove rejected or damaged materials from site.

.2 Protect surrounding surfaces and work of others. Install temporary protective covers, nosings, etc. Remove before final inspection.

.3 During construction and until completed and protected by flashings or caps, keep masonry work, particularly cavities, dry by using waterproof, non-staining coverings extending over and down side surfaces to protect walls and mortar cure from wind-driven rain. Maintain wall cavities free of mortar droppings to prevent bridging and to ensure drainage. Leave temporary clean out openings at base of cavity and afterwards reinstate when mortar cleaned.

.4 Protect completed work from marking or other damage, particularly from overhead mortar droppings.

.5 Provide temporary protection to interior of building existing weatherproof surface disturbed prior to installing new masonry.

.6 Provide adequate temporary bracing of new and existing masonry work during construction until permanent lateral support in place.

PART 2 - PRODUCTS

2.1 Materials

.1 **Mortars:**

.1 **Cement** - CAN/CSA-A5-M88 - 'Portland Cement'.

.2 **Cement -** CAN/CSA-A8-M88 - 'Masonry Cement'

.3 **Sand** - CSA -A82.56-M1976 - 'Aggregate for Masonry Mortar'.

.4 **Water** - Drinking quality.

.5 **Lime -** Hydrated Lime to ASTM C207 and ASTM C5

.6 **Lime Putty -** Soak Hydrated Lime not less than 12h in water.

.7 **Plasticizer:** (for structural purposes)

Acceptable Products: Or Approved Equal

Master Builders 'Omicron'
Sternson 'Sterad 300'

.8 **Mortar Colours** - Non-fading, non-staining, lime-proof metallic oxide pigments.

Acceptable Manufacturers: Or Approved Equal

Northern Pigment

.2 **Mortar Mixes:**

.1 **Non-staining Mortar [for above grade-grey]**
Type 'S': to CSA -A179-M1976 [12.5 MPa]
1 part cement
$^{1}/_{2}$ part lime putty
4-$^{1}/_{2}$ parts sand
Plasticizer to manufacturers directions

.2 **Pointing Mortar [for repairs]:**
1 part cement
$^{1}/_{8}$ part lime putty
3 parts sand [carefully selected to match existing colour]

.3 **Non-shrink Grout [for inserts, bearing plates, etc.]:** Pre- mixed, minimum strength 4 MPa at 28 days.

Acceptable Products: Or Approved Equal

C.C. Chemicals	'In Pakt'
CPD Services	'Non-shrink Grout'
Master Builders	'Masterflow 713'
Sternson	'Ferrogrout'
Meadows	'U-3'

.3 **Handling Mortar:** Prepare only sufficient mortar usable within one hour of mixing. Wash out mixing box, transport boards, mixing and handling tools between each load. Add only enough water to maintain mix at a stiff workable consistency.

.4 **Masonry Reinforcement, Ties and Concrete Block Ties:**

.1 **Single Wythe Concrete Block Reinforcement:** To CAN3-A370 and A371-M84; hot dipped galvanized ladder type 4.76 mm ($^{3}/_{16}$") side rods and 4.76 mm ($^{3}/_{16}$") cross rods, with preformed corner pieces.

Acceptable Products: Or Approved Equal

Blok-Lok	'Blok-Lok BL30 Extra Heavy Duty'
Dur-O-Wal	'Ladur DW200 Extra Heavy Duty'

.2 **Composite Brick Concrete Block Reinforcement:** To CAN3- A370 and A371-M84,:hot dipped galvanized truss type 4.76 mm ($^{3}/_{16}$") side rods and 4.76 mm ($^{3}/_{16}$") cross rods, with preformed corner pieces.'

Acceptable Products: Or Approved Equal

Blok-Lok	'4 wire Blok-Trus BL32 Extra Heavy Duty'
Dur-O-Wall	'Truss Double DW120 Extra Heavy Duty'

.5 **Concrete Block:**

.1 To CAN3-A165.1-M85 with units to match existing including all specialty shapes, from one manufacturer; uniform in colour, shade and texture; test-rated at:

.1 **S/15.0/A:** 75 percent solid for exposed interior block walls.

.2 Provide test reports attesting to the requirements of the specified material.

Acceptable Products: Or Approved Equal

Day and Campbell 'Ty-lon (Limestone Finish)'

.6 **Face Brick:**

.1 To CAN/CSA-A82.1-M87, Grade SW, Type FBS maximum water absorbtion of 8 percent in 24 hour cold water submersion test and complying with the freeze-thaw test in CAN3-A82.2-M78. Provide a recent or new test report altesting to these requirements. To match existing size, colour, type and texture.

.7 **Weep Hole Vents:** Purpose-made plastic or galvanized steel, designed to drain cavities to exterior by means of a 10 mm ($^3/_8$") sloped tube, spaced horizontally at 600 mm oc (2 ft) in vertical joints at bottom of cavities [i.e. at bearing courses, at shelf angles, and at lintels].

Acceptable Products: Or Approved Equal

Dur-O-Wall 'Weep Holes'
Goodco'Goodco 'Vents'

Guenette 'No. 20'

.8 **Sheet Membrane Flashing:** 1.5 mm thick, self stick membrane .

Acceptable Products: Or Approved Equal

Henry/Bakor 'Blue Skin TWF'

PART 3 - EXECUTION

3.1 Preliminary Work

.1 Give at least [5] days notice to the Architect before starting work.

3.2 General

.1 Do all work in accordance with CAN3-A371-M84, Masonry Construction for Buildings and CAN/CSA-A405-M87 (see #6 in 1.3).

.2 Use lightweight concrete blocks for exposed interior surfaces of walls or partitions. Regular weight blocks may be used for concealed surfaces. Lay and point exposed masonry with extreme care as to evenly distribute masonry units to prevent patches and streaks and to produce a homogeneous surface for painted finish.

3.3 **Co-ordination**

.1 Co-ordinate masonry work with work of other trades. Obtain and build in fittings supplied by others. Instruct masonry trade to fit work of others, as required.

.2 Distribute units of varying colours and/or textures throughout the wall surface to avoid spottiness in finished surface. Do not use units with colours or textures excessively contrasting with the overall range. Reject chipped, blemished, cracked or defective units.

3.4 **Grades, Lines and Levels**

.1 Ensure grades, lines and levels are accurate, plumb, square and true to line.

3.5 **Coursing**

.1 Match existing coursing pattern.

.2 Erect masonry with level, accurately spaced courses.

.3 Align coursing horizontally and vertically.

.4 Take particular care at corners and reveals.

.5 Construct masonry evenly in maximum lifts of 1.5 m (5 ft) per day.

3.6 **Tolerances** To CAN3-A371-M84, Clause 5.3.1:

.1 **Plumb:** Maximum tolerance of 6 mm in 3 m ($^1/_4$" in 10 ft).

.2 **Level:** Maximum tolerance of 6 mm in 6 m ($^1/_4$" in 20 ft).

.3 **Line:** Maximum tolerance of 6 mm in 6 m ($^1/_4$" in 20 ft).

3.7 **Cutting**

.1 Lay out masonry work to ensure a minimum of cut units.

.2 Where necessary cut units with approved masonry saw.

.3 Make cuts straight, square and free from chips or breaks.

.4 Reject cuts with fractures on face edge.

.5 Do not install cut units at corners or reveals.

3.8 **Beds**

.1 Place units on full mortar beds.

.2 Butter ends of units for full vertical joints.

.3 Partially filled beds or partially filled vertical joints are not acceptable.

.4 At end of each days work, securely cover exposed and curing work.

.5 Concrete masonry units to have face shells and their end joints fully filled with mortar, and joints squeezed tight together. Fill webs at cores; to be reinforced

and grouted and strike flush at core taking care to prevent mortar from falling into core.

3.9 Joints

.1 As the work proceeds, wipe surface with a rough cloth to remove unsightly mortar stains.

.2 Unless otherwise specified, when mortar is 'thumb-print' hard, tool joints evenly, concave, smooth and straight where exposed to view, strike flush elsewhere or where indicated on drawings or specified herein. Press mortar tight against masonry units on both sides of joints. Remove excess material or burrs left after jointing. Use trowel or rub with burlap bag.

.3 Ensure vertical joints form smoothly into horizontal joints, all uniformly concave approximately 10 mm ($^3/_8$") high.

.4 Throwing mortar droppings into joints, deep or excessive furrowing of bed joints, using mortar that has taken initial set is strictly prohibited. Where adjustment must be made after mortar has started to set, remove mortar and replace with fresh supply.

3.10 Lintels, Sleeves, etc.

.1 Accurately build in lintels, sleeves, ties, frames, plugs, hangers, anchors, plates and other fitments.

3.11 Expansion Joints

.1 As shown on the drawings and as required by CAN3-S304-M84 and OBC.

.2 Accurately construct weather barred reveals with vertical joints plumb and true and as detailed on drawings.

.3 Build horizontal expansion joints to proper clearances.

3.12 Control Joints

.1 As required by CAN3-S304-M84 and OBC: material to suit size and shape of joint as detailed on drawings.

.2 Construct joints in a toothed staggered pattern as detailed on drawings.

.3 As wall is being constructed place soft control joint backer pad into joint (see 2.6) in the longest continuous available lengths.

.4 Clear mortar from joint and prepare for sealing with specified control joint back up rod (see 2.7).

3.13 On Completion

.1 After mortar has cured and if staining has occurred, wash down surfaces as follows. Protect other work during washdown operations.

.1 **For Concrete Block, Brick and Concrete Faces:** Wet surface with clear water. Scrub in a zinc sulphate solution [i.e. zinc sulphate 200 g. to 1 L water] and remove stains with a fibre brush. Thoroughly flush with clean water.

3.14 **Clean-up**

.1 Carefully rub down finish surfaces and remove stains using a rough cloth and/or fibre brushes. Remove mortar droppings, debris and broken or chipped units.

3.15 **Maintenance**

.1 Replace or repair any work damaged during construction or warranty period, including removing and neutralizing efflorescence.

-End-

PART 1 - GENERAL

1.1 Scope

.1 Comply with Division 1: General Requirements.

.2 Provide materials, labour and equipment for the installation of rough carpentry shown on the drawings, described herein or as necessary to complete the work.

1.2 Related Work Under Other Sections:

None

1.3 Applicable Codes and Standards

.1 Comply with requirements of Ontario Building Code, Ontario Occupational Health and Safety Act and municipal building By-laws and Regulations.

.2 **Lumber:** Identifiable by the NLGA grade stamp of an agency certified by The Canadian Lumber Standards Accreditation Board.

.3 **Pressure treated wood:** To CAN/CSA -O80 Series-M89. Identifiable by the ULC classification label.

.4 **Lumber fastenings:** To OBC Section 4.3.1 and Part 9.

1.4 Delivery, Storage and Handling

.1 Delivery all materials as specified any defective, damaged, warped material or material deemed to be inferior to the specification by the Architect will be promptly replaced.

.2 All materials shall be storaged and stacked in order to prevent damage from exposure to moisture.

1.5 Samples

.1 Provide 300 mm (12") long sample pieces of all pressure preserved wood components to be exposed to view. The samples will be reviewed by the Architect for colour and quality, the samples will be adjusted until the Architect is satisfied. The accepted samples will serve as a standard for all other work.

1.6 Co-ordination and Co-operation:

.1 Co-ordinate and co-operate with all other trades to ensure satisfactory and expeditious completion of the work.

.2 Provide and install all necessary components specified under this section, required to be fixed to or inset in the work of other sections. Inform related sections as to their locations.

PART 2 - PRODUCTS

2.1 Materials

.1 **Lumber Materials:**

.1 **Lumber:** [Eastern White Spruce], [Eastern Red Pine] [Douglas Fir] [grade stamped] softwood S4S, kiln dried to maximum 19 percent

moisture content, to CAN/CSA-O141-1970 and NLGA Standard Grading Rules for Canadian Lumber [1984], unless shown otherwise.

.2 Lumber for each type of structural component; of same species and grade.

.3 Use machine stress-rated lumber wherever possible to CAN/CSA-O86-M84, Table 53; do not use glued end or finger-jointed lumber for framing.

.4 **Lumber:** To OBC Subsection 9.3.2 and as follows:

LUMBER	**MINIMUM GRADE**
Framing [Studs, joists, beams, columns]	Structural No. 1
Board [Floor, wall, roof supports]	Standard No. 2
Backing [Furring, blocking, grounds, bucks]	Standard No. 2
Roof [Cants, curbs, nailers, sleepers, pressure treated]	Standard No. 2

.2 **Plywood Blocking:** Exterior grade Douglas Fir Plywood, To CSA-O121- M1978, sheathing grade.

.3 **Building Paper:** To CAN/CGSB 51.32-M77 laminated type.

.4 **Vapor Barrier:** Polyethylene Film; to CAN/CGSB-51.34-M86, Type 2, 6 mil thick.

.5 **Adhesive:** To CAN/CGSB-71.26-M88, cartridge loaded.

.6 **Fastenings and Hardware:**

.1 Spiral or annular grooved nails, spiral spikes or heavy duty staples; to OBC Subsection 9.23.3.

.2 For exterior applications, interior high-humidity areas and in preservative treated applications; hot dip, galvanized fastenings to CAN/CSA-G164-M1981.

.3 For other sight-exposed fasteners and hardware; primer paint coating to CAN/CGSB-1-GP-181M.

.4 **Specialty hardware types:**

.1 **To hollow masonry and gypsum board walls:** Toggle type bolts.

.2 **To solid masonry and concrete surfaces:** Expansion shield with lag screw, or lead plug with wood screw.

.3 **To structural steel:** Bolts through drilled holes,
OR
.3 **To structural steel:** Welded stud bolts,
OR
.3 **To structural steel:** Power driven, self-tapping screws.

.5 **Screws:** To be stainless steel and/or brass with flat countersunk heads, of length and size to ensure positive fastening or as noted on drawings.

.6 **Expansion Shields:** Lead shield type.

.7 **Surface-applied Wood Preservatives (for exposed cut surfaces):** To be copper naphthenate solutions containing a minimum of 2% copper. Use all manufacturers precautions in using the products.

.1 **For exterior paint, stained or natural finishes on air exposed lumber:** To manufacturers recommendations.

Acceptable Products:

Hickson	'Wolman (Cedar tone)'

.2 **For interior and/or exterior concealed or covered lumber as specified:** To manufacturers recommendations.

Acceptable Products:

Osmose	'Pentox Green'
Solignum	'1-4-2, 1.35'

.8 **Pressure Preservatives:** To CAN/CSA-O80 P5 Series-M89, water-borne preservatives vacuum pressure impregnated and CAN/CSA-O80 Series-M89 in general.

.1 Lumber used for structural decking, beams, purlins, braces, columns, fascias, trim, blocking, timbers etc. To CAN/CSA-O80.1, .2, .5, .9 Series M-89. To an average net retention of 6.4 kg/m^3 (0.040 pcf).

Acceptable Products:

Hickson	'Cedar Tone Plus'

.2 For all concealed exterior lumber (other than items specified under 2.1.8). Lumber used for roof cants, curbs, nailers, sleepers, sheathing, plywood decking, and interior lumber in contact with concrete block or poured concrete surfaces. To CAN/CSA-O80.1, .2, .5, .9 Series M-89 water borne preservative chromated copper arsenate (CCA) to an average net retention of 6.4 kg/m^3 (0.40pcf).

PART 3 - EXECUTION

3.1 Preliminary Work

.1 Give at least [5] days notice to the Architect before starting work.

.2 Drill all holes in steel members required unless steel members have been predrilled.

3.2 **Framing**

.1 Comply with OBC, Section 9.23.

3.3 **Erection**

.1 Install members plumb, true to line, levels and elevations and uniformly spaced.

.2 Form continuous members from pieces of longest practical length.

.3 Install spanning member with 'crown-edge' up.

.4 Do not use material which is warped, split, checked, twisted, or cupped unless otherwise directed.

.5 Fabrication and installation methods to allow for expansion and contraction of the specified materials.

.6 Install all rough hardware including nails, screws, bolts, washers, brackets, hangers, and fastening devices of all types.

.7 Fasten to hollow units and drywall with toggle bolts; to solid masonry or concrete with lead expansion shields and lag screws; and to structural steel with bolts through drilled holes, or welded stud-bolts or power driven self-drilling screws. Do NOT use organic fibre or wood plugs.

.8 Cast in anchors or inserts as specified, or drill concrete and use expansion shields and bolts.

.9 Set or countersink all fastening devices flush with surface of framing members. all fastenings shall be drawn up tight. Countersink bolts where necessary to provide clearance for other work. Use 10 mm ($^3/_8$") bolts for 50 mm (2") nominal bucks and blocking. Locate fasteners within 300 mm (12") of ends and uniformly spaced between. Space bolts at 800 mm (2'-8") oc.

3.4 **Appearance Grade Materials**

.1 Install lumber and panel members and finish with translucent or transparent stain type coatings with grade-marks, labels and other defacements concealed. Do not surface cut or sand to remove these marks.

3.5 **Furring and Blocking**

.1 Install furring and blocking accurately located and secured to provide support bases for surface-applied fitments [e.g. cabinets, plumbing fixtures, accessories, electrical fitments, etc.].

.2 Align and plumb faces of furring and blocking to a tolerance of 1:600.

.3 Install miscellaneous wood members. Do not regard furring, blocking or strapping indicated as exact or complete. Locate and secure these pieces to suit site conditions. Provide adequate fastenings and support required for attaching work of other sections.

.4 Fasten wood to masonry where required using approved nails.

.5 Install all wood blocking and plywood back-up required. Shape as necessary, and securely fix to steel where indicated.

.6 Install wood strapping behind all plywood panels to receive electrical, communication or mechanical devices, switches, controls and similar components. Strapping shall be nominal 25 x 50 mm (1" x 2") material located at 400 mm (16") oc. Recess vertical edge of furring of member adjacent to edge of panel 25 mm (1"). Cut ends of vertical furring 16 mm ($^5/_8$") back from top and bottom edges of panels.

3.6 **Rough Bucks and Nailers**

.1 Securely install wood bucks and nailers as required.

.2 Unless otherwise detailed, use material minimum 38 mm ($1^1/_2$") thick fastened with 9 mm ($^3/_8$") bolts located minimum 300 mm (12") from ends of members and uniformly spaced at minimum 800 mm (32").

3.7 **Clean-up**

.1 Remove debris and waste from site and leave 'broom clean'.

-End-

PART 1 - GENERAL

1.1 Scope

.1 Comply with Division 1 :General Requirements.

.2 Provide materials, labour and equipment for the installation of site-applied wood trim, moldings, millwork, door frames and screens, shelving, and tack boards as shown on the drawings, described herein, or as necessary to complete the work.

1.2 Related Work Under Other Sections

.1 Section 06100: Rough Carpentry, [co-ordinating work with this section.]

.2 Section 07900: Sealants, [co-ordinating work with this section.]

.3 Section 08131: Steel Doors and Frames, [install work with this section.]

1.3 Applicable Codes and Standards

.1 Comply with requirements of Ontario Building Code, Ontario Occupational Health and Safety Act and municipal building By-laws and Regulations.

.2 Millwork to the Quality Standards of the Architectural Woodwork Manufacturers Association of Canada, AWMAC-2009, Custom Grade.

1.4 Qualifications

.1 All work of this section must be performed by carpenters having a minimum of (5) years experience in work of similar type. They must be certified by their respective associations for this type of work.

1.5 Delivery, Storage and Handling

.1 Deliver all materials as specified, any defective, damaged, warped material or material deemed to be inferior to the specification by the Architect will be promptly replaced.

.2 All materials shall be stored and stacked in order to prevent damage from exposure to moisture.

1.6 Co-ordination and Co-operation

.1 Co-ordinate and co-operate with all other trades to ensure satisfactory and expeditious completion of the work.

.2 Co-ordinate installation of work to be built-in by other sections, also equipment to be incorporated into finished carpentry work.

.3 Review drawings of other sections affecting work of this section to co-ordinate locations of other components.

1.7 Samples

.1 Submit 300 mm (12") long samples of each type of trim and molding.

.2 Do not proceed with work before the Architect's acceptance.

1.8 **Shop Drawings**

.1 For the following finish carpentry items, submit [6] copies of shop drawings clearly showing details of installation profiles, jointing and other related details.

1. Casework [site fabricated] & Trims
2. Mouldings
3. Wood Door Frames and Wood Screens

PART 2 - PRODUCTS

2.1 **Softwood Lumber:** To CSA-O141-1970 and NLGA Grading Rules, with maximum 14 percent moisture content. Use selected yard lumber for natural or paint finish. Clear Select Douglas Fir, Clear Select White Pine, Clear Select Red Cedar.

2.2 **Hardwood Lumber:** To National Hardwood Lumber Association [NHLA] standards, moisture content maximum 14 percent. Select Birch or Poplar as indicated on drawings or specified herein.

2.3 **Hardwood Plywood:** To CSA-O115-M1982 of thicknesses shown; plain sliced veneers; architectural grade, birch or poplar, good 1 side, sound other side, veneer on plywood core with Type 1 bond.

2.4 **Douglas Fir Plywood:** To CSA-O121-M1978 good 1 side sound other side select face, free from boats or defects.

2.5 **Miscellaneous Hardware:** To Section 05600: Miscellaneous Metals.

2.6 **Finished Hardware:** To Section 08710: Finish Hardware, supplied from hardware schedule.

2.7 **Fastenings:** Finishing nails and screws: To CSA-B111-1974, hot dip galvanized for exterior work, electrogalvanized for interior work, or resin coated nails for power nailing of interior work.

2.8 **Adhesive:**

.1 **For Millwork:** Polyvinyl adhesive to CSA-O112.4-M1977.

.2 **For Casework and Cabinetwork:** Water resistant urea resin to CSA-O112.5-M1977, Type 1 and 2.

2.9 **Sealing Tape:** Preformed butyl tape 10-15 durometer hardness, paper release, width and thickness, as specified by manufacturer.

PART 3 - EXECUTION

3.1 **Preliminary Work**

.1 Give at least [5] days notice to the Architect before starting work.

.2 Provide temporary protection to all interior areas during operations.

.3 Upon completion of any site fitting in which core materials are exposed, apply one coat of sealer to all such surfaces scheduled to be concealed in the finished work.

.4 Drill holes in steel members required unless steel members have been pre-drilled under separate sections. Obtain Architect's acceptance prior to drilling.

3.2 Installation - General

.1 Install plastic laminate work with concealed fastening devices. Method of securing plastic laminate work shall be reviewed before commencing installation. Fasteners shall not be more than 600 mm (24") oc and 150 mm (6") from edges and ends. Scribe edge of plastic laminate to abutting dissimilar surfaces to effect neat, true and plumb closure.

.2 Install woodwork to custom grade requirements of AWMAC. Where items are being installed under this section which are furnished by sections other than 06221.

.3 Install work in accordance with drawings and as specified to effect a secure, neat and complete installation.

.4 Install materials in longest lengths possible, jointing only where support is obtained. Erect materials plumb, level, square and to required lines. Accurately cut, fit, frame and fasten members in a neat manner consistent with quality specified.

.5 Space fastenings at not greater than 600 mm (2'-0") oc unless otherwise specified. Locate fastenings not more than 150 mm (6") from end of member. Fastenings shall be staggered such that centre of fastening device is not greater than the lesser of 38 mm (1-$^1/_2$") from edge of framing member, or $^1/_3$ the width member.

.6 Plugging of concealed fastening devices shall consist of solid plugs up to 25 mm (1") diameter, and 10 mm ($^3/_8$") plywood for holes over 25 mm (1") diameter; same species as surrounding wood. End grain plugs are acceptable.

.7 Incorporate accepted provision to recognize expansion and contraction characteristics of materials. Make joints to conceal shrinkage; mitre exterior corners; cope interior corners; mitre or scarf end-to-end joints. Use blind mitre splines and dowels where detailed on drawings or as necessary.

.8 Nail trim with finish nails of properly selected dimension to hold members firmly in place without splitting wood.

.9 On exposed finished work, set all nails for filler. Do not drive wood screws when setting.

.10 When preservative treated wood members are cut, planed or drilled under this section, apply wood preservative to freshly exposed surfaces in accordance with manufacturers instructions prior to permanently affixing such members.

.11 Provide cutouts as required for inserts, grilles, service devices and other fitments and fixtures as required by other Sections.

.12 Make allowance where fixed objects pass through or project into and around periphery of work of this Section to permit normal movement without restriction.

.13 Install all work provided by Section 06221: Factory Cabinet Work.

3.3 **Window Stools:**

.1 Permanently fix window stools to interior sill using appropriate construction adhesive, unless otherwise noted.

3.4 **Other Doors and Steel Frames**

.1 Accurately hang; fit plumb and square without binding doors shall swing shut with 1.5 mm ($^1/_{16}$") clearance at head. 2.4 mm ($^3/_{32}$") at jambs and 6 mm ($^1/_4$") clearance over finished floor surfaces.

.2 Install steel frames in locations where indicated. Verify position in wall relate to adjacent components and surfaces.

.3 Install steel frames using accepted temporary bracing members to anchor head member to structure above securely. Install frames rigid and accurately aligned plumb, level and true to line in all planes. Anchor floor plates on concealed face of jamb to floor substrate material in an accepted manner. Provide and install metal shims where required to ensure level and plumb vertical and horizontal alignment of all surfaces.

.4 Install jamb extension members to ensure rigid installation. Effect all connections in an accepted manner.

.5 Install temporary wood brace at head for frame openings wider than 1.4 m (4'-6") in masonry walls until masonry is complete and set.

.7 Remove doors for finishing and sealing of edges by Section 09900: Basic Painting and re-install when dry.

3.5 **Finish Hardware**

.1 Take delivery of and install all finish hardware including butts, hinges, snaps, closers, panic hardware, strikes, bolts, escutcheons, cylinders,

weatherstripping and any other supplied. Check each item as received and distribute to respective door sections.

.2 Install all other items as directed by Architect.

.3 Install lock cylinders to specialty items such as aluminum entrances, and the like.

.4 Make provisions for counter-sinking or counter-boring screw heads.

.5 Mount door stops for swing doors where hardware may contact wall finish or built-in fitments.

.6 Fix push and pull plates with minimum 6 screws each. Fix kick plates with screws at not more than 150 mm (6") oc. Where push and pull sets are back-to-back, mount with suitable through bolts.

.7 Install matching strike boxes with locksets and latchsets.

.8 Unless otherwise specified, allow minimum throw of 13 mm ($^1/_2$") for dead bolts.

.9 Install extension flush bolts to top and bottom of inactive leaf of pairs of doors without panic devices or other emergency hardware.

.10 Refer to section 08710 for further installation information.

3.6 **Final Finishing**

.1 Sandpaper finished wood surfaces thoroughly as required to produce uniformly smooth surface, always sanding in direction of grain run, except do not sand wood which is scheduled to be left rough. No coarse grained sandpaper mark, hammer mark, or other similar imperfections are acceptable.

.2 Clean work and notify painter when work is ready for sealing and finishing. Inspect work and co-operate fully in adjusting work to the Architect's approval.

3.7 .1 On completion of all work in building, check woodwork and plastic laminate work carefully for defects. Clean plastic laminate surfaces and remove identification marks.

.2 Adjust and refit working parts, and refinish as required to provide smooth operation without sticking and binding.

.3 Damage to work of this section attributable to work under separate sections shall be corrected by this section at no cost to owner.

3.8 **Interior Trim**

.1 Install, glue and finish nail to AWMAC Standard, custom grade.

.2 Select running trim to match adjacent pieces of even colour, grain and texture.

.3 Set nails and secure neatly; leave no hammer or drive marks; securely anchor to wall or floor bearings.

3.9 Completion

.1 Clean work and notify painter when work is ready for sealing and finishing. Inspect work and co-operate fully in adjusting work to the Architect's approval.

-End-

PART 1 - GENERAL

1.1 Scope

.1 Comply with Division 1: General Requirements.

.2 Provide materials, labour and equipment for factory fabricated cabinet, casework, as shown on the drawings, described herein or as necessary to complete the work.

1.2 Related Work Under Other Sections

.1 Section 06240: Laminated Plastics and Stone Counter Top, [provide and install all laminated plastic.]

.2 Section 08712: Cabinet Hardware, [provide and install all specified cabinet hardware and accessories.]

.3 Division 16: Electrical, [co-ordinate work with this section.]

1.3 Standards

.1 Millwork to Standards of the Architectural Woodwork Manufacturers Association of Canada, AWMAC-2009, Custom Grade.

.2 Materials, workmanship and performance standards to CAN3-A278-M82.

1.4 Shop Drawings

.1 Provide [6] copies of shop drawings clearly showing details of construction, profiles, jointing, fastenings, colour schedule, hardware and finishes to the Architect's approval. Indicate site verified dimensions.

1.5 Delivery, Storage and Handling

.1 Delivery all materials as specified any defective, damaged, warped material or material deemed to be inferior to the specification by the Architect will be promptly replaced.

.2 Protect all items and store to preclude damage, warping and excessive changes in moisture content. Contractor shall ensure that dry storage areas are provided with sufficient heat to avoid harmful effects. Min. storage temperature, 16°C; relative humidity 25 to 55%.

.3 Protect exposed surfaces of plastic laminate by covering with heavy Kraft paper or approved alternative protection material prior to leaving shop.

1.6 Co-ordination and Co-operation:

.1 Co-ordinate and co-operate with all other trades to ensure satisfactory and expeditious completion of the work.

.2 Provide and install all necessary components specified under this section, required to be fixed to or inset in the work of other sections. Inform related sections as to their locations.

1.7 **Warranty**

.1 Provide a signed certificate warranting that factory cabinetwork will retain finishing and performance standards listed in CAN/CSA-A278-M82 Paragraph 6. Finishing for (2) years after date of final acceptance.

PART 2 - PRODUCTS

2.1 **Materials:**

.1 **Softwood Lumber:** To CSA-O141-1970 and NLGA Grading Rules, with maximum 14 percent moisture content. Use selected yard lumber for natural or paint finish. Clear Select Douglas Fir, Clear Select White Pine, Clear Select Red Cedar.

.2 **Hardwood Lumber:** To National Hardwood Lumber Association [NHLA] standards, moisture content maximum 14 percent. Solid Red Oak and/or Clear Select Birch as indicated on drawings or specified herein.

.3 **Hardwood Plywood:** To CSA-O115-M1982 Architectural Grade (G/So) good 1 side sound other side, of thicknesses shown on drawings, plain sliced veneers, red oak veneer on plywood core with Type 1 bond.

.4 **Douglas Fir Plywood:** To CSA-O121-M1978 Architectural Grade (G/So) good 1 side sound other side, of thicknesses shown on drawings, select face, free from boats or defects.

.5 **Special Plywood:** To CSA-O115-M1982, Architectural Grade (G2S) 'Baltic Plywood', comprised of Baltic Birch 9 plys to 13 mm ($^1/_2$") and/or 11 plys to 16 mm ($^5/_8$") good 2 sides.

.6 **Highdensity Particle Core:** To CAN3-O188.1-M78.

.7 **Highdensity Veneered Particle Core:** To CAN3-O188.1-M78, Architectural Grade (G1S) and (G2S), of thicknesses shown on drawings, plain sliced veneers, red oak veneer on high density particle core with Type 1 bond.

.8 **Highdensity Melamined Particle Core:** Core to CAN3-O188.1-M78, General Purpose Grade laminate to CAN3-A172-M79.

.9 **Fastenings:** Nails and screws to CSA-B111-1974

.1 Provide all items of rough hardware required to complete work of this section including without being limited to nails, bolts, washers, screws, metal shims, tie wire, expansion shields, clips and similar type fastenings.

.2 Use electro-galvanized steel nails with flat head of length to ensure positive fastening.

.3 Use electro-galvanized steel screws with Robertson flat head, of length to ensure positive fastening.

.4 All fastening devices shall be set or countersunk flush with surface of framing member.

.10 **Adhesives:**

.1 **Polyvinyl Adhesive:** To CSA-O112.4-M1977

.2 **Water resistant area resin:** To CSA-O112.5-M1977, Type 1 and 2.

.3 **Contact and Construction Adhesives:** as required to complete site installation

.11 **Plastic Laminate:** To Section 06340: Laminated Plastic.

.12 **Sealants:** To CAN/CGSB-19.24-M90, Type 1, Class B, multi-component, chemical curing sealant; colour to match countertop or splash back.

2.2 General

.1 Obtain all on-site dimensions before fabricating items. Obtain all relevant data and incorporate provisions for items of equipment enclosed by millwork.

.2 Take site dimensions and verify wall alignment prior to proceeding with fabrication. Site conditions that vary with reviewed shop drawings shall be specifically noted on reviewed drawings and forwarded to Architect. Variances, due to site conditions necessitating significant revisions to shop drawings shall be accepted prior to fabrication.

.3 Fabricate running members in maximum standard lengths obtainable for the particular species wherever possible. Machining and sanding criteria to AWMAC standards.

.4 Fit all joints tight. Locate joints at points which will not interfere with, affect strength of detract form appearance of materials.

.5 Securely fasten intersecting framing members together at corners in an approved manner.

.6 Incorporate adequate provisions for scribing and fitting to adjoining surfaces in an approved manner.

.7 Provide for and incorporate provisions to recognize inherent shrinkage characteristics of materials specified.

.8 All cabinetwork shall be constructed to AWMAC standards, custom grade, flush overlay construction to details shown on drawings and/or specified herein.

.10 Construct fitments as shown or noted, adequately framed, and complete with gables, divisions and other members required to provide a firm and rigid installation. Use 19 mm ($^3/_4$") thick materials unless otherwise detailed. Edge band exposed edges with solid matching trim glued to substrate thickness as shown on drawings or specified herein.

.11 Where work is to be built in, allow additional material for scribing to permanent surfaces.

.12 **Cabinet Structure:** Flush overlay construction with exposed [i.e. facings, toe spaces, ends and gables] and semi-exposed [i.e. shelves, backs, drawer sides and backs] surfaces to AWMAC Standards 'Custom Grade' high density particle core minimum 19 mm ($^3/_4$") thick melamine or wood veneered finish with solid wood or plastic laminated banded edges continuously glued, as indicated on drawings. Plastic Laminate, as specified in Section 06221.

2.3 **Finishes:**

.1 **Laminated Plastic Finish:** Sand finished surfaces smooth; apply laminated plastic banded edges as specified in Section 06240: Laminated Plastic.

2.4 **Schedule of Manufactured Items**

.1 **General:** List of items contained in this schedule is not intended to be a complete and comprehensive list of all items to be furnished under this section. This list contains requirements which supersede AWMAC Grade requirements and/or provide supplementary information not necessarily contained on drawings. See drawings for extent of work.

.2 **Plastic Laminate Surfaced Wall and Column Panels:** To Section 06240: Laminated Plastic.

.3 **Wall and Column Panels:**

.1 Provide all framing required to adequately support built panels and shadow boxes.

PART 3 - EXECUTION

3.1 Preliminary Work

.1 Give at least [5] days notice to the Architect before starting work.

3.2 Installation

.1 Installation of all millwork by this Section.

.2 Where hardware installation is specified as part of work of this section make necessary site adjustments and assure correct and trouble-free installation.

.3 Make allowances where fixed objects pass through or project into and around periphery of work of this section to permit normal movement without restriction.

.4 Install all electrical junction boxes and empty conduits just above top of back of box section in shadow boxes ‘A’ and ‘B’ for future wiring and devices by others. Co-ordinate exact location with electrician.

.5 Install millwork tightly around all new and existing junction boxes on site and /or shop install any new junction boxes provided by electrician as required.

3.3 Adjust and Clean-up

.1 All working parts shall be adjusted, as required, to operate smoothly without sticking and binding.

.2 Upon completion of fabrication of work of this section, clean plastic laminate surfaces and remove identification marks.

-End-

PART 1 - GENERAL

1.1 Scope

.1 Comply with Division 1: General Requirements.

.2 Provide materials, labour and equipment for laminated plastic work as shown on the drawings, described herein, or as necessary to complete the work.

1.2 Related Work Under Other Sections:

.1 Section 06200: Finish Carpentry, [provide countertops to this section for installation.]

.2 Section 06221: Factory Cabinet Work, [provide plastic laminate to this section for installation.]

1.3 Standards

.1 Millwork to Standards of the Architectural Woodwork Manufacturers Association of Canada, AWMAC-2009, Custom Grade.

.2 To CAN3-A278-M82.

1.4 Shop Drawings

.1 Provide [6] copies of shop drawings clearly showing details of construction, profiles, jointing, fastenings, colour schedule, hardware and finishes to the Architect's approval. Indicate site verified dimensions.

1.5 Delivery and Storage

.1 Deliver laminated plastic finished surfaces with heavy kraft paper protection and store in cartons during shipping.

.2 Protect laminated plastic surfaces during fabrication and installation stages; do not remove protective covering until final clean-up prior to final inspection.

.3 Do not store or install materials in areas where relative humidity is less than 25 percent or greater than 60 percent at 22 degrees C.

1.6 Warranty

.1 Provide a certificate to the Architect warranting that the laminated plastic will not warp, split or delaminate for (2) years after date of final acceptance.

PART 2 - PRODUCTS

2.1 Material

.1 **Laminated Plastic:** To CAN3-A172-M79, Grade GP Type S, general purpose 1.5 mm ($^{1}/_{16}$") thickness pattern in standard colour range; texture finish. Architect will select from the following:

Acceptable Products:

Formic TFL panels 86992-756 Natural Maple on all exposed faces ½" and ¾" thick

Wilsonart post form grade Y0371-22 Arden Park Carrera for counter tops, backsplash and return

Hidden interior faces Formic Natural Maple 756

.2 **Laminated Plastic Backing for Door and Drawer Fronts:** By same manufacturer as laminated plastic facing, minimum 0.5 mm ($^1/_{64}$") thick, Formic 756 Natural Maple

.3 **Plywood Cores:** Douglas Fir plywood; to CSA-O121-M1978, solid two sides, 19 mm ($^3/_4$") thick unless otherwise detailed.

.4 **Standard Density Core Particle Board:** To CAN3-O188.1-M78, Grade H 19 mm ($^3/_4$") thick unless otherwise detailed.

Acceptable Products:
Wilsonart TFL panel 7970-18 High Line

.5 **Adhesive:** Contact adhesive to CAN/CGSB-71.20-M88 to laminated plastic manufacturer's instructions.

.6 **Sealer:** Water resistant, acceptable to laminated plastic manufacturer.

.7 **Sealant:** To CAN/CGSB-19.24-M90; normal temperature for wet conditions; movement range to 25 percent; colour to match countertop cover.

.8 **Draw Bolts and Splines:** For new core bases, acceptable to fabricator.

.9 **Premanufactured Instrument Storage Units:**
Supply and Install Wenger #73 and #77 in Fusion Maple Laminate with full grille doors.
Wenger Corporation 1-800-493-6437

2.2 **Fabrication**

.1 Comply with CAN3-A172-M79, Appendix A.

.2 Plastic laminate work shall meet Premium grade requirements of AWMAC except where otherwise specified, regardless of the grade of cabinetwork on which it is supported or attached

.3 Bond plastics laminate to core material with specified thermosetting adhesive and with a sustained force of 550 kpa (80 psi) during entire curing period. Apply self-edging using electro-pressure techniques. Ease exposed edges as 15°-20° from vertical. Balance all cores with backing sheet.

.4 Orange peel ripple, telegraphing of core and waviness of exposed edges are not acceptable. Assemble plastic laminated with neatly butted finishes and self-edging applied prior to face veneers.

.5 Apply plastic laminate to all counter and vanity tops as detailed. Arrange adjacent parts of continuous laminate work to match in colour and pattern. Form shaped profiles and bends as detailed.

.6 Within jobsite handling limitations, make tops and skirts continuous from 3.0 m (10'-0") stock lengths. Place joint over gables whenever practicable

.7 Take particular care in measuring, cutting and fitting.

.8 Ensure adjacent laminate sheets match in colour and pattern.

.9 Apply plastic facing sheets to base material as recommended by laminate and adhesive manufacturers. Ensure laminate and core profiles coincide to provide full continuous support and bond over entire surface. Use continuous lengths to minimize joints; maintain joints minimum 600 mm (2 ft) from sink cutouts. Offset joints in plastic facing from core joints.

.10 Form shaped profiles and accurately bend to laminate manufacturer's directions.

.11 Apply laminate to exposed edges of core material for straight self-edging strips or flatwork. Chamfer exposed edges uniformly at 20 degrees; do not mitre laminate edges.

.12 Apply laminate backing sheets, where required, to conceal core material to manufacturer's directions.

.13 Where indicated, apply laminated plastic liner sheets to interior of cabinetry to manufacturer's directions.

PART 3 - EXECUTION

3.1 Preliminary Work

.1 Give at least [5] days notice to the Architect before starting work.

3.2 Installation

.1 Install work plumb, true and square, neatly scribed and fitted to adjoining surfaces.

.2 Make fastenings to cabinets, metal brackets and walls in concealed and secure manner.

.3 Use draw bolts and splines to form tight flush hairline joints.

.4 Rabbet cores at skirt and heel to provide a half lap joint. Glue heel and cores together under pressure.

.5 Ensure cutouts are prepared for inserts, sinks, grilles, appliances, outlet boxes, etc. Round internal corners, chamfer edges and seal exposed core edges.

.6 At junction of splash back and wall, apply a small continuous sealant bead.

.7 Remove kraft paper protective covering.

3.3 Clean-up

.1 Remove debris and leave finished work clean and polished.

-End-

PART 1 - GENERAL

1.1 Scope

.1 Comply with Division 1: General Requirements.

.2 Provide materials, labour and equipment to complete joint sealant work as shown on the drawings, schedules, resealing of existing joints, spray foam sealant, described herein, or as necessary to complete the work.

1.2 Related Work Under Other Sections

.1 Section 06200: Finish Carpentry, [provide and install all sealant.]

.2 Section 09900: Basic Painting, [provide and install all sealant.]

1.3 Standards

.1 Comply with Ontario Building Code, Parts 5 and 9.

1.4 Supervision

.1 Comply with the recommendations and directions of manufacturers whose materials are specified. Consult manufacturer's technical representative and discuss the following terms with decisions confirmed in writing by the Contractor.

.1 Weather conditions under which work will be done.

.2 Anticipated frequency of joint movement.

.3 Shape factor of the joint.

.4 Durometer hardness, slump and curing characteristics of materials specified.

.5 Joint characteristics as built.

.6 Sample of sealed joint to be acceptable to Architect prior to completion.

1.5 Environmental Requirements

.1 Ensure sealant and substrate materials are at minimum temperature +5 degrees C (40 degrees F).

.2 Where necessary to apply sealants below temperature of +5 degrees C (40 degrees F), follow manufacturers recommendations.

1.6 Co-ordination and Co-operation

.1 Co-ordinate and co-operate with all other trades to ensure satisfactory and expeditious completion of the work.

1.7 Warranty

.1 Provide a signed certificate warranting that caulking work will not leak, crack, crumble, melt, shrink, run, lose adhesion or stain adjacent

surfaces for a period of five [5] years after the certificate of final acceptance.

PART 2 - PRODUCTS

2.1 Materials

.1 **Primers:** Type recommended by sealant manufacturer.

.2 **Joint Fillers:**

.1 **General:** Compatible with primers and sealant, outsized 30 to 50 percent.

.2 **Extruded Closed Cell Foam:** Polyethylene, urethane, neoprene or vinyl; Shore A, hardness 20, tensile strength 140 to 200 kPa.

Acceptable Products: Or Approved Equal

Sternson	'Backer Rod'
Industrial Thermo Polymers	'Backer Rod'

.3 **Extruded Tubing:** Polyvinyl chloride or neoprene; with 6 mm ($^1/_4$") minimum thick walls.

.4 **Bond Breaker:** Pressure sensitive plastic tape.

Acceptable Products: Or Approved Equal

3M Ltd.	'No. 266 or No. 481'

.5 **Sealants:**

.1 **Sealant for vertical and horizontal non-traffic bearing joints:**

.1 Dry conditions, normal temperature range, movement range to 25 percent: to CAN/CGSB-19.18-M87, 'Sealing Compound, One Component, Silicone Base, Solvent Curing'.

.2 Dry conditions, low temperature range, movement range to 25 percent: to CAN/CGSB-19.13-M87, 'Sealing Compound, One Component, Elastomeric Chemical Curing'.

.3 Wet conditions, normal or low temperature range, movement range to 25 percent: to CAN/CGSB-19.24-M90, 'Sealing Compound, Multi-Component Chemical Curing'.

.2 **Acoustic sealant:** to CAN/CGSB-19.21-M87, 'Sealing and bedding Compound, Acoustical'.

Acceptable Manufacturers: Or Approved Equal
CGE Construction Sealants
Dow Corning Construction Sealants
Hilti
Mono
Tremco

.6 **Foam Insulating Sealant:** Two component rigid polyurethane foam in nozzle or pressure-applicator to CAN/CGSB-51.23-92, 'Spray-Applied Rigid Polyurethane Cellular Plastic Thermal Insulation'.

Acceptable Products: Or Approved Equal

Insta-Foam	'Froth Pak'.
Mono	'Instant Foam'

.7 **Joint Cleaner:** Xylol, methylethyleketone, toluol or non-corrosive type recommended by sealant manufacturer and compatible with joint forming materials.

.8 **Colours:** To match adjacent surfaces or clear as directed by the Architect.

PART 3 - EXECUTION

3.1 Preliminary Work

.1 Give at least [5] days notice to the Architect before starting work.

3.2 Location

.1 Seal with sealant at the junction of the following **exterior** finishing materials, unless sealant is specified to be included in the work of other sections.

.1 Concrete to concrete (including external joints of precast concrete).
.2 Concrete to metal.
.3 Concrete to masonry.
.4 Masonry to metal
.5 Masonry to masonry.
.6 Metal to metal.
.7 Metal to wood.
.8 Wood to Wood.
.9 Wood to Masonry
.10 Wood to concrete.

.2 Seal at the junction of the following **interior** finishing materials unless sealant is specified to be included in the work of other sections:

.1 Concrete to concrete.
.2 Concrete to metal.
.3 Concrete to masonry.
.4 Masonry to metal.
.5 Masonry to masonry.
.6 Metal to metal.
.7 Gypsum Board to existing surfaces.
.8 Metal to gypsum board.

.3 Install pre-molded joint fillers in accordance with manufacturer's instructions, working in close co-operation with waterproofing trades.

.4 Seal joints from face to exposed surface.

3.3 Inspection

.1 Ensure joints to receive sealant are properly prepared.

.2 Ensure surfaces to be caulked are sound, dry, free from dirt, water, frost, loose materials, corrosion, paint and other foreign matter.

.3 Inspect joint sizes and correct to achieve depth ratio of $^1/_2$ joint width with minimum width and depth of 6 mm ($^1/_2$") and maximum width of 20 mm ($^3/_4$").

.4 Commence sealing work only after joint surfaces have been inspected and approved by the Architect. For projects with unusual or complicated caulking conditions, the Architect may require the sealant manufacturer’s

representative to visit site to discuss installation procedures with the contractor.

3.4 **Preparation**

.1 Before starting sealing, test materials for indications of staining or poor adhesion.

.2 Commence sealing on masonry only after mortar has cured.

.3 Remove all dust, dirt, other foreign matter and existing sealant and backer materials. Allow joint surfaces to dry thoroughly.

.4 Remove rust, mill scale and coatings from ferrous metals by wire brush, grinding or sandblasting.

.5 Remove oil, grease and other coatings from non-ferrous metals with joint cleaner.

.6 Prepare concrete, masonry, glazed and vitreous surfaces to sealant manufacturers instructions.

.7 Install joint filler to achieve correct joint depth.

.8 Where necessary to prevent staining, mask adjacent surfaces prior to priming and sealing.

.9 Apply bond breaker tape where required to manufacturers instructions.

.10 Prime sides of joints in accordance with sealant manufacturers instructions immediately prior to sealing.

.11 Do not exceed shelf life and pot life of the materials and installation times as marked on the containers.

.12 For two part materials, mix sealants thoroughly with a mechanical mixer, capable of mixing at 80-100 rpm without mixing air into materials. Continue mixing until the material is of uniform colour and free from streaks of unmixed components.

3.5 **Application**

.1 Apply sealants and joint primers to manufacturers instructions. Apply sealant using gun with proper size nozzle. Use sufficient pressure to fill voids and joints solid. Superficial pointing with skin bead is not acceptable.

.2 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities. Neatly tool surface to a slight concave profile.

.3 In masonry cavity construction, vent sealed joints from cavity to 3 mm ($^1/_8$") beyond external face of wall by inserting vent tubing at bottom of

each joint and maximum of 1500 mm (5ft) OC vertically. Position tube to drain to exterior.

.4 Ensure that the correct sealant depth is maintained. The following chart is a guide for providing effective width-to-depth ratios for specified sealant:

JOINT WIDTH	**JOINT DEPTH**	
	Minimum	Maximum
6 mm ($^1/_4$")	3 mm ($^1/_8$")	
6 mm-13 mm ($^1/_4$"-$^1/_2$")	One half width	Equal to width
13 mm-25 mm ($^1/_2$"-1")	One half width	Equal to width
Over 25 mm (1")	As reviewed by Architect	

.5 Cut out damaged sealant unacceptable to the Architect; reprepare and prime joints and install new materials as directed.

3.6 Protection

.1 Provide wood planks or other approved, non-staining means of protection for the completed sealant installations where required to protect work from mechanical, thermal, chemical and other damage by other construction operations and traffic.

.2 Maintain protection securely in place until project completion. Remove protection when directed by the Architect.

3.7 Clean-up

.1 Clean adjacent surfaces immediately.

.2 Remove excess sealant and droppings using recommended cleaners as work progresses.

.3 Remove masking after tooling of joints. Remove materials installed for protection. Wash and leave work neat and clean.

-End-

PART 1 - GENERAL

1.1 Scope

.1 Comply with Division 1: General Requirements.

.2 Provide materials, labour and equipment to provide rated labelled and unrated steel doors, insulated metal panels and frames complete, as shown on the drawings, described herein, or as necessary to complete the work.

1.2 Related Work Under Other Sections

.1 Section 04211: Basic Unit Masonry, [co-ordinating with work of this section.]

.2 Section 06100: Rough Carpentry, [co-ordinating with work of this section.]

.3 Section 06200: Finish Carpentry, [co-ordinating with work of this section and provide all steel doors for installation.]

.4 Section 07900: Sealants, [co-ordinating with work of this section.]

.5 Section 08711: Hardware, [install work of this section.]

.6 Section 09900: Basic Painting, [co-ordinating with work of this section.]

1.3 Standards

.1 **Welding:** To CSA-W59-M1989.

.2 Perform work of this section in accordance with requirements of Canadian Manufacturing Specifications for Steel Door and Frames, latest version of Canadian Steel Door and Frame Manufacturers' Association (CSDFMA) standard, except as otherwise specified herein.

1.4 Delivery, Storage and Handling

.1 Carefully handle doors, frames and screens to preclude any disfigurement, twisting or marking.

.2 Store frames on supports such that a minimum clearance of 100 mm (4") is maintained between underside of metal and ground or floor. Prevent moisture damage.

.3 Cover doors and frames in an approved manner to protect from inclement weather, water and damage.

.4 Cover all prefinished steel surfaces with protective masking.

1.5 Co-ordination and Co-operation

.1 Co-ordinate and co-operate with all other trades to ensure satisfactory and expeditious completion of the work.

1.6 **Shop Drawings**

.1 Submit [6] copies of shop drawings clearly indicating each door frame screen material, core thickness, reinforcements, glazing, type, profiles location of exposed fasteners and arrangement of hardware, etc.

.2 Include schedule identifying each unit with door marks and number relating to numbering on drawings and in door schedule.

.3 Show all door swings.

PART 2 - PRODUCTS

2.1 **Materials**

.1 **Sheet Steel:** Cold rolled, commercial grade, to ASTM A526/A526 M85 with zinc finish. Interior ZF001 and Exterior G90.

.2 Minimum thickness for sheet steel components shall be in accordance with CSDFMA Specifications except as follows:

		GAUGE NO.	EQUIVALENT THICKNESS
.1	Frames & closures angles.	16	1.5 mm (0.0598")
.2	Frames for openings larger than 1200 x 2184 mm (4'-0"x7'-2").	14	1.9 mm (0.0747")
.3	Frame reinforcement & extension channels.	14	1.9 mm (0.0747")
.4	Doors and metal panels. Surface sheets	16	1.5 mm (0.0598")
	Surface sheets for doors greater than 1200 x 2184 mm (4'-0" x 7"x2")	16	1.5 mm (0.0598")

.5 Metal jamb anchors occurring in exterior walls shall be fabricated from galvanized sheet steel having zinc coating designation Z275 to ASTM A5250-77, 3 per frame minimum.

.2 **Core**

.1 In addition to CSDFMA specifications, interior rated doors; resin impregnated pre-expanded Kraft honeycomb core, and semi-rigid glass fibre insulation at 0.04 kg/m^3 (3 ld/ft^3) to requirements of CSA-A101-M1983, Type 1 is acceptable. Maximum opening of honeycomb shall be 19 mm ($^3/_4$").

.2 Exterior doors and metal panels; self-extinguishing foamed-in-place urethane foam only for 1-3/4" doors and metal panels and glass fibre for frames.

.3 Sound rated doors; sufficient density to provide satisfactory structural support and sound reduction characteristics of 32 decibels at average frequencies of 125 to 4,000.

.3 **Door Bumpers:** To manufacturers requirements of colour selected.

.4 **Primer:** Zinc rich primer conforming to CGSB-1-GP-181M.

.5 **Panel Fasteners:** Concealed fasteners of approved hot dip galvanized steel, type to provide accurate, secure installation.

.6 **Metal Filler:** Two component epoxy type.

.7 **Phosphatizing:** To CGSB-31-GP-105Ma.

.8 **Accessories:** Guard boxes, tie anchors, hinges, strikes, reinforcing, spreaders, finishing hardware, glazing stops, etc. of approved manufacturers.

2.2 **Welding**

.1 Ensure welds are continuous, free from inclusions, porosity, lack of fusion penetration, uneven contour, undercuts and cracks. Remove weld spatter on expose surfaces. **NOTE: Continuously weld all seams and joints, grind smooth flush, dress and fill.**

2.3 **Fabrication (frames)**

.1 Form profiles accurately to details indicated. All frames shall have mitred and welded corners. Knock down frames are unacceptable for this project.

.2 Prepare for hardware using approved templates.

.3 Reinforce all door frames for closers.

.4 Fill all exposed surface depressions and all joints resulting from fabrication of frames with metallic filler and sand to a smooth, uniform finish.

.5 Prepare each door frame for bumpers unless indicated otherwise. Provide and install 3 bumpers on strike jamb of each single leaf door frame and 2 bumpers on head of double leaf door frame.

.6 Ship each frame complete with easily removable metal channel or angle shaped spreaders.

.7 Terminate all door frames at top concrete slab. Provide floor plates for anchorage of slab.

.8 Provide jamb/mullion extension/reinforcement channels for each jamb and mullion in metal stud partitions extending to underside of structure with approved provision for vertical adjustment.

.9 Reinforce door heads for frames with door openings exceeding width of 1500 mm (5'-0"). Weld all reinforcement to frame in an approved manner to realize total strength potential.

.10 Provide frames with integral base at locations indicated.

.11 Make allowance for deflection to ensure structural loads are not transmitted to frames.

.12 Use thermally broken and insulated frames to exterior doors.

2.4 **Fabrication (slab doors and panels)**

.1 Construction all doors and panels of flush type hollow steel construction or honeycomb core construction. Form each face from a single sheet of metal. **NOTE: Continuously weld all seams and joints, grind smooth flush, dress and fill.**

.2 Reinforce doors to ensure that the maximum corner-to-corner racking of doors does not exceed 1.5 mm ($^1/_{16}$").

.3 Prepare doors for hardware as per frame requirements. Where pairs of doors occur, prepare meeting edge to receive integral astragal. Refer to Hardware Schedule for removable mullions, astragals and the like for fire rated doors.

.4 Bevel strike edges of doors 1.5 mm ($^1/_{16}$") maximum.

.5 Provide continuous metal closure at top of doors flush with edges of exposed surfaces. Provide continuous metal closure at bottom of doors.

.6 Clean doors of all deleterious substances and contaminants, sand, flood coat with air drying paste filler, and again sand to eliminate all unevenness or irregularities including dimpling resulting from welding.

PART 3 - EXECUTION

3.1 **Installation:** Provide doors, frames and screens to appropriate section as listed in 1.2 above for installation with 3 anchors minimum per frame.

3.2 **Clean-up**

.1 After inspection and acceptance, remove manufacturers labels, clean and polish, ready for painting under Section 09900.

-End-

PART 1 - GENERAL

1.1 Scope

.1 Comply with Division 1: General Conditions.

.2 This section is used as a control of the hardware and for the provision of dimensional information and all other requirements necessary for the installation of the finish hardware.

1.2 Related Work Under Other Sections

.1 Section 06200: Finish Carpentry, [provide all finish hardware to this section for installation.]

1.3 Standards

.1 Hardware must be listed on the CAN/CGSB-'69' series 'Qualified Products List' and ANSI/BHMA 'A' Series, except interior use door closers and National Builders' Hardware Association (NBHA).

.2 Locate and install door hardware to the Canadian Steel Door and Frame Manufacturers Association Standard 'Canadian Metric Guide', unless otherwise detailed.

.3 Use only one manufacturer for similar products.

1.4 Delivery, Storage and Handling

.1 Deliver each item of hardware packaged separately in original individual containers, with necessary screws, keys, instructions and installation templates. Mark each container with item number show on list.

.2 Be responsible for arranging delivery time and date to site, or door manufacturer, of all hardware so that all work may progress without delay or interruptions.

.3 Hardware supplier and hardware installer together shall check, in detail, hardware delivered to site to prevent discrepancies, shortages or omissions.

.4 Storage and protection of hardware is responsibility of the general Contractor and/or installer.

.5 Any loss or damage shall be the Contractor's sole responsibility. Exercise close control over handling of hardware particularly the distribution of keys.

1.5 Maintenance Data

.1 Provide maintenance data, parts list, manufacturer's instructions for each type of door closer, lockset, door holder, and panic hardware.

.2 Provide (2) sets of wrenches for door closers and locksets.

.3 Brief Owner's maintenance staff regarding proper care of hardware such as lubrication of locksets, and adjustments of door closers, cleaning and general maintenance.

1.6 **Certification and Warranty**

.1 Hardware supplier shall inspect operation of all installed hardware. Upon completion of this inspection, present a list of deficiencies to General Contractor for correction. Forward copies of deficiency list to Owner and Consultant.

.2 On completion of finish hardware installation, and after rectification of deficiencies, submit to Finish Hardware Consultant written certification that all materials are accounted for, correctly installed and functioning normally.

.3 Submit a written warranty, in accordance with Division covering replacement of defective door closers for a period of four years from the expiration of the standard one year warranty. Total warranty period of (5) years.

1.7 **Co-ordination**

.1 Before furnishing any hardware, check all drawings and specifications for hardware requirements, verify door swings, check all shop drawings with frame and door schedules and advise Architect in writing of any discrepancies noted.

PART 2 - PRODUCTS

2.1 **Finish Hardware** See Hardware Schedule.

PART 3 - EXECUTION

3.1 **Installation**

.1 All installation to manufacturers recommendations.

3.2 **Templates**

.1 Provide timely lists of materials complete with setting diagrams, dimensions and sizes to all concerned.

.2 Use template hardware for hollow metal doors and frames.

.3 Provide necessary templates for preparation of doors and frames.

3.3 **Installation, Heights and Requirements**

.1 Hinges: 3 per door for doors less than 2130 mm (7'-0") in height. 4 per door for doors over 2130 mm (7'-0") in height.

.2 Deadlock Strikes: 1260 mm ($49^1/_2$") form finished floor.

.3 Mortise Strikes: 980 mm ($38^1/_2$") form finished floor.

.4 Backset for Locksets: 70 mm ($2^3/_4$").

.5 Push Plates and Door Pulls: 1066 mm (42") from finished floor.

.6 Deadlocks: 1250 mm (50") from finished floor.

.7 Exit Device Cross Bar: 990 mm (39") from finished floor.

.8 Door Closers and Door Holders: Degree of opening to be 90 degrees unless noted otherwise.

.9 All installation heights to meet A.N.S.I. requirements and be approved by Finish Hardware Consultants.

3.4 **Clean and Adjust**

.1 Upon completion of finish hardware installation adjust for smooth silent secure operation.

.2 Clean and polish finish hardware and adjacent surfaces ready for use.

-End-

PART 1 - GENERAL

1.1 Scope

.1 Comply with Division 1: General Conditions.

.2 Provide materials, labour and equipment to install new cabinet hardware shown on the drawings described herein, or as necessary to complete the work.

1.2 Related Work Under Other Sections

.1 Section 06221: Factory Cabinet Work [provide all cabinet hardware under this section]

.2 Section 08710: Finish Hardware [provide all lock sets to this section]

1.3 Standards

.1 Hardware as listed on CGSB-69-GP-8M 'Qualified Products List'.

.2 Installations to Architectural Woodwork Manufacturers Association of Canada Standard AWMAC-1984.

.3 Performance standards to CAN3-A278-M82;

.4 Use only manufacturer of similar products; preferably the same products as used in the existing building, if satisfactory and available.

1.4 Handling

.1 Clearly label each package of hardware, together with installation instructions with regard to location on project.

.2 Deliver and store packages in locked, clean, dry storage room and maintain a check-off inventory list as each item or package of items is installed.

PART 2 - PRODUCTS

2.1 **For Each Bank of Adjustable Shelving:** Four satin nickel-plated adjustable standards complete with four semi-concealed brackets for each shelf.

Acceptable Products:

Richelieu	No. 5834-180 for Metal Shelf Clips for drilled holes.

2.2 **For Each Drawer:**

.1 One pair zinc-plated full extension side mount drawer slides rated at 25 kg (50 lbs) soft close type.

Acceptable Products:

Grant	No. 328 Assembly
Accuride	No. C2037 Assembly

.2 One stainless steel drawer pull.

Acceptable Products:

Richelieu	No. 221 102 mm (4")

2.3 **For Each 19 mm ($^3/_4$") Door as noted:**

.1 One pair soft-closing concealed hinges, steel body, plastic strike, clip type with inserta.

Acceptable Products:

Blum	'Modul 110 degree'

.2 One stainless steel door pull.

Acceptable Products:

Richelieu	No. 221 102 mm (4")

.3 One standard cam lock with 4 identical keys.

Acceptable Products:

Richelieu	No. 225-084 140

2.4 **For Each 19 mm (1.5") Door as noted:**

.1 One pair soft-closing concealed hinges, steel body, plastic strike, clip type with inserta.

Acceptable Products:

Blum	'Modul 110 degree'

.2 One stainless steel door pull.

Acceptable Products:

Gallery Specialty Hardware	No. 4012 300 mm (12")

.3 One standard cam lock with 4 identical keys.

Acceptable Products:
Richelieu No. LOC806034614A

PART 3 - EXECUTION

3.1 Provide installation instructions and templates to cabinet fabricator.

3.2 Install hardware to manufacturer's instructions; adjust for smooth, silent and secure operation.

3.3 Clean and polish installation and adjacent surfaces, ready for use.

-End-

PART 1 - GENERAL

1.1 Scope

.1 Comply with Division 1: General Requirements.

.2 Provide materials, labour and equipment for the installation of resilient floor tile and wall base shown on the drawings, described herein, or as necessary to complete the work.

1.2 Related Work Under Other Sections

None

1.3 Standards

.1 Do resilient tile and base work in strict accordance with the detailed directions of the manufacture's supplying the material.

1.4 Samples

.1 Provide a manufacturers technical manual clearly showing the project name, tile types, accessories and colours, together with installation, cleaning and maintenance requirements.

1.5 Maintenance Materials

.1 Provide extra (1) standard size full box of each floor tile and base type and colour from the same production runs as the materials to be installed. Store where directed for future maintenance use.

1.6 Delivery and Storage

.1 Deliver in original packages and containers. Handle materials carefully to avoid damage to new and existing work. Store materials under suitable protective coverings on skids clear of ground or floor. Keep dry and free from foreign matter.

1.7 Environmental Conditions

.1 Maintain material and room at 20 degrees C minimum for 24 hours before, during and after installation.

.2 Maintain air and structural base temperatures at temperatures recommended by material manufacturers for 48 hours before, during and 48 hours after installation.

1.8 Warranty

.1 Provide a signed certificate warranting material and installation against loosening, cupping and shrinking for a period of two [2] years from the date of the certificate of final acceptance.

PART 2 - PRODUCTS

2.1 Materials

.1 **Luxury Vinyl Tile (LVT):** To ASTM F1700, Full Glue down LVT 235 x 1505 mm size (6"x36"), 4.5 mm thick, Large and Local Collection, Rendered Flax/938 Mountain Ash, commercial grade LVT.

Acceptable Products:
Mohawk Group

.2 **Base:** Straight, top set, fire retardant nitrile plasticized vinyl to CAN/CSA A126.5-87, Type 2 and CAN/ULC S102.2-M88, plain pattern, 2.4 mm ($^3/_{32}$") thick, 100 mm (4") high, in maximum lengths. Maximum flame spread rating 25, maximum smoke developed 60.

Acceptable Products:
Tarkett Vinyl Cove Base 4” 38 Pewter CB.

.3 **Transition Strips:** Continuous Stepless transition trim, of sections listed below.

Acceptable Products:

Schlüter-Systems	'Reno Ramp, Aluminum Finish, size to suit' [LVT to zero]

.4 **Primer and Adhesive:**

.1 **For Vinyl Composition Tile:** Waterproof, contact type, selected to suit all substrates and locations to flooring manufacturer’s recommendations.

.2 **For LVT:** Waterproof, contact type, selected to suit all substrates and locations to flooring manufacturer’s recommendations.

.2 **For Bases, Thresholds, etc.:** High wet strength, fire and smoke rated to CAN/CGSB 41-GP-34M and to primer and adhesives and manufacturer’s printed directions.

Acceptable Products: Or Approved Equal

Flextile	'1251-V'	[covebase cement] [rubber/vinyl]
Domcor/Deltal	'Covegrip #97'	

.5 **Filler/Leveller:** Purpose made full self leveling latex-cement underlayment over existing concrete subfloor.

Acceptable Products: Or Approved Equal

Ardex or Mapei

.6 **Moisture Mitigation Membrane:** Full coverage purpose made one component water based 2 coat system moisture mitigation membrane.

Acceptable Products: Or Approved Equal

Ardex 'VR98'

PART 3 - EXECUTION

3.1 **Preliminary Work**

.1 Give at least [5] days notice to the Architect before starting work.

.2 Provide temporary protection to all areas during operations.

3.2 **Preparation of Subfloor**

.1 Remove all high spots and fill in all low spots, holes and cracks with specified filler.

.2 Vacuum clean floor before applying tile.

.3 Remove all soil, loose material and deposits which could affect the bond.

.4 Apply full self leveling compound and moisture mitigation membrane.

3.3 **LVT Application**

.1 Apply full coverage adhesive uniformly over surface using notched spreader as recommended by the tile manufacturer. Spread only sufficient adhesive to ensure that tile covering is complete before initial set occurs.

.2 Lay tile with joints parallel to building lines; produce a stile pattern as shown on drawings 1/3-2/3 offset.

.3 Carefully scribe and cut tile to fit around fixed objects, corners, frames, etc.

.4 Provide edge strips at unprotected edges, or exposed edges and at joints between dissimilar floor materials.

.5 Roll tile with a 68 kg (150lb.) roller to expel air bubbles and level other imperfections.

3.4 **Base Application**

.1 Apply adhesive to wall and floor only.

.2 Lay out base to minimize number of joints.

.3 Set preformed external corners.

.4 Set base in full bed of adhesive to both wall and floor surfaces, straight, level and to 1:400 tolerance.

.4 To produce tight closed joints, scribe and fit bases accurately coped at internal corners to produce tight closed joints to preformed corners, door frames and other objects.

3.5 **Clean-up**

.1 Remove excess adhesive with approved stripper solution; rinse and dry.

.2 Wash floor tile and bases to manufacturer's directions.

.3 Prohibit traffic on floor for 48 hours after installation.

.4 Remove and dispose of debris and leave premises in a washed condition.

.5 **Owner will be responsible for the sealing and waxing of the floors and bases.**

.6 Provide extra (1) standard size box of each tile for future maintenance.

-End-

PART 1 - GENERAL

1.1 Scope

.1 Comply with Division 1: General Requirements.

.2 Provide materials, labour and equipment for painting and finishing new and existing materials as shown on the drawings, described herein, or as necessary to complete the work.

1.2 Related Work Under Other Sections

.1 Section 04211: Basic Unit Masonry, [painting new masonry.]

.2 Section 05120: Structural Steel, [painting of structural steel.]

.3 Section 07900: Sealant, [co-ordinating with work of this section.]

.5 Section 09250: Gypsum Board, [painting of gypsum board.]

.6 Division 15: Mechanical, [painting of all mechanical items and painting ll mechanical grilles in Vestibule Ceiling to match metal tile colour.]

.7 Division 16: Electrical, [painting of all electric items.]

1.3 Standards

.1 **Paint Materials:** To MPI Architectural Painting Specification Manual and MPI Maintenance Repainting Manual, Exterior and Interior Systems. Provide signed certificate stating materials comply with the standards and that paint materials for each coating are products of one manufacturer only. Use only odourless solvent products in all interior locations. Do not mix or thin. Use materials and colours directly from the manufacturer's containers.

.2 **Workmanship Standards:** To MPI Architectural Painting Specification Manual and MPI Maintenance Repainting Manual, Exterior and Interior Systems as applicable with sufficient coats to provide full coverage, colour match and uniform sheen, but using minimum number of coats specified. Conform to regulations of authorities having jurisdiction.

1.4 Samples

.1 Submit the successful manufacturers colour system with the approved colours marked and related to those used on the approved colour schedule. Submit the colours to the Architect for approval and retention in the project file. Ensure finished work matches manufacturers colour sample.

1.5 Environmental Requirements

.1 Do not apply paint finish in areas where dust is being generated.

.2 Do not clean equipment, brushes, rollers, etc. on the premises.

.3 During paint operations, provide sufficient fresh air circulation.

.4 In cold weather, use temporary exhaust fans or ozone air purifier.

1.6 Delivery and Storage

.1 Deliver materials in original containers with labels intact and seals unbroken.

.2 Store materials under covers and protect from fire at all times. The Architect will not provide material storage space.

1.7 Protection

.1 Before commencement of work, remove cover plates of service devices, surface hardware, frames of lighting fixtures and all other obstructions. Replace them in satisfactory condition when work of this section is completed, to the approval of Architect.

.2 Before commencement of work, protect all surface hardware that is impractical to remove. Protect all weather stripping, acoustic and smoke seal gaskets in an approved manner.

.3 Remove soiled and used rags, waste and empty containers from the building daily. Take all precautions to preclude a fire.

.4 Post legible signs at all points of entry to the areas in which work of this section is being applied.

.5 Erect suitable barriers to prevent traffic and other trades from working in such areas during application of this work.

1.8 Inspection

.1 Have material suppliers' representatives visit site in company with Contractor and painter prior to commencement of operations to discuss finishing procedures to be used and to analyze conditions of surfaces to be coated, in order that alternative recommendations may be accorded consideration, should adverse conditions exist.

.2 Ensure that material suppliers' representatives visit site at intervals during surface preparation and application operations, to ensure that specified surface preparation has been completed, specified products are being used, proper number of coats are being applied, and specified finishing procedures are being implemented.

.3 Submit to Contractor and Architect a written report of material suppliers' representatives verify conformance to Specifications.

1.9 Maintenance Materials

.1 Provide extra (1) 4L unopened can of each colour of paint and stain. Store where directed for future maintenance use.

PART 2 - PRODUCTS

2.1 **Colours:** as selected by the Architect (Maximum up to 4 colours per space.)

2.2 **Gloss Values**

.1 Gloss values at 60% and Sheen Values at 85% determined in accordance with MPI Gloss:

.1	0 to 5 for flat.	max. 10 sheen
.2	5 to 10 for high sheen flat.	10-35 sheen
.3	10 to 25 for eggshell.	10-35 sheen
.4	25 to 35 for satin.	min. 35 sheen
.5	35 to 70 for semi-gloss	
.6	70 to 85 for gloss	
.7	85 to 100 for high gloss	

2.4 **Interior Finish Materials:**

.1 For New Concrete
One coat Block Filler
Two coats Primer Sealer
Two coats Satin or Semi-Gloss Enamel

.2 For Existing Concrete Block
One coat Multi Surface Primer Sealer for oil or latex based original paint
Two coats Satin Enamel

.3 For Epoxy Finish on New Concrete Block
Two coats Block Filler
One coat Epoxy Primer
Two coat Epoxy Colour Coat

.4 For Epoxy Existing Concrete Block
One coat Epoxy Multi Surface Primer for oil or latex based original paint
Two coat Epoxy Colour Coat

.5 For New Gypsum Board and Plaster Walls and Ceilings
One coat Primer Sealer
Two coats Flat Paint on Ceiling and Two coats Satin on Walls

.6 For Existing Gypsum Board and Plaster Walls and Ceilings
One coat Multi Surface Primer Sealer for oil or latex based original paint
Two coats Flat Paint on Ceiling and Two coats Satin on Walls

.7 For New Gypsum Board and Plaster Walls in High Humidity Areas
One coat Primer Sealer
Two coats Semi-Gloss Enamel

.8 For Existing Gypsum Board and Plaster Walls in High Humidity Areas
One coat Multi Surface Primer for oil or latex based original paint
Two coats Satin Enamel

.9 For Painted New Wood Doors (on exposed edges)
One coat Primer Sealer
Two coats Semi-Gloss Enamel

.10 For Painted Existing Wood Doors (on exposed edges)
One coat Multi Surface Primer for oil or latex based original paint
Two coats Semi-Gloss Enamel

.11 For New Primed Ferrous Metal Surfaces
One coat Spot Priming
One coat Multi Surface Primer for oil or latex based original paint
Two coats Gloss Enamel

.12 For Existing Primed Ferrous Metal Surfaces
One coat Spot Priming Rust Inhibitor Type
One coat Multi Surface Primer for oil or latex based original paint
Two coats Gloss Enamel

.13 For New Galvanized and Zinc Coated Metal
One coat Cementitious Galvanized Metal if bare metal or
One coat Primer
Two coats Semi-Gloss Enamel

.14 For Existing Galvanized and Zinc Coated Metal
One coat Cementitious Galvanized Metal if bare metal or
One coat Spot Priming Rust Inhibitor Type
One coat Multi Surface Primer for oil or latex based original paint
Two coats Semi-Gloss Enamel

.15 For Pipe Insulation Covering
One coat Tinted Primer
Sealer
One coat Semi-Gloss Enamel

.16 Existing and New Interior Wood Stained
One coat wiping stain
One coat sanding sealer
Two coats Semi-Gloss Varnish

2.5 Exterior Finish Materials

.1 For New Primed Ferrous Metal Surfaces
One coat Spot Priming
One coat Multi Surface Primer for oil or latex based original paint
Two coats Gloss Enamel

.2 For Existing Primed Ferrous Metal Surfaces
One coat Spot Priming Rust Inhibitor Type
One coat Multi Surface Primer for oil or latex based original paint
Two coats Gloss Enamel

.3 For New Galvanized and Zinc Coated Metal
One coat Cementitious Galvanized Metal if bare metal or
One coat Primer
Two coats Semi-Gloss Enamel

.4 For Existing Galvanized and Zinc Coated Metal
One coat Cementitious Galvanized Metal if bare metal or
One coat Spot Priming Rust Inhibitor Type
One coat Multi Surface Primer for oil or latex based original paint
Two coats Semi-Gloss Enamel

Acceptable Products: (Premium professional quality paint as per the current MPI Manual. Products with specific manufacturer listed will not be substituted without Architect's written approval)

Benjamin Moore
Dulux-Glidden
Para Paints and Coatings
Sherwin Williams
Or Approved Equal

PART 3 - EXECUTION

3.1 Preliminary Work

.1 Give at least [5] days notice to the Architect before starting work.

3.2 Preliminary Repairs

.1 Cut away the cracked or fissured finish to expose the primary substrate for a minimum of 300 mm (12") on both sides of the crack[s] or fissure[s].

.2 Examine substrate surface and where cracks or fissures are due to normal settlement or acceptable building movement, fill with compatible materials to material manufacturer's directions and the Architect's approval.

.3 Fill and neatly join repairs to existing work for both substrate and finish; trowel to an even, level and matching texture; cure and sand as required.

.4 Reprime entire repair to ensure colour and texture matches the surrounding finished surfaces prior to normal repainting operations.

3.3 Preparation of Surfaces

.1 Prepare wood surfaces to MPI standards:

.1 Use CAN/CGSB 10-GP-126M vinyl sealer over knots and resinous areas.

.2 Apply wood paste filler to nail holes and cracks.

.3 Tint filler to match stains used to finish woodwork.

.2 Touch up shop primer on steel with MPI approved primer applied to MPI procedures.

.3 Prepare galvanized steel and zinc coated surfaces to CAN/CGSB 85-GP-16.

.4 Prepare masonry, surfaces to MPI procedures.

.5 Prepare new wallboard surfaces to MPI procedures. Fill cracks with plaster patching compound.

.6 Prepare copper piping and accessories to MPI procedures.

.7 Thoroughly clean all existing surfaces, sand and scrape loose paint from existing surfaces, remove all abandoned wall plugs, nails, screws, remove all oil, grease, tar, etc., fill all holes and low areas flush with existing surfaces, sand and prime paint.

3.4 Application

.1 Sand and dust between each coat to remove defects visible from a distance up to 1.5 m (5 ft).

.2 Finish bottoms, edges, tops and cut-outs of doors after fitting as specified for door surfaces.

.3 Finish tops of cabinets and projecting ledges, above and below sight lines as specified for surrounding surfaces.

.4 Finish closets and alcoves as specified for adjoining rooms.

.5 Repainted surfaces within already painted areas must colour match existing.

.6 After painting, drawers, window sashes and doors must operate freely.

3.5 Mechanical and Electrical Equipment

.1 Paint exposed conduits, pipes, hangers and other mechanical and electrical equipment occurring in finished areas including inside cupboards and cabinet work. Colour and texture to match adjacent surfaces, except where noted otherwise.

.2 Paint interior of ductwork where visible with primer and one coat matte black paint.

.3 Paint both sides and edges of plywood backboards for mounting equipment before installation. Leave equipment in original finish except for touch-up as required; paint conduits, mounting accessories and other unfinished items.

3.6 Completion

.1 Remove protection; make good damage to this and adjacent work.

2 Remove materials, debris, tools, plant and equipment from the premises.

3.7 Clean-up

.1 Remove rubbish, rags and oily waste from the site daily and at final completion and keep areas clean.

.2 Upon completion, clean blemished surfaces to the Architect's satisfaction. Repair any damage. Replace hardware plates, drapes, pulls, etc.

.3 Leave building and painted site equipment in a 'cleaned and polished' condition.

To be completed by Contractor before commencing work as verification of Architects colour selection.

APPENDIX A

Project Date
Municipality Page of

1. Submit name of material manufacturer for future maintenance and matching.

   _____

2. List material manufacturers numbers which comply with CAN/CGSB Standard for each primer sealer, paint, varnish, enamel and filler.

Any unauthorized materials will be removed from the site.

_____ _____
Signature/Company Seal Date

-End-

PART 1 - GENERAL

1.1 Scope

.1 Comply with Division 1: General Requirements.

.2 Provide materials, labour and equipment for the installation of all visual display boards and signage to locations shown on the drawings.

1.2 Related Work Under Other Sections

.1 Section 06200: Finish Carpentry, [co-ordinating with work of this section.]

.2 Section 07900: Sealants, [co-ordinating with work of this section.]

1.3 Examination:

.1 Examine all surfaces and conditions upon which the work of this section depends. Report all discrepancies to the Architect.

.2 Commencement of work means acceptance of these surfaces

1.4 Delivery, Storage and Handing

.1 Deliver and store materials undamaged in original wrappings and containers with manufacturers labels and seals intact.

.2 Store materials in suitable storage place. Prevent damage during handling and storage.

1.5 Shop Drawings

.1 Submit [6] copies of shop drawing clearly indicating types, materials, finishes, sizes, etc.

PART 2 - PRODUCTS

2.1 Materials:

.1 **Quantity and Location:** As Shown on Drawings

.2 **Sheet Steel:** To ASTM A526/A526M-85.

.3 **Aluminum Frame:** To Aluminum Association Alloy AA6063.T.5. 19 x 12 x 19 mm ($^3/_4$"x $^1/_2$"x $^3/_4$"), minimum wall thickness 1.0 mm (0.04")

.4 **Hardware:** Include minimum 4 keyhole steel mounting brackets.

.5 **Finishes:** White boards to be 'white' porcelain baked enamel. Aluminum to be clear anodized.

.6 **High Density Particle Core Backer Board:** 12 mm ($^1/_2$") for white boards and 6 mm ($^1/_4$") for cork boards.

Acceptable Products:
Architectural School Products or approved equal 'White Board 9800 with continuous marker tray and
1" continuous Aluminum/Cork Tack Strip Display Rail'

2.2 **Fabrication:**

.1 **Frames:** Mitre all corners frames screwed to backing @ 150 mm (6") on centre.

.2 **Exposed Cork or Porcelain Surfaces:** To be pressure/heat factory laminated.

PART 3 - EXECUTION

3.1 **Erection**

.1 Install boards and signage in accordance with manufacturer's instructions and Board's Guidelines attached.

.2 Hang units, plumb, level, rigidly supported with toggle type anchor bolts in hollow stud walls.

3.2 **Clean-up**

.1 Remove debris resulting from the work.

.2 Leave installation in a tidy condition ready for use.

-End-

CONTENTS

END OF SECTION

PART 1 – GENERAL

1.1 WORK INCLUDED IN THIS SECTION

.1 Refer to drawings for detailed demolition scope of work.

.2 All existing building services not affected by this work shall be maintained in operation during and after the demolition work is complete. Any accidental interruption of existing building services not required by this project will be promptly repaired at no additional cost to the Board.

.3 Prior to removing any piping, ensure the system is completely isolated and is not live.

.4 Complete all work impacting existing Building Operations after hours only.

1.2 QUALIFICATIONS

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

1.3 EXAMINATION

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

1.4 SALVAGE

.1 Reserved.

.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.

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.

1.2 DUTIES OF MECHANICAL CONTRACTOR

.1 The mechanical contractor shall assume the responsibilities and duties including but not limited to the ones described below:

.2 Superintendence

.1 Provide full time on-site superintendent personnel and supporting staff with proven experience in project of similar value and complexity.

.2 Site superintendent shall have over-all authority to speak for and represent the mechanical contractor.

.3 Coordination

.1 Coordinate the work with all the sub-trades involved to ensure that the work will be carried out on schedule and in proper sequence.

.2 Take complete responsibility for all remedial work that results from failure to coordinate any aspect of the mechanical work prior to its fabrication and/or installation.

.3 Take responsibility for the delivery of equipment necessary to complete the work in accordance with the approved schedule.

.4 Staffing and Scheduling

.1 Within seven days after the award of the contract, the Mechanical Contractor shall provide to the Owner's representative the following information:

1 Appointment of official representatives in the project.
2 Schedule of work.
3 Delivery schedule for specified equipment.
4 Requirements for temporary facilities, site signs, storage, etc.

.5 Work Completion Meeting

.1 Prior to application for Substantial Performance of the Work, the mechanical contractor shall participate in the take-over meeting. Agenda to include the following:
1 Review of outstanding deficiencies.
2 Submission of maintenance manuals, warranties and as-built drawings.
3 Results of performance tests and described further in this section.

4 Scheduling of training to Owner's personnel.

1.3 INTENT

.1 Bidders for this work shall include for all labor, material, equipment and all other related cost including all applicable taxes (except HST) and fees to provide the work as indicated on the drawings.

.2 Misinterpretation of any requirement of the drawings and specifications will not relieve the Mechanical Contractor of responsibility. If in any doubt, the Mechanical Contractor shall contact the Consultant for written clarification prior to submitting a bid for the Work.

.3 Supplementary to definitions established are:

1. "Concealed" means hidden from normal 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 change, 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. Install as high as possible, unless otherwise directed by the Consultant All drains, pipes, ducts, etc., particularly those which may interfere with the inside treatment of the building, or conflicting with other trades, shall be installed only after the locations have been approved by the Consultant. Special care shall be taken in the installation of all mechanical services including, but not exclusive to drains, pipes, and ducts, which are to be concealed, to see that they come within the finished lines of floors, walls, and ceilings. Where such drains, pipes, ducts, etc., have been installed in such a manner as to cause interference, they shall be removed and re-installed in suitable locations without extra cost to the Owner.

.6 Before commencing work, check and verify all grade and invert elevations, stacks, levels, and dimensions, to ensure proper and correct installation of the work.

.7 In every place where there is space indicated as reserved for future or other equipment, leave such space clear, install blank offs, shut off valves with blind flanges and other work so that the necessary connections can be made without any stoppages to the system. Consult with the consultant whenever necessary for this purpose.

.8 In addition to the work specifically mentioned in the Specifications and shown on the drawings, provide all other items that are obviously necessary to make a complete working installation, including those required by the Authorities Having Jurisdiction over the work.

.9 The mechanical plans show approximate locations for wall mounted devices. Obtain Consultant's approval of mounting heights and locations before commencement of work.

.10 Prepare and submit complete interference drawings (in PDF format) to avoid and/or resolve conflict of trades and to coordinate the work of the Mechanical Division with that of all other Trades. Submission of interference drawings shall be done no later than 10 business days after the Project has officially begun. The cost of producing the interference drawings shall be included for in the Base Tender Price.

.11 Include costs (in the Base Tender Price) for the services of a third-party to 3D scan the entire area of construction upon completion of demolition. System shall be Matterport or similar. The intent to is capture and submit to the Consultant a full 3D perspective of the space. This model shall be used to identify any potential conflicts ahead of installation and ordering of equipment to allow for quick resolution of site conflicts. 3D Model shall capture all architectural, structural, mechanical and electrical conditions on site and all such conditions shall be part of the model. The model, along with site verifications, shall be used as the basis for interference

drawings.

1.5 EXAMINE SITE

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

1.6 SUBCONTRACTOR'S SHOP

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

1.7 CLEANING

.1 During the performance of the work and on the completion, remove from the place of the work all debris, rubbish and waste materials caused by the performance of the work. Remove all tools and surplus materials after completion and acceptance of the work.

.2 All equipment shall be thoroughly vacuumed out at the time of final acceptance of the work.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Protection of Equipment:

.1 Equipment and material placed on the job site shall remain in the custody of the Contractor until phased acceptance, whether or not the Owner has reimbursed the Contractor for the equipment and material. The Contractor is solely responsible for the protection of such equipment and material against any damage.

.2 Place damaged equipment in first class, new operating condition; or, replace same as determined and directed by the Consultant. Such repair or replacement shall be at no additional cost to the Owner.

.3 Protect interiors of new equipment and piping systems against entry of foreign matter. Clean both inside and outside before painting or placing equipment in operation.

.4 Existing equipment and piping being worked on by the Contractor shall be under the custody and responsibility of the Contractor and shall be protected as required for new work.

.2 Cleanliness of Piping and Equipment Systems:

.1 Exercise care in storage and handling of equipment and piping material to be incorporated in the work. Remove debris arising from cutting, threading and welding of piping.

.2 Piping systems shall be flushed, blown or pigged as necessary to deliver clean systems.

.3 Clean interior of all tanks prior to delivery for beneficial use by the Owner.

.4 Contractor shall be fully responsible for all costs, damage, and delay arising from failure to provide clean systems.

1.9 INSTALLATION OF WORK

.1 Be responsible for:

.1 The layout of the work shown on the drawings and specified herein, and for any damage caused to the Owner by improper location or carrying out of this work.

.2 The prompt installation of the work in advance of concrete pouring or similar work.

.3 The condition of all material and equipment supplied and for the protection and maintenance of work completed.

.2 Coordinate with other trades and schedule all work to suit the date for the substantial performance established in the construction contract.

.3 Furnish items to be "built-up" in ample time and give necessary information and assistance in connection with the building in of the same.

.4 Proceed with the work as quickly as practical so that construction may be completed in as short a time as possible and in accordance with the building schedule.

.5 Ensure that all equipment and material is ordered in time to meet the building schedule. Provide a schedule of equipment deliveries to the Owner within the time limit stipulated.

.6 Furnish promptly information required for the construction schedule.

.7 Manufactured products supplied with instructions for their installation shall be installed in strict accordance with those instructions.

.8 All new ductwork and piping shall be supported from a secondary structure site supplied and installed by the Contractor consisting of unistruct (or alternate as necessary) structure fastened to the building OWSJ structure. No supporting of piping, conduits ductwork or equipment from the roof deck will be permitted.

1.10 CODES, PERMITS, FEES AND CONNECTIONS

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

.4 For information, a specific code or standard might be mentioned. This information must not be taken as the only code or standard applicable.

.5 When part of equipment does not bear the required CSA label, the contractor shall obtain from CSA or Hydro Electric Power Commission, when that part of the equipment is an electric component, a special approval and pay the applicable fees.

.6 Furnish necessary certificates as evidence that the work installed conforms with laws and regulations of Authorities having jurisdiction. Changes in work requested by an Authority having jurisdiction shall be carried out without charge.

1.11 MATERIALS

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

1.12 BASE BID SPECIFIED EQUIPENT & SUBSTITUTIONS WITH APPROVED ALTERNATES

.1 Where two or more designations are listed, the Contractor shall base the submitted Tender Price based on the base specified equipment.

.2 Where there is one product specified, the submitted Tender Price shall be based on the base specified equipment.

1.13 MATERIAL SUBSTITUTIONS

.1 After execution of the Contract, requests for substitution of materials of makes other than those specifically named in the Contract Documents may be approved by the Consultant, subject to owner’s review and acceptance of the financial credits involved.

.2 In the absence of such express approval by the Consultant, the Mechanical Contractor will be held to furnish specified items under the base bid.

1.14 SHOP DRAWINGS AND SAMPLES

.1 Submit to the Consultant detailed dimension shop drawings and installation wiring diagrams for all mechanical equipment. Further details and special requirements called for in these specifications shall be shown on the shop drawings.

.2 Ensure that copies of all reviewed shop drawings are available on the job site for reference.

.3 Provide samples of mechanical equipment as requested in the specification at the same time as

the shop drawing submission.

.4 **The Mechanical Contractor is responsible for consolidating all Mechanical Shop Drawings and submitted them in no more than three (3) packages as per the following:**

1. HVAC Equipment and Material.
2. Plumbing Equipment, Fixtures and Material.
3. Fire Protection Equipment, Fixtures and Material.

Individual shop drawings not consolidated will not be accepted.

1.15 AS-BUILT DRAWINGS

.1 Maintain up to date "as built" drawings on site.

.2 At the conclusion of the project, the Consultant will forward to the Contractor a set of electronic files of the project. The Contractor shall modify the files as required, to reflect the as-built conditions, mark them conspicuously in the title block as "as-built drawings" and submit the modified files to the Consultant for review. Completion of the As-Built Drawings in AutoCAD will be the responsibility of the Mechanical Contractor at no extra cost to the project. The Mechanical Contractor is responsible for updating all Architectural Plans based on the Architectural As-Builts while producing the Mechanical As-Builts

.3 Put a digital copy of the as-built files (in AutoCAD 2017 format) as part of the Operations and Maintenance manuals.

.4 Any subsequent changes found by the Consultant shall remain the responsibility of the Contractor at no charge to the Owner.

1.16 TEMPORARY AND TRIAL USAGE

.1 After any part of the work has been completed, the Consultant will make an inspection, and performance tests of such parts shall be carried out under the direction of the Consultant. If deficiencies are found, they shall be immediately rectified to the satisfaction of the Consultant. After such deficiencies have been rectified, the work shall be placed in service at such time and in such order as the Consultant may direct. If, in placing a portion of the equipment in service, it is necessary to make temporary connections in the wiring in order to obtain proper operation, such connections shall be provided to the extent and in the manner required by the Consultant.

.2 Temporary or trial usage of any mechanical devices, machinery, apparatus, equipment or materials shall not be construed as evidence of the acceptance of same.

.3 No claims for damage will be considered for injury to, or the breaking of any parts of such work which may be used.

1.17 CONSULTANT'S INSTRUCTIONS

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

specification.

1.18 ADDITIONAL WORK AND CHANGES

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

1.19 WARRANTY

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

1.20 SCHEDULING OF WORK

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

1.21 ENERGY CONSUMPTION

.1 The Consultant may reject equipment submitted for approval on basis of performance or energy consumed or demanded.

.2 All equipment installed on the project shall conform to the requirements outlined in ASHRAE 90.1 latest edition.

1.22 ELECTRIC MOTORS

.1 Provide motors for mechanical equipment as specified.

.2 If delivery of specified motor will delay delivery or installation of any equipment, install an acceptable motor for temporary use. Final acceptance of equipment will not occur until specified motor is installed.

.3 All motors shall be manufactured and installed in accordance with CSA requirements.

.4 Motor speed shall be 1750 rpm unless otherwise specified.

.5 All motors shall be "T" frame CEMA Standard Design "B" with Class "B" insulation, 40□C ambient, standard drip-proof with a 1.15 service factor, or as otherwise specified. Motors in air stream or exposed shall be TEFC type.

.6 Motors shall be of adequate size to operate associated equipment and drive mechanisms under all conditions of load and service and to bring equipment up to operating speed within 13 seconds without overloading, and be not less than the nameplate HP specified or indicated on

the Drawings.

.7 Integral HP motor sizes ½ HP and above shall be squirrel cage induction motors rated 575 volt or 230volt, 3 phase, 60 hertz, unless noted otherwise.

.8 Fractional HP motors up to but not including ½ HP shall be rated 120 volt, single phase, 60 hertz and will be capacitor start, induction motors, with adequate thrust capacity when used with direct mounted equipment, and shall be provided with integral overload and overheating protection. Shaded pole starting devices will not be accepted.

.9 Multi-speed motors and associated switching devices shall be circuited to protect the motor at each speed.

.10 All motors, 1 HP and up shall comply with the Ontario Hydro EnerMark Motor Efficiency Level as tested either CSA 390 M 1985, or IEEE 112B, and be approved under the Canadian Electrical Safety Code.

.11 All starter panels shall be lockable and supplied with locks.

.12 Special Requirements:

.1 Where motor power requirements of equipment furnished deviate from power shown on plans, provide electrical service designed under the requirements of NFPA 70 without additional time or cost to the Owner.

.2 Assemblies of motors, starters, controls and interlocks on factory assembled and wired devices shall be in accordance with the requirements of this specification.

.13 Wire and cable materials specified in the electrical division of the specifications shall be modified as follows:

.1 Wiring material located where temperatures can exceed 71 degrees C (160 degrees F) shall be stranded copper with Teflon FEP insulation with jacket. This includes wiring on the boilers.

.2 Other wiring at boilers and to control panels shall be NFPA 70 designation THWN.

.3 Provide shielded conductors or wiring in separate conduits for all instrumentation and control systems where recommended by manufacturer of equipment.

.14 Select motor sizes so that the motors do not operate into the service factor at maximum required loads on the driven equipment. Motors on pumps shall be sized for non-overloading at all points on the pump performance curves.

.15 Motors utilized with variable frequency drives shall be rated “inverter-ready” per NEMA Standard, MG1, Part 31.4.4.2. Provide motor shaft grounding apparatus that will protect bearings from damage from stray currents.

.16 Insulation Resistance: Not less than one half meg-ohm between stator conductors and frame,

to be determined at the time of final inspection.

1.23 EQUIPMENT REQUIREMENTS AND INSTALLATION

.1 Permit equipment maintenance and disassembly by use of unions or flanges to minimize disturbance to connecting piping and duct systems and without interference from building structure or other equipment.

.2 Provide accessible means for lubricating equipment including permanent lubricated bearings.

.3 For all base mounted boilers, pumps, compressors, air handling units, fans and other rotating equipment, provide chamfered edge housekeeping pads a minimum of 4" high and 4" larger than equipment dimensions all around. Work shall be performed by the trades specializing in this work.

.4 Pipe drain lines, overflows and safety relief vents to drains. If the horizontal drains present a tripping hazard, use aluminum checkered plate covers.

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

1.24 LIFTING ATTACHMENTS

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

1.25 THERMOMETERS AND PRESSURE GAUGES

.1 General:

.1 Locate direct reading thermometers and gauges for reading from floor or platform.

.2 Provide remote reading thermometers and gauges where direct reading instruments cannot be satisfactorily located.

.3 Locate engraved lamacoid nameplate as specified in Section Identification, identifying medium adjacent to thermometers and gauges.

.2 Thermometers:

.1 Industrial, 9" adjustable angle cast aluminum case, CGSB standard CAN/CGSB-14.4-M88 red reading mercury, lens front tube, white scale black embossed figures, clear glass or acrylic window, tapered aluminum stem.

.2 Scale shall be suitable for 2 times the temperature range of service. Scale shall be combined Celsius and Fahrenheit.

.3 Standard of Acceptance: Weiss, Ashcroft, Trerice.

.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 INTERFERENCE DRAWINGS

.1 The Mechanical Contractor is responsible for preparing detailed interference drawings once

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

1.44 MECHANICAL PROJECT COMPLETION

.1 10 (ten) days prior to substantial performance of work obtain documentation and/or prepare certification of the following items and submit them to the Owner's representative.

.1 All inspection certificates including drainage, Plumbing, and refrigeration.
.2 Guarantee certificates as called for under "Warranty".
.3 Record drawings.
.4 Operating and Maintenance Manuals.
.5 Test certifications as called for under "Testing".
.6 Provide a signed statement to the effect that all tests for mechanical systems and equipment have been completely carried out in the Trade Sections of these Specifications and to the manufacturer's recommendations, and in accordance with the requirements of all authorities having jurisdiction.

1.45 PERFORMANCE TESTS AND EQUIPMENT START-UP

.1 After all equipment has been installed, adjusted, balanced and started up, subject equipment to a series of performance tests, as soon as conditions permit.

.2 The timing of the tests shall be arranged to suit the convenience of the Consultant, and the manner and duration shall be as the Consultant deems necessary. Record the daily start and stop times, operating hours and functions performed. Ensure that the performance tests are witnessed by the Consultant.

.3 All major equipment including but not limited to boilers, pumps, sand filters are to be inspected by the manufacturer to ensure that the equipment has been installed in accordance with their recommendations.

.4 Operate equipment under varying load conditions, demonstrate start-up sequence, normal shutdown, simulated emergency shutdown, operation of temperature, etc., and safety controls. Operate switches and electrical devices for correct wiring sequences. Adjust components to achieve a proper functional relationship among all the components of all the systems. Repeat these functions as many times as deemed necessary by the Consultant to achieve reliable operation.

.5 Repair defects and repeat tests as necessary. During test maintain lubrication schedule, set, align and tension drives.

.6 At the successful completion of Performance Tests and all testing and balancing, make the systems ready for final inspection and subsequent acceptance of the Owner. Replace and clean filters, flush out lines and equipment, remove and clean strainers, fill liquid systems and purge air. Provide water treatment to pipes and report in accordance to Section 15602. Disinfect all domestic water as required by current by-laws and Authorities Having Jurisdiction.

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

1.46 PROJECT SPECIFIC NOTES

1. Obtain all approvals from public authorities having jurisdiction prior to commencing any work. Include, in the tender price, for all permit and inspection fees required by Authorities having Jurisdiction. Arrange for and attend all inspections required as per requirements of the Building Department or an Authority having Jurisdiction.

2. Examine architectural drawings and specifications and all contract documents before proceeding with the work. Any discrepancies between the drawings and specifications of all disciplines must be referred to the architect before any affected work is commenced.

3. The Mechanical Contractor shall furnish all labour, material, tools, equipment, etc. required to complete all work shown on the drawings and as specified in the contract documents. The work shall be performed in accordance with rules and regulations of all authorities having legal jurisdiction over the work. This Contractor shall provide any small items of work not specifically called for but required to complete the intended installation and/or required to achieve the desired intent or functional utility.

4. Perform all work in full accordance with the Ontario Building Code, All Applicable Codes, HWDSB standards and good practices and the requirements of all other Authorities Having Jurisdiction. All work performed by this division shall be done in accordance with all manufacturer's recommendations. Obtain all available manufacturer's recommendations and comply.

5. All cutting, patching, coring, scanning, xraying, making good and fire stopping required for the work of this division shall be carried out by this division. The Mechanical Contractor is responsible for and shall pay for any and all damage to the building and/or surrounding area incurred by work of this division.

6. Review the designated substances survey provided by the board in detail prior to commencing any work.

7. The Mechanical Contractor must review and submit shop drawings for all materials to be supplied as a part of the Contract in conjunction with the General Contractor to the Architect and Mechanical Consultant prior to ordering. Order only upon receipt of approval. Order, supply and install as per all comments. The Shop Drawings must be reviewed and ensured for compliance with the Contract Documents by the Mechanical Contractor and General Contractor prior to submission; confirmation of review and

confirmation that the submittal is in compliance with the Contract Documents is the responsibility of the Mechanical Contractor and General Contractor to include in writing with each Shop Drawing Submittal. Any non-conformance of the Submittal with the Contract Documents identified by the Mechanical Consultant will require a resubmission of the Shop Drawing Submittal by the Mechanical Contractor prior to review. The Mechanical Contractor shall bear all costs of any review by the Mechanical Consultant beyond the Original Shop Drawing Submission at a cost of $250.00 CAD + HST per resubmission.

8. All access panel ratings shall match that of the surface in which it is being installed. All access panels requiring supply/install as a part of the project work shall be included for in the Base Tender Price.

9. Coordinate with all other trades present on site throughout the full course of construction. Lay out of all work so as not to conflict with the work of other trades. Carry out work promptly which may interfere with the work and/or schedule of any other trades.

10. Cleanup and garbage: the contractor is responsible for maintaining as clean of a work area as possible during construction. The contractor is responsible to clean-up and remove tools from the site at the end of every working day. Disposal of all redundant materials, devices, and equipment is the responsibility of the contractor on a daily basis.

11. All work shall be done with minimum possible interruption to the existing building systems and in the time schedule permitted by the school board. Consult with the project supervisor prior to pricing. Complete the project within the allocated schedule.

12. Unless otherwise explicitly stated in writing in the Contract Documents, all materials, labour, scope and descriptions of work described in the Contract Documents is the responsibility of the Mechanical Contractor to supply and install as a part of the Base Tender Price. No materials and/or labour is to be completed under the Project Allowances unless explicitly noted as such in the Contract Documents.

13. All demolition and new work shall be completed in strict accordance with the Contract Documents with no deviations unless instructed by the Mechanical Consultant in writing prior to execution of the work. The Mechanical Consultant is not responsible, nor required, to accept any work (regardless of its compliance with code) not completed in accordance with the Contract Documents. The Mechanical Contractor will be responsible, at his/her cost, of furnishing a Sealed Letter from a Professional Engineer licensed in the Province of Ontario to accept and assume responsibility for all work not completed in accordance with the Contract Documents. The cost of obtaining this letter and the retaining of the Engineer, including all associated inspection charges, is the sole responsibility of the Contractor.

14. Unless otherwise noted, all devices, equipment, material, supplies, etc. shown on the drawings or otherwise required for a fully operational system as described/illustrated on the Drawings shall be supplied and installed under this Project. It shall not be assumed that any of the devices, equipment, material, supplies, etc. shown on the Drawings are to be provided (in part or in whole) by any other Party.

15. The Mechanical Contractor is responsible for taking pictures of work completed at the end of each week for record purposes. Pictures shall be taken throughout the work space and shall demonstrate all work completed that past week. When requested, share the pictures with the Mechanical Consultant. Pictures may be used for review of the monthly draws, conflicts identified on site, etc.

1.47 CLOSEOUT DOCUMENTS

.1 Coordinate with the General Contractor to submit a comprehensive Closeout Document Package incorporating documents from all trades in one consolidated package. Closeout Documents shall consist of one (1) 3-ring binder hard copy and 3 USBs/CDs. The Mechanical Section of the Closeout Documents shall consist of the following:

(a) Mechanical Contractor Warranty Letter, signed and dated. Warranty shall be for a period of twelve (12) months starting on the Date of Substantial Completion.
(b) Project Shop Drawings, in consecutive order of the Consultant's number scheme.
(c) O&M Manuals for all equipment supplied on the project.
(d) AHJ Inspection Certificates & All Test Certificates.
(e) Fire Damper installation letter from the Sheet Metal Contractor stating 'All fire dampers and fire flaps have been installed in strict accordance with the Manufacturer's recommendations and requirements as well as Code Requirements.'
(f) Start-Up Reports for all Equipment.
(g) Red-Line As-Builts and CAD As-Builts (both completed by the Mechanical Contractor).

1.48 PROJECT PROGRESS THROUGHOUT CONSTRUCTION

.1 The Mechanical Contractor is responsible for taking photos of all existing conditions and mechanical systems on site being affected by the Project at the onset of construction. All photos shall be date stamped.

.2 The Mechanical Contractor is responsible for taking photos of the project's progress throughout the construction site every two weeks. All progress photos shall be shared and sent electronically to the Mechanical Consultant on the 15th and 30th of every month. Photos are meant to illustrate the progress of the project and correction of any deficiencies identified in routine site reviews and review of progress photos.

.3 The Mechanical Consultant will, from time-to-time, visit the Project Site and issue a Field Review Report. The Mechanical Contractor is obligated to rectify any deficiency identified within 7 working days of receipt of the Report. The Mechanical Contractor is responsible for signing the Field Review Report upon 72 hours of the report being sent to the General Contractor, acknowledging receipt of the report. The Mechanical Contractor must take photos of all remedial work within 7 working days of receipt of the Report and distribute to the Consultant.

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.

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:

Pipe Size (NPS)	Distance m (ft)	Dia. of Rod mm (in)
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.

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

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

2.2 RECESSED ACCESS DOOR FOR DRYWALL APPLICATIONS

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

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

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

2.2.4 The hinge shall be a concealed pivoting rod.

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

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

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

2.3 RECESSED ACCESS DOOR FOR PLASTER APPLICATIONS

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

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

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

2.3.4 The hinge shall be a concealed pivoting rod.

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

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

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

2.4 FLUSH ACCESS DOORS FOR TILED WALL APPLICATIONS

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

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

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.

3.1.2 The Mechanical Contractor shall provide a set of drawings showing locations and types of all access doors located in public areas to the Consultant for approval, prior to commencing the installation of any piping or ductwork within these areas.

3.1.3 Access doors shall be turned over to the building trade that is responsible for finishing the wall or ceiling where the access door is required.

3.1.4 The Mechanical Contractor shall be responsible for providing the access doors required to be installed in ductwork. Refer to other sections for requirements.

END OF SECTION

1 GENERAL

1.1 GENERAL

.1 Section Includes:

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

1.2 DEFINITIONS

.1 Exposed Areas

.1 Finished areas and other areas used by personnel in normal use of building, such as equipment rooms and storage rooms.

.2 Concealed Areas

.1 Duct or pipe tunnels, duct or pipe chases, spaces above accessible ceilings, and crawl spaces.

2 PRODUCTS

2.1 STANDARD OF ACCEPTANCE

.1 W. H. Brady Co. catalogue numbers are used as a basis of identification.

.2 Stock catalogue numbers are listed in these specifications. Subcontractor is responsible to review schedules and provide required markers. In some instances, "non-stock" markers (special) may be required.

2.2 MANUFACTURER'S NAMEPLATES

.1 Manufacturer's nameplates:

.1 Provide metal nameplate on each piece of equipment, mechanically fastened with raised or recessed letters.
.2 Provide Underwriters' Laboratories or CSA registration plates, as required by respective agency.
.3 Manufacturers nameplate to indicate size, equipment model, manufacturer's name, serial number, voltage, cycle, phase and power of motors.
.4 Locate nameplates so that they are easily read. Do not insulate or paint over plates.

2.3 VALVE TAGS

.1 Metal Tags: Brass or aluminium with stamped or engraved letters; tag sizes minimum 2 inches (round, square, or rectangle) with smooth edges. Thickness 19 gauge (.040 inches) minimum.

.2 Beaded Chain: Size 6, brass or aluminium, 4 1/2 inches long with locking link.

2.4 PIPE MARKERS/ARROW TAPE ABOVE GROUND

.1 Colour: Conform to ANSI A13.1.

.2 Self-Sticking Pipe Markers/Arrow Tape: Material B-946, flexible, vinyl film tape with pressure sensitive permanent adhesive backing and printed markings.

.3 Suitable for indoor/outdoor application.

.4 Temperature range: Minus 40 degrees to 180 degrees F.

2.5 UNDERGROUND PIPING WARNING TAPE

.1 Tracer wire and test station(s) required when burying cast iron, ductile iron, or non-metallic piping.

.2 Tracer Wire: #10AWG THHN/THWN, yellow, solid copper.

.3 Tracer Wire Test Station: C.P. Test Services. Test Station: Plastic Pipe, cast iron cover, 2-point terminal box.

2.6 CONTROLS IDENTIFICATION

.1 Refer to section 25 20 11.

2.7 EQUIPMENT IDENTIFICATION

.1 Labelling shall be furnished and installed by the contractor

.2 Engraved signs shall be dark letters on light background.

.3 Identify mechanical equipment and HVAC controls, e.g., air handling units, pumps, heat transfer equipment, water treatment devices, controls instruments, stationary tanks/containers, and similar items, with nameplates or tags.

.4 Provide engraved nameplates made of rigid plastic laminate in which colored top and bottom layers of the material are thermoset with a contrasting color core. Minimum thickness 0.062 inch.

.5 Size: min. 1" x 3".

.6 Material Colour: White background/ black lettering.

.7 Manufacturer: Brady, No. B-1

.8 Provide lettering as follows:

.1 Size: 10 point minimum
.2 Spacing: 1/4 inch from top, 1/8 inch from bottom, 1/16 inch between lines.
.3 Provide nameplate with component nomenclature as noted in the Equipment Schedules. Coordinate with the controls sub-contractor.

.9 As a minimum, identify the system, e.g., HVAC (heating, ventilating, and air conditioning), the component, e.g., FGF (furnace, gas fired), and the sequence number.

2.8 **SAFETY SIGNS**

.1 Colors associated with specific words such as "Danger," "Warning," "Caution," or "Notice" shall conform to ANSI Z35.1.

2.9 **DUCTWORK IDENTIFICATION**

.1 Provide labels on the two sides and the bottom of all ductwork at intervals of every 5’ to note the System Type (‘Fresh Air Supply’, ‘Return’, ‘Exhaust’) and directional arrows.

3 EXECUTION

3.1 **PREPARATION**

.1 Degrease and clean surfaces to receive adhesive for identification materials.

3.2 **INSTALLATION**

.1 Valve Tags:

.1 Install with brass beaded chain.
.2 Steel stamp or engrave valve tag in accordance with schedule herein.
.3 Letter style block, 1/4-inch height minimum.
.4 Tag all valves in concealed or exposed areas except isolation and by-pass valves installed adjacent to the equipment they serve.
.5 Provide typewritten letter size list of applied tags and location. Frame under glass and hang where directed.

.2 Pipe Markers Above Ground:

.1 Install in accordance with manufacturer's instructions.
.2 Seal markers with clear lacquer.
.3 Identify piping in exposed or concealed areas in accordance with schedule herein.
.4 Pipe marker consists of pipe contents identification with flow direction arrow tape. Provide consistent color scheme, unless otherwise noted.
.5 Wrap arrow tape completely around pipe at both ends of pipe markers.

.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 QUALITY ASSURANCE

.1 Comply with OBC and NFPA 90A requirements, particularly paragraphs pertaining to the maximum flame spread index (currently set at 25) and maximum smoke development index (currently set at 50).

.2 All materials shall be compatible and suitable for service temperature, and shall not contribute to corrosion or otherwise attack surface to which applied in either the wet or dry state.

.3 Every package or standard container of insulation or accessories delivered to the job site for use must have a manufacturer's stamp or label giving the name of the manufacturer and description of the material.

1.3 SUBMITTALS

.1 Submit in accordance with Section 20 05 11 shop drawings and product data

.2 Provide the following:

.1 Insulation materials: Specify each type used and state surface burning characteristics.
.2 Insulation facings and jackets: Each type used. Make it clear that white finish will be furnished for exposed ductwork, casings and equipment.
.3 Insulation accessory materials: Each type used.
.4 Manufacturer's installation and fitting fabrication instructions for flexible unicellular insulation.

1.4 STORAGE AND HANDLING OF MATERIAL

.1 Store materials in clean and dry environment, pipe covering jackets shall be clean and unmarred. Place adhesives in original containers. Maintain ambient temperatures and conditions as required by printed instructions of manufacturers of adhesives, mastics and finishing cements.

1.5 STANDARDS OF ACCEPTANCE

.1 Knauf Fiber Glass
.2 Owens/Corning Fiberglass
.3 Armstrong
.4 Johns Manville
.5 Rockwool Manufacturing

2 PRODUCTS

2.1 GENERAL

.1 K-factors (thermal conductivity) shown are expressed in BTU•in/hr•ft2•F.

2.2 FIBERGLASS PIPE INSULATION

.1 Insulation:

.1 Rigid molded in compliance with ASTM C547, Class 1, minimum density 3.5 pounds/cubic foot, K-factor of approximately 0.24 at 75 degrees F, suitable for temperatures from minus 20 degrees F to 450 degrees F.

.2 Vapor Barrier

.1 Factory applied vapor barrier all-service type with self-sealing lap and butt strips.

.3 Valves and Fitting Covers

.1 Pre-molded PVC covers with fiber glass insert. Manufacturers: Proto Corp., Ceelco.

.4 Applications

.1 All domestic cold water piping.
.2 All domestic hot water and recirculation piping.
.3 All hot water heating piping.
.4 All glycol heating piping
.5 All condensate piping.
.6 All horizontal and vertical sections of storm drainage.
.7 All horizontal and vertical sections of sanitary drainage.

2.3 INSULATION THICKNESS

.1	Hot water heating, all piping sizes:	1”
.2	Domestic hot water less than 2"	1"
.3	Domestic hot water larger than 2"	1½”
.4	Domestic cold water, all piping sizes:	1"
.5	Condensate, all piping sizes:	1”
.6	Storm & Sanitary Piping, all piping sizes:	1”

2.4 ADHESIVE, MASTIC, CEMENT

.1 ASTM C449: Mineral fiber hydraulic setting thermal insulating and finishing cement.

.2 Other: Insulation manufacturers' published recommendations.

2.5 MECHANICAL FASTENERS

.1 Wire: 1.3 mm thick (18 gage) soft annealed galvanized or 1.9 mm (14 gage) copper clad steel or nickel copper alloy.
.2 Bands: 20 mm (3/4 inch) nominal width, brass, galvanized steel, aluminum or stainless steel.

2.6 CANVAS JACKETING

.1 Apply in concealed areas, compact, firm ULC listed heavy plain weave, cotton fabric at 220 g/m sq.

2.7 PVC JACKETING

.1 Apply in exposed areas on piping with operating temperatures less than 180°F. (80°C.).

.2 Piping: ULC listed PVC moulded type jacketing material, gloss white complying with 25 Flame Spread and 50 Smoke Developed ratings.

.3 Fittings: ULC listed PVC, gloss white, 1-piece, pre-moulded fittings complying with 25 Flame Spread and 50 Smoke Developed ratings.

.4 PVC Application: strictly in accordance with the requirements of Authorities having jurisdiction.

.5 Ultraviolet resistant.

.6 Fastenings: To manufacturer's standard(s).

2.8 METAL JACKETING

.1 At all locations where the pipe is located outdoors or in heavy abuse areas, use metal jacketing to protect piping or ductwork insulation.

.2 Jacketing: Aluminum, 0.016 inches thick, embossed surface, with factory bonded moisture barrier.

.3 Valve and Fitting Insulation Covers: Fabricate from same material as jacketing or use prefabricated insulation covers made in two matching halves.

.4 Metal Jacketing Bands: 1/2 inch wide, aluminum or stainless.

2.9 PROTECTION SADDLES AND SHIELDS

.1 Provide factory engineered galvanized steel hanger shields on horizontal insulated pipe complying with MSS SP-58 and MSS SP-59 standards for gauge and length of saddle.

2.10 SADDLES (PIPING/TUBING UP TO 2 INCHES)

.1 Use 180 degree saddle on systems utilizing teardrop type hangers.

.2 Use 360 degree saddle on systems utilizing trapeze hangers or clamps.

2.11 INSERTS AND SHIELDS (PIPING/TUBING OVER 2 INCHES)

.1 Use 360 degree calcium silicate insert with a 180 degree shield on systems utilizing clevis or teardrop type hangers.

.2 Use 360 degree calcium silicate with a 360 degree shield on systems utilizing trapeze hangers or clamps.

.3 The unit shall have an integral moisture barrier consisting of a tri-laminate All-Service Jacket equal and similar to the jacketing on the adjoining insulation.

.4 Insert: Calcium silicate, minimum density 9 pounds/cubic foot.

3 EXECUTION

3.1 EXAMINATION

.1 Verify that items to be insulated have been pressure tested and approved before applying insulation material.

.2 Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION - GENERAL

.1 Install materials in accordance with manufacturer's instructions.

.2 Required pressure tests of piping joints and connections shall be completed and the work approved by the Consultant for application of insulation. Surface shall be clean and dry with all foreign materials, such as dirt, oil, loose scale and rust removed.

.3 Except for specific exceptions, insulate entire specified equipment, piping (pipe, fittings, valves, accessories). Insulate each pipe and duct individually. Do not use scrap pieces of insulation where a full length section will fit.

.4 Insulation materials shall be installed with smooth and even surfaces, with jackets and facings drawn tight and smoothly cemented down at all laps. Insulation shall be continuous through all sleeves and openings, except at fire dampers and duct heaters (NFPA 90A). Vapor retarders shall be continuous and uninterrupted throughout systems with operating temperature 16 degrees C (60 degrees F) and below. Lap and seal vapor barrier over ends and exposed edges of insulation. Anchors, supports and other metal projections through insulation on cold surfaces shall be insulated and vapor sealed for a minimum length of 150 mm (6 inches).

.5 Install vapor stops at all insulation terminations on either side of valves, pumps and equipment and particularly in straight lengths of pipe insulation.

.6 Insulation on hot piping and equipment shall be terminated square at items not to be insulated, such as access openings and nameplates. Cover all exposed raw insulation with white sealer or

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^{O}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

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 of butyl rubber compression gaskets for all pipe connections.: to ASTM C564-2009.

.2 SS clamps.

2.2.4 Provide PVC piping for Urinals in accordance with OBC for above-grade drainage in lieu of Cast Iron.

2.3 PUMPED DRAINAGE

2.3.1 Pumped drains shall be galvanized steel.

2.4 DRAINAGE AND VENTS

2.4.1 Piping And Fittings

2.4.2 For buried sanitary, storm and vent piping:

.1 ASTM D2665, ASTM D2949, ASTM B251

.2 ASTM D3034, ASTM F891

.3 CAN/CSA- B181.2 for PVC DWV or

.4 CAN/CSA B182.1- for plastic DWV.

2.4.3 Joints

.1 Solvent weld for PVC: to ASTM D2564.

.2 Solvent weld for ABS: to ASTM D2235.

.3 For sizes above 4" (100mm).

Provide Ring-Tite joints 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 20 05 11.

3.1.4 PVC piping shall not be utilized above grade. PVC piping is acceptable for below grade piping where permitted by Code. The PVC piping shall convert to cast iron prior to the point where it penetrates the floor slab.

3.1.5 Provide venting to plumbing fixtures and fixture groups in accordance with the Ontario Building Code Plumbing Code and local authorities having jurisdiction.

3.1.6 Install buried pipe on 6" (150 mm) bed of clean sand, shaped to accommodate hubs and fittings, to line and grade as indicated. Backfill with clean sand.

3.1.7 Install piping parallel and close to walls to conserve space and to grade indicated, and to suit the installation of related work.

3.1.8 Apply solvent to male end of joints only.

3.1.9 Pipe installation: Pipe shall be installed as specified and indicated on the drawings.

3.1.10 The piping system shall be installed in accordance with the manufacturers current published installation procedures.

3.1.11 PVC piping shall not be utilized above grade. PVC piping is acceptable for below grade piping where permitted by Code. The PVC piping shall convert to cast iron prior to the point where it penetrates the floor slab.

3.1.12 Where piping passes through floor or wall below grade pack and seal in concrete in accordance with Mechanical General Requirements.

3.1.13 Provide venting to all plumbing fixtures and fixture groups in accordance to the Ontario Building Code - Plumbing Code and local authorities having jurisdiction.

3.1.14 If tests are required by an authority having jurisdiction, perform tests in presence of each

governing authority and obtain certification. Repeat tests as often as necessary to obtain certification.

3.1.15 Test pressure shall not exceed 1-1/2 times the maximum rated pressure of the lowest related element in the system.

3.1.16 Remove all fittings which do not withstand test pressure, replace and retest.

3.1.17 Eliminate leaks, or remove and refit defective parts.

3.2 TESTING

3.2.1 The drainage and vent system shall be tested in accordance with the Ontario Building Code - Plumbing Code and tested in accordance with the requirements of the authority having jurisdiction, perform tests in the presence of each governing authority and obtain certification. Repeat tests as often as necessary to obtain certification.

3.2.2 Perform tests before piping is covered or concealed.

3.2.3 Remove all fittings which will not withstand test pressure, and replace after test.

3.2.4 Eliminate leaks, or remove and refit defective parts.

END OF SECTION

1 GENERAL

1.1 Conform to Sections of Division 1 as applicable.

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

1.1.2 All plumbing fixtures depicted on the Drawings with a "Fixture Tag" ('WC-1' or WC-1) is a new plumbing fixtures and to be supplied and installed by the Mechanical Contractor in full complete with all necessary cold/hot water supply, drainage and vent piping.

1.2 REFERENCES

ANSI/ARI	Drinking Fountains and Self-Contained, Mechanically Refrigerated Drinking Water Coolers.
ANSI/ARI 1020	Application and Installation of Drinking Fountains and Drinking Water Coolers.
CAN/CSA-B45 Series-02	CSA Standards on Plumbing Fixtures.
CAN/CSA-B125-01	Plumbing Fittings.

1.3 SUBMITTALS

1.3.1 Product Data

1.3.1.1 Submit product data in accordance with the Mechanical General Requirements.

1.3.1.2 Indicate dimensions, construction details and roughing-in dimensions for all fixtures and trim.

1.3.2 Maintenance Data

1.3.2.1 Provide maintenance data for incorporation into manual specified in the Mechanical General Requirements.

1.3.2.2 Data to include:

- Description of plumbing fixtures and trim giving manufacturers name, type, model, year capacity and flow.
- Details of operation, servicing and maintenance.
- Recommended spare parts list.

1.4 FIXTURES AND TRIM

1.4.1 Manufacture plumbing fixtures in accordance with CAN/CSA-B45 Series. Conform to latest code requirements for water saving features noted in the Ontario Building Code.

1.4.2 Manufacture plumbing fittings in accordance with CAN/CSA-B125.

1.4.3 Architectural drawings to govern in determination of number and location of fixtures.

1.4.4 Fixtures in any one washroom or location to be product of one manufacturer and of same type, unless otherwise noted.

1.4.5 Trim in any one washroom or location to be product of one manufacturer and of same type, unless otherwise noted.

1.4.6 Exposed plumbing brass to be chrome plated.

1.4.7 The type number and letter allocated to each style of fixture identifies that particular fixture on Mechanical Drawings.

2 PRODUCTS

2.1 STAINLESS STEEL SINK-SINGLE COMPARTMENT "SS-1"

2.1.1 Sink: American Standard Colony 25 x 22 Single Bowl Stainless Steel Kitchen Sink (20 gauge stainless steel). Model: 20SB8252283S.075. Colony Single Bowl Sink, 3 Hole, 8" deep bowl, top mount installation, bottom sound deadening pads with undercoating.

2.1.2 Faucet: American Standard Monterrey Two-Handle Top-Mount Kitchen Faucet with Laminar Flow in Base of Spout. Model: 6409.180 Top Mount Faucet with 8" Gooseneck Spout & Laminar Flow in Spout Base. Field-convertible rigid / swivel gooseneck spout. Vandal-resistant metal wrist blade handles with red/blue indexes. 1.5 gpm pressure compensating laminar flow device in the base of the spout. Plain spout end. Durable cast brass construction. Field-convertible rigid-swivel gooseneck spout with 8" reach. Plain spout end. 1/4 turn ceramic disc valve cartridges. 1/2" male threaded inlet shanks with shank nuts and brass coupling nuts. Vandal-resistant wrist blade handles with blue & red color indexes. 1.5 gpm/5.7 L/min. maximum flowrate.

2.1.3 Supplies: McGuire #H165LKN3 supplies with angle stops, escutcheons and flexible copper risers. McGuire #8912CB cast brass 'P' trap, 1-1/2" with cleanout, unions and escutcheon.

2.1.4 Provide Franke 'Washroom System' offset strainer.

2.1.5 Mixing Valve: Mechanical mixing valve with thermostatic limit stop by Lawler Model TMM-1070 with temperature adjust dial & with integral back checks. Set valve temperature at 115 deg. F, shut-off at 120 deg. F. ASSE1070 approved. Tempered water supplied by mixing valve located below sink. Connect tempered water supply to hot water side of faucet and cold water supply to cold water side of faucet. Provide tee, adaptor and flex copper tubing to suit installation. Deck mounted soap dispenser to be specified by architect and provided & installed by the general contractor

2.2 STAINLESS STEEL SINK-SINGLE COMPARTMENT "SS-2"

2.2.1 Sink: Franke ART36-316-1 Art Room Sink, Single Bowl T316. Single compartment self rimming topmount sink without faucet ledge. 18 gauge (1.2 mm), type 316 (EN 1.4401 17/12/2) stainless steel. Exposed surfaces are #4 satin finished. Undercoated to reduce condensation and resonance. Includes waste fitting, factory applied rim seal, and factory installed EZ TORQUETM fasteners. Certified to ASME A112.19.3-2008 / CSA B45.4-08. Centre waste location, 3 1/2" (89

mm) type 316 (EN 1.4401 17/12/2) stainless steel crumb cup strainer with 1 1/2" (DN 38) type 316 (EN 1.4401 17/12/2) stainless steel tailpiece.

2.2.2 Faucet: American Standard Monterrey Two-Handle Top-Mount Kitchen Faucet with Laminar Flow in Base of Spout. Model: 6409.180 Top Mount Faucet with 8" Gooseneck Spout & Laminar Flow in Spout Base. Field-convertible rigid / swivel gooseneck spout. Vandal-resistant metal wrist blade handles with red/blue indexes. 1.5 gpm pressure compensating laminar flow device in the base of the spout. Plain spout end. Durable cast brass construction. Field-convertible rigid-swivel gooseneck spout with 8" reach. Plain spout end. 1/4 turn ceramic disc valve cartridges. 1/2" male threaded inlet shanks with shank nuts and brass coupling nuts. Vandal-resistant wrist blade handles with blue & red color indexes. 1.5 gpm/5.7 L/min. maximum flowrate.

2.2.3 Supplies: McGuire #H165LKN3 supplies with angle stops, escutcheons and flexible copper risers. McGuire #8912CB cast brass 'P' trap, 1-1/2" with cleanout, unions and escutcheon.

2.2.4 Provide Franke 'Washroom System' offset strainer.

2.2.5 Mixing Valve: Mechanical mixing valve with thermostatic limit stop by Lawler Model TMM-1070 with temperature adjust dial & with integral back checks. Set valve temperature at 115 deg. F, shut-off at 120 deg. F. ASSE1070 approved. Tempered water supplied by mixing valve located below sink. Connect tempered water supply to hot water side of faucet and cold water supply to cold water side of faucet. Provide tee, adaptor and flex copper tubing to suit installation. Deck mounted soap dispenser to be specified by architect and provided & installed by the general contractor

3 EXECUTION

3.1 FIXTURE INSTALLATION

3.1.1 Prior to commencing any work, refer to Architectural Drawings for exact placement location and mounting height of all plumbing fixtures. Failure to do so resulting in an install not complying with the Architectural Drawings or code compliance shall require the Mechanical Contractor to rectify the installation at no extra cost.

3.1.2 Insulate indirect waste of handicapped usage lavatory with 25 mm (1") thick insulation as described in Piping Insulation Specification.

3.1.3 Provide institutional grade caulking (clear colour) of all plumbing fixtures at all surfaces where the plumbing fixture interfaces with the wall or floor. Review extent of caulking with the Architect prior to commencing work. Any damage, discolouration or build up of dust resulting in subsequent construction activities by any trade prior to handing over of the Spaces to the Owner shall require removal of the caulking and installation of new. Caulking shall be done in a neat manner.

3.2 ADJUSTMENT

3.2.1 Verify maximum settings of thermostatic mixing valves.

3.2.2 Adjust stream regulator of drinking fountains as necessary to ensure proper operation.

3.2.3 Clean out aerator screens and strainers after lines have been flushed.

END OF SECTION

1.1. **REQUIREMENTS INCLUDED**

1.2. Procedures for onsite demonstration and testing of equipment and systems, including temporary facilities.

1.3. **INSTRUCTION OF CLIENT'S OPERATING PERSONNEL.**

1.3.1. All demonstrations, instructions and testing must be completed prior to Client acceptance for beneficial use. All safety devices most pass 100 percent before the mechanical systems can be accepted for beneficial use.

1.3.2. Plumbing and emergency power systems are not included.

1.4. **DEFINITIONS**

1.4.1. Start Up: Initial inspection, cleaning, lubrication, adjustment, and operation of equipment and systems by the contractor with the assistance of the representatives of the equipment manufacturers.

1.4.2. Pre Tests: The final stage of the startup procedure. This occurs after all adjustments have been made except for minor fine-tuning that can be done during the pre test. Serves as verification that the systems are ready for the final test. Witnessing of pre test by the Consultant is not required.

1.4.3. Final Tests: Tests, witnessed by the Commissioning Agent or their representative, which demonstrate that all equipment and systems are in compliance with requirements.

1.5. **QUALITY ASSURANCE**

1.5.1. Experienced, trained technical service personnel who are representatives of the equipment manufacturers and system designers shall demonstrate, provide instructions, pre test and final test, as specified, the following equipment:

1.5.1.1. Boilers and economizers
1.5.1.2. Burners
1.5.1.3. Control systems.
1.5.1.4. Instrumentation.

1.5.2. Experienced technicians shall demonstrate and provide instructions on the following equipment (as applicable to the project):

1.5.2.1. Boilers and Burners
1.5.2.2. Chillers and Cooling Towers
1.5.2.3. Pumps and piping systems

1.5.2.4. Air handling equipment
1.5.2.5. Exhaust/Return Fans
1.5.2.6. Control and safety valves
1.5.2.7. BAS and VFDs

1.5.3. The person responsible for programming the BAS shall demonstrate and provide instructions on hardware, software and programming.

1.5.4. The Board will provide a list of personnel to receive instructions and will coordinate their attendance at agreed upon times.

1.5.5. All safety devices shall comply with the TSSA requirements.

1.6. **SUBMITTALS**

1.6.1. Names and qualifications of personnel performing demonstrations, instructions and tests.

1.6.2. Certification that pre testing is complete.

1.6.3. Preliminary schedule of all demonstrations, instructions and final tests two weeks prior to proposed dates.

1.6.4. Provide reports within three weeks after satisfactory completion of demonstrations, instructions, and tests. List date, type of work, persons participating, amount of time, test results, calculations of test results, test data.

1.6.5. Completed System Readiness Checklists provided by the Commissioning Agent and completed by the contractor, signed by a qualified technician and dated on the date of completion,

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1. **PREPARATION FOR FINAL TESTS, DEMONSTRATIONS, AND INSTRUCTIONS**

3.1.1. Verify that equipment and systems are fully operational. Complete all start up and pre test activities for all equipment and systems. Complete all construction and finish work.

3.1.2. Arrange for all test personnel for all equipment to be continuously present during one period of time so that all equipment and systems can be tested in their interrelated functions. For instance, the burner in a heating system shall be tested during the boiler testing, and instrumentation performance will be evaluated in conjunction with boiler testing.

3.1.3. Deliver maintenance and operating manuals four weeks prior to instruction period.

3.1.4. Furnish all special tools.

3.2. **FINAL TESTS**

3.2.1. Demonstrate proper operation of each equipment and system.

3.2.2. Provide tests on equipment as specified in the individual specification sections.

3.3. **STARTUP AND TESTING**

3.3.1. The Commissioning Agent will observe startup and contractor testing of selected equipment. Coordinate the startup and contactor testing schedules with the Resident Engineer and Commissioning Agent. Provide a minimum of 7 days prior notice.

3.4. **COMMISSIONING**

3.4.1. Provide commissioning documentation in accordance with the requirements of the Commissioning Agency for all inspection, start up, and contractor testing required above and required by the Systems Readiness Checklist.

3.5. **DEMONSTRATIONS AND TRAINING**

3.5.1. Demonstrate operation and maintenance of equipment and systems to Board personnel no more than two weeks prior to scheduled Board operation of the plant.

3.5.2. Use operation and maintenance manuals as basis of instruction. Review contents of manuals with personnel in detail to explain all aspects of operation and maintenance.

3.5.3. Demonstrate start up, operation, control, adjustment, trouble shooting, servicing, maintenance, and shut down of each item of equipment. Allow Government personnel to practice operating the equipment under supervision of instructors.

3.5.4. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instructions.

3.5.5. Submit training plans and instructor qualifications

3.6. **TIME ALLOCATED FOR DEMONSTRATIONS AND INSTRUCTIONS**

3.6.1. At least 8 total instructor hours to include all new building services installed under this project.

3.6.2. At least 4 total instructor hours to include BAS and computer workstation and programs.

3.6.3. Do not exceed three trainees per session, one four hour session, per day, per trainee.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL

.1 This section of the specification shall be read in conjunction with and be governed by the requirements outlined in Section 20 05 11.

.2 Definitions

1. Refrigerating system: Combination of interconnected refrigerant-containing parts constituting one closed refrigeration circuit in which a refrigerant is circulated for the purpose of extracting heat.

2. Low side means the parts of a refrigerating system subjected to evaporator pressure.

3. High side means the parts of a refrigerating system subjected to condenser pressure.

4. Brazed joint: A gas-tight joint obtained by the joining of metal parts with alloys which melt at temperatures higher than 427 degrees C (800 degrees F) but less than the melting temperatures of the joined parts.

.3 Quality Assurance

1. Comply with ASHRAE Standard 15, Safety Code for Mechanical Refrigeration. The application of this Code is intended to assure the safe design, construction, installation, operation, and inspection of every refrigerating system employing a fluid which normally is vaporized and liquefied in its refrigerating cycle.

2. Comply with ASME Boiler and Pressure Vessel Code: Section IX: Welding and Brazing Qualifications.

3. 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.

.4 Submittals

1. Sizing of refrigerant lines shall be by the air conditioning equipment manufacturer, based on the total developed length of pipes, site-measured. Final pipe sizing shall be shown on the submittal documents.

2. Shop Drawings: Sufficient information for components noted, including valves and refrigerant piping accessories, piping schematics, clearly presented, shall be included to determine compliance with drawings and specifications for components noted below:
    1. Tubing and fittings, including pipe sizes for each coil and condensing unit.
    2. Valves

3. Strainers
4. Moisture-liquid indicators
5. Filter-driers
6. Flexible metal hose
7. Liquid-suction interchanges
8. Oil separators (when specified)
9. Gages
10. Pipe and equipment supports.
11. Flexible elastomeric pipe insulation
12. Refrigerant and oil
13. Pipe/conduit roof penetration cover
14. Soldering and brazing materials
15. Indoor supports arrangement and manufacture
16. Roof pipe supports and manufacture.

3. Layout of refrigerant piping and accessories, including flow capacities, valves locations, and oil traps slopes of horizontal runs, floor/wall penetrations, and equipment connection details.

4. Certification: Copies of certificates for welding procedure, performance qualification record and list of welders' names and symbols.

5. Design Manual: Furnish two copies of design manual of refrigerant valves and accessories.

6. The Contractor, as a part of the Shop Drawing submission, shall submit the refrigerant pipe sizing and design with the written approval of the Manufacturer of the system that the refrigerant pipe sizing and design is compliant with the Manufacturer’s recommendations.

PART 2 PRODUCTS

2.1 PIPING AND FITTINGS

.1 Refrigerant Piping

1. Copper refrigerant tube, ASTM B280, cleaned, dehydrated and sealed, marked ACR on hard temper straight lengths. Coils shall be tagged ASTM B280 by the manufacturer.

.2 Soldering:

1. Solder joints: Wrought copper fittings, ANSI B16.22.

2. Solder, refrigerant tubing: Cadmium free, AWS A5.8, 45 percent silver brazing alloy, Class Bag-5.

3. Solder, water and drain: 95-5 tin-antimony, ASTM B32 (95TA).

4. Flanges and flanged fittings: ANSI B16.24.

.3 Refrigeration Valves:

1. Stop Valves: Brass or bronze alloy, packless, or packed type with gas tight cap, frost proof, backseating.

2. Pressure Relief Valves: Forged brass with nonferrous, corrosion resistant internal working parts of high strength, cast iron bodies conforming to ASTM A126, Grade B. Set valves in accordance with ASHRAE Standard 15.

3. Solenoid Valves: ARI 760, UL-listed, two-position, direct acting or pilot-operated, moisture and vapor-proof type of corrosion resisting materials, designed for intended service, and solder-end connections. Fitted with suitable NEMA 250 enclosure of type required by location.

4. Thermostatic Expansion Valves: Brass body with stainless-steel or non-corrosive non ferrous internal parts, diaphragm and spring-loaded (direct-operated) type with sensing bulb and distributor having side connection for hot-gas bypass and external equalizer. Size and operating characteristics as recommended by manufacturer of evaporator and factory set for superheat requirements. Solder-end connections. Testing and rating in accordance with ASHRAE Standard 17.

5. Check Valves: Brass or bronze alloy with swing or lift type, with tight closing resilient seals for silent operation; designed for low pressure drop, and with solder-end connections. Direction of flow shall be legibly and permanently indicated on the valve body.

6. Strainers: Designed to permit removing screen without removing strainer from piping system, and provided with screens 80 to 100 mesh in liquid lines up to 30 mm (1-1/8 inch), 60 mesh in liquid lines over 30 mm (1-1/8 inch), and 40 mesh in suction lines. Provide strainers in liquid line serving each thermostatic expansion valve, and in suction line serving each refrigerant compressor not equipped with integral strainer.

7. Refrigerant Moisture/Liquid Indicators: Double-ported type having heavy sight glasses sealed into forged bronze body and incorporating means of indicating refrigerant charge and moisture indication. Provide screwed brass seal caps.

8. Refrigerant Filter-Dryers: ULC listed, angle or in-line type, as shown on drawings. Conform to ASHRAE Standard 63. Heavy gage steel shell protected with corrosion-resistant paint; perforated baffle plates to prevent desiccant bypass. Size as recommended by manufacturer for service and capacity of system with connection not less than the line size in which installed. Filter driers with replaceable filters shall be furnished with one spare element of each type and size.

9. Flexible Metal Hose: Seamless bronze corrugated hose, covered with bronze wire braid, with standard copper tube ends.

10. Oil Separators: Provide for condensing units, where determined as necessary by the equipment manufacturer. All welded steel construction with capacity to eliminate a minimum of 95 percent of the oil from the hot gas flowing through it. Provide manufacturer's published ratings for minimum and maximum refrigeration tonnage corresponding to this oil separating efficiency. Conform to ASHRAE Standard 69. Separator shall be equipped with a float valve to prevent return of the hot gas to crankcase, and shall have isolating stop valves so it can be opened and services without pumping out any other part of the system. ASME construction or ULC listed.

2.2 PIPE SUPPORTS

.1 See Drawings for the typical pipe support detail.

2.3 REFRIGERANT AND OIL

.1 Provide required refrigerant and oil for proper system operation.

2.4 REFRIGERANT PIPE INSULATION

.1 All refrigerant piping shall be insulated with not less than 3/4" inch elastomeric closed cell insulation as manufactured by Armaflex Armacell series. The insulation shall conform to the OBC requirements for smoke and flame development. Insulation shall be complete with UV resistant aluminum sleeve jacket and sealant.

.2 All refrigerant piping insulation mounted outdoors (on the roof) shall be coated with water-based acrylic enamel as manufactured by Armaflex WB finish series. Apply as per the manufacturer's instruction.

.3 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

2.5 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.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install refrigerant piping and refrigerant containing parts in accordance with the manufacturer's instructions, ASHRAE Standard 15 and ANSI B31.5. Refrigerant piping shall be brazed with 15 percent silver solder in accordance with AWS A5.8.

.2 Prior to installing the refrigerant piping, inspect the available ceiling space and select the most direct route, with minimal interference with the existing utilities and building elements.

.3 Drill adequate openings through the existing interior partitions, floors and roof to allow for the passage of the refrigerant piping. Where required allow for access doors. For roof penetrations, refer to details on the drawings.

.4 Make good all surfaces affected by the work.

.5 Horizontal runs shall be sloped toward compressor to insure oil return. Install piping as short as possible, with a minimum number of joints, elbow and fittings.

.6 The lines should be installed so that they will not obstruct services access to the indoor coil, air handling system or filter.

.7 Install piping with adequate clearance between pipe and adjacent walls and hangers to allow for service and inspection. Space piping, including insulation, to provide 25 mm (one inch) minimum clearance between adjacent piping or other surface. Use pipe sleeves through walls, floors, and ceilings, sized to permit installation of pipes with full thickness insulation.

.8 Swab fittings and valves with manufacturer's recommended cleaning fluid to remove oil and other compounds prior to installation.

.9 Install hangers and supports per Section 20 05 11, ANSI B31.5 and the refrigerant piping manufacturer's recommendations.

.10 Protect refrigerant system during construction against entrance of foreign matter, dirt and moisture; have open ends of piping and connections to compressors, condensers, evaporators and other equipment tightly capped until assembly.

.11 Under no circumstances shall the refrigerant compressor be used to evacuate the system. The evacuation shall be accomplished by the use of a vacuum pump at an ambient temperature not less than 35OF to ensure removal of all moisture and non-condensable gases.

.12 Pass nitrogen gas through the pipe or tubing to prevent oxidation as each joint is brazed. Cap the system with a reusable plug after each brazing operation to retain the nitrogen and prevent entrance of air and moisture.

.13 Pipe relief valve discharge to outdoors for systems containing more than 45 kg (100 pounds) of refrigerant.

.14 Firestopping: Fill openings around uninsulated piping penetrating floors or fire walls, with firestop material.

.15 Apply flexible cellular insulation and fabricate fittings in accordance with the manufacturer's written instructions. Use proper size material. Do not stretch or strain insulation. To avoid undue compression of insulation, provide cork stoppers or wood inserts at supports as recommended by the insulation manufacturer.

.16 Where possible, slip insulation over the pipe or tubing prior to connection, and seal the butt joints with adhesive. Where the slip-on technique is not possible, slit the insulation and apply it to the pipe sealing the seam and joints with contact adhesive. Optional tape sealing, as recommended by the manufacturer, may be employed.

.17 Apply two coats of weather-resistant finish as recommended by the manufacturer to insulation exposed to outdoor weather.

3.2 TENDER PROCESS

.1 All refrigerant pipe sizing is to be completed by the Manufacturer of the VRF/Fan Coil System at the time of pricing. All sizing is to be provided to the Mechanical Contractor prior to bid submission. The Mechanical/Refrigeration Contractor is responsible for including all costs associated with supplying and installing a complete refrigerant/VRF system in the Base Tender Price. Include for all components necessary (filters, dryers, sight glasses, valves, etc.) for a complete refrigerant/VRF system in the Base Tender Price.

3.3 FIELD QUALITY CONTROL

.1 Prior to initial operation examine and inspect piping system for conformance to plans and specifications and ASME 31.5.

.2 The Manufacturer of the Fan Coil/VRF System is responsible for site reviewing the installation process throughout construction (a minimum of three (3) visits are required) and a final review upon completion of the full installation and prior to start-up. The Manufacturer of the Fan Coil/VRF System shall certify and provide written confirmation that the refrigeration system, including the piping, has been installed in strict accordance with the Manufacturer’s recommendations.

3.4 FIELD TESTS

.1 After completion of piping installation and prior to initial operation, conduct test on piping system according to ASME B31.5. Furnish materials and equipment required for tests. Perform tests in the presence of the consultant. If the test fails, correct defects and perform the test again until it is satisfactorily done and all joints are proved tight.

.2 The high and low side of each system shall be tested and proved tight at not less than the lower of the design pressure or the setting of the pressure-relief device protecting the high or low side of the system, respectively.

.3 Test Medium: A suitable dry gas such as nitrogen or shall be used for pressure testing. The means used to build up test pressure shall have either a pressure-limiting device or pressure-reducing device with a pressure-relief device and a gage on the outlet side. The pressure relief device shall be set above the test pressure but low enough to prevent permanent deformation of the system components.

3.5 SYSTEM TEST AND CHARGING

.1 System Test and Charging: As recommended by the equipment manufacturer or as follows:

1. Connect a drum of refrigerant to charging connection and introduce enough refrigerant into system to raise the pressure to 70 kPa (10 psi) gage. Close valves and disconnect refrigerant drum. Test system for leaks with halide test torch or other approved method suitable for the test gas used. Repair all leaking joints and retest.

2. Connect a drum of dry nitrogen to charging valve and bring test pressure to design pressure for low side and for high side Test entire system again for leaks.

3. Evacuate the entire refrigerant system by the triplicate evacuation method with a vacuum pump equipped with an electronic gage reading in mPa (microns). Pull the system down to 665 mPa (500 microns) and hold for four hours then break the vacuum with dry nitrogen (or refrigerant). Repeat the evacuation two more times breaking the third vacuum with the refrigeration to be charged and charge with the proper volume of refrigerant.

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.

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 Submit shop drawings and product data in accordance with the contract documents and Section 20 05 11.

.2 Sound power data for all fans coil units to be provided. Sound power data shall include sound power data for supply fan discharge and sound power levels radiated from the unit.

1.3 MAINTENANCE DATA AND MANUALS

.1 Provide maintenance data for incorporation into maintenance manual as indicated in the contract documents and Section 20 05 11.

1.4 CAPACITY AND PERFORMANCE

.1 As indicated on the drawings and equipment schedules.

1.5 STANDARD OF ACCEPTANCE FOR THE FAN COIL UNITS AND OUTDOOR CONDENSING UNITS

.1 Base Specified Product: Mitsubishi
.2 Alternate Manufacturer: Daikin

All alternate Manufacturers listed above must ensure that their product is equal or superior in specifications in all respects to the Base Specified Product.. No acceptance of alternate products will be entertained is the above criteria are not met.

PART 2 PRODUCTS

2.1 INDOOR HI-WALL AC INDOOR UNIT

General:

.1 The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, and an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory. The unit shall be suitable for use in plenums in accordance with UL1995 ed 4.

Fan:

.1 Indoor units shall feature adjustable external static pressure settings up to 0.20 in. WG.
   a. The indoor unit fan shall be an assembly with one statically and dynamically balanced Sirocco fan direct driven by a single motor with permanently lubricated bearings.
   b. The indoor fan shall consist of three (3) speeds, High, Mid, and Low.

Filter:

.1 Return air shall be filtered by means of a standard factory installed return air filter.

Coil:

.1 The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing. The tubing shall have inner grooves for high efficiency heat exchange. All tube joints shall be brazed with phos-copper or silver alloy.
   a. The coils shall be pressure tested at the factory.
   b. Coil shall be provided with a sloped drain pan. Units without sloped drain pans which must be installed cockeyed to ensure proper drainage are not allowed.
   c. The unit shall be provided with an integral condensate lift mechanism able to raise drain water 21 inches above the condensate pan.

Electrical:

.1 The unit electrical power shall be 208/230 volts, 1 phase, 60 hertz. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

Controls:

.1 Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.
   a. Control board shall include contacts for control of external heat source. External heat may be energized as second stage with 1.8°F – 9.0°F adjustable deadband from set point.
   b. Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.
   c. Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

2.2 ELECTRICAL

.1 All unit electrical specifications shall be as listed in the Equipment Schedule on the Drawings.

2.3 CONTROLS

.1 Controls shall consist of a microprocessor-based control system which shall control space temperature, determine optimum fan speed, and run self diagnostics. The temperature control range shall be from 62F to 84F (16.67C to 28.89C).

.2 The unit shall have the following functions as a minimum:

a. An automatic restart after power failure at the same operating conditions as at failure.
b. A timer function to provide a minimum 24--hour timer cycle for system Auto Start/Stop.
c. Temperature--sensing controls shall sense return air temperature.
d. Indoor coil freeze protection.
e. Wireless infrared remote control to enter set points and operating conditions.
f. Automatic air sweep control to provide on or off activation of air sweep louvers.
g. Dehumidification mode shall provide increased latent removal capability by modulating system operation and set point temperature.
h. Fan-only operation to provide room air circulation when no cooling is required.

.3 Diagnostics shall provide continuous checks of unit operation and warn of possible malfunctions. Error messages shall be displayed at the unit. Fan speed control shall be user--selectable: high, medium, low, or microprocessor controlled automatic operation.

.4 The unit is intended to be controlled by the School's existing Building Automation System. The unit shall come complete with all hardware, software and components necessary to interface with the School's BAS System and in full compliance with the the School Board's Controls Standards and Sequences. Consultant with HWDSB's Controls Group and Controls Contractor at the time of Shop Drawing preparation and prior to manufacturing to ensure that the unit is properly manufactured to work with the School's BAS System. BACNet control points or functionality will not be permitted whatsoever. Refer to Controls Sequences for the full extent of control and sequences for the units. The unit shall come shipped with ready-to-go controls points to meet the desired control points and sequences. Any site modifications to the existing unit to bring it to compliance with HWDSB's Standards and requirements will be responsibility of the Unit Manufacturer in the event of miscoordination or inadequate coordination.

2.4 SPECIAL FEATURES (FIELD INSTALLED):

.1 Condensate Pump: The condensate pump shall remove condensate from the drain pan when gravity drainage cannot be used. Pump shall be designed for quiet operation. Pump shall consist of two parts: an internal reservoir/sensor assembly, and a remote sound-shielded pump assembly. A liquid level sensor in the reservoir shall stop cooling operation if the liquid level in the reservoir is unacceptable. Pump shall be interlocked with the unit. AC unit will not operate if pump is OFF.

2.5 VRF AIR-COOLED CONDENSING UNIT

.1 General

a. The outdoor units shall be equipped with multiple circuit boards that interface to the controls system and shall perform all functions necessary for operation. The outdoor unit shall have a powder coated finish. The outdoor unit shall be completely factory assembled, piped and wired.

.2 Condensing unit cabinet construction

a. The casing(s) shall be fabricated of galvanized steel, bonderized and finished with a powder coated baked enamel. Units cabinets shall be able to withstand 960 hours of salt spray.

.3 Variable speed condenser fan:

a. The modular outdoor unit module shall be furnished with one direct drive, inverter driven, variable speed propeller type fan. The unit shall be manufactured, and factory set for operating under 0 ‘wg external static, but capable of operation under a maximum of 0.24” w.g external static via a dipswitch setting.
b. The fan motor shall have inherent protection, have permanently lubricated bearings, and be completely variable speed. The fan motor shall be mounted for quiet operation. The fan shall be provided with a raised guard to prevent contact with moving parts. The outdoor unit shall have vertical discharge airflow.

.4 Wrap around high efficiency condenser coil:

a. The outdoor coil shall be of the wrap around configuration with nonferrous construction with lanced or corrugated plate fins on copper tubing. A minimum clearance of 1 3/8” shall be allowed between modular units to facilitate sufficient air flow across the wrap around condenser coils. The coil fins shall have a factory applied corrosion resistant blue-fin finish.the outdoor coil shall include four (4) circuits with two position valves for each circuit, except for the last stage. The coil shall be protected with an integral metal guard. Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.

.5 Variable speed scroll compressor:

a. The high efficiency modular air-cooled outdoor units shall be provided complete with an inverter driven scroll hermetic compressor(s) (72/96 mbh one compressor 120/144 MBH two compressors). The compressor motor shall be of DC brushless configuration with auto tuning inverter control to achieve optimum compressor/motor performance levels particularly during off design conditions. Non inverter-driven compressors shall not be deemed acceptable for this application. Compressors driven by induction are not allowed in this instance.
b. A crankcase heater(s) shall be factory mounted on the compressor(s).each compressor shall be capable of modulation down to 19% of rated capacity.
c. The compressor(s) shall be equipped with an internal thermal overload. The compressor shall be mounted to avoid the transmission of vibration.

.6 Unit shall be supplied with a non-penetrating rooftop, six-point support with 24”x24” roof pads (from Portable Pipe Hangers or equal). The unit support shall be dimensioned and of a size to prevent tip over of the unit under any local weather conditions. Provide a 24”x24” concrete paver and 24”x24” rigid insulation below the concrete paver below each foot of the support.

2.6 REFRIGERANT LINES:

.1 The manufacturer shall provide sizing of all refrigerant piping for both AC systems as a part of the Shop Drawing transmittal. Sizing shall be based on all actual pipe lengths and heights. All calculations shall be sealed by a Professional Engineer licensed in Ontario by PEO.

.2 The Mechanical Contractor is responsible for providing all accessories and refrigerant specialities required for a complete and operational system.

.3 The Mechanical Contractor shall obtain a copy of the piping diagram from the Manufacturer at the time of pricing; price to include all requirements as required by the Manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install unit in accordance with manufacturers instructions and as indicated. Maintain service clearances as required by the manufacturer's literature.

.2 Start-up and adjustment: by the Manufacturer's Representative.

.3 Supply all control devices, sensors, relays and wiring required to make the equipment fully functional in accordance with the sequence of operation indicated in the Controls Section. Assemble all components that require field installation. Include all step-down transformers, relays and other devices, as required.

.4 Supply and install all low-voltage control wiring between the fan coil unit and the wall-mounted controller, between the rooftop VRF unit and the fan coil units and between the VRF unit and the wall-mounted controller. Supply and install all necessary step-down transformers.

3.2 WARRANTY

.1 Warranty for all equipment shall be minimum one (1) year from the date of Substantial Completion.

END OF SECTION

CONTENTS

END OF SECTION

1.1 REFERENCES

.1 Division 1, General Requirements, is a part of this Section and shall apply as if repeated here.

1.2 APPLICATION

.1 This Section applies to and is a part of all Sections of the Electrical Contractor.

1.3 WORK INCLUDED

.1 Sections of these Electrical Specifications are not intended to delegate functions nor to delegate work and supply to any specific trade and the work shall include all labour, materials, equipment and tools required for a complete and working installation as described.

1.4 INTENT

.1 Mention herein or indication on drawings of articles, materials, operations or methods requires: supply of each item mentioned or indicated, of quality, or subject to qualifications noted; installation according to conditions stated and; performance of each operation prescribed with furnishing of necessary labour, equipment and incidentals for Electrical Trade, The Electrical Contractor.

.2 Supplementary to definitions established are:

1. "Concealed" means hidden from normal sign in furred spaces, shafts, ceiling spaces, walls, or partitions. Wiring, raceways, and electrical boxes for all new or relocated devices shall be concealed.

2. "Exposed" means work normally visible, including work in equipment rooms, tunnels, and similar spaces.

3. "Provide" (and all tenses) means supply and install for a complete, operational, and code-compliant system, including all devices/equipment as specified complete with wiring, raceways, electrical boxes, and all other accessories or components required for a complete, operational, and code-compliant installation.

4. "Install" (and all tenses) means secure in position, connect as specified, test, and verify.

5. "Supply" means to supply all devices/equipment to the responsible trade.

6. "Remove" means to isolate, disconnect, disassemble, remove, and dispose of all devices, equipment, wiring, raceways, and connections to other equipment. Patch and make good all surfaces affected by the removal. Remove and dispose of all redundant material off site

.3 Where used, wordings such as "approved, to approval, as directed, permitted, permission, accepted, acceptance", shall mean: approved, directed, permitted, accepted, by authorized representative of the Owner.

.4 Equipment and installation provided under this Division shall conform to applicable standards and regulations of the following organizations:

Canadian Standards Association (CSA)
Underwriter's Laboratories of Canada (ULC)
Ontario Electrical Safety Code (OESC)
Electrical Safety Authority (ESA)
Ontario Building Code (OBC)

1.5 WORKMANSHIP

.1 Workmanship and method of installation shall conform to best standards and practice. Where required by local or other By-Laws and Regulations, tradesmen shall be licensed in their trade.

1.6 TEMPORARY & TRIAL USAGE

.1 Temporary or trial usage of any equipment or materials shall not be construed as evidence of acceptance of same and no claim for damage shall be made for injury to or breaking of any part of such work which may be so used..

1.7 BY-LAWS & REGULATIONS

.1 Work shall conform with latest rules, regulations and definitions of Canadian Electrical Code and applicable Municipal and Provincial Codes and Regulations, and with requirements of other authorities having jurisdiction in the area where work is to be performed. Minor changes required by an authority having jurisdiction shall be carried out without change to the Contract amount. Standards established by drawings and specifications shall not be reduced by applicable codes or regulations.

1.8 PERMITS & FEES

.1 File Contract Drawings with proper authorities and obtain their approval of installation and permits for same before proceeding with work. Prepare and submit necessary detailed shop drawings as required by Authorities.

.2 Pay all fees in connection with examination of drawings, permits, inspections and final certificate of approval.

.3 All ESA Costs shall be included in the Electrical Contractor’s Base Tender Price.

1.9 CERTIFICATES

.1 Furnish necessary certificates as evidence that work installed conforms with laws and

regulations of authorities having jurisdiction.

1.10 GUARANTEE - WARRANTY

.1 All material and labour provided as a part of the project shall be warrantied for a period of twelve (12) months starting from the Date of Substantial Completion for the Project.

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 make 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 changes to the Manufacturer of any materials/labour after execution of the Project Contract is not permitted.

1.13 INTERFERENCE DRAWINGS

.1 Prepare and submit complete interference drawings (in PDF format) to avoid and/or resolve conflict of trades and to coordinate the work of the Electrical Division with that of all other Trades. Submission of interference drawings shall be done no later than 20 business days after the Project has officially begun. The cost of producing the interference drawings shall be included for in the Base Tender Price.

.2 Interference drawings shall indicate exact arrangements, of all areas and equipment to scale with dimensions.

.3 Cooperate with work of the Mechanical Contractor and provide data requested and as required in the preparation of interference drawings for the work of The Mechanical Contractor.

.4 Make interference drawings in conjunction with all parties and trades concerned showing sleeves and openings and passage of electrical work through building structure. Drawings shall also show inserts, special hangers and other features to indicate routing through confined spaces, installation of equipment in such areas.

.5 Provide detail drawings, fully dimensioned, of equipment in Boiler and Mechanical Equipment Rooms, Electrical Rooms, Fan Rooms, etc. Base equipment drawings on approved Shop Drawings and include, but do not necessarily limit to, details pertaining to access, clearances, sleeves, connections, etc.

.6 Provide detail drawings of pulling pits, equipment bases, anchors, floor and roof curbs, etc., pertaining to Electrical work.

1.14 SHOP DRAWING MATERIAL & LISTS

.1 Prepare and submit shop drawings and lists of materials for review in accordance with Architectural Sections. Make submittals of more than two pages in booklet form. Individual and loose drawings will not be accepted for review.

.2 Prior to equipment fabrication, delivery or installation, submit complete lists of materials proposed, indicating manufacturer, catalogue numbers and complete performance data.

.3 Review of Shop Drawings by Consultant is for sole purpose of ascertaining conformance with general design concept. This review shall not mean that Architect and/or Engineer approves detail design inherent in Shop Drawings, responsibility for which shall remain with Contractor and such review shall not relieve Contractor of his responsibility for meeting all requirements of Contract Documents. Contractor is responsible for dimensions to be confirmed and correlated at site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of work with all trades.

.4 Shop drawings transmitted via facsimile (fax) machines, or copies of same, will not be accepted for review.

1.15 RECORD DOCUMENTS

.1 Conform to General Requirements. Maintain at least two (2) sets of documents and clearly mark in RED on same as job progresses, changes and deviations from work shown so that on completion Owner will have records of exact location of ducts and equipment and record of material and equipment changes.

.2 Record all homerun conduits, junction boxes for complete lighting, power and systems on As-Built Drawings.

.3 Contractor shall obtain clean set of prints from Consultant at start of Contract Work and shall keep these prints up-to-date at jobsite, accurately recording all changes made on project and locating all services, equipment, etc. which may have been shown only diagrammatically on Contract Documents.

.4 Contractor shall ensure that as-built information is accurately recorded and shall check same. As-Built drawings shall be reviewed with Consultant at each jobsite meeting.

.5 Upon completion of Contract Work, prior to Substantial Performance inspection and after final review with Consultants, Contractor shall neatly transfer recorded information and make final As-Built submission to Consultant in the following form:

- One (1) set of clean, legible prints.
- Updated AutoCad 2004 drawings. The cost of transferring all redline markups from the PDFs to the CAD files is the responsibility and cost of the Contractor.

.6 Consultants shall be responsible for reviewing As-Built information provided by Contractor. Revise drawings to suit any comments until acceptable for submission to the Owner.

.7 The Contractor is responsible for incorporating all information from Project Addenda, Contemplated Changes Notices, Site Instructions, Change Directives and as-found existing conditions into CAD format at no extra cost to the Contract.

1.16 JOB SITE WORK SHOP AND STORAGE

.1 Supply job site office, workshop, tools, scaffolds and material storage as required to complete the work of this Division. Location of temporary buildings, use of space on site or within building shall be to later direction.

1.17 PROTECTION

.1 Securely plug or cap open ends of electrical raceways or equipment to prevent entry of dirt, dust, debris, water, snow or ice. Clean all equipment inside and outside before testing.

.2 Equipment stored on site shall be protected from weather and kept dry and clean at all times. Take care to avoid corrosion of metal parts.

.3 Protect work installed from damage. Secure all unfinished or loose work to prevent movement.

1.18 INSTRUCTIONS TO OPERATOR

.1 Instruct Building Operators in repair, maintenance and operation of Electrical Systems and associated equipment.

.2 Supply three (3) full Operation and Maintenance Instructions each in stiff cover, three-ring binder suitably indexed, separated and labeled. Operate each item of equipment in presence of Operators to ensure understanding of working parts and function of each item of equipment.

.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, HWDSB 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.

28. Run all raceways/wiring concealed above drop ceilings. Where there is an accessible drop ceiling, raceways shall be run in the accessible drop ceiling.

1.25 CLOSEOUT DOCUMENTS

.1 Coordinate with the General Contractor to submit a comprehensive Closeout Document Package incorporating documents from all trades in one consolidated package. Closeout Documents shall consist of one (1) 3-ring binder hard copy and 3 USBs/CDs. The Electrical Section of the Closeout Documents shall consist of the following:

(a) Electrical Contractor Warranty Letter, signed and dated. Warranty shall be for a period of twelve (12) months starting on the Date of Substantial Completion, except for the Fire Alarm System which shall be for a period of eighteen (18) months starting on the Date of Substantial Completion
(b) Project Shop Drawings, in consecutive order of the Consultant's number scheme.
(c) O&M Manuals for all equipment supplied on the project.
(d) ESA Inspection & 'Final' Certificates.
(e) Red-Line As-Builts (by the Electrical Contractor) and CAD As-Builts (completed by the Electrical Contractor).
(f) Short Circuit Calculation, Coordination and Arc Flash Study Report, Test Report for the new Panel and Thermal Graphic Scan.

1.26 TRAINING & DEMONSTRATION

.1 At the completion of the project, provide a complete training and walkthrough of all new and/or replaced electrical systems provided as part of the project. Participants of the training and walkthrough will be established by the Owner. Responsibilities including the following:

(a) Demonstrate to the appointed Staff the intent of all new devices, equipment and system and how to operate them and maintain them in accordance with the Manufacturer's Requirements.
(b) Provide end-to-end training on how to use the new devices, equipment and systems installed for the School's day-to-day operations.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Conform to Section 26 05 00 Common Work Results for Electrical.

1.2 MATERIALS

.1 Materials shall be new, of Canadian manufacture where available, first quality and uniform throughout. Submit tender based on the use of materials and equipment specified, or on the listed acceptable alternate equipment as further detailed.

.2 Electrical materials shall be C.S.A. approved and be so labeled. Material not C.S.A. approved shall receive acceptance for installation by Electrical Safety Authority (ESA) Special Inspections Branch before delivery, and modifications and charges required for such acceptance shall be included in work of this Section. Material shall not be installed or connected to the source of electrical power until approval is obtained.

.3 Confirm capacity, ratings and characteristics of equipment items being provided to supply power to equipment provided under other Sections of the work. Resolve discrepancies before such items are purchased.

1.3 MATERIAL ACCEPTANCE

.1 Acceptance of materials installed presumes that materials have not been damaged or exposed to conditions that would adversely affect performance and life expectancy.

.2 If in the opinion of the Consultant, materials have sustained damage, or have been exposed to abnormal conditions it shall be the responsibility of the Contractor to have such tests performed as deemed necessary by the Consultant to establish condition and therefore, acceptability of installed materials.

PART 2 - PRODUCTS

2.1 RACEWAYS

.1 Rigid galvanized steel conduit shall comply with CSA Specification C22.2 No. 45.

.2 Electrical metallic tubing (EMT) may be used in place of rigid conduit in dry locations subject to governing regulations, embedded in masonry walls, and concealed above suspended ceilings. Connectors shall be of gland watertight EMT type with factory-installed insulated throats and provide compression type EMT couplings (cast fittings/set-screws are not acceptable) to be forged steel.

.3 Rigid PVC conduit shall comply with CSA Specification C22.2 No. 136.

.4 Watertight flexible conduit: "Sealtite" PVC jacketed flexible steel with Hubbell-Kellum strain relief grips; shall comply with CSA Standard C22.2 No. 56.

.5 Surface wall-mounted raceways shall be Wiremold No. 4000 metallic type complete with two channels and all necessary fittings, closers, device modules, etc. Wiremold or approved equal only.

2.2 WIRE & CABLE

.1 Branch wire and cable shall comprise copper conductors, sized as noted, rated 75 deg. C., 600 volt minimum flame retardant insulation, and CSA approved for application.

.2 Wire and cable installed in conduit shall be PVC insulated Type TWH - Flame retardant and comply with CSA Specification C22.2 No. 75.

.3 Use Electrovert "Z-Type" code markers for control & communication conductors.

4. All branch wiring shall be RW90.

5 All feeder cables shall be XLPE RW90.

6. All underground feeders and branch circuits run from and to outdoor environment shall be XLPE RWU90.

2.3 DEVICES

.1 Wiring devices unless otherwise specified herein, or noted, shall be as manufactured by Hubbell, Leviton or Pass & Seymour.

.2 Light Switches for shall be of low-voltage type as scheduled on the Drawings.

.3 Occupancy sensors shall be of low-voltage type as scheduled on the Drawings.

.4 Key-operated switches shall be of low-voltage type as scheduled on the Drawings.

.5 Standard 15 Ampere, 120 volt duplex receptacles generally shall be specification grade Hubbell, 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 - 450 mm

Television Outlets - 400 mm
Data/Telephone Outlets - 400 mm
Manual Fire Alarm Stations – 1,150 mm
Panelboards – 2,000 mm to top of trim for standard panels.
Clocks - 2000 mm or 300 mm below ceiling (except where mounted in a Control Panel).
Thermostats – 1,200 mm
Fire Alarm Audible Temporal Pattern Horn/Strobes – As per CAN/ULC-S524.

3.3 HOLES & DRILLING

.1 Pneumatic hammers and percussion drills are prohibited.

.2 Where not sleeved, make holes through concrete walls and floors by core-drill only. Obtain Architect's approval before drilling.

.3 Seal holes and sleeves through floors to serve as water dam.

3.4 CUTTING & PATCHING

.1 Layout and install work in advance of other Sections for all new work. Bear all costs resulting from failing to comply with this requirement.

.2 Pay for cutting and patching and making good as required for work of this Division by reason of faulty or late work. Employ appropriate trades already engaged on the site to perform such cutting, patching and making good existing walls, floor, ceiling, etc. Before commencing, obtain Architect's approval for extent and nature of cutting. Make

good, disturbed surfaces to the Architect's approval.

3.5 EXCAVATION & BACKFILL

.1 Provide necessary excavating and backfilling inside and outside building required for work of this Division, performed as specified under another Division of the work, except as modified below.

.2 Keep excavations free from water, pump as necessary.

.3 Excavation for underground services shall be to required depths and dimension and shall be prepared as required, so that no portion of any conduit, bears directly against any rock or other hard surface.

.4 Remove and dispose of all surplus excavated material.

.5 Backfill promptly after approval of work. Prevent damage to or displacement of walls, piping, conduits, waterproofing and other work.

.6 For direct buried conduit and cable in all soil conditions excavate to 150 mm (6") below and a minimum of 200 mm (8") to either side of the cable run. Fill back with a bedding

of sand.

.7 Backfill trenches within building, with clean sharp sand in individual layers of maximum 150 mm (6") thickness, compacted to a density of 100% Standard Proctor. Hand compact the first layers up to a compacted level of minimum one foot. Hand or machine compact the balance up to grade, using approved equipment.

.8 Backfill trenches outside buildings with granular `A' gravel in layers not exceeding 150 mm (6") thickness, compacted to 100% Standard Proctor density up to grade level; manual compaction up to 450 mm (18") and mechanical compaction, using approved equipment, for the balance.

.9 Make good work where damaged by excavation and filling work of this Division. Repair any subsequent settlement of fill placed under this Division and pay all costs in replacement of other work damaged by such settlement and restoration.

3.6 CONCRETE WORK

.1 Provide concrete work where required for work of this Division in accordance with applicable requirements specified in Concrete Division 3.

.2 Provide concrete Lighting Standard Bases, required for the work of this Division. Refer to detail on drawings.

.3 Provide concrete Duct Banks required for the work of this Division. Refer to detail on drawing for typical construction details.

.4 Reinforced concrete duct banks shall be keyed into sides of foundation walls. Extend and connect reinforcing steel of duct banks to reinforcing steel of foundation wall construction to prevent failure at the junction of the pipe support and wall.

.5 Provide 100 mm (4”) high housekeeping pads for all floor mounted electrical equipment, such as switchboard, distribution panels and transformer, etc.

3.7 HANGERS & INSERTS

.1 Provide necessary hangers and inserts for work of this Division.

.2 Fasten to cast-in place concrete by suitable drilled or cast-in inserts.

.3 Fasten to structural steel using bolts or welded fasteners.

.4 Do not use wood, chain, wire lashings, strap or grappler bar hangers except where noted or detailed.

.5 Support fixtures independently of ceiling suspension systems. Provide additional supports as required, which shall be fastened to building structure steel members, joists, beams, etc., but not metal pan or roof decking. Material for additional supports and their

installation shall comply with requirements of U.L.C. Refer to "List of Equipment and Materials" Vol. 2, and "Supplement" for application to rated assemblies.

.6 Support outlet and junction boxes independently of the conduits running to them where required by electrical code and where deemed necessary by the Architect, use steel angle brackets or steel rods to support outlets and fixtures, to the building structure.

.7 Drilled fastenings to concrete shall be self-drilling concrete anchors, Phillips 'Red-Head' or approved equal. The maximum weight per fastening shall not exceed 25% of manufacturer's 'pull-out' load data.

.8 Surface mounted or stem suspended fixtures fastened to non-removable ceilings, 2 hr. fire rated ceiling assemblies, or mounted between metal suspension of exposed T-grid ceilings, shall be provided with minimum of two points of attachment for each 300 mm x 1200 mm (1' x 4') luminaire, using metal `channel-bar' fastened to building structure. Attach luminaires to `channel-bar' by means of threaded steel rods. Channel-bar shall be adequately supported and of a construction to prevent deflection under load, as selected from manufacturer's published data, and to Architect's approval. `Channel-bar' shall be Unistrut, Burndy, Flexibar, Cantrough or Canadian Strut Products or approved equal.

.9 Use support clips (e.g. Caddy Type IDS) for suspension of fixtures attached to exposed T-grid ceilings. Clips shall be supported directly from building structure and not from suspended ceiling system.

.10 Provide recessed fluorescent fixtures with support frames, and plastering frames where applicable.

.11 Chain where permitted and specified for the installation of fluorescent lighting fixtures shall be No. 4, 2 mm (.080") Tenso Pattern coil steel chain, plated with a strength of 82 kg (180 lbs.) as manufactured by Dominion Chain Co. Ltd. or approved equal. Where 'S' hooks are used with chain, they shall be No. 6 type with open strength of 82 kg (180 lbs.) minimum. Attachment of chain at both ends of support shall develop full strength of chain.

.12 Support outlet boxes, junction boxes, conduit and the like, mounted on exposed steel deck roofing by means of self-tapping minimum #10 gauge screws, secured through bottom member of deck corrugation. Do not pierce top of steel deck.

3.8 PAINTING

.1 Hangers, support framing and all equipment fabricated from ferrous metals which are not protected with zinc or other suitable corrosion-resistant finish shall have at least one coat of a corrosion-resistant paint applied before shipment or immediately on arrival at the site.

.2 After installation, touch up all scratches, chips, other damage and defects in paint, using zinc chromate primer or paint or special enamels as necessary to match the original.

.3 Finish and colour of all equipment shall be coordinated to provide uniform appearance.

.4 Painting of conduits and supports and other exposed surface work will be done under Painting Section except as noted. Install materials in time to be painted together with mounting surfaces.

.5 Do not paint over nameplates.

.6 Refer to other Sections for special paint finishes of equipment.

3.9 NAMEPLATES & SCHEDULES

.1 Identify electrical equipment supplied under this Division with 3 mm thick black laminated plastic nameplate to indicate equipment controlled to provide instruction or warning. Fasten each plate with two chrome plated screws. Lettering shall be 6 mm high for small devices such as control stations and at least 13 mm high for all other equipment. Submit a list of proposed nameplates for approval before manufacture.

.2 Provide panelboards with typewritten schedules identifying outlets and equipment controlled by each branch circuit including existing panels being changed. Protect schedules with non-flammable clear plastic.

.3 Identify junction boxes, pull boxes, cover plates, conduits and the like, provided for future extension, indicating their function (e.g. power, fire alarm, communication).

.4 Verify room names and numbers prior to listing on nameplates and schedules.

3.10 BRANCH CIRCUIT WIRING & FEEDER CABLES

.1 Provide branch circuit wiring, conduits and feeders as required for Lighting, Power and Auxiliary Systems. Separate conduit systems shall be provided for feeder, lighting and power systems, for exit light system and auxiliary communication systems.

3.11 CONDUIT, RACEWAYS AND WIREWAYS

.1 Wire and cable shall be installed in conduit as follows:

Rigid galvanized steel conduit shall be used:
- .1 Where noted and required by regulations.
- .2 Where subject to mechanical damage.
- .3 For all exposed conduit work.

.2 Electrical metallic tubing (EMT) may be used in place of rigid conduit in dry locations subject to governing regulations, embedded in masonry walls, and concealed above suspended ceilings. Connectors shall be of gland watertight EMT type with factory-installed insulated throats and provide compression type EMT couplings (cast fittings/set-screws are not acceptable) to be forged steel.

.3 Use flexible metallic conduit for connections to chain suspended and recessed fixture drops, motors and similar equipment to prevent transmission of vibration. A code-gauge green grounding conductor shall be provided for all such connections. Use "Sealtite" conduit with Hubbell-Kellum Sealtite conduit strain relief grips for all such connections at motors.

.4 Fasten every conduit and cable to structure by means of approved conduit clamps or clips. Wire lashing is not acceptable.

.5 Conceal conduits and wiring except where noted. Run exposed conduits parallel to building lines and to other conduits. Provide every empty conduit with a pull rope (3 mm polypropylene rope) and identify to designate its function (Power, Telephone, Fire Alarm and the like).

.6 Where conduit is installed in concrete slabs, obtain general approval, prior to commencing the work, on both maximum dimension and cross-overs which may be used therein.

.7 Install conduits in such a manner as to conserve head room and interfere as little as possible with free use of space through which they pass. Obtain approval for routing of same. Keep conduits at least 150 mm clear high temperature work.

.8 Conduit installed at the roof level of exposed structures, shall be run tight to roof deck, above purlins and beams.

.9 Conduit and cables for electrical work in demountable type and drywall type partitions shall enter from above, from a junction box concealed in the ceiling above and shall comprise a flexible conduit connection.

.10 All branch wiring shall be provided with a separate code gauge supplementary grounding conductor run in each conduit or duct, terminating at ground block at panelboards.

.11 Run conduit exposed in mechanical equipment rooms, electrical rooms, fan rooms, and the like, and installed after mechanical and other equipment is completed. Install fixtures, outlets, starters, etc., to clear and to suit application.

.12 Wiring, boxes, conduit fittings, etc., in hazardous areas shall conform with Ontario Electrical Code, covering explosion-proof areas. Provide conduit seals where required by these regulations.

.13 Provide housekeeping curbs around exposed conduits feeding panels, disconnect switches, starters, etc. penetrating floors in front of walls.

3.12 WIRE & CABLE

.1 Wire and cable shall not be installed at temperatures below 20°C unless "minus 40" type is used. Wiring to heating equipment shall be rated 90°C minimum, the ampacity of which shall be limited to 75°C value.

.2 Conductors used for all auxiliary systems (e.g. Fire Alarm) shall be tagged and/or colour-coded, and where applicable shall agree with manufacturer`s wiring diagrams.

.3 Minimum wire size for power wiring shall be No. 12 AWG gauge unless specified otherwise. Minimum wire size for "Common" neutral conductors shall be No. 10 AWG. Control wiring shall be #14 AWG red insulation. Maximum voltage drop between furthest outlet of any circuit, when fully energized, and panel to which it is connected shall not exceed two percent except for electric heating circuits which shall not exceed one percent.

.4 Cables shall be terminated with moisture-proof connectors, clamped to sheet metal enclosure by a single non-ferrous locknut and grounding bushing.

.5 Sheaths of multi-conductor cables shall be grounded at both cable ends.

.6 Sheaths of single conductor cables shall be grounded at supply end only. Provide a Code Gauge Grounding Conductor with each feeder cable run.

.7 Number of wires indicated for lighting and power, motor and motor control, alarm, signal, communications, and auxiliary systems is intended to show general scheme only. The required number and types of wires shall be installed in accordance with equipment manufacturer's diagrams and requirements, and with requirements of the installation, except that specification standards shall not be reduced.

.8 Solderless connectors with nylon-jacketted "Vibration-proof" screw-on wire connectors ideal "Wing Nuts", rated 600 volts shall be used for joints in Branch Wiring.

.9 Use compression joints and terminals for all control wiring; and all conductors #4 AWG and larger. Mechanical connections are acceptable at panelboards and circuit breakers where these are part of factory-assembly.

.10 Wire or cables in feeders, sub-feeders and branch circuits shall be colour-coded in accordance with Ontario Electrical Safety Code. Each end of feeder terminations (e.g. in Switchboard, Panelboards, switches, splitters and the like) Code Phase A - Red, Phase B - Black, Phase C - Blue, Neutral - White.

.11 Use C.G.E. Vulkan X-Link insulated cables for circuits protected by ground fault circuit interrupters.

.12 Include in each conduit, tubing and raceway, a code gauge green supplementary grounding conductor which shall be connected to suitable ground bus in equipment.

.13 Armoured or sheathed cables may be used only for wiring within demountable and dry wall type partitions and if additionally specified or detailed; however it shall not be directly buried in or below concrete slabs.

3.13 OUTLET, JUNCTION & PULL BOXES

.1 Use suitable electrical boxes for terminations and junctions on conduit work. Install pull boxes where necessary to permit installation of conductors. Support pull boxes, outlet boxes, panels and other cabinets independently of conduit.

.2 Provide each light switch, wall receptacle and other device with an outlet box of suitable dimensions and a faceplate. Outlet boxes shall be adapted to their respective locations.

.3 "Thruwall" and "Utility" type boxes shall not be used.

.4 Electrical boxes and panels shall be CSA approved, code-gauge sheet metal, galvanized or with suitable protective treatment. Secure covers with screws or bolts.

.5 Outlet boxes shall not be installed "Back-to-Back" in walls; separate by a minimum of 150 mm.

.6 Use "Masonry Type" outlet boxes for flush installation in masonry walls as detailed on standard Detail Drawings attached hereto.) Standard sectional boxes, 1004, 1104 and the like, shall not be used).

.7 Install surface mounted devices, in cast conduit fittings, with threaded hubs and suitable stainless steel faceplates.

.8 Paint the full length of conduits (installed above accessible and inaccessible ceilings) and main pull and junction boxes (excluding obvious outlet boxes) as per the following colour scheme:

- Lighting	Yellow
- Lighting Controls	Orange
- Power	Blue
- Fire Alarm	Red
- Telephone/Data	Green
- Public Address, Sound and Clock System	Purple

All conduits shall be painted with minimum three (3) coats of paint along the full circumference of the conduit for a clean and consistent finish. Conduits shall be painted prior to installation.

.9 In addition, each box shall be identified with a system and service designator of logic reference to the service.

3.14 ACCESS DOORS & ACCESS MARKERS

.1 Supply access doors for installation under the work of other Divison where electrical equipment requiring maintenance or adjustment or inspection is located above ceilings, within walls or behind furring; except ceilings of lay-in removable panel type.

.2 Access doors shall be 12 gauge hinged metal Stelpro Ltd. or equal #722 flush type, minimum size 300 mm x 300 mm (12" x 12") "Reach-in" 300 mm x 600 mm (12" x 24") "Crawl-in", with prime coat finish, concealed hinges, screwdriver lock and plaster key. Access doors in finished masonry or drywall construction shall be #722 less plaster key. Access doors shall be #726 in acoustic tile ceilings; #704 in drywall ceiling and #726E in plaster ceilings.

.3 Access doors in fire rated ceiling assemblies, all fire rated walls, duct shaft or in corridor walls shall be UL, ULC or WHI listed 1-1/2 hour fire rated access doors equal to LeHage #L1010 or Acudor #150B with screwdriver lock.

.4 Where lay-in removable panel ceilings requiring hold-down clips are used, access doors are not required but panels shall be secured with accessible hold-down clips and marked with Buildemup #6 RH brass paper fasteners inserted through acoustic panel and bent over. paint heads with blue enamel before installation.

.5 Obtain approval for sizes and locations.

3.15 PANELBOARDS

.1 Provide handle locking devices on circuit breakers feeding Plumbing, Heating, Ventilating equipment and controls and all auxiliary systems, time switches, and other devices as noted. Paint handles white, to permanently identify location and function. Provide 30 spare handle locking devices for future use.

.2 Circuit numbers on drawings do not necessarily correspond to the numbers on the lighting panels. Circuits sharing a common neutral shall not be connected to the same main. Panel circuit breakers which are used directly for the switching of lighting fixtures shall be grouped in consecutive numbers commencing at breaker number one.

.3 Use "Panduit" lok-strap cable ties for panelboard branch wiring.

.4 Provide empty conduits from flush panelboards, and others as noted, terminating in accessible ceiling spaces, sized to accommodate spare and space breaker provisions. One 25 mm (1") conduit for each three spare breakers or spaces.

.5 Provide two (2) 1” empty conduits c/w pull strings to the floor below ceiling space.

3.16 ELECTRIC WORK FOR OTHER DIVISIONS

.1 Examine Architectural and Mechanical (Plumbing, Heating, Ventilating and Air Conditioning) plans and specifications to determine extent of electrical work in connection with these Divisions which is to be done under the work of the Electrical Division.

.2 In general, all loose motor starters and associated controls for mechanical equipment will be supplied under Division 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 & BONDING - GENERAL

.1 Ground and bond all electrical systems in accordance with provisions of the Ontario Electrical Code.

.2 Provide a grounding electrode in accordance with Section 10 of the Canadian Electrical Code.

.3 Install grounding conductors to permit the shortest and most direct path from equipment to ground. Install grounding conductors in rigid galvanized conduit with both conductor and conduit bonded at both ends. Provide bonding jumpers with approved clamps to maintain ground continuity of metallic raceway systems at all expansion joints.

.4 Ground connections to grounding conductors shall be accessible for inspection and made with approved solderless connectors bolted to the equipment of structure to be grounded. Clean contact surface prior to making connections to ensure proper metal to metal contact. Connections shall be of the type that grounds both conduit and conductor, and cap screws, bolts, nuts and washers shall be silicon bronze.

3.18 FIRESTOPPING & SEALING

.1 Make fire rated and/or watertight where applicable seals at sleeves and other opening through floors and walls where conduit/cable passing through. Sleeves to extend minimum 25mm (1 inch) from both ends of the opening.

.2 Provide firestopping protection of openings through floors and fire rated walls and ceiling assemblies. 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

1.1.1 Refer to Section 26 05 00, Common Work Results for Electrical.

1.2 SCOPE

1.2.1 Work includes, but not limited to:

1.2.1.1 Providing new Electrical Panels throughout the Project Site as per the Drawings.

1.2.1.2 Obtaining approvals from and cooperation with Authorities having Jurisdiction, before and commencing Work.

1.2.1.3 Preparation of all necessary Working Drawings for submission to Inspection Authorities.

1.3 INSPECTION & TESTING

1.3.1 Systems, equipment and all major items of material shall be tested to the satisfaction of the Consultant, and as required to establish compliance with plans and specifications, and with the requirements for the Authorities having jurisdiction.

1.3.2 Faulty and defective equipment shall be replaced with new materials. Conductors which are found to be shorted or grounded, or to have less than proper insulation resistance, shall be replaced with new conductors.

1.3.3 Tests shall include but are not limited to the following:

1.3.3.1 Test of power cables shall include megger tests to establish proper insulation resistance, and phase-to-ground resistance of cables.

1.3.3.2 Test of all adjustable electrical protective devices of switchgear to establish calibration and operation in accordance with Specifications and approved co-ordination curves.

1.3.3.3 Visual examination of switchgear to determine adherence to allowable manufacturing tolerance and compliance with manufacturer's recommended installation requirements.

1.3.3.4 Proper functioning of all systems.

1.3.3.5 Polarity tests - to establish proper polarity connections to all sockets and receptacles.

1.3.3.6 Calibration setting, and test-tripping, of all protective relays and devices, using "Primary-injection" equipment, in accordance with approved co-ordination schedule.

1.3.3.7 Test of all alarm devices and contacts.

1.3.3.8 Inspection after system is energized shall include infrared thermo graphic examination of

current carrying parts in switchgear, transformers, and at ducts. The Contractor shall cooperate with Inspection personnel, open all equipment enclosures to permit inspection, and make good defective conditions.

1.3.4 Testing Company

1.3.4.1 Retain the services of an independent testing company, to Consultant's approval to perform the above tests.

1.3.4.2 The testing company shall submit test results directly to the Consultant.

1.3.4.3 Include copies of tests in Maintenance and Operating Manual.

1.3.5 Certification of Tests

1.3.5.1 When work is complete, submit three (3) copies of test results and a signed statement listing all tests that have been performed as required by Specifications and manufacturer's instructions.

PART 2 PRODUCTS

2.1 ELECTRICAL PANELS:

2.1.1 Panelboards as scheduled, shall comprise "Branch" panelboards, with fixed bolted connection thermal-magnetic, quick-make, quick-break, 40oC, calibrated ULC rated `SWD' switching duty, molded-case circuit breaker branches. "Plug-in" breakers are not acceptable. Multipole breakers shall be common trip type.

2.1.2 Panelboards shall include the following features:

.1 Flush or surface trim as noted.
.2 Concealed hinges and lockable door.
.3 Combination catch and lock semi flush tumbler type - all keyed alike.
.4 Adjustable self-positioning trims.
.5 Plain trims not displaying any names or Symbols.
"Vault" type handles shall not be used except in unfinished areas.
.6 Typed schedules of circuits indicating equipment and area controlled on the backs of panel doors, in a steel trim pocket, covered with transparent non-inflammable plastic.
.7 Insulated neutral block.
.8 Supplementary ground block.
.9 Copper Bus.
.10 Isolated ground bar, as noted.
.11 Surge-suppression system, as noted.
.12 Sprinkler-proof

2.1.3 Power and Distribution type panelboards shall be breaker type, as scheduled on the drawings.

2.1.4 Unless noted otherwise, panelboards with main breakers or remote controlled switches shall be

provided with an indicating pilot lamp flush mounted in top of face trim which shall be connected to a 15 amp. circuit in the panelboard which shall be locked on and shall serve to indicate when the main breaker is in the closed position. Pilot lamp units shall be LED type or other approved types designed to provide maximum lamp life. Provide lamacoid nameplate to identify main breaker.

2.1.5 Panelboard shall be of circuit breaker type 120/208 Volt, 3 phase, 4 wire mains, minimum interrupting rating of 22,000A, RMS symmetrical at 208 Volt.

2.1.6 All panels shall be of code gauge steel with prime coat finish for painting. All locks on all panels shall be common to one key and shall also be common to the locks on the distribution panel. The Subcontractor shall be deliver three duplicate keys to the Owners. All panel hardware shall be chrome plated. All tubs shall be a minimum of 6" deep. Where panels are surface mounted they shall be sprinkler-proofed.

2.1.7 Acceptable Manufacturers are:

.1 Eaton (Cutler-Hammer)

or equivalent from:

.2 Schneider (Square `D')

.3 Siemens

PART 3 EXECUTION

3.1 ELECTRICAL PANELBOARDS

3.1.1 Provide complete electrical service as shown on the drawings and as further described here.

3.1.2 Grounding service, equipment, feeders, and the like shall be performed in accordance with Electrical Safety Regulations.

3.1.3 Submit shop drawings of all panelboards prior to ordering.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

1.2 STANDARDS

1.2.1 ANSI/IEEE Standard 242 Recommended practice for protection and coordination of commercial power system most current edition.

1.2.2 ANSI/IEEE Standard 399 Recommended practice for power system analysis most current Edition.

1.2.3 NETA STANDARD ATS 2005: Electrical Acceptance Testing Specification for electrical power equipment and distribution system most current Edition.

1.2.4 NFPA 70-E Standard for Electrical Safety in the Work Place most current Edition.

1.2.5 IEEE STD- 1584 Guide for performing Shock and Arc Flash Hazard Calculations most current Edition.

1.2.6 Canadian Electrical Code most current Edition.

1.2.7 Ontario Electrical Safety Code most current Edition.

1.2.8 CSA Z462 Electrical Safety in the Work Place (Draft).

1.3 SCOPE OF WORK

1.3.1 The Short Circuit; Protection and Coordination and Shock & Arc Flash Studies shall be completed for all distribution system modes of operation;

1.3.2 Normal power distribution operating mode;

1.3.3 The studies need to take into account how the about power distribution system modes of operation interrelate to each other in completion of the studies and recommendations provided with the studies.

1.3.4 The following minimum Utility Design Fault Levels shall be used in completion of the studies:

1.3.5 13,800 volts the minimum Design Fault Level to be used is 500 MVA.

1.3.6 27,600 volts the minimum Design Fault Level to be used is 835 MVA.

1.3.7 The Professional Engineer, licensed to practice in the Province of Ontario, completing the studies shall confirm the noted Design Fault Levels with the Local Power Utility. The above is the minimum that shall be used in the completion of the studies.

1.3.8 The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA 70E – 2004 annex D

1.3.9 The power system(s) short circuit; protection and coordination; shock and arc flash studies shall be completed by a Professional Engineer, licensed to practice in the Province of Ontario, specializing in this field. All information required to complete these studies shall be obtained through formal requests to related Trade(s) such as the Local Power Utility and manufacturers supplying the equipment.

1.3.10 Once the required Short Circuit; Protection and Coordination and Shock & Arc Flash Studies have been completed and submitted for review by the Consultant and all clarification have been provided and the reviewed studies have been acknowledged by the Consultant. The recommendations shall be implemented by the Contractor and a letter confirming that the implementations of the recommendations have been completed shall be submitted by the Contractor to the Consultant.

1.3.11 Arc Flash Study shall be focused on achieving incident energy level "Category 2" in the main electrical room; sub electrical rooms; and other associated electrical spaces.

1.3.12 No exceptions shall be permitted with respect to these required studies.

1.3.13 The Study shall be completed by Enkompass Power and Energy Corporation or Brosz Technical Services.

1.4 DESCRIPTION OF WORK

1.4.1 The Contractor shall provide all studies as required by code and as outlined within this Specification section. The studies shall cover all electrical distribution systems and all of the various modes of operation of the electrical distribution systems.

1.4.2 The Study shall be a fully comprehensive study including the following:
- .1 All Utility Equipment upstream of the Main Service.
- .2 The Main Service Equipment (including the main switchboard/main distribution panel and switch).
- .3 All new panelboards, transformers, motor loads and mechanical equipment throughout the Renovated Areas.

1.4.3 No electrical distribution equipment Shop Drawings for any of the electrical distribution systems shall be reviewed by the Consultant prior to the required studies being submitted and the review process with respect to the studies being completed. Should the Contractor order any or all of the electrical distribution equipment they do so at their own risk. Should changes be required to be made to any or all of the distribution equipment the Contractor will cover all costs.

1.4.4 It is important that all requests to related trades such as mechanical, equipment supplier is completed and information obtained in less than ten (10) working days of commencing of contract.

1.4.5 No assumption shall be made where it is possible to obtain the information from the manufacturer and equipment suppliers regarding impedances, protective device time current curves and cable lengths, type and size from the Contractor.

1.4.6 The Contractor will need to provide following information to the Consultant completing the studies:

1.4.6.1 Preliminary types and cable lengths.

1.4.6.2 All of the required equipment data from the electrical equipment vendor(s);

1.4.6.3 All of the required equipment data from the generator vendor(s);

1.4.6.4 All of the required equipment data from the UPS vendor(s);

1.4.6.5 All of the required equipment data from the transformer (power and distribution transformers) vendor(s);

1.4.6.6 All protective device co-ordination curves;

1.4.6.7 All protective device ground fault curves;

1.4.6.8 All damage curves for equipment and cables;

1.4.6.9 All required electrical data for elevators;

1.4.6.10 All required electrical data for mechanical equipment; and

1.4.6.11 Other data as required and requested by the Professional Engineer completing the studies.

1.4.7 The " input data revised or modified " for performing studies will be required to be updated and resubmitted to the Consultant once the Contractor has finalized all of his actual electrical types and feeder lengths.

1.4.8 These studies of high important and shall be completed and submitted within 20 - 25 working days after the letter of intent has been issued to the Contractor.

1.5 SYSTEM PROTECTION AND CO-ORDINATION

1.5.1 Retain one of the designated testing companies who specialize in this type of Work to prepare an equipment coordination study and schedule for all protective devices in the system in cooperation with suppliers of all pertinent switchgears; testing covered under cash allowance.

1.5.2 The firm of testing specialists shall be responsible for calculating short circuit kA rating, checking, adjusting, calibration and setting up of all protective devices in accordance with the values shown in the reviewed coordination study under this Contract.

1.5.3 Coordinate the relays, breakers and fuses to provide selective tripping or blowing. Coordinate the breakers, fuses, protective relaying and ground fault protection so that the breaker or fuse immediately ahead of a fault will trip or blow clearing the fault and leaving the system ahead of the tripped or blown protective device in the normal operating mode the study must also address the other distribution system modes of operation.

1.5.4 The curves shall be accompanied by the individual time current curves of each device to enable the verification of the ratings and settings used. These coordination curves shall be submitted for review and the various ratings and settings shall be made by the manufacturer's before the equipment is shipped. Review of these coordination curves will not eliminate the responsibility of the Contractor

to provide correct protection and coordination.

1.5.5 Co-ordination curves shall be plotted showing the following:

1.5.5.1 Plot utility relays or fuses protecting the incoming service. This information shall be obtained directly from the Local Utility;

1.5.5.2 Main and feeder protection devices at every voltage level;

1.5.5.3 Main and feeder protection devices ground fault curves at every voltage levels;

1.5.5.4 Protection devices associated with the largest motor or refrigeration compressor; and

1.5.5.5 Protection devices associated with the emergency power distribution system; UPS power distribution system and the Co-Generation power distribution system and showing all fault levels.

1.5.6 Each co-ordination time-current curve shall include:

1.5.6.1 A single line diagram for the portion of the system involved;

1.5.6.2 Transformer and cable damage curves where applicable;

1.5.6.3 Available fault current level on the portion of the system involved;

1.5.6.4 Ground fault curves; and

1.5.6.5 Generator fault and damage curves where applicable.

1.5.7 Protection and Coordination curves shall be submitted as part of a report outlining the protection and coordination procedures, final breaker and relay settings and fuse ratings for the entire power distribution system(s) and modes of operation. The report shall clearly list all the breakers with their tag and final settings even if there are identical systems on the Project. I.e. information about the same settings can be duplicated if applicable with breaker in different locations. This list will be checked and signed off by the Professional Engineer who prepared and completed the studies.

1.5.8 Co-ordinate with the electrical equipment vendors; mechanical equipment vendors and obtain the recommended settings on protection devices (re: breaker and overloads). Incorporate this information on the associated studies.

1.5.9 The goal of this portion of the study is to achieve selective protection and coordination of protective devices including ground fault and to reduce the incident energy levels to within “Category 2” where applicable.

1.6 SHOCK AND ARC FLASH HAZARDS

1.6.1 This portion of the study shall be prepared and completed by a Professional Engineer, licensed to practice in the Province of Ontario. The study shall be based on power distribution systems

diagrams and the various power distribution operating modes.

1.6.2 The Contractor shall obtain and provide all required information as required for the study to be completed.

1.6.3 The study and the report shall provide a full summary of the shock and arc flash hazard. The completion of the study shall with compliance with NFPA 70E and related standards and methods established in the industry.

1.6.4 The IEEE-1584 must be used for the calculation of the incident energy.

1.6.5 The study will ensure that worst case hazards are identified. This means that arc flash energy is calculated at the maximum fault and to include overloads conditions where applicable.

1.6.6 The study shall cover all electrical distributed equipment and distribution systems operating modes and voltage levels within the facility and site as well as the main incoming service to the building(s) and site.

1.6.7 The study will identify the arc flash boundaries, and incident energy at suggested distance of working. Determination of system operating modes and conditions that can impact short circuit currents and arc flash hazard energy levels shall be identified well in advance and shall be conveyed to the Owner and Consultant for confirmation.

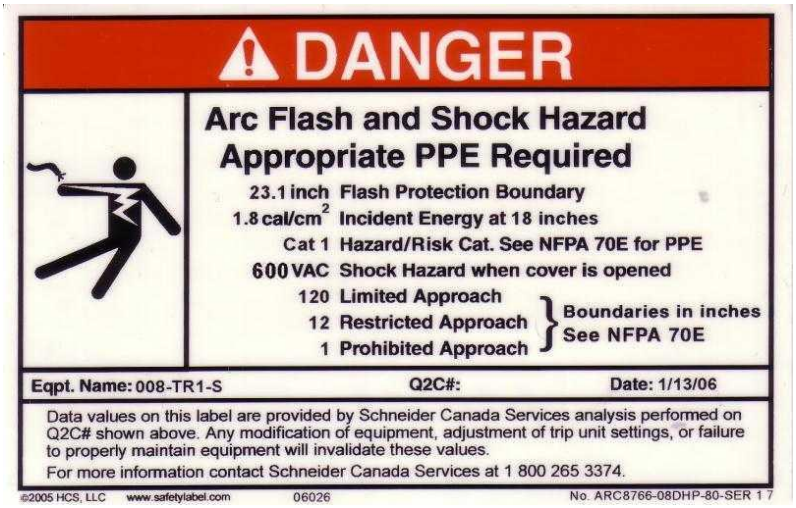
1.6.8 The study will clearly state any assumptions made for arc-fault currents. L-G ground fault and L-L-L. The worst case scenario(s) shall be reflected in the reported as minimum requirement.

1.6.9 Arc-flash labels shall be created and installed on each piece of electrical distribution equipment for all electrical distribution systems.

1.6.10 The labels shall be per ANSI Z535. The labels shall identify the hazard level and protective clothing required.

1.6.11 Safe working distances shall be based upon the calculated arc flash boundary considering incident energy of 1.2 Cal / cm2.

1.6.12 The label reflected below is an example of the required detail of what is to be on the label. A separate label shall be provided for each piece of the electrical distribution systems.



1.6.13 The shock and arc flash warning label shall have as a minimum the following information reflected on it:

1.6.13.1 Boundaries as per NFPA and CSA Z462 (Draft);

1.6.13.2 Flash Protection boundary;

1.6.13.3 Limited shock approach boundary;

1.6.13.4 Restricted shock approach boundary;

1.6.13.5 Prohibited shock approach boundary;

1.6.13.6 Personal protective equipment required to be employed and used with respect to each piece of electrical distribution equipment;

1.6.13.7 Incident Energy per IEEE 1584 recommended distance; and

1.6.13.8 Voltage value for Shock Hazard.

1.6.14 At least 24-hour training shall be provided to the staff employed at the facility to explain meaning of labels and protective equipment, and work permits for energized work. This is to ensure the implementation of the safety program that addresses the following as a minimum:

1.6.14.1 Ministry of Labour requirements;

1.6.14.2 Personal protective equipment;

1.6.14.3 Understanding of the shock and arc flash categories;

1.6.14.4 Electrical equipment labeling requirements;

1.6.14.5 Development of local Standard Operating Procedures (SOPs);

1.6.14.6 Lock out and tag out; and

1.6.14.7 Remote switching of equipment.

1.7 INSTALLATION

1.7.1 On completion of the calibration and testing, a full report shall be prepared by the testing specialists and submitted to the Consultant for review, comments and approval.

1.7.2 The report shall confirm that all protective devices have been adjusted and set in accordance with the protection and coordination study and that the protective systems provide the necessary degree of selective protection as well as selective ground fault protection.

1.7.3 The report shall include tabulation of settings and/or rating of all protective devices.

1.7.4 Each protective device shall be labelled with the proper setting for the device. Labels shall be installed or marked on the protective device behind glass windows. Fusible devices shall be labelled showing the size, type and current rating of the fuse element.

1.7.5 The firm conducting the protection and coordination study shall conduct on-site verification testing to ensure that all relays, breaker settings and fuse sizing has been set in accordance with the coordination study recommendations.

1.7.6 All shock and arc flash labels have been installed.

1.7.7 The Owner reserves the right to retain the services of an independent testing company to monitor, review and verify the results of the test report submitted by the Contractor.

1.7.8 Provide the services of electricians to assist in equipment tests performed by the independent testing companies appointed by the Owner, including thermo graphic (infrared) testing of bus bar joints and contacts of circuit breakers, etc. Remove cover plates, etc. to enable testing company to gain access to the equipment.

1.7.9 The Contractor shall be responsible to co-ordinate with equipment manufacturers to ensure that the equipment is furnished with protection as recommended in the co-ordination study.

1.7.10 Upon completion of the Project, after the commissioning stage has been completed and all commissioning deficiencies have been corrected and the Owner has acknowledged the commissioning is now complete. The Contractor shall conduct a complete thermo infrared scan of the entire electrical distribution systems. The timing of this scan shall be coordinated with the Owner.

1.7.11 The Short Circuit; protection and coordination; shock and arc flash studies shall be completed and the Consultants review process finalized in advance of any electrical equipment being manufactured, ordered and delivered to the Project.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED INSTRUCTIONS

.1 Refer to Section 26 05 00 Common Work Results for Electrical.

1.2 WORK INCLUDED

.1 Provide electrical lighting fixtures and systems scheduled, complete with drivers, mounting kits and necessary accessories required for their installation and performance.

.2 Obtain and review all information with regards to the proper installation of all lighting systems from the Manufacturer. No installation shall be completed without a thorough review of the Manufacturer's recommendations and guidelines for installation. All installations shall comply with these recommendations and guidelines as well as any other requirements mandated by Authorities having Jurisdiction and local governing codes.

1.3 DRIVER CONDITIONING

.1 All LED fixtures shall remain energized for a stabilizing period as recommended by the Manufacturer.

1.4 SHOP DRAWINGS

.1 Conform to requirements of Section 26 05 00 Common Work Results for Electrical.

.2 Submit for review an electronic submission of shop drawings containing illustrations of each fixture. Illustrations to be complete showing dimensions light distribution and mounting requirements. Illustrations to be noted to indicate special features and finishes. A copy is to be retained by the Contractor on the site, to ensure co-ordination of installation requirements.

.3 LED fixture shop drawings must indicate Driver Manufacturer and Model No. for each fixture.

.4 No light fixtures shall be ordered without the review and written approval of the Electrical Engineer. Shop drawings should indicate proposed mounting method and hardware required to facilitate a complete and safe installation.

PART 2 - PRODUCTS

2.1 REFERENCE NUMBERS

.1 Catalogue reference numbers given for individual fixture types are intended as a guide when read with the description and the fixture as finally applied. Verify catalogue references with description and coordinated with installation conditions, with particular regard to ceiling construction details, type and finish before ordering fixtures.

2.2 LENSES

.1 Plastic lenses in lighting fixtures shall be acrylic with minimum thickness of 3 mm (0.125 inches) and, providing flame spread and smoke density ratings, complying with applicable Federal and Provincial Codes; Ontario Fire Marshal's Fire Safety Design Standard; and the Ontario Building Code. Paragraph 3.1.13.1 (1).

.2 Removable components of fixtures (louvres, lenses, wire guards, and the like) to be limited to maximum 1220 mm (48") in length.

2.3 FIXTURE SCHEDULE

Refer to Drawings for Specifications.

2.4 LIGHTING HARDWARE

.1 The Contractor must supply and install all light fixtures as per the Manufacturer’s recommendations as well as to the satisfaction of all Authorities having Jurisdiction, Code requirements, the Architect, and the Electrical Engineer.

.2 Include, in the tender price, for all lighting hardware required for a complete and safe installation.

.3 Lighting hardware includes, but isn’t limited to, the mounting hardware required for each fixture. The Contractor is responsible for reviewing architectural finishes in all areas and providing lighting and mounting hardware to suit.

.4 All parts used as a part of the installation must be of the same manufacturer as the respective light fixture. Wherever available, all parts must be unique to the respective fixture and purchased with the light fixture from the same supplier and manufacturer.

2.5 PHOTOMETRIC

.1 The Electrical Contractor is responsible for obtaining a complete photometric of the entire area of lighting installation prepared by a professional, third-party specializing in such work. All fixtures of all types shall be depicted on one layout. Refer to Architectural drawings for ceiling heights. Submit a copy of the interior and exterior photometric with the shop drawing submittal for the light fixtures. The Electrical Contractor in conjunction with the Manufacturer remains responsible for the accuracy of the photometric results and acceptance of fixtures based on this.

.2 Photometric statistics shall be prepared for each zone/room. Statistics such as max/min and average footcandle readings shall be included in the photometric submittal.

.3 Photometric shall take into account site condition impacts such as partitions, washroom stall partitions, suspended ceilings, reflectances, etc.

2.6 APPROVED EQUAL PRODCUTS

.1 The Contractor is permitted to provide alternate products to the base product specified as long as the alternate fixture is equal or superior to the base bid product in all specifications. The Contractor remains responsible for ensuring compliance of the alternate product to the base specifications outlined above.

.2 All alternate fixtures must be reviewed and approved in writing by the Electrical Engineer or Owner **during pricing**. No substitutions will be permitted to the base product upon award of the Contract.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Support all fixtures 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 COMPLETION

.1 Fixtures shall be clean at the time of final acceptance.

END OF SECTION