**Health Canada | Santé Canada**

**1000253100**

# LCDC BUILDING BLOCK 4

# PERIMETER HEATING REPLACEMENT

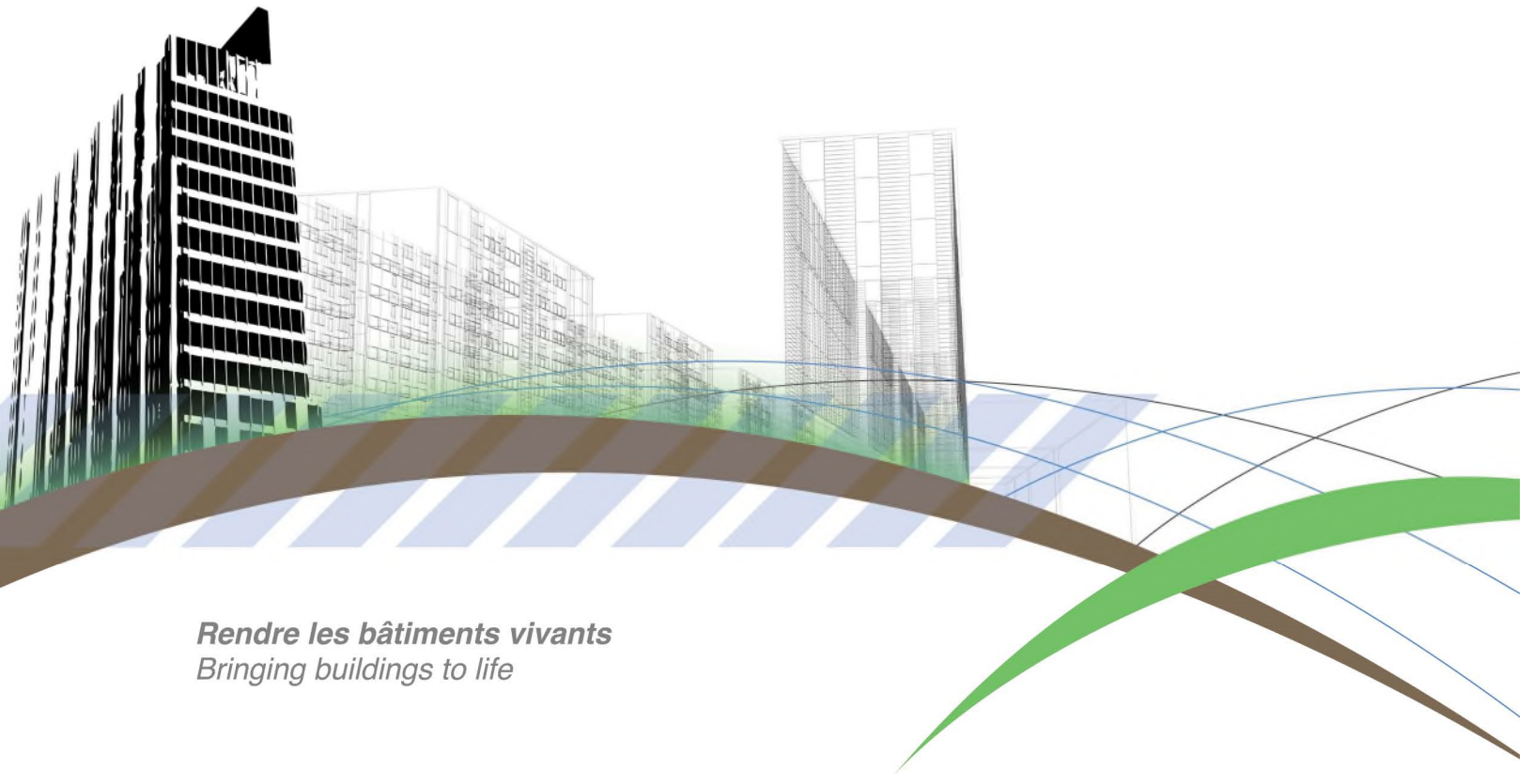
# BÂTIMENT LCDC BLOC 4

# REMPLACEMENT DU CHAUFFAGE PÉRIMÉTRIQUE

**100 Eglantine Driveway, Ottawa, Ontario.**

Issued for Tender

October 27, 2023



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*Bringing buildings to life*

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## 100 Eglantine Driveway, Ottawa, Ontario.

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**MECHANICAL**

PREPARED BY:


2023-10-26

**Ryan Chartrand, P.Eng.**

**2023-10-27**

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## PART 1 GENERAL SPECIFICATIONS

### 1.1 RELATED SECTIONS

.1 Division 01 – General Requirements (architectural specifications), if applicable.

### 1.2 REFERENCES

.1 Applicable Codes (publications in effect – latest and most stringent)

- .1 National Building Code of Canada.
- .2 Ontario Fire Code.
- .3 National Plumbing Code of Canada.
- .4 Canada Labour Code.

### 1.3 APPLICABLE ITEMS

.1 The following items found in this section are applicable:

- .1 Items related to general requirements.
- .2 Items related to mechanical requirements.
- .3 Items related to electrical requirements.

### 1.4 MECHANICAL GENERAL SPECIFICATIONS

.1 Specification analysis, drawings, and site visits.

- .1 The general contractor and sub-contractors must complete one mandatory visit arranged by the HC Project Manager during the tender phase. No additional costs will be granted due to the general contractor and sub-contractors omitting equipment. In case of errors or omissions, the general contractor and sub-contractors will have the responsibility, during the examination of the documents for tender, to notify the representatives responsible to request appropriate clarifications and/or necessary corrections.
- .2 Dimensions cannot be taken directly from drawings, unless specifically indicated.
- .3 If needed, consult the engineering firm prior to the execution of unclear work. If unclear work is executed, the engineering firm reserves the right to order the work to be redone at the Contractor’s expense.
- .4 All addenda are an integral part of the tender documents.

.2 Normalization, codes, security, and permits.

- .1 All the work relating to the drawings and specifications shall be completed according to the last editions of codes and pertinent rules established by the municipal, provincial, and federal commissions. All work shall respect trade standards for installation and disposal.
- .2 The general contractor and sub-contractors will need to obtain, at their own expense, all permits required to complete the work and in accordance with regulating codes and laws.

.3 The general contractor and sub-contractors shall ensure that all work executed on the project will correspond to the latest editions and bulletins of the revisions of laws, codes, and rules, following:

.1 Occupational health and safety legislation.

.2 Regulations respecting industrial and commercial establishments.

.3 Safety codes for the construction industry.

.4 The general contractor and sub-contractors shall also ensure that all workers possess the required qualifications for the realization of the work.

.5 The general contractor and sub-contractors shall have a copy of all construction documents, signed, and sealed onsite for the duration of the work.

.3 Existing equipment to be retained

.1 All existing equipment to be retained must be visually inspected and tested. The general contractor as well as the sub-contractors must ensure that all existing equipment is in perfect condition and in working order. From this acceptance, the Contractors becomes responsible for the existing equipment to be retained. In case of damage, the contractors are responsible for repairing or replacing the equipment to the satisfaction of the HC Project Manager.

.2 All costs related to the replacement of the equipment after the Contractor has taken possession will the responsibility of the Contractor.

.4 Delivery, Storage and Manipulation

.1 Immediately after signing the contract, verify the requirements for the delivery and anticipate any delays. Notify the HC Project Manager and consultant of any delays, allowing measures to be taken to either substitute the product or to proceed with corrective actions at an early stage to prevent delays.

.2 If the HC Project Manager and the consultant is not advised of any delays at the onset of the work, and if the work appears to be delayed, the consultant has the right to substitute the anticipated product for an equivalent that can be delivered faster, without increasing the price of the contract.

.3 Handle and store to avoid any damage or alteration of the products, while following the manufacturer's instructions.

.4 Store in their original packaging any bundled or grouped products, leave the packaging label and the manufacturer's seal intact. Do not open or untie any products prior to installation.

.5 Products likely to be damaged by the weather shall be contained under a weatherproof enclosure.

.6 Without any additional charges, replace the damaged products to the satisfaction of the HC Project Manager and consultant.

.5 Transportation

.1 The general contractor and sub-contractors will be responsible for all costs related to the transportation, storage, and manipulation of all necessary equipment to execute his work.

.6 Submittals

.1 Shop Drawings

.1 As soon as possible, after the contract is signed, the general contractor and sub-contractors must submit shop drawings for approval of all equipment to be installed, as well as the list of materials that he proposes to use including the manufacturers names and catalogue numbers.

.2 The shop drawings must be identified equipment using the naming provided by the shop drawings and/or specifications.

.3 Shop drawings must be supplied in batches by discipline, such as:

.1 Division 23 – HVAC

.4 If more than one product is on the same shop drawing, the submitting contractor must clearly identify which equipment is proposed.

.5 The submitting contractor can submit the shop drawings as follows:

.1 PDF format.

.6 Shop drawings will be automatically refused if:

.1 They are not identified following the naming specified on the drawings.

.2 They are unclear or unreadable.

.3 Equipment is not identified on each drawing.

.4 Drawings are not submitted in batches.

.7 Materials

.1 All the materials used for this project shall be new, of a superior quality and approved by the Canadian Standards Association (CSA).

.8 Coordination

.1 The general contractor will be responsible for the coordination of all the work and will be responsible for the coordination between himself, the subcontractors, and all other related subcontractors. Related costs due to the lack of coordination will be absorbed 100% by the General Contractor.

.2 The General Contractor will be responsible of coordinating with the subcontractors and the HC Project Manager for all power shutdowns and any other shutdowns required.

.3 Shutdowns can take approximately 3 weeks from notice receipt by HC Project Manager.

.9 Interferences and Fabrication Drawings

.1 All equipment shall be installed using the least space possible to avoid interferences. The HC Project Manager and consultant shall approve all changes in the positioning of equipment to be installed.

.1 Submit for review in PDF format.

.2 The general contractor and sub-contractors shall prepare interference drawings (scale 1:50) on AutoCAD (sketches will not be accepted) complete

with all trade drawings to be reviewed and approved by HC Project Manager and the consultant.

.3 The drawings shall include, without limitations: the required pads, sleeves, and openings. In addition, the drawings shall clearly show all new and existing equipment (above the ceiling), fire protection piping, sprinklers, and accessories, plumbing piping and accessories, ductwork layouts, and cable trays as required to fully coordinate with all trades (fire protection, plumbing, electrical, general contractor) to avoid interferences.

.4 Include all existing installations in drawings.

.5 The mechanical drawings are schematic and do not present equipment connection details. Should costs be incurred to respect any clearance recommended by the manufacturer, the layout requires elbows, transitions, or general modifications within a 1500 mm radius of the proposed layout, associated costs will be carried by the contractor. The exact location of the piping must be coordinated by the General contractor and sub-contractors.

.6 All surface mounted equipment shall be meticulously coordinated and approved by the HC Project Manager and consultant and no surface mounted equipment installation is permitted without the written authorization of said HC Project Manager and consultant.

.10 Access Doors

.1 Access doors shall be supplied by the sub-contractor and installed by the General Contractor and shall have a fire rating (if required).

.2 Provide the following access doors (for each discipline):

.1 For all equipment behind gypsum walls or ceilings.

.2 Isolation valves.

.3 For all other auxiliary devices.

.3 The doors shall be made of galvanized steel with a thickness of 3 mm, installed with hidden stainless-steel hinges equipped with a self-closing system that can be opened using a screwdriver. The frame dimensions shall be 300 x 300 mm, minimum, and 600 x 600 mm, maximum, depending on the requirements. The frame shall be appropriate with the type of wall or ceiling construction. The General Contractor is responsible for determining the exact placement of the access doors.

.11 Hiding and Accessibility

.1 Unless otherwise specified or indicated, hide all pipework in partitions and walls, below floors or in suspended ceilings.

.2 All installations shall be aligned with the building orientation and axis.

.3 The installation of access doors or other approved devices is required to facilitate the access for maintenance and repairs of the hidden installations.

.12 Openings and Sleeves

.1 All openings shall be coordinated (dimensions and exact locations) between the General Contractor and subcontractors.

.2 The subcontractors shall be responsible for all openings in walls and floors of 200 mm (8") or less.

.3 The General Contractor shall be responsible for all openings in walls and floors of 225 mm (9") or more.

.4 All the required resurfacing will be executed by the General Contractor at his expense, new resurfacing to match existing.

.5 The General Contractor will be responsible of all X-rays required prior to making openings.

.6 The General Contractor is responsible to seek a work analysis from a Structural Engineer to prevent compromise of the integrity structural components prior to boring or cutting.

.7 The use of a jack hammer is prohibited.

.8 All openings in an existing building shall be coordinated by the General Contractor with the HC Project Manager and consultant beforehand (time and date).

.13 Vibration and Seismic Controls Devices

.1 The general contractor and sub-contractors shall be responsible for obtaining the services of an Engineer for the preparation of the documents necessary for the seismic installations. A compliance report, signed and sealed, will also be required after completion of the work, to be included in the operations and maintenance manual. The mechanical contractor shall be responsible for supplying and installing the seismic supports and anti-vibrating devices required for the installation of any mechanical equipment, according to documents prepared by the seismic Engineer.

.14 Inspection of Work

.1 The general contractor and sub-contractors shall be responsible for advising the HC Project Manager and consultant, in writing, 48 hours in advance before closing walls and ceilings to allow for inspection of the work executed.

.2 If the general contractor and sub-contractors proceeds with closing the walls and ceilings prior to the completion of the inspection, the HC Project Manager and consultant reserves the right to demand that the walls and ceilings be reopened at the General Contractor’s expenses.

.15 Tests and Adjustments

.1 At the end of the project, the general contractor and sub-contractors shall execute all testing and adjusting per drawings, specifications, and manufacturer's recommendations, to obtain maximum efficiency. If the results are not satisfactory, the HC Project Manager or consultant has the right to request assistance from the manufacturer and the general contractor and sub-contractors shall bear all additional costs. An inspection shall be conducted when all final adjustments have been done. The HC Project Manager and consultant shall analyze all reports submitted by the Contractors. If the figures do not correspond to the desired outcome, the Contractors shall redo necessary testing and adjusting until they obtain the prescribed results, per the drawings and specifications.

.16 As-Built Drawings

.1 The general contractor and sub-contractors shall have the responsibility to produce, at the end of the project, the as-built drawings for all new work.

.2 Each subcontractor shall need to mark with red pens all the modifications to the tender drawings on a paper copy. If he desires, the Contractor can obtain extra copies from the consultant in exchange for the cost of reproduction.

.3 Each subcontractor shall identify individual as-built drawings as "as-built" and include their address, company name, and date.

.17 Replacement Parts

.1 The general contractor and sub-contractors must deliver to the HC Project Manager, prior to the final reception of work, the materials mentioned in their specifications and drawings. He must submit to the HC Project Manager a list of the materials delivered with a signed copy of the receipt by the HC Project Manager.

.18 Warranty

.1 The general contractor and sub-contractors must deliver to the HC Project Manager and consultant all the documents listed in this specification and a warranty document that honours the materials used in the project are free of defects and that the work executed was done according to standards. The warranty shall cover a full year from the date of acceptance of the work and any equipment failure shall be replaced immediately.

.19 Closeout Submittals (Operation & Maintenance Manuals)

.1 At the end of the project, the general contractor and sub-contractors will have the responsibility to create and compile an operation manual, in a binder, three (3) copies AND an electronic copy, which will be used for maintenance. The manual shall include:

.1 The shop drawings approved by the consultant.

.2 The warranty letters.

.3 The seismic compliance letters.

.4 The as built drawings.

.5 The HVAC inspection reports.

.6 The water calibration reports.

.7 The above list is neither limiting nor exhaustive.

.20 Training

.1 The general contractor and sub-contractors are responsible for providing training to the building Operation & Maintenance personnel for them to operate all mechanical and electrical systems.

.1 Provide two (2) 4-hour training sessions for the building Operation & Maintenance personnel.

.21 Fire Stopping

.1 Fire stopping shall be according to CAN4-S115.

.2 Supply all materials/sealants required to seal all holes in walls requiring fire rating.

## PART 2 GENERAL

### 2.1 TAXES

.1 Pay all taxes properly levied by law including federal, provincial, and municipal taxes.

### 2.2 FEES, PERMITS AND CERTIFICATES

.1 Pay all fees and obtain all permits. Provide authorities with drawings and information for acceptance certificates. Provide inspection certificates as evidence that work complies with requirements of Authorities having jurisdiction.

### 2.3 REGULATORY REQUIREMENTS

.1 References and Codes

.1 Materials must be new, and work shall comply with the minimum applicable standards of the “References” indicated in the specification sections, the Building Code(s) in effect and all applicable Provincial and Municipal codes. In the case of conflict or discrepancy, the most stringent requirement shall apply.

.2 Building Smoking Environment

.1 Smoking is not permitted in the building. Obey smoking restrictions on building property.

.3 Hazardous Material Discovery

.1 Stop work immediately when material resembling spray or trowel-applied asbestos, Polychlorinated Biphenyl (PCB), mould or other designated substance is encountered during demolition work.

.1 Take preventative measure and promptly notify the HC Project Manager and the consultant.

.2 The general contractor will be responsible to provide the remediation instructions.

.3 Do not proceed until proposed preventive and remediation measures have been approved by the consultant and HC Project Manager. HC will not provide the instructions.

### 2.4 FIRE SAFETY REQUIREMENTS

.1 Comply with both the Building Code in effect and the National Fire Code in effect for safety of persons in buildings in the event of a fire and the protection of buildings from the effects of fire, as follows:

.1 Building Code in effect: for fire safety and fire protection features that are required to be incorporated in a building during construction.

.2 The National Fire Code:

.1 The on-going maintenance and use of the fire safety and fire protection features incorporated in buildings.

.2 The conduct of activities that might cause fire hazards in and around buildings.

.3 Limitations on hazardous contents in and around buildings.

.4 The establishment of fire safety drawings.

.5 Fire safety at construction and demolition sites.

.3 Where can cause activation of fire alarms or fire suppression, extinguishing or protection systems:

.1 Provide “Watchman Service” as described in Building Code and Fire Code; In general, watchman service is defined as an individual conversant with “Fire Emergency Procedures”, performing fire picket duty within an unprotected and unoccupied (no workers) area once per hour.

.2 HC Project Manager will provide the fire alarm by-pass during regular working hours.

.3 If by-pass is needed after regular working hours, inform HC Project Manager 72 hours in advance.

.4 If a by-pass is needed after regular hours, the general contractor and sub-contractors are responsible of retaining services of manufacturer for fire protection systems at their own expense.

.1 This pertains to work related to cutting, welding, soldering or other construction activities that might activate fire protection systems.

## 2.5 HAZARDOUS MATERIALS

.1 Hazardous Materials: product, substance, or organisms that may cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into the environment.

.2 Comply with the requirements of the Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials, and regarding labelling and the provision of Material Safety Data Sheets (SDS).

.3 For work in occupied buildings, provide 48 hours’ notice to the HC Project Manager and consultant for work involving designated substances, hazardous substances (Canada Labour Code Part II Section 10), and before painting, caulking, installing carpet, or using adhesives and other materials, that cause off gassing.

## 2.6 COMMON PRODUCT REQUIREMENTS

.1 Quality of Work:

.1 Carry out work using qualified licensed workers or apprentices in accordance with Provincial Act respecting manpower vocational training and qualification.

.2 Permit employees registered in Provincial apprenticeship program to perform specific tasks only if under direct supervision of qualified licensed workers.

.3 Determine permitted activities and tasks by apprentices, based on level of training attended and demonstration of ability to perform specific duties.

.2 Storage, Handling and Protection:

.1 Handle and store products in manner to prevent damage, adulteration, deterioration, and soiling and in accordance with manufacturer's instructions.

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove packaging or bundling until required in work.

.3 Manufacturer’s Instructions: unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.

**2.7 CLEANING**

.1 Inspect site and examine conditions predisposed to influence the execution of the work and ensure to fully understand the existing conditions onsite.

.2 Clean up as work progresses. At the end of each work period and more often if ordered by the HC Project Manager, remove debris from site, neatly stack material for use, and clean up generally.

.3 Upon completion, remove scaffolding, temporary protection, and surplus materials. Make good defects noted at this stage.

.4 Clean areas under contract to a condition equal to what previously existed and to approval of HC Project Manager.

**2.8 COST BREAKDOWN**

.1 Before submitting first progress claim, submit breakdown of Contract Amount in detail as directed by the HC Project Manager and aggregating the Contract Amount. After approval by the HC Project Manager and consultant, cost breakdown will be used as the basis of progress payments.

## PART 3 SHOP DRAWINGS LISTS

**3.1 NOT USED**

.1 Not used.

## PART 4 EXECUTION

**4.1 NOT USED**

.1 Not used.

**END OF SECTION**

## PART 1 GENERAL

### 1.1 RELATED WORK TO BE CARRIED BY AWARDED CONTRACTOR

.1 **Furniture Handling:** The general contractor is responsible for relocating, safeguarding, and eventually restoring all furniture necessary to facilitate the completion of the work. The general contractor is responsible for providing all furniture covering if necessary to fully project all furniture.

.2 **Ceiling Tile Management:** It is the general contractor's responsibility to systematically remove, securely store, and subsequently reinstall ceiling tiles to accommodate the progress of the work.

.3 **Carpet Preservation:** The preservation and protection of carpets within the designated work area are of utmost importance. The contractor is required to take all necessary measures to ensure the carpets remain undamaged during the project.

.4 **Temporary Heating Requirements:** If temporary heating is necessary, the contractor must strictly adhere to electrical heating solutions. The use of gas heating is strictly prohibited and will not be permitted under any circumstances.

.5 **Drywall work:**

.1 Preparation:

.1 Assessment: Evaluate the area to determine the extent of drywall opening required for HVAC access.

.2 Protection: Cover floors and nearby furniture with protective materials to prevent damage.

.2 Opening Drywall:

.1 Marking: Mark the area of drywall to be removed, ensuring it aligns with the HVAC work.

.2 Cutting: Use a utility knife to cut along the marked lines. Be cautious of electrical wiring and plumbing lines behind the drywall.

.3 Removal: Gently remove the cut drywall sections to expose the plumbing components.

.3 HVAC Work:

.1 Repair/Installation: Perform necessary HVAC installations as per the project requirements.

.2 Inspection: Ensure all HVAC work is up to code and passes inspection standards.

.3 Advise HC Project Manager and consultant for inspection prior to closing drywall.

.4 Closing Drywall:

.1 Fitting: Cut new drywall sections to fit the openings created for plumbing work.

.2 Attaching: Secure the new drywall pieces to the studs using screws or nails, ensuring they are flush with the existing wall surface.

.3 Taping and Mudding: Apply joint tape over the seams and cover with joint compound. Feather the edges for a smooth finish.

.4 Sanding: Sand the dried joint compound until the surface is even and smooth.

.5 Priming: Apply a primer coat to the patched area to prepare it for painting.

.5 Finishing:

.1 Painting: Match the paint color and finish to the existing wall and apply paint to the patched area.

.2 Cleanup: Remove any debris and clean the area thoroughly.

.3 Restoration: Reinstall baseboards, trims, or any other fixtures removed during the process.

.6 Final Inspection:

.1 Visual Inspection: Check the patched area for any imperfections or visible seams.

.2 Functionality: Ensure that the plumbing works correctly without any leaks or issues.

.3 Safety: Confirm that all electrical and plumbing connections are secure and safe for use.

.7 Documentation:

.1 Record Keeping: Maintain records of materials used, work done, and any inspections or permits acquired during the process.

.6 Strict adherence to these guidelines is imperative for the project's successful completion. Non-compliance will necessitate the general contractor assuming complete financial and operational responsibility, including the replacement of any damaged furniture and ceiling tiles, as well as covering the cost of cleaning or replacing the carpet.

## 1.2 GENERAL HIGH-LEVEL SCOPE OF WORK / PHASING

.1 **Vacating All Floors:**

.1 The first step involves vacating all floors within the project area to facilitate renovation.

.2 **Simultaneous Demolition:**

.1 Simultaneously, demolition work will commence on all floors, ensuring a synchronized approach to the renovation process.

.3 **Ground Floor Piping and Manifold:**

.1 While demolition is in progress, new main piping and manifold installation on the ground floor will commence, optimizing project efficiency.

.4 **Phase-by-Phase Demolition Completion:**

.1 As demolition work is completed on each floor, new construction work for that specific floor will commence.

.5 **Floor-Specific Demolition and New Work:**

.1 After demolition on the 3rd floor is finished, new construction work will begin on this floor.

.2 Subsequently, upon completion of the demolition on the 2nd floor, new work for that floor will commence.

.3 The same approach will be followed for the ground floor.

.6 **Activation of Heating Systems:**

.1 Upon the completion of the new work on each floor (3rd, 2nd, and ground), the heating systems for that respective floor will be activated, allowing for safe occupancy.

.7 It is important to note that the scope is not limited or exhaustive. Furthermore, it is the responsibility of the general contractor to develop and provide the complete scope of work, including scheduling and all associated details. The detailed scope should be in alignment with the high-level scope of the project.

## 1.3 WORK SEQUENCE

.1 Construct Work in stages to accommodate the HC Project Manager use of premises during construction if needed.

.2 Co-ordinate Progress Schedule with Occupancy during construction.

.3 Construct Work in stages to provide for continuous public usage. Do not close off public usage of facilities until use of one stage of Work will provide alternate usage.

## 1.4 CONTRACTOR USE OF PREMISES

.1 Execute work with the least possible interference or disturbance to normal use of premises. Plan with the HC Project Manager to facilitate work as stated.

.2 Maintain existing services to building and provide personnel and vehicle access.

.3 Where security is reduced by work, provide temporary means to maintain security.

.4 Closures: protect work temporarily until permanent enclosures are completed.

.5 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

## 1.5 EXISTING UTILITY SERVICES

.1 Notify HC Project Manager 3 weeks in advance and inform utility companies of intended interruption of services and obtain required permission.

.2 Establish location and extent of service lines in area of work before starting Work. Notify HC Project Manager and consultant of findings.

.3 Submit schedule to and obtain approval from HC Project Manager for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.

.4 Protect, relocate, or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.

.5 Record locations of maintained re-routed and abandoned service lines.

## 1.6 NOISE, DUST AND ODOR PRODUCING WORK

.1 Any planned work generating significant noises, dust or odors must be promptly communicated to HC Project Manager at least 72 hours in advance.

.2 Work producing noises, dust or odors must be planned and completed early morning or late in the afternoon.

.3 For work producing dust, the general contractor and the subcontractor are responsible of supplying dust control equipment to mitigate dust propagation such as exhaust fans or other equipment. They are also responsible to isolate the construction zone from the occupied zone by means of barriers that also limits dust propagation.

.4 The HC Project Manager will if needed evaluate the proposed work in terms of its potential impact on employees' well-being and overall operations within the premises.

.5 Based on the evaluation, the HC Project Manager may approve the work to proceed during regular working hours or request that the work be rescheduled to after normal working hours.

## 1.7 CONTROL WORK

.1 The general contractor as well as the subcontractors must coordinate all control related work with the building control contractor, namely Siemens.

.2 All costs related to the control work will be the responsibility of the general contractor as well as the subcontractors.

## 1.8 REQUIRED DOCUMENTS

.1 Maintain at job site, one copy of each document as follows:

.1 Contract Drawings.

.2 Specifications.
.3 Addenda / Site Instructions / Change Orders.
.4 Reviewed Shop Drawings.
.5 List of Outstanding Shop Drawings.
.6 List of Request for Information (RFIs).
.7 Other Modifications to Contract.
.8 Field Test Reports.
.9 Copy of Approved Work Schedule.
.10 Health and Safety Plan and Other Safety Related Documents.

## PART 2 PRODUCTS

### 2.1 NOT USED

.1 Not used.

## PART 3 EXECUTION

### 3.1 NOT USED

.1 Not used.

**END OF SECTION**

## PART 1 GENERAL SPECIFICATIONS

### 1.1 RELATED REQUIREMENTS

.1 Refer to all sections 01.

### 1.2 ACCESS AND EGRESS

.1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial, and other regulations.

### 1.3 USE OF SITE AND FACILITIES

.1 Execute work with the least possible interference or disturbance to normal use of premises. Plan with the HC Project Manager to facilitate work as stated.

.2 Maintain existing services to building and provide personnel and vehicle access.

.3 Where security is reduced by work, provide temporary means to maintain security.

.4 HC Project Manager will assign sanitary facilities for use by Contractor's personnel. Clean facilities at each end of workday.

.5 Closures: protect work temporarily until permanent enclosures are completed.

### 1.4 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

.1 Execute work with least possible interference or disturbance to building operations occupants, public and normal use of premises. Arrange with HC Project Manager and consultant to facilitate execution of work.

### 1.5 EXISTING SERVICES

.1 Notify the HC Project Manager and consultant of intended interruption of services and obtain required permission.

.2 Where work involves breaking into or connecting to existing services, give HC Project Manager 3 weeks’ notice for necessary interruption of mechanical or electrical service throughout the course of work. Keep duration of interruptions minimum. Determine the best time to interrupt service with the HC Project Manager.

## 1.6 SPECIAL REQUIREMENTS

.1 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic, and security regulations.

.2 Keep within limits of work and avenues of ingress and egress.

.3 Ingress and egress of general Contractor and sub-contractor vehicles at site is limited.

.4 Deliver materials outside of peak traffic hours 8:00 to 11:00 and 13:00 to 15:00 unless otherwise approved by HC Project Manager.

.5 Coordinate and schedule with HC Project Manager 72 hours in advance for any large deliveries.

## 1.7 SECURITY

.1 Where security has been reduced by Work of Contract, provide temporary means to maintain security.

.2 Security clearances:

.1 Personnel employed on this project will be subject to security checks. Obtain clearance, as instructed, for everyone who will require to enter premises.

.2 Obtain requisite clearance, as instructed, for everyone required to enter premises.

.3 Personnel will be checked daily at the start of the work shift and provided with a pass which must be always worn. Pass must be returned at the end of work shift and personnel checked out.

## 1.8 BUILDING SMOKING ENVIRONMENT

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

# PART 2 PRODUCTS

## 2.1 NOT USED

.1 Not used.

# PART 3 EXECUTION

## 3.1 NOT USED

.1 Not used.

**END OF SECTION**

## PART 1 GENERAL SPECIFICATIONS

### 1.1 RELATED REQUIREMENTS

.1 Refer to all sections 01.

### 1.2 PRECONSTRUCTION MEETING

.1 Within 5 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.

.2 HC Project Manager, Consultant, general contractor, major Subcontractors, field inspectors, and supervisors will be in attendance.

.3 Establish time and location of meeting and notify parties concerned minimum five (5) days before meeting.

.4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.

.5 Agenda to include:

- .1 Appointment of official representative of participants in the Work.
- .2 Schedule of work and construction progress schedule.
- .3 Schedule of submission of shop drawings. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .4 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
- .5 Owner provided products.
- .6 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .7 Maintenance manuals and closeout submittals.
- .8 Take-over procedures, acceptance, and warranties.
- .9 Monthly progress claims, administrative procedures, photographs, hold backs.
- .10 Appointment of inspection and testing agencies or firms.
- .11 Insurances, transcript of policies.

### 1.3 PROGRESS MEETINGS

.1 During course of Work and two (2) weeks prior to project completion, schedule progress meetings.

.2 General contractor, major Subcontractors involved in Work and HC Project Manager and consultant are to be in attendance.

.3 Notify parties minimum five (5) days prior to meetings.

.4 The general contractor to record minutes of meetings and circulate to attending parties and affected parties not in attendance within two (2) days after meeting.

.5 Agenda to include the following:

.1 Review, approval of minutes of previous meeting.
.2 Review of Work progress since previous meeting.
.3 Field observations, problems, conflicts.
.4 Problems which impede construction schedule.
.5 Review of off-site fabrication delivery schedules.
.6 Corrective measures and procedures to regain projected schedule.
.7 Revision to construction schedule.
.8 Progress schedule, during succeeding work period.
.9 Review submittal schedules: expedite as required.
.10 Maintenance of quality standards.
.11 Review proposed changes for affect on construction schedule and on completion date.
.12 Other business.

## PART 2 PRODUCTS

### 2.1 NOT USED

.1 Not used.

## PART 3 EXECUTION

### 3.1 NOT USED

.1 Not used.

**END OF SECTION**

## PART 1 GENERAL SPECIFICATIONS

### 1.1 RELATED SECTIONS

.1 N/A.

### 1.2 DEFINITIONS

.1 Activity: element of Work performed during course of Project. Activity normally has expected duration and expected cost and expected resource requirements. Activities can be subdivided into tasks.

.2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally, Bar Chart should be derived from commercially available computerized project management system.

.3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.

.4 Construction Work Week: Refer to Construction Working Hours in Section 01 00 50 Statement of Work for exact working period. Define schedule calendar working days as part of Bar (GANTT) Chart submission.

.5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.

.6 Master Plan: summary-level schedule that identifies major activities and key milestones.

.7 Milestone: significant event in project, usually completion of major deliverable.

.8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involve using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.

.9 Project Planning, Monitoring and Control System: overall system operated by HC Project Manager to enable monitoring of project work in relation to established milestones.

### 1.3 REQUIREMENTS

.1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.

.2 Plan to complete Work in accordance with prescribed milestones and time frame.

.3 Ensure that it is understood that Award of Project or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

## 1.4 SUBMITTALS

.1 Submit to HC Project Manager and consultant within 2 working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring, and reporting of project progress.

.2 Submit Project Schedule to HC Project Manager and consultant within 2 working days of receipt of acceptance of Master Plan.

## 1.5 PROJECT MILESTONES

.1 Project milestones form interim targets for Project Schedule.

## 1.6 MASTER PLAN

.1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).

.2 HC Project Manager and consultant will review and return revised schedules within 2 working days.

.3 Revise impractical schedule and resubmit within 1 working day.

.4 Accepted revised schedule will become Master Plan and be used as baseline for updates.

## 1.7 PROJECT SCHEDULE

.1 Develop detailed Project Schedule derived from Master Plan.

.2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:

.1 Award.
.2 Shop Drawings.
.3 Permits.
.4 Mobilization.
.5 Electrical.
.6 Testing and Commissioning.

## 1.8 PROJECT SCHEDULE REPORTING

.1 Update Project Schedule on weekly basis reflecting activity changes and completions, as well as activities in progress.

.2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays, and impact with possible mitigation.

**1.9 PROJECT MEETINGS**

.1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.

**PART 2 PRODUCTS**

**2.1 NOT USED**

.1 Not used.

**PART 3 EXECUTION**

**3.1 NOT USED**

.1 Not used.

**END OF SECTION**

## PART 1 GENERAL SPECIFICATIONS

### 1.1 RELATED REQUIREMENTS

.1 Refer to all sections 01.

### 1.2 ADMINISTRATIVE

.1 Submit to HC Project Manager and consultant, submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.

.2 Do not proceed with Work affected by submittal until review is complete.

.3 Present shop drawings, product data, samples, and mock-ups in SI Metric units.

.4 Where items or information is not produced in SI Metric units converted values are acceptable.

.5 Review submittals prior to submission to HC Project Manager and consultant. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated, and identified as to specific project will be returned without being examined and considered rejected.

.6 Notify HC Project Manager and consultant, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.7 Verify field measurements and affected adjacent Work are coordinated.

.8 The general contractor's responsibility for errors and omissions in submission is not relieved by HC Project Manager and consultant review of submittals.

.9 The general contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by HC Project Manager and consultant.

.10 Keep one reviewed copy of each submission on site.

### 1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.

.2 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes, and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.3 Allow a total of five (5) workdays for HC Project Manager and consultant to review each submission.

.4 Adjustments made on shop drawings by HC Project Manager and consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to HC Project Manager and consultant prior to proceeding with Work.

.5 Make changes in shop drawings as HC Project Manager and consultant, may require, consistent with Contract Documents. When resubmitting, notify HC Project Manager and consultant, in writing of revisions other than those requested.

.6 Accompany submissions with transmittal letter, in containing:

.1 Date.
.2 Project title and number.
.3 Contractor's name and address.
.4 Identification and quantity of each shop drawing, product data and sample.
.5 Other pertinent data.

.7 Submissions include:

.1 Date and revision dates.
.2 Project title and number.
.3 Name and address of:
.1 Subcontractor.
.2 Supplier.
.3 Manufacturer.
.4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
.5 Details of appropriate portions of Work as applicable:
.1 Fabrication.
.2 Layout, showing dimensions, including identified field dimensions, and clearances.
.3 Setting or erection details.
.4 Capacities.
.5 Performance characteristics.
.6 Standards.
.7 Relationship to adjacent work.

.8 After HC Project Manager and consultant review, distribute copies.

.9 Delete information not applicable to project.

.10 Supplement standard information to provide details applicable to project.

.11 If upon review by HC Project Manager and consultant, no errors or omissions are discovered or if only minor corrections are made, copies will be returned, and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

.12 The review of shop drawings is for the sole purpose of ascertaining conformance with general concept.

.1 This review shall not mean that HC and consultant approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.

.2 Without restricting generality of foregoing, the submitting Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

## 1.4 CERTIFICATES AND TRANSCRIPTS

.1 Immediately after award of Contract, submit Workers' Compensation Board status (WSIB).

.2 Submit transcription of insurance immediately after award of Contract.

# PART 2 PRODUCTS

## 2.1 NOT USED

.1 Not used.

# PART 3 EXECUTION

## 3.1 NOT USED

.1 Not used.

**END OF SECTION**

## PART 1 GENERAL

### 1.1 RELATED REQUIREMENTS

.1 Refer to all sections 01.

### 1.2 INSPECTION

.1 Allow HC Project Manager and consultant access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.

.2 HC Project Manager and consultant can order parts of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction.

### 1.3 REJECTED WORK

.1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by HC Project Manager or consultant as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

.2 Make good other Contractor's work damaged by such removals or replacements promptly.

.3 If in opinion of HC Project Manager, it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by HC Project Manager and consultant.

## PART 2 PRODUCTS

### 2.1 NOT USED

.1 Not used.

## PART 3 EXECUTION

### 3.1 NOT USED

.1 Not used.

**END OF SECTION**

# PART 1 GENERAL

## 1.1 RELATED SECTIONS

.1 Refer to all sections 01.

## 1.2 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by other Contractors.

.2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by HC Project Manager.

.3 Plan and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.4 Provide on-site containers for collection of waste materials and debris. Location to be coordinated with HC Project Manager.

.5 Provide and use marked separate bins for recycling. Refer to Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.6 Dispose of waste materials and debris at designated dumping areas on Crown property or off site.

.7 Clean interior areas prior to start of finishing work and maintain areas free of dust and other contaminants during finishing operations.

.8 Store volatile waste in covered metal containers and remove from premises at end of each working day.

.9 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

.10 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

.11 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

## 1.3 FINAL CLEANING

.1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

.2 Before final inspection, remove surplus materials, tools, equipment, and construction materials.

.3 Remove all waste products and debris including that caused or other Contractors on the project.

.4 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

**1.4 WASTE MANAGEMENT AND DISPOSAL**

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

**PART 2 PRODUCTS**

**2.1 NOT USED**

.1 Not used.

**PART 3 EXECUTION**

**3.1 NOT USED**

.1 Not used.

**END OF SECTION**

## PART 1 GENERAL

### 1.1 WASTE MANAGEMENT GOALS

.1 Prior to start of Work conduct meeting with HC Project Manager and consultant to review and discuss PWGSC's Waste Management Plan and Goals.

.2 PWGSC's Waste Management Goal 75 percent of total Project Waste to be diverted from landfill sites. Provide HC Project Manager documentation certifying that waste management, recycling, reuse of recyclable and reusable materials has been extensively practiced.

.3 Accomplish maximum control of solid construction waste.

.4 Preserve environment and prevent pollution and environment damage.

### 1.2 RELATED SECTIONS

.1 Refer to all sections 01.

### 1.3 REFERENCES

.1 LEED Canadian Green Building Council (CGBC), Green Building Rating System, For New Construction and Major Renovations LEED Canada-NC, Version 1.0 - December 2004.

### 1.4 DEFINITIONS

.1 Class III: non-hazardous waste - construction renovation and demolition waste.

.2 Demolition Waste Audit (DWA): relates to actual waste generated from project.

.3 Inert Fill: inert waste - exclusively asphalt and concrete.

.4 Materials Source Separation Program (MSSP): consists of series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation.

.5 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.

.6 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.

.7 Recycling: process of sorting, cleansing, treating, and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

.8 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.

.9 Separate Condition: refers to waste sorted into individual types.

.10 Source Separation: acts of keeping different types of waste materials separate beginning from first time they became waste.

.11 Waste Audit (WA): detailed inventory of materials in building. Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project. Indicates quantities of reuse, recycling, and landfill. Refer to Schedule A.

.12 Waste Management Coordinator (WMC): contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.

.13 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. Refer to Schedule B. WRW is based on information acquired from WA (Schedule A).

## 1.5 DOCUMENTS

.1 Maintain at job site, one copy of following documents:

- .1 Waste Audit.
- .2 Waste Reduction Workplan.
- .3 Material Source Separation Plan.

## 1.6 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Prepare and submit following prior to project start-up:

- .1 Submit 2 copies of completed Waste Audit (WA): Schedule A.
- .2 Submit 2 copies of completed Waste Reduction Workplan (WRW): Schedule B.
- .3 Submit 2 copies of completed Demolition Waste Audit (DWA): Schedule C.
- .4 Submit 2 copies of Materials Source Separation Program (MSSP) description.

.3 Submit before final payment summary of waste materials salvaged for reuse, recycling or disposal by project using deconstruction/disassembly material audit form.

- .1 Failure to submit could result in hold back of final payment.
- .2 Provide receipts, scale tickets, waybills, and show quantities and types of materials reused, recycled, co-mingled, and separated off-site or disposed of.
- .3 For each material reused, sold, or recycled from project, include amount in tonnes, quantities by number, type and size of items and the destination.

.4 For each material land filled or incinerated from project, include amount in tonnes of material and identity of landfill, incinerator, or transfer station.

## 1.7 WASTE AUDIT (WA)

.1 Conduct WA prior to project start-up.

.2 Prepare WA: Schedule A.

.3 Record, on WA - Schedule A, extent to which materials or products used consist of recycled or reused materials or products.

## 1.8 WASTE REDUCTION WORKPLAN (WRW)

.1 Prepare WRW prior to project start-up.

.2 WRW should include but not limited to:

.1 Destination of materials listed.
.2 Deconstruction/disassembly techniques and sequencing.
.3 Schedule for deconstruction/disassembly.
.4 Location.
.5 Security.
.6 Protection.
.7 Clear labelling of storage areas.
.8 Details on materials handling and removal procedures.
.9 Quantities for materials to be salvaged for reuse or recycled and materials sent to landfill.

.3 Structure WRW to prioritize actions and follow 3R's hierarchy, with Reduction as priority, followed by Reuse, then Recycle.

.4 Describe management of waste.

.5 Identify opportunities for reduction, reuse, and recycling of materials. Based on information acquired from WA.

.6 Post WRW or summary where workers at site can review content.

.7 Set realistic goals for waste reduction, recognize existing barriers, and develop strategies to overcome these barriers.

.8 Monitor and report on waste reduction by documenting total volume and cost of actual waste removed from project.

## 1.9 DEMOLITION WASTE AUDIT (DWA)

.1 Prepare DWA prior to project start-up.

.2 Complete DWA: Schedule C.

.3 Provide inventory of quantities of materials to be salvaged for reuse, recycling, or disposal.

## 1.10 MATERIALS SOURCE SEPARATION PROGRAM (MSSP)

.1 Prepare MSSP and have ready for use prior to project start-up.

.2 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by HC Project Manager.

.3 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.

.4 Provide containers to deposit reusable and recyclable materials.

.5 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.

.6 Locate separated materials in areas which minimize material damage.

.7 Collect, handle, store on-site, and transport off-site, salvaged materials in separate condition.

.1 Transport to approved and authorized recycling facility or to users of material for recycling.

.8 Collect, handle, store on-site, and transport off-site, salvaged materials in combined condition.

.1 Ship materials to site operating under Certificate of Approval or premises of Owner.

.2 Materials must be immediately separated into required categories for reuse or recycling.

## 1.11 STORAGE, HANDLING AND PROTECTION

.1 Store, materials to be reused, recycled, and salvaged in locations as directed by HC Project Manager.

.2 Unless specified otherwise, materials for removal become Contractor's property.

.3 Protect, stockpile, store, and catalogue salvaged items.

.4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.

.5 Protect structural components not removed for demolition from movement or damage.

.6 Support affected structures. If safety of building is endangered, cease operations, and immediately notify HC Project Manager.

.7 Protect surface drainage, mechanical and electrical from damage and blockage.

.8 Separate and store materials produced during dismantling of structures in designated areas.

.9 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.

.1 On-site source separation is recommended.

.2 Remove co-mingled materials to off-site processing facility for separation.

.3 Provide waybills for separated materials.

## 1.12 DISPOSAL OF WASTES

.1 Do not bury rubbish or waste materials.

.2 Do not dispose of waste, volatile materials, mineral spirits, oil, paint thinner into waterways, storm, or sanitary sewers.

.3 Keep records of construction waste including:

.1 Number and size of bins.

.2 Waste type of each bin.

.3 Total tonnage generated.

.4 Tonnage reused or recycled.

.5 Reused or recycled waste destination.

.4 Remove materials from deconstruction as deconstruction/disassembly Work progresses.

.5 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.

## 1.13 SCHEDULING

.1 Co-ordinate Work with other activities at site to ensure timely and orderly progress of Work.

# PART 2 PRODUCTS

## 2.1 NOT USED

.1 Not used.

## PART 3 EXECUTION

### 3.1 SELECTIVE DEMOLITION

.1 Reuse of Building Elements: this project has been designed to result in end of project rates for reuse of building elements as follows: do not demolish building elements beyond what is indicated on Drawings without approval by HC Project Manager's.

### 3.2 APPLICATION

.1 Do Work in compliance with WRW.

.2 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

### 3.3 CLEANING

.1 Remove tools and waste materials on completion of Work and leave work area in clean and orderly condition.

.2 Clean-up work area as work progresses.

.3 Source separate materials to be reused/recycled into specified sort areas.

### 3.4 DIVERSION OF MATERIALS

.1 From following list, separate materials from general waste stream and stockpile in separate piles or containers, as reviewed by HC Project Manager, and consistent with applicable fire regulations.

.1 Mark containers or stockpile areas.

.2 Provide instruction on disposal practices.

.2 On-site sale of salvaged, recovered, reusable recyclable material is not permitted.

### 3.5 CANADIAN GOVERNMENTAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT

.1 Schedule E - Government Chief Responsibility for the Environment:

| Province | Address | General Inquires | Fax |
|---|---|---|---|
| Ontario | Ministry of Environment and Energy, 135 St. Clair Avenue West, Toronto, Ontario, M4V 1P5 | 416-323-4321<br>800-565-4923 | 416-323-4682 |
| | Environment Canada Toronto, Ontario | 416-734-4494 | |

| Province | Address | General Inquires | Fax |
|---|---|---|---|

**END OF SECTION**

## PART 1 GENERAL

### 1.1 RELATED SECTIONS

.1 Section 01 10 10 – General Instructions – Electromechanical.

.2 Section 01 91 31 – Commissioning (Cx) Plan.

### 1.2 ACRONYMS

.1 AFD - Alternate Forms of Delivery, service provider.

.2 BMM - Building Management Manual.

.3 Cx - Commissioning.

.4 EMCS - Energy Monitoring and Control Systems.

.5 O&M - Operation and Maintenance.

.6 PI - Product Information.

.7 PV - Performance Verification.

.8 TAB - Testing, Adjusting and Balancing.

.9 CMMS – Computerized Maintenance Management System

### 1.3 GENERAL

.1 Cx is a planned program of tests, procedures and checks conducted systematically on systems and integrated systems of the finished Project. Cx is performed after systems and integrated systems are completely installed, functional and Contractor's Performance Verification responsibilities have been completed and approved. Objectives:

.1 Verify installed equipment, systems and integrated systems operate in accordance with contract documents and design criteria and intent.

.2 Ensure appropriate documentation is compiled into the BMM.

.3 Effectively train O&M staff.

.2 The general contractor to assists in Cx process, operating equipment, and systems, troubleshooting and adjusting as required.

.1 Systems to be operated at full capacity under various modes to determine if they function correctly and consistently at peak efficiency. Systems to be interactively with each other as intended in accordance with Contract Documents and design criteria.

.2 During these checks, adjustments to be made to enhance performance to meet environmental or user requirements.

.3 Design Criteria: as per client's requirements or determined by designer. To meet Project functional and operational requirements.

## 1.4 COMMISSIONING OVERVIEW

.1 For Cx responsibilities refer to Section 01 91 31 – Commissioning (Cx) Plan.

.2 Cx to be a line item of Contractor's cost breakdown.

.3 Cx activities supplement field quality and testing procedures described in relevant technical sections.

.4 Cx is conducted in concert with activities performed during stage of project delivery. Cx identifies issues in Planning and Design stages which are addressed during Construction and Cx stages to ensure the installations are constructed and proven to operate satisfactorily under weather, environmental and occupancy conditions to meet functional and operational requirements. Cx activities include transfer of critical knowledge to facility operational personnel.

.5 The Consultant will issue Interim Acceptance Certificate when:

.1 Completed Cx documentation has been received, reviewed for suitability, and approved by Consultant.

.2 Equipment, components, and systems have been commissioned.

.3 O&M training has been completed.

## 1.5 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

.1 Should equipment, system components, and associated controls be incorrectly installed or malfunction during Cx, correct deficiencies, re-verify equipment and components within the unfunctional system, including related systems as deemed required by the Consultant, to ensure effective performance.

.2 Costs for corrective work, additional tests, inspections, to determine acceptability and proper performance of such items to be borne by Contractor. Above costs to be in form of progress payment reductions or hold-back assessments.

## 1.6 PRE-CX REVIEW

.1 Before Construction:

.1 Review contract documents, confirm in writing to Consultant.

.1 Adequacy of provisions for Cx.

.2 Aspects of design and installation pertinent to success of Cx.

.2 During Construction:

.1 Coordinate provisions, location, and installation of provisions for Cx.

.3 Before start of Cx, ensure:

.1 Have completed Cx Plan up to date.

.2 Ensure installation of related components, equipment, sub-systems, systems are complete.

.3 Fully understand Cx requirements and procedures.

.4 Have Cx documentation shelf ready.

.5 Understand completely design criteria and intent and specific features.

.6 Submit complete start-up documentation to Consultant.

.7 Have Cx schedules up to date.

.8 Ensure systems have been cleaned thoroughly.

.9 Complete TAB procedures on systems, submit TAB reports to Consultant for review and approval.

.10 Ensure "As-Built" system schematics are available.

.4 Inform Consultant in writing of discrepancies and deficiencies on finished works.

## 1.7 CONFLICTS

.1 Report conflicts between requirements of this section and other sections to Consultant before start-up and obtain clarification.

.2 Failure to report conflict and obtain clarification will result in application of most stringent requirement.

## 1.8 SUBMITTALS

.1 Submittals: in accordance with Section 01 10 10 – General Instructions – Mechanical and Electrical.

.1 Submit no later than 4 weeks after award of Contract:

.1 Draft Cx documentation.

.2 Preliminary Cx schedule.

.2 Request in writing to Consultant for changes to submittals and obtain written approval at least 4 weeks prior to start of Cx.

.3 Submit proposed Cx procedures to Consultant where not specified and obtain written approval at least 4 weeks prior to start of Cx.

.4 Provide additional documentation relating to Cx process required by Consultant.

## 1.9 COMMISSIONING DOCUMENTATION

.1 Consultant to review and approve Cx documentation.

.2 Provide completed and approved Cx documentation to Consultant.

## 1.10 COMMISSIONING MEETINGS

.1 Convene Cx meetings following project meetings.

.2 Purpose: to resolve issues, monitor progress, identify deficiencies, relating to Cx.

.3 Continue Cx meetings on regular basis until commissioning deliverables have been addressed.

.4 At 60% construction completion stage, a separate Cx scope meeting shall be convened to review progress, discuss schedule of equipment start-up activities, and prepare for Cx. Issues at meeting to include:

.1 Review duties and responsibilities of Contractor and subcontractors, addressing delays and potential problems.

.2 Determine the degree of involvement of trades and manufacturer's representatives in the commissioning process.

.5 Thereafter Cx meetings to be held until project completion and as required during equipment start-up and functional testing period.

.6 Meeting will be chaired by contractor, who will record and distribute minutes.

## 1.11 STARTING AND TESTING

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

## 1.12 WITNESSING OF STARTING AND TESTING

.1 Provide 14 days’ notice prior to commencement.

.2 Consultant to witness of start-up and testing.

.3 Contractor's Cx Agent to be present at tests performed and documented by sub-trades, suppliers, and equipment manufacturers.

## 1.13 MANUFACTURER'S INVOLVEMENT

.1 Obtain manufacturers installation, start-up, and operations instructions prior to start-up of components, equipment and systems and review with consultant.

.1 Compare completed installation with manufacturer's published data, record discrepancies, and review with manufacturer.

.2 Modify procedures detrimental to equipment performance and review same with manufacturer before start-up.

.2 Integrity of warranties

.1 Use manufacturer's trained start-up personnel where specified elsewhere in other divisions or required to maintain integrity of warranty.

.2 Verify with manufacturer that testing as specified will not void warranties.

.3 Qualifications of manufacturer's personnel

.1 Experienced in design, installation and operation of equipment and systems.

.2 Ability to interpret test results accurately.

.3 To report results in clear, concise, logical manner.

## 1.14 PROCEDURES

.1 Verify that equipment and systems are complete, clean, and operating in normal and safe manner prior to conducting start-up, testing and Cx.

.2 Conduct start-up and testing in following distinct phases:

.1 Included in delivery and installation:

.1 Verification of conformity to specification, approved shop drawings and completion of PI report forms.

.2 Visual inspection of quality of installation.

.2 Start-up: follow accepted start-up procedures.

.3 Operational testing: document equipment performance.

.4 System PV: include repetition of tests after correcting deficiencies.

.5 Post-substantial performance verification: to include fine-tuning.

.3 Correct deficiencies and obtain approval from Consultant after distinct phases have been completed and before commencing next phase.

.4 Documents require tests on approved PV forms.

## 1.15 START-UP DOCUMENTATION

.1 Assemble start-up documentation and submit to Consultant for approval before commencement of commissioning.

.2 Start-up documentation to include:

.1 Factory and on-site test certificates for specified equipment.

.2 Pre-start-up inspection reports.

.3 Signed installation/start-up check lists.

.4 Start-up reports,

.5 Step-by-step description of complete start-up procedures, to permit Consultant to repeat start-up at any time.

## 1.16 TEST RESULTS

.1 If start-up, testing and/or PV produce unacceptable results, repair, replace or repeat specified starting and/or PV procedures until acceptable results are achieved.

.2 Provide workforce and materials, assume costs for re-commissioning.

## 1.17 START OF COMMISSIONING

.1 Notify Consultant at least 21 days prior to start of Cx.

.2 Start Cx after elements of building affecting start-up and performance verification of systems have been completed.

## 1.18 INSTRUMENTS/EQUIPMENT

.1 Submit to Consultant for review and approval:

.1 Complete list of instruments proposed to be used.

.2 Listed data including, serial number, current calibration certificate, calibration date, calibration expiry date and calibration accuracy.

.2 Provide the following equipment as required:

.1 2-way radios.

.2 Ladders.

.3 Equipment as required to complete work.

## 1.19 COMMISSIONING PERFORMANCE VERIFICATION

.1 Conduct Cx:

.1 Under actual or accepted simulated operating conditions, over entire operating range, in all modes.

.2 On independent systems and interacting systems.

.2 Cx procedures to be repeatable and reported results are to be verifiable.

.3 Follow equipment manufacturer's operating instructions.

.4 EMCS trending to be available as supporting documentation for performance verification.

## 1.20 WITNESSING COMMISSIONING

.1 Consultant and HC Project Manager to witness activities and verify results.

## 1.21 CHECKS AND ADJUSTMENTS

.1 Adjust and changes which become apparent as Cx proceeds.

.2 Perform static and operational checks as applicable and as required.

## 1.22 DEFICIENCIES, FAULTS, DEFECTS

.1 Correct deficiencies found during start-up and Cx to satisfaction of Consultant and HC Project Manager.

.2 Report problems, faults or defects affecting Cx to Consultant in writing. Stop Cx until problems are rectified. Proceed with written approval from Consultant.

**1.23 COMPLETION OF COMMISSIONING**

.1 Upon completion of Cx leave systems in normal operating mode.

.2 Except for warranty and seasonal verification activities specified in Cx specifications, complete Cx prior to issuance of Interim Certificate of Completion.

.3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by Consultant and HC Project Manager.

**1.24 ACTIVITIES UPON COMPLETION OF COMMISSIONING**

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

**1.25 TRAINING**

.1 In accordance with Section 01 10 10 – General Instructions – Mechanical and Electrical.

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

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

**1.27 OCCUPANCY**

.1 Cooperate fully with Consultant and HC Project Manager during stages of acceptance and occupancy of facility.

**1.28 INSTALLED INSTRUMENTATION**

.1 Use instruments installed under Contract for TAB and PV if:

.1 Calibration certificates have been deposited with Consultant.

.2 Calibrated EMCS sensors may be used to obtain performance data if sensor calibration has been completed and accepted.

**PART 2 PRODUCTS**

**2.1 NOT USED**

.1 Not used.

## PART 3 EXECUTION

### 3.1 NOT USED

.1 Not used.

**END OF SECTION**

## PART 1 GENERAL

### 1.1 RELATED SECTIONS

.1 Not used.

### 1.2 INSTALLATION/START-UP CHECK LISTS

.1 Include the following data:

.1 Product manufacturer's installation instructions and recommended checks.

.2 Special procedures as specified in relevant technical sections.

.3 Items considered good installation and engineering industry practices deemed appropriate for proper and efficient operation.

.2 Installer to sign check lists upon completion, certifying stated checks and inspections have been performed. Return completed check lists to Consultant. Check lists will be required during Commissioning and will be included in Building Maintenance Manual (BMM) at completion of project.

.3 Use of check lists will not be considered part of commissioning process but will be stringently used for equipment pre-start and start-up procedures.

### 1.3 PRODUCT INFORMATION (PI) REPORT FORMS

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

.2 Prior to Performance Verification (PV) of systems complete items on PI forms related to systems and obtain Consultant's approval.

### 1.4 PERFORMANCE VERIFICATION (PV) FORMS

.1 PV forms to be used for checks, running dynamic tests and adjustments carried out on equipment and systems to ensure correct operation, efficiently and function independently and interactively with other systems as intended with project requirements.

.2 PV report forms include those developed by Contractor records measured data and readings taken during functional testing and Performance Verification procedures.

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

## 1.5 COMMISSIONING FORMS

.1 Use Commissioning forms to verify installation and record performance when starting equipment and systems.

.2 The general contractor will be responsible for providing the commissioning report forms developed for the specific project, along with the commissioning proposal, for review and approval by the consultant.

.3 Strategy for use:

.1 Contractor will provide required shop drawings information and verify correct installation and operation of items indicated on these forms.

.2 Confirm operation as per design criteria and intent.

.3 Identify variances between design and operation and reasons for variances.

.4 Verify operation in specified normal and emergency modes and under specified load conditions.

.5 Record analytical and substantiating data.

.6 Verify reported results.

.7 Form to bear signatures of recording technician and reviewed and signed off by Consultant.

.8 Submit immediately after tests are performed.

.9 Reported results in true measured SI unit values.

.10 Provide Consultant with originals of completed forms.

.11 Maintain copy on site during start-up, testing and commissioning period.

## 1.6 COMPUTERIZED MAINTENANCE MANAGEMENT SYSTEM (CMMS)

.1 All Contractors are responsible to fill out the Equipment Data Collection Form (RP2 Contract) for all equipment being removed, replaced, or updated, and all new equipment.

## 1.7 LANGUAGE

.1 All work can be conducted in either official language.

# PART 2 PRODUCTS

## 2.1 NOT USED

.1 Not used.

# PART 3 EXECUTION

## 3.1 NOT USED

.1 Not used.

**END OF SECTION**

## PART 1 GENERAL

### 1.1 RELATED SECTIONS

.1 Section 01 10 10 – General Instructions – Electromechanical.

.2 Section 23 05 93 – Testing, Adjusting and Balancing for HVAC.

### 1.2 SUBMITTALS

.1 Submittals: in accordance with Section 01 10 10 – General Instructions – Electromechanical.

.2 Shop drawings to show but not limited:

- .1 Mounting arrangements.
- .2 Operating and maintenance clearances.
- .3 Detailed drawings of bases, supports, and anchor bolts.
- .4 Acoustical sound power data, where applicable.
- .5 Points of operation on performance curves.
- .6 Manufacturer to certify current model production.
- .7 Certification of compliance to applicable codes.

.3 Closeout Submittals:

- .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 10 10 – General Instructions – Electromechanical.
- .2 Operation and maintenance manual approved by, and final copies deposited with, HC Project Manager and consultant before final inspection.
- .3 Operation data to include:
  - .1 Control schematics for systems including environmental controls.
  - .2 Description of systems and their controls.
  - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
  - .4 Operation instruction for systems and component.
  - .5 Description of actions to be taken in event of equipment failure.
  - .6 Valve schedule and flow diagram.
  - .7 Colour coding chart.
- .4 Maintenance data to include:
  - .1 Servicing, maintenance, operation, and trouble-shooting instructions for each item of equipment.
  - .2 Data to include schedules of tasks, frequency, tools required and task time.

.5 Performance data to include:

.1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified.

.4 Testing, adjusting and balancing reports as specified in Section 23 05 93 – Testing, Adjusting and Balancing for HVAC.

.6 Approvals:

.1 Submit one (1) copy of draft Operation and Maintenance Manual to the HC Project Manager and consultant for approval. Submission of individual data will not be accepted unless directed by the HC Project Manager and Consultant.

.2 Make changes as required and re-submit as directed by the HC Project Manager and Consultant.

.7 Additional data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.8 Site records:

.1 The Consultant will provide one (1) set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems and control systems.

.2 Use distinct colour waterproof ink for each service.

.3 Make available for reference purposes and inspection.

.9 As-built drawings:

.1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.

.2 Identify each drawing in lower right-hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).

.3 Submit to HC Project Manager and consultant for approval and make corrections as directed.

.4 Perform testing, adjusting, and balancing for HVAC using as-built drawings.

.5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

.10 Submit copies of as-built drawings for inclusion in final TAB report.

## 1.3 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 10 10 – General Instructions – Electromechanical.

.2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 10 10 – General Instructions – Electromechanical.

## 1.4 MAINTENANCE

.1 Furnish spare parts in accordance with Section 01 10 10 – General Instructions – Electromechanical. Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 10 10 – General Instructions – Electromechanical.

## 1.5 DELIVERY, STORAGE, AND HANDLING

.1 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 10 10 – General Instructions – Electromechanical.

# PART 2 PRODUCTS

## 2.1 NOT USED

.1 Not used.

# PART 3 EXECUTION

## 3.1 FIRE STOPPING

.1 Fire stopping shall be supplied and installed by the Division 23 Contractor.

## 3.2 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:

.1 Provide manufacturer's field services consisting of product use recommendations site visits for inspection of product installation in accordance with manufacturer's instructions.

.2 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting, and cleaning of product and submit to HC Project Manager.

## 3.3 DEMONSTRATION

.1 HC Project Manager and Consultant will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 Trial usage to apply to following equipment and systems:

.1 Operation of new heating loops c/w valves, and accessories.

.3 Supply tools, equipment, and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, troubleshooting, and servicing of all systems and equipment during regular work hours, prior to acceptance.

.4 Use operation and maintenance manual, as-built drawings, and audiovisual aids as part of instruction materials.

.5 Instruction duration time requirements as specified in appropriate sections.

.6 HC Project Manager can record these demonstrations for future reference.

## 3.4 PROTECTION

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

## 3.5 CLEANING

.1 Cleaning in accordance with Section 01 10 10 – General Instructions – Electromechanical.

**END OF SECTION**

## PART 1 GENERAL

### 1.1 RELATED SECTIONS

.1 Section 23 01 00 – Common Work Results for HVAC.

.2 Section 23 05 48 – Vibration and Seismic controls for HVAC Piping and Equipment.

### 1.2 REFERENCES

.1 Publications in effect:

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.181, Ready-Mixed Organic Zinc-Rich Coating.

.2 National Fire Code of Canada (NFCC)

### 1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 23 01 00 – Common Work Results for HVAC.

.2 Product Data:

.1 Provide manufacturer's printed product literature, specifications and datasheets for piping and equipment and include product characteristics, performance criteria, physical size, finish, and limitations.

## PART 2 PRODUCTS

### 2.1 MATERIAL

.1 Paint: zinc-rich to CAN/CGSB-1.181.

.1 Coating: in accordance with manufacturer's recommendations for surface conditions.

## PART 3 EXECUTION

### 3.1 APPLICATION

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

### 3.2 CONNECTIONS TO EQUIPMENT

.1 In accordance with manufacturer's instructions unless otherwise indicated.

.2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.

.3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

## 3.3 CLEARANCES

.1 Provide clearance around systems, equipment, and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer and National Fire Code of Canada.

## 3.4 DRAINS

.1 Install piping with grade in direction of flow except as indicated.

.2 Install drain valve at low points in piping systems, at equipment, and at section isolating valves.

.3 Pipe each drain valve discharge separately to above floor drain.

.1 Discharge to be visible.

.4 Drain valves: NPS 3/4 globe valves unless indicated otherwise, with hose end male thread, cap, and chain.

## 3.5 DIELECTRIC COUPLINGS

.1 General: compatible with system, to suit pressure rating of system.

.2 Locations: where dissimilar metals are joined.

## 3.6 PIPEWORK INSTALLATION

.1 Install in accordance with Section 23 05 48 – Vibration and Seismic controls for HVAC Piping and Equipment.

.2 Screwed fittings jointed with Teflon tape.

.3 Protect openings against entry of foreign material.

.4 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.

.5 Assemble piping using fittings manufactured to ANSI standards.

.6 Saddle type branch fittings may be used on mains if branch line is no larger than half size of main.

.1 Hole saw (or drill) and ream main to maintain full inside diameter of branch line prior to welding saddle.

.7 Install exposed piping, equipment, rectangular cleanouts, and related items parallel or perpendicular to building lines.

.8 Install concealed pipework to minimize furring space, maximize headroom, conserve space.

.9 Slope piping, except where indicated, in direction of flow for positive drainage and venting.

.10 Install, except where indicated, to permit separate thermal insulation of each pipe.

.11 Group piping wherever possible and as indicated.

.12 Ream pipes, remove scale and other foreign material before assembly.

.13 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.

.14 Provide for thermal expansion.

.15 Valves:

.1 Install in accessible locations.
.2 Remove interior parts before soldering.
.3 Install with stems above horizontal position unless indicated.
.4 Valves accessible for maintenance without removing adjacent piping.
.5 Install globe valves in bypass around control valves.
.6 Use ball valves at branch take-offs for isolating purposes except where specified.

## 3.7 SLEEVES

.1 General: install where pipes pass through masonry, concrete structures, fire rated assemblies, and as indicated.

.2 Material: schedule 40 black steel pipe.

.3 Construction: use annular fins continuously welded at mid-point at foundation walls and where sleeves extend above finished floors.

.4 Sizes: 6 mm minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation.

.5 Installation:

.1 Concrete, masonry walls, concrete floors on grade: terminate flush with finished surface.
.2 Other floors: terminate 25 mm above finished floor.
.3 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint to CAN/CGSB-1.181.

.6 Sealing:

.1 Every where:
.1 Provide space for firestopping.
.2 Maintain fire rating integrity.
.2 Sleeves installed for future use: fill with lime plaster or other easily removable filler.
.3 Ensure no contact between copper pipe or tube and sleeve.

## 3.8 ESCUTCHEONS

.1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.

.2 Construction: one-piece type with set screws.

.1 Chrome or nickel-plated brass or type 302 stainless steel.

.3 Sizes: outside diameter to cover opening or sleeve.

.1 Inside diameter to fit around pipe or outside of insulation if so provided.

## 3.9 PREPARATION FOR FIRESTOPPING

.1 Install firestopping within annular space between pipes, ducts, insulation, and adjacent fire separation in accordance with Section 23 05 00 – Common Work Results for HVAC.

.2 Insulated pipes: ensure integrity of insulation and vapour barriers.

## 3.10 FLUSHING OUT OF PIPING SYSTEMS

.1 Before start-up, clean interior of piping systems in accordance with requirements of Section 23 01 00 – Common Work Results for HVAC.

.2 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including replacement of filters in piping systems.

## 3.11 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

.1 Advise HC Project Manager and consultant 48 hours minimum prior to performance of pressure tests.

.2 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period in relevant mechanical sections.

.3 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.

.4 Conduct tests in presence of HC Project Manager and consultant.

.5 Pay costs for repairs or replacement, retesting, and making good. HC Project Manager and consultant to determine whether repair or replacement is appropriate.

.6 Insulate or conceal work only after approval and certification of tests by HC Project Manager and consultant.

## 3.12 EXISTING SYSTEMS

.1 Connect into existing piping systems at times approved by the HC Project Manager and consultant.

.2 Be responsible for damage to existing plant by this work.

## 3.13 CLEANING

.1 Proceed in accordance with Section 23 01 00 – Common Work Results for HVAC.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools, and equipment.

**END OF SECTION**

## PART 1 GENERAL

### 1.1 RELATED SECTIONS

.1 Section 23 05 53.01 – Mechanical Identification.

### 1.2 REFERENCES

.1 Publications in effect:

.1 American Society of Mechanical Engineers (ASME).

.1 ASME B40.100, Pressure Gauges and Gauge Attachments.

.2 ASME B40.200, Thermometers, Direct Reading, and Remote Reading.

.2 Canadian General Standards Board (CGSB).

.1 CAN/CGSB-14.4, Thermometers, Liquid-in-Glass, Self-Indicating, Commercial/Industrial Type.

.2 CAN/CGSB-14.5, Thermometers, Bimetallic, Self-Indicating, Commercial/Industrial Type.

### 1.3 SUBMITTALS

.1 Submittals in accordance with Section 23 05 00 – Common Work Results for HVAC.

.2 Submit shop drawings and product data.

.3 Submit manufacturer's product data for following items:

.1 Thermometers.

.2 Pressure gauges.

.3 Stop cocks.

## PART 2 PRODUCTS

### 2.1 GENERAL

.1 Design point to be at mid-point of scale or range.

### 2.2 DIRECT READING THERMOMETERS

.1 Industrial, liquid filled, 125 mm scale length: to CAN/CGSB14.4.

### 2.3 THERMOMETER WELLS

.1 Copper pipe: copper or bronze.

.2 Steel pipe: brass.

## 2.4 PRESSURE GAUGES

.1 112 mm, dial type: to ASME B40.100, Grade 2A, phosphor bronze bourdon tube having 0.5% accuracy full scale unless otherwise specified.

.2 Provide:

.1 Gasketed pressure relief back with solid front.

.2 Bronze stops cock.

# PART 3 EXECUTION

## 3.1 GENERAL

.1 Install so they can be easily read from floor or platform. If this cannot be accomplished, install remote reading units.

.2 Install between equipment and first fitting or valve.

## 3.2 THERMOMETERS

.1 Install in wells on piping. Provide heat conductive material inside well.

.2 Install in locations as indicated and on new heating supply and return piping in mechanical room.

.3 Install wells for balancing purposes.

.4 Use extensions where thermometers are installed through insulation.

## 3.3 PRESSURE GAUGES

.1 Install in following locations:

.1 Install in locations as indicated and on new heating supply and return piping in mechanical room.

.2 Install gauge cocks for balancing purposes.

.3 Use extensions where pressure gauges are installed through insulation.

## 3.4 NAMEPLATES

.1 Install engraved limacoid nameplates as specified in Section 23 05 53.01 – Mechanical Identification, identifying medium.

**END OF SECTION**

## PARTIE 1 GENERAL

### 1.1 RELATED REQUIREMENTS

.1 Not used.

### 1.2 REFERENCES

.1 American Society of Mechanical Engineers (ASME)

.1 ASME B16.1-15, Cast Iron Pipe Flanges and Flanged Fittings.

.2 ASTM International Inc.

.1 ASTM A49-12, Standard Specification for Heat-Treated Carbon Steel Joint Bars.

.2 ASTM A126-04(2014), Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

.3 ASTM A536-84(2014), Standard Specification for Ductile Iron Castings.

.4 ASTM B61-15, Standard Specification for Steam or Valve Bronze Castings.

.5 ASTM B62-17, Standard Specification for Composition Bronze, or Ounce Metal Castings.

.6 ASTM B85/B85M-14, Standard Specification for Aluminum-Alloy Die Castings.

.7 ASTM B209-14, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.3 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS)

.1 MSS SP-61-09, Pressure Testing of Steel Valves.

.2 MSS SP-70-11, Grey Iron Gate Valves, Flanged and Threaded Ends.

.3 MSS SP-71-11, Grey Iron Swing Check Valves, Flanged and Threaded Ends.

.4 MSS SP-82-1992, Valve Pressure Testing Methods.

.5 MSS SP-85-2002, Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.

### 1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 23 05 00 – Common Work Results for HVAC.

.2 Product Data:

.1 Provide manufacturer's printed product literature and data sheets for equipment and systems and include product characteristics, performance criteria, physical size, finish, and limitations.

.3 Shop Drawings:

.1 Submit data for valves specified in this Section.

.4 Closeout submittals :

.1 Provide maintenance data for incorporation into manual specified in Section 23 05 00 – Common Work Results for HVAC.

## PARTIE 2 PRODUCTS

### 2.1 MATERIAL

.1 Valves:

.1 Except for specialty valves, to be of single manufacturer.

.2 Standard specifications:

.1 Gate valves: MSS SP-70.

.2 Globe valves: MSS SP-85.

.3 Check valves: MSS SP-71.

.3 Requirements common to valves, unless specified otherwise:

.1 Body, bonnet: cast iron to ASTM B209 Class B, ductile iron to ASTM A536 Grade 65-45-12.

.2 Connections: flanged ends plain face to ANSI B16.1.

.3 Inspection and pressure testing: to MSS SP-82.

.4 Bonnet gasket: non-asbestos.

.5 Stem: to have precision-machined Acme or 60 degrees V threads, top screwed for handwheel nut.

.6 Stuffing box: non-galling two-piece ball-jointed packing gland, gland bolts and nuts.

.7 Gland packing: non-asbestos.

.8 Handwheel: die-cast aluminum alloy to ASTM B85/B85M or malleable iron to ASTM A49. Nut of bronze to ASTM B62.

.9 Identification tag: with catalogue number, size, other pertinent data.

.4 All products to have CRN registration numbers.

### 2.2 GATE VALVES

.1 NPS 2 1/2 - 8, non rising stem, inside screw, iron trim, solid wedge disc:

.1 Body and multiple-bolted bonnet: with [bosses in body and bonnet for taps and drains, full length disc guides designed to ensure correct re-assembly, Class 300.

.2 Disc: solid offset taper wedge, bronze to ASTM B62.

.3 Seat rings: renewable bronze to ASTM B62, screwed into body.

.4 Stem: bronze to ASTM B62.

.5 Disc: solid offset taper wedge, cast iron to ASTM A126 Class B, secured to wrought steel stem.

.6 Seat: integral with body.

.7 Stem: wrought steel.

.8 Operator: handwheel.

## PARTIE 3 EXECUTION

### 3.1 INSTALLATION

.1 Install rising stem valves in upright position with stem above horizontal.

### 3.2 CLEANING

.1 Proceed in accordance with Section 23 05 00 – Common Work Results for HVAC.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools, and equipment.

**END OF SECTION**

## PART 1 GENERAL

### 1.1 RELATED SECTIONS

.1 Section 23 01 00 – Common Work Results for HVAC.

.2 Section 23 05 48 – Vibration and Seismic Controls for HVAC Piping and Equipment.

### 1.2 REFERENCES

.1 Publications in effect

- .1 American Society of Mechanical Engineers (ASME)
  - .1 ASME B31.1, Power Piping.
- .2 ASTM International
  - .1 ASTM A125, Standard Specification for Steel Springs, Helical, Heat-Treated.
  - .2 ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
  - .3 ASTM A563, Standard Specification for Carbon and Alloy Steel Nuts.
- .3 Factory Mutual (FM)
- .4 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
  - .1 MSS SP58, Pipe Hangers and Supports - Materials, Design and Manufacture.
  - .2 MSS SP69, Pipe Hangers and Supports - Selection and Application.
  - .3 MSS SP89, Pipe Hangers and Supports - Fabrication and Installation Practices.
- .5 Underwriter's Laboratories of Canada (ULC)

### 1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 23 01 00 – Common Work Results for HVAC.

.2 Product Data:

- .1 Provide manufacturer's printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish, and limitations.
- .2 Provide all details of suspension and support for ceiling suspended equipment.

.3 Shop Drawings:

- .1 Submit drawings stamped and signed by professional Engineer registered or licensed in the Province of Ontario, Canada.

.2 Submit shop drawings for:

.1 Bases, hangers, and supports.

.2 Connections to equipment and structure.

.3 Structural assemblies.

.4 Manufacturers' Instructions:

.1 Provide manufacturer's installation instructions.

.5 Closeout submittals

.1 Provide maintenance data for incorporation into manual specified in Section 23 05 00 – Common Work Results for HVAC.

## PART 2 PRODUCTS

### 2.1 SYSTEM DESCRIPTION

.1 Design Requirements:

.1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts, and assemblies.

.2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP58.

.3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.

.4 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.

.5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP58.

### 2.2 GENERAL

.1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1 and MSS SP58.

.2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

### 2.3 EQUIPMENT SUPPORTS

.1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel as per manufacturer recommendation.

### 2.4 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

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

## 2.5 OTHER EQUIPMENT SUPPORTS

.1 Fabricate equipment supports from structural grade steel meeting requirements of Structural documents.

.2 Submit structural calculations with shop drawings.

# PART 3 EXECUTION

## 3.1 MANUFACTURER'S INSTRUCTIONS

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

## 3.2 INSTALLATION

.1 Install in accordance with:

.1 Manufacturer's instructions and recommendations.

## 3.3 CLEANING

.1 Clean in accordance with Section 23 01 00 – Common Work Results for HVAC.

.1 Remove surplus materials, excess materials, rubbish, tools, and equipment.

**END OF SECTION**

## PART 1 GENERAL

### 1.1 RELATED SECTIONS

.1 Section 23 01 00 – Common Work Results for HVAC.

### 1.2 REFERENCES

.1 Publications in effect

.1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Safety Data Sheets (SDS).

.2 National Building Code of Canada.

### 1.3 SUBMITTALS

.1 Submittals: in accordance with Section 23 01 00 – Common Work Results for HVAC.

.1 Submit manufacturer's printed product literature, specifications, and datasheet. Include product characteristics, performance criteria, and limitations. Detailed schedules of flexible and rigidly mounted equipment, showing vibration isolators and seismic restraints by referencing numbered descriptive drawings.

.2 Submit shop drawings: in accordance with Section 23 01 00 – Common Work Results for HVAC.

.1 Shop drawings: submit drawings stamped and signed by professional Engineer registered or licensed in Province of Ontario, Canada.

.2 Provide separate shop drawings for each isolated system, system shop drawings, complete with performance and product data.

.3 Provide detailed drawings of seismic control measures for equipment and piping.

.3 Quality assurance submittals: submit following in accordance with Section 23 01 00 – Common Work Results for HVAC.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Instructions: submit manufacturer's installation instructions.

.3 Manufacturer's Field Reports: manufacturer's field reports specified.

.4 Provide a signed letter from an Engineer registered or licensed in the Province of Ontario, Canada, demonstrating compliance with seismic installation requirements.

## PART 2 PRODUCTS

### 2.1 GENERAL

.1 Size and shape of bases type and performance of vibration isolation as indicated.

## PART 3 EXECUTION

### 3.1 MANUFACTURER'S INSTRUCTIONS

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

### 3.2 INSTALLATION

.1 Seismic control measures to meet requirements of National Building Code of Canada.

.2 Install vibration isolation equipment in accordance with manufacturer’s instructions and adjust mountings to level equipment.

.3 Ensure piping, ducting and electrical connections to isolated equipment do not reduce system flexibility and that piping, conduit and ducting passage through walls and floors do not transmit vibrations.

.4 Unless indicated otherwise, support piping connected to isolated equipment with spring mounts or spring hangers with 25 mm minimum static deflection as follows:

.1 Up to NPS4: first 3 points of support. NPS5 to NPS8: first 4 points of support. NPS10 and Over: first 6 points of support.

.2 First point of support: static deflection of twice deflection of isolated equipment, but not more than 50 mm.

.5 Where isolation is bolted to floor use vibration isolation rubber washers.

.6 Block and shim level bases so that ductwork and piping connections can be made to rigid system at operating level before isolator adjustment is made. Ensure that there is no physical contact between isolated equipment and building structure.

### 3.3 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:

.1 Arrange with manufacturer's representative to review work of this Section and submit written reports to verify compliance with Contract Documents.

.2 Manufacturer's Field Services: consisting of product use recommendations and periodic site visits to review installation, scheduled as follows:

.1 Upon completion of installation.

.3 Submit manufacturer's reports to HC Project Manager and Consultant further to manufacturer representative's review.

.4 Adjust and correct in accordance with written report.

.2 Inspection and Certification:

.1 Experienced and competent sound and vibration testing professional engineer to take vibration measurement for HVAC systems after startup and TAB of systems.

.2 Establish adequacy of equipment isolation and acceptability of noise levels in occupied areas and where appropriate, remedial recommendations (including sound curves).

.3 Submit complete report of test results.

## 3.4 CLEANING

.1 Proceed in accordance with Section 23 01 00 – Common Work Results for HVAC.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools, and equipment.

**END OF SECTION**

## PART 1 GENERAL

### 1.1 RELATED SECTIONS

.1 Section 23 01 00 – Common Work Results for HVAC.

### 1.2 REFERENCES

.1 Publications in effect

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.60, Interior Alkyd Gloss Enamel.

.2 CAN/CGSB-24.3, Identification of Piping Systems.

### 1.3 SUBMITTALS

.1 Submittals: in accordance with Section 23 01 00 – Common Work Results for HVAC.

.2 Product data to include paint colour chips, other products specified in this section.

## PART 2 PRODUCTS

### 2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

.1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.

.2 Lettering and numbers raised or recessed.

.3 Information to include, as appropriate:

.1 Equipment: manufacturer's name, model, size, serial number, capacity.

.2 Motor: voltage, Hz, phase, power factor, duty, frame size.

### 2.2 SYSTEM NAMEPLATES

.1 Colours:

.1 Black letters, white background (except where required otherwise by applicable codes).

.2 Construction:

.1 3 mm thick laminated plastic or white anodized aluminum, matte finish, with square corners, letters accurately aligned, and machine engraved into core.

.3 Sizes:

.1 According to following table:

| Size # mm | Sizes (mm) | No. of Lines | Height of Letters (mm) |
|---|---|---|---|
| 1 | 10 x 50 | 1 | 3 |
| 2 | 13 x 75 | 1 | 5 |
| 3 | 13 x 75 | 2 | 3 |
| 4 | 20 x 100 | 1 | 8 |
| 5 | 20 x 100 | 2 | 5 |
| 6 | 20 x 200 | 1 | 8 |
| 7 | 25 x 125 | 1 | 12 |
| 8 | 25 x 125 | 2 | 8 |
| 9 | 35 x 200 | 1 | 20 |

.2 Use maximum of 25 letters/numbers per line.

## 2.3 IDENTIFICATION PIPING SYSTEMS

.1 Color coded self-adhesive piping markers including a directional arrow.

## 2.4 CONTROLS COMPONENTS IDENTIFICATION

.1 Identify all systems, equipment, components, controls, sensors with system nameplates as per building standard.

.2 Inscriptions to include function and (where appropriate) fail-safe position.

## 2.5 LANGUAGE

.1 Identification as per building standard.

# PART 3 EXECUTION

## 3.1 MANUFACTURER'S INSTRUCTIONS

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

## 3.2 INSTALLATION

.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.2 Provide ULC and/or CSA registration plates as required by respective agency.

.3 Identify system as per building standard.

## 3.3 NAMEPLATES

.1 Locations:

.1 In conspicuous location to facilitate simple reading and identification from operating floor.

.2 Standoffs:

.1 Provide for nameplates on hot and/or insulated surfaces.

.3 Protection:

.1 Do not paint, insulate, or cover.

## 3.4 LOCATION OF IDENTIFICATION PIPING SYSTEMS

.1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.

.2 Adjacent to each change in direction.

.3 At least once in each small room through which piping passes.

.4 On both sides of visual obstruction or where run is difficult to follow.

.5 On both sides of separations such as walls, floors, partitions.

.6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.

.7 At beginning and end points of each run and at each piece of equipment in run.

.8 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.

.9 Identification easily and accurately readable from usual operating areas and from access points.

.1 Position of identification at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

## 3.5 CLEANING

.1 Proceed in accordance with Section 23 01 00 – Common Work Results for HVAC.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools, and equipment.

**END OF SECTION**

## PART 1 GENERAL

### 1.1 RELATED SECTIONS

.1 Not used.

### 1.2 SUMMARY

.1 TAB is used throughout this Section to describe the process, methods, and requirements of testing, adjusting, and balancing for HVAC.

.2 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do other work as specified in this section.

### 1.3 QUALIFICATIONS OF TAB PERSONNEL

.1 Submit names of personnel to perform TAB to HC Project Manager and consultant within 90 days of award of contract.

.2 Provide documentation confirming qualifications, successful experience.

.3 TAB: performed in accordance with the requirements of standard under which TAB Firm's qualifications are approved:

.1 Publications in effect:

.1 Associated Air Balance Council, (AABC) National Standards for Total System Balance, MN-1.

.2 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems.

.3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing.

.4 Recommendations and suggested practices contained in the TAB Standard: mandatory.

.5 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.

.6 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.

.7 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.

.8 TAB Standard quality assurance provisions such as performance guarantees form part of this contract.

.1 For systems or system components not covered in TAB Standard, use TAB procedures developed by TAB Specialist.

.2 Where new procedures, and requirements, are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used (AABC, NEBB, or TABB), requirements and recommendations contained in these procedures and requirements are mandatory.

## 1.4 PURPOSE OF TAB

.1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads.

.2 Adjust and regulate equipment and systems to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.

.3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

## 1.5 EXCEPTIONS

.1 TAB of systems and equipment regulated by codes, standards to satisfaction of authority having jurisdiction.

## 1.6 COORDINATION

.1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule to ensure completion before acceptance of project.

.2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

## 1.7 PRE-TAB REVIEW

.1 Review contract documents before project construction is started and confirm in writing to HC Project Manager and Consultant adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.

.2 Review specified standards and report to HC Project Manager and Consultant in writing proposed procedures which vary from standard.

.3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

## 1.8 STARTUP

.1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.

.2 Follow special start-up procedures specified elsewhere in Division 23.

## 1.9 OPERATION OF SYSTEMS DURING TAB

.1 Operate systems for length of time required for TAB and as required by HC Project Manager and Consultant for verification of TAB reports.

## 1.10 START OF TAB

.1 Notify HC Project Manager and Consultant 48 hours prior to start of TAB.

.2 Start TAB when construction is essentially completed.

.3 Installation of ceilings, doors, windows, other construction affecting TAB.

.4 Application of weather-stripping, sealing, and caulking.

.5 Pressure, leakage, other tests specified elsewhere Division 23 are completed.

.6 Provisions for TAB installed and operational.

.7 Start-up, verification for proper, normal, and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:

## 1.11 APPLICATION TOLERANCES

.1 Do TAB to following tolerances of design values:

.1 Hydronic systems: plus, or minus 10%.

## 1.12 ACCURACY TOLERANCES

.1 Measured values accurate to within plus or minus 2% of actual values.

## 1.13 INSTRUMENTS

.1 Prior to TAB, submit to HC Project Manager and Consultant list of instruments used together with serial numbers.

.2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.

.3 Calibrate within 3 months of TAB. Provide certificate of calibration to HC Project Manager and Consultant.

## 1.14 SUBMITTALS

.1 Submit, prior to commencement of TAB:

.1 Proposed methodology and procedures for performing TAB if different from referenced standard.

**1.15 PRELIMINARY TAB REPORT**

.1 Submit for checking and approval of HC Project Manager and consultant, prior to submission of formal TAB report, sample of rough TAB sheets. Include:

.1 Details of instruments used.

.2 Details of TAB procedures employed.

.3 Calculation procedures.

.4 Summaries.

**1.16 TAB REPORT**

.1 TAB report to show results in SI units and to include:

.1 Project record drawings, and system schematic.

.2 Submit PDF of TAB Report to HC Project Manager and Consultant for verification and approval, in English.

**1.17 VERIFICATION**

.1 Reported results subject to verification by HC Project Manager and Consultant.

.2 Pay costs to repeat TAB as required to satisfaction of HC Project Manager and Consultant.

**1.18 SETTINGS**

.1 After TAB is completed to satisfaction of HC Project Manager and Consultant, close access doors, lock devices in set positions, ensure sensors are at required settings.

.2 Permanently mark settings to allow restoration at any time during life of facility. Do not eradicate or cover markings.

**1.19 COMPLETION OF TAB**

.1 TAB considered complete when final TAB Report received and approved by HC Project Manager and Consultant.

## PART 2 PRODUCTS

**2.1 NOT USED**

.1 Not used.

## PART 3 EXECUTION

**3.1 NOT USED**

.1 Not used.

## PART 1 GENERAL

### 1.1 RELATED SECTIONS

.1 Not used.

### 1.2 REFERENCES

.1 Publications in effect:

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)

.1 ASHRAE Standard 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA co-sponsored; ANSI approved; Continuous Maintenance Standard).

.2 American Society for Testing and Materials International (ASTM)

.1 ASTM B209M, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate (Metric).

.2 ASTM C335/C335M, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.

.3 ASTM C411, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.

.4 ASTM C449, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.

.5 ASTM C533, Calcium Silicate Block and Pipe Thermal Insulation.

.6 ASTM C547, Mineral Fiber Pipe Insulation.

.7 ASTM C795, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

.8 ASTM C921, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.3 Canadian General Standards Board (CGSB)

.1 CGSB 51-GP-52Ma, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.2 CAN/CGSB-51.53, Poly (Vinyl Chloride) Jacketing Sheet, for Insulated Pipes, Vessels, and Round Ducts

.4 Department of Justice Canada (Jus)

.1 Canadian Environmental Assessment Act (CEAA), 1995, c. 37.

.2 Canadian Environmental Protection Act (CEPA), 1999, c. 33.

.3 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.6 Manufacturer's Trade Associations

.1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards.

.7 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC-S701, Thermal Insulation, Polystyrene, Boards and Pipe Covering.

.3 CAN/ULC-S702, Thermal Insulation, Mineral Fibre, for Buildings

.4 CAN/ULC-S702.2, Thermal Insulation, Mineral Fibre, for Buildings, Part 2: Application Guidelines.

## 1.3 DEFINITIONS

.1 For purposes of this section:

.1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.

.2 "EXPOSED" - will mean "not concealed" as specified.

.2 TIAC ss:

.1 CPF: Code Piping Finish.

## 1.4 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications, and datasheet. Include product characteristics, performance criteria, and limitations.

.3 Shop Drawings:

.1 Submit shop drawings in accordance with Section 23 05 00 – Common Work Results for HVAC.

.4 Quality assurance

.1 Qualifications:

.1 Installer: specialist in performing work of this Section and have at least 3 years successful experience in this size and type of project, qualified to standards of TIAC.

# PART 2 PRODUCTS

## 2.1 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC-S102.

.1 Maximum flame spread rating: 25.

.2 Maximum smoke developed rating: 50.

## 2.2 HVAC PIPING INSULATION

.1 Mineral fibre specified includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24 degrees C mean temperature when tested in accordance with ASTM C335.

## 2.3 INSULATION SECUREMENT

.1 Tape: self-adhesive, aluminum, reinforced, 50 mm wide minimum.

.2 Contact adhesive: quick setting.

.3 Canvas adhesive: washable.

.4 Tie wire: 1.5 mm diameter stainless steel.

.5 Bands: stainless steel, 19 mm wide, 0.5 mm thick.

## 2.4 VAPOUR RETARDER LAP ADHESIVE

.1 Water based, fire retardant type, compatible with insulation.

# PART 3 EXECUTION

## 3.1 MANUFACTURER'S INSTRUCTIONS

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

## 3.2 PRE-INSTALLATION REQUIREMENT

.1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed, and certified.

.2 Surfaces clean, dry, free from foreign material.

## 3.3 INSTALLATION

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturer’s instructions and this specification.

.3 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

.1 Install hangers, supports outside vapour retarder jacket.
.2 Hangers are not to penetrate insulation.

.4 Supports, Hangers:

.1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

## 3.4 REMOVABLE, PRE-FABRICATED, INSULATION AND ENCLOSURES

.1 Application: at expansion joints, valves, primary flow measuring elements, flanges, and unions at equipment.

.2 Design: to permit movement of expansion joint and to permit periodic removal and replacement without damage to adjacent insulation.

.3 Insulation:

.1 Insulation, fastenings, and finishes: same as system.

.2 Jacket: polyvinyl chloride (PVC)

## 3.5 INSTALLATION OF ELASTOMERIC INSULATION

.1 Insulation to remain dry. Overlaps to manufacturer’s instructions. Ensure tight joints.

.2 Provide vapour retarder as recommended by manufacturer.

## 3.6 PIPING INSULATION SCHEDULES

.1 Install new insulation on all new piping and existing piping altered by work and accessories.

.2 Includes valves, valve bonnets, strainers, flanges, and fittings unless otherwise specified.

.3 Mineral fibre specified includes glass fibre, rock wool, slag wool.

.4 Thermal conductivity ("k" factor) not to exceed specified values at 24 degrees C mean temperature when tested in accordance with ASTM C335.

.1 All hot water supply and return piping provide tie into existing insulation touched by work.

.1 Provide fiber glass premolded insulation according to ONGC 51-GP-9M, with all service jacket and vapour-barrier according to ONGC 51-GP-52M and have a maximum conductivity "k" (ASTM C553) of 0.042w/m°c at 93°c (0.31btu in/hr-sqft°f at 200°f).

.2 Thickness: 38mm (1½").

## 3.7 JACKETS SCHEDULES

.1 Polyvinyl Chloride (PVC):

.1 One-piece moulded type and sheet to CAN/CGSB-51.53 with pre-formed shapes as required.

.2 Colours: by consultant.

.3 Minimum service temperatures: -20 degrees C.

.4 Maximum service temperature: 65 degrees C.

.5 Moisture vapour transmission: 0.02 perm.

.6 Thickness: 0.5 mm.

.7 Fastenings:

.1 Use solvent weld adhesive compatible with insulation to seal laps and joints.

.2 Tacks.

.3 Pressure sensitive vinyl tape of matching colour.

.8 Location: all insulated exposed piping.

## 3.8 CLEANING

.1 Proceed in accordance with Section 23 05 00 – Common Work Results for HVAC.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools, and equipment.

**END OF SECTION**

## PART 1 GENERAL

### 1.1 SUMMARY

.1 Section Includes:

.1 Procedures and cleaning solutions for cleaning mechanical piping systems.

### 1.2 REFERENCE STANDARDS

.1 ASTM International (ASTM)

.1 ASTM E202-, Standard Test Methods for Analysis of Ethylene Glycols and Propylene Glycols.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Safety Data Sheets (SDS).

### 1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's printed product literature, specifications, and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.2 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

### 1.4 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling, and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions.

.2 Waste Management and Disposal:

.1 Waste Management and Disposal: separate waste materials for recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

## PART 2 PRODUCTS

### 2.1 CLEANING SOLUTIONS

.1 Tri-sodium phosphate: 0.40 kg per 100 L water in system.

.2 Sodium carbonate: 0.40 kg per 100 L water in system.

.3 Low-foaming detergent: 0.01 kg per 100 L water in system.

## PART 3 EXECUTION

### 3.1 MANUFACTURER'S INSTRUCTIONS

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

### 3.2 CLEANING HYDRONIC SYSTEMS

.1 Timing: systems operational, hydrostatically tested and with safety devices functional before cleaning is carried out.

.2 Cleaning Agency:

.1 Retain qualified water treatment specialist to perform system cleaning.

.3 Install instrumentation such as flow meters, orifice plates, pitot tubes, flow metering valves only after cleaning is certified as complete by water treatment specialist.

.4 Cleaning procedures:

.1 Provide detailed report outlining proposed cleaning procedures at least 4 weeks prior to proposed starting date. Report to include:

.1 Cleaning procedures, flow rates, elapsed time.

.2 Chemicals and concentrations used.

.3 Inhibitors and concentrations.

.4 Specific requirements for completion of work.

.5 Special precautions for protecting piping system materials and components.

.6 Complete analysis of water used to ensure water will not damage systems or equipment.

.5 Conditions at time of cleaning of systems:

.1 Systems: free from construction debris, dirt, and other foreign material.

.2 Control valves: operational, fully open to ensure that terminal units can be cleaned properly.

.3 Strainers: clean prior to initial fill.

.4 Install temporary filters on pumps not equipped with permanent filters.

.5 Install pressure gauges on strainers to detect plugging.

.6 Report on Completion of Cleaning:

.1 When cleaning is completed, submit report, complete with certificate of compliance with specifications of cleaning component supplier.

.7 Hydronic Systems:

.1 Fill the system with water, ensure air is vented from the system.

.2 Use water meter to record volume of water in system to +/- 0.5%.

.3 Add chemicals under direct supervision of chemical treatment supplier.

.4 Closed loop systems: circulate system cleaner at 60 degrees C for at least 36 hours. Drain as quickly as possible. Refill with water and inhibitors. Test concentrations and adjust to recommended levels.

.5 Flush velocity in system mains and branches to ensure removal of debris. System pumps may be used for circulating cleaning solution if velocities are adequate.

.6 Add chemical solution to system.

.7 Establish circulation, raise temperature slowly to maximum design or 82 degrees C minimum. Circulate for 12 hours, ensuring flow in all circuits. Remove heat, continue to circulate until temperature is below 38 degrees C. Drain as quickly as possible. Refill with clean water. Circulate for 6 hours at design temperature. Drain and repeat procedures specified above. Flush through low point drains in system. Refill with clean water adding to sodium sulphite (test for residual sulphite).

## 3.3 START-UP OF HYDRONIC SYSTEMS

.1 After cleaning is completed and system is filled:

.1 Establish circulation and expansion tank level, set pressure controls.

.2 Ensure air is removed.

.3 Check pumps to be free from air, debris, possibility of cavitation when system is at design temperature.

.4 Dismantle system pumps used for cleaning, inspect, replace worn parts, install new gaskets and new set of seals.

.5 Clean out strainers repeatedly until the system is clean.

.6 Check water level in expansion tank with cold water with circulating pumps OFF and again with pumps ON.

.7 Repeat with water at design temperature.

.8 Check pressurization to ensure proper operation and to prevent water hammer, flashing, cavitation. Eliminate water hammer and other noises.

.9 Bring the system up to design temperature and pressure slowly.

.10 Perform TAB as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.11 Adjust pipe supports, hangers, springs as necessary.

.12 Monitor pipe movement, performance of expansion joints, loops, guides, anchors.

.13 Re-tighten bolts using torque wrench, to compensate for heat-caused relaxation. Repeat several times during commissioning.

.14 Check operation of drain valves.

.15 Adjust valve stem packings as systems settle down.

.16 Fully open balancing valves (except those that are factory-set).

.17 Check operation of over-temperature protection devices on circulating pumps.

.18 Adjust alignment of piping at pumps to ensure flexibility, adequacy of pipe movement, absence of noise or vibration transmission.

## 3.4 CLEANING

.1 Proceed in accordance with Section 01 74 00 - Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools, and equipment.

**END OF SECTION**

## PART 1 GENERAL

### 1.1 REFERENCE STANDARDS

.1 American National Standards Institute/American Water Works Association (ANSI/AWWA)

.1 ANSI/AWWA C111/A21.11, Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

.2 American Society of Mechanical Engineers (ASME)

.1 ASME B16.1, Grey Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.

.2 ASME B16.3, Malleable Iron Threaded Fittings: Classes 150 and 300.

.3 ASME B16.5, Pipe Flanges and Flanged Fittings: NPS ½ through NPS 24 Metric/Inch Standard.

.4 ASME B16.9, Factory-Made Wrought Buttwelding Fittings.

.5 ASME B18.2.1, Square Hex, Heavy Hex and Askew Head Bolts and Hex, Heavy Hex, Hex Flange. Loaded Head and Lag Screws (Inch Series).

.6 ASME B18.2.2, Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series).

.3 ASTM International (ASTM)

.1 ASTM A47/A47M, Standard Specification for Ferritic Malleable Iron Castings.

.2 ASTM A53/A53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.

.3 ASTM A536, Standard Specification for Ductile Iron Castings.

.4 ASTM B61, Standard Specification for Steam or Valve Bronze Castings.

.5 ASTM B62, Standard Specification for Composition Bronze or Ounce Metal Castings.

.4 Manufacturer's Standardization of the Valve and Fittings Industry (MSS)

.1 MSS-SP-67, Butterfly Valves.

.2 MSS-SP-70, Grey Iron Gate Valves, Flanged and Threaded Ends.

.3 MSS-SP-71, Grey Iron Swing Check Valves Flanged and Threaded Ends.

.4 MSS-SP-80, Bronze Gate, Globe, Angle and Check Valves.

.5 MSS-SP-85, Grey Iron Globe, Angle Valves, Flanged and Threaded Ends.

## 1.2 EXTRA STOCK MATERIALS

.1 Supply spare parts as follows:

.1 Valve seats: 1 minimum for every ten valves, each size. Minimum one.

.2 Discs: 1 minimum for every ten valves, each size. Minimum one.

.3 Stem packing: 1 minimum for every ten valves, each size. Minimum one.

.4 Valve handles: 2 minimum of each size.

.5 Gaskets for flanges: 1 minimum for every ten flanges.

## 1.3 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.2 Storage and Handling Requirements:

.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect hydronic systems from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

# PART 2 PRODUCTS

## 2.1 PIPE

.1 Steel pipe: to ASTM A53/A53M, Grade [B], as follows:

.1 To NPS 6: Schedule 40.

## 2.2 PIPE JOINTS

.1 NPS 2 and under: screwed fittings with PTFE tape.

.2 NPS 2-1/2 and over: welding fittings and flanges to CSA W48.

.3 Roll grooved: standard coupling to CSA B242.

.4 Flanges: plain weld neck to ANSI/AWWA C111/ A21.11.

.5 Orifice flanges: slip-on raised face, 2100 kPa.

.6 Flange gaskets: to ANSI/AWWA C111/ A21.11.

.7 Pipe thread: taper.

.8 Bolts and nuts: to ASME B18.2.1 and ASME B18.2.2.

.9 Roll grooved coupling gaskets: type EPDM.

## 2.3 FITTINGS

.1 Screwed fittings: malleable iron, to ASME B16.3, Class 150.

.2 Pipe flanges and flanged fittings:

.1 Cast iron: to ASME B16.1, Class 125.

.2 Steel: to ASME B16.5.

.3 Butt-welding fittings: steel, to ASME B16.9.

.4 Unions: malleable iron, to ASTM A47/A47M and ASME B16.3.

.5 Fittings for roll grooved piping: malleable iron to ASTM A47/A47M ductile iron to ASTM A536.

.6 Balancing, for TAB:

.1 Sizes: calibrated balancing valves, as specified in this section.

.2 NPS 2 and under:

.1 Globe, with plug disc

.7 Drain valves: Gate, Class 125, non-rising stem, solid wedge disc.

## PART 3 EXECUTION

### 3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for hydronic systems installation in accordance with manufacturer's written instructions.

.1 Inform HC Project Manager and Consultant of unacceptable conditions immediately upon discovery.

.2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from HC Project Manager and Consultant.

### 3.2 PIPING INSTALLATION

.1 Install pipework in accordance with Section 23 05 05 – Installation of Pipework.

### 3.3 CIRCUIT BALANCING VALVES

.1 Install flow balancing valves as indicated.

.2 Remove the handwheel after installation and when TAB is complete.

.3 Tape joints in prefabricated insulation on valves installed in heating water mains.

### 3.4 CLEANING, FLUSHING AND START-UP

.1 In accordance with Section 23 08 16 - Cleaning and Start-Up of HVAC Piping Systems.

### 3.5 TESTING

.1 Test system in accordance with Section 23 05 00 - Common Work Results for HVAC.

**END OF SECTION**

## PART 1 GENERAL

### 1.1 REFERENCE STANDARDS

.1 ASTM International (ASTM)

.1 ASTM A47/A47M, Standard Specification for Ferritic Malleable Iron Castings.

.2 ASTM A278/A278M, Standard Specification for Grey Iron Castings for Pressure-Containing Parts for Temperatures up to 650 degrees F (350 degrees C).

.3 ASTM A516/A516M, Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate - and Lower - Temperature Service.

.4 ASTM A536, Standard Specification for Ductile Iron Castings.

.5 ASTM B62, Standard Specification for Composition Bronze or Ounce Metal Castings.

## PART 2 PRODUCTS

### 2.1 FIN RADIATION

.1 Non-Ferrous Elements:

.1 Elements fin and tube size and number of rows to be provided as per plan schedule.

.2 Elements to be fabricated with seamless copper tube with aluminum fins where the tube is mechanically expanded into the fin collars. Tube to be swaged at one end.

.3 Elements to be rated for maximum 200 psi working pressure.

.4 ASTM A536, Standard Specification for Ductile Iron Castings.

.5 Manufacturer to have IBR listed finned tube.

.2 Support of Enclosure and Elements:

.1 Die formed brackets to be provided for support of element. Brackets to interface with enclosures as needed to suit the given enclosure style.

.2 Support cradles to allow lateral movement for expansion and contraction. Hanger strip to be provided in 6-foot lengths, minimum 18-gauge steel.

.3 For continuous runs, the recommended center distance for brackets or pedestals is 30 to 36 inches.

## 2.2 AIR VENT

.1 Duovent high-capacity air vent with automatic and manual vent feature:

.1 Body and cover are brass construction.

.2 Air vent with silicone rubber seal.

.3 Float is high temperature resistant polyethylene.

.4 Air vent shall have brass body, cover, and silicone rubber seal. Float shall be constructed of high temperature resistant polyethylene. ASTM A536, Standard Specification for Ductile Iron Castings.

## 2.3 STRAINER

.1 A wye-pattern cast iron strainer to be installed as indicated on the plans.

.2 The strainer must have a tapped retainer cap and threaded end connections.

.3 Strainer shall be rated to 400psi (27.6 bar) WOG at 150ºF (66ºC); 250psi (17.2 bar) WSP at 406ºF (208ºC).

## 2.4 BALANCING VALVE

.1 Maximum Working Pressure: 300 psi / 20 bar (pn20)

.2 Operating Temperature Range: -4°F to 300°F (-20°C to 150°C)

.3 Body/Bonnet: Brass-c46500

.4 Stem/Disc: Brass-c46500

.5 Elastomers: EPDM (may contain silicone)

.6 Handwheel: Reinforced Nylon; ABS.

.7 Valves can be “line sized” for applications with 2 to 4 ft/ sec (0.7 to 1.3 m/s) flow velocity for nominal pipe size. For valve sizing based on design flow, check the Range Chart and Flow Rate Ranges.

.8 All valves are furnished with PT Ports for differential pressure measurement across the venturi.

.9 Refer to Flow Rate Ranges for venturi Flow Coefficients

.10 For optimum accuracy, locate the valve at 5 pipe diameters downstream of a fitting and 2 pipe diameters upstream of a fitting.

## 2.5 CONTROL VALVE

.1 New control valve to attach to existing Siemens SSC81.5U actuator.

.2 Direct coupled universal bonnet.

.3 Stainless-steel trim.

.4 ANSI Leakage Class IV (0.01% of cV).

.5 Body 1/2- and 3/4-inch C37700 Forged brass, 1-inch UNS CA 844 Bronze Body.

.6 Stem Stainless steel ASTM A582 Type 303.

.7 Packing Ethylene propylene O-ring.

.8 Valve size 1/2 inch to 1 inch (15 mm to 25 mm).

.9 Body style: Globe.

.10 Seat style: Metal-to-metal.

.11 Action normally open/normally closed.

.12 Valve body rating ANSI Class 250.

.13 Stem travel (Stroke) 7/32-inch (5.5 mm).

**2.6 DESLUDGER**

.1 Provide as shown on the drawings a desludger as per Drag'eau DS-D65.

## PART 3 EXECUTION

### 3.1 APPLICATION

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

### 3.2 GENERAL

.1 Maintain adequate clearance to permit service and maintenance. Check shop drawings for conformance of tappings for ancillaries and for equipment operating weights.

### 3.3 STRAINERS

.1 Install in horizontal or down flow lines.

.2 Ensure clearance for removal of basket.

.3 Install ahead of each pump.

### 3.4 AIR VENTS

.1 Install at high points of systems.

.2 Install gate valve on automatic air vent inlet.

### 3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools, and equipment in accordance with Section 01 74 00 - Cleaning.

.3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

Appendix A – Designated Substance Survey and Report (DSR)

# PROJECT-SPECIFIC DESIGNATED SUBSTANCE REPORT
# PERIMETER HEATING REPLACEMENT PROJECT

**LABORATORY CENTRE FOR DISEASE CONTROLS**
**100 EGLANTINE DRIVEWAY**
**OTTAWA, ONTARIO**

**ATTENTION:**

**SEBASTIEN BOUDREAULT**
**PROJECT MANAGER**

**GEC PROJECT No. 33381**
**October 3rd, 2023**

**Greenough Environmental Consulting Inc.**
**29 Capital Drive, Ottawa, ON K2G 0E7**
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# 1.0 INTRODUCTION

Greenough Environmental Consulting Inc. (GEC) was commissioned by COSMEL (Client) under the direction of Sebastien Boudreault (Principal Managing Partner), to conduct a *Project-Specific* Designated Substance Survey and Report (DSR) for the upcoming project anticipated within the Laboratory Centre for Disease Control located in Tunney's Pasture at 100 Eglantine Driveway in Ottawa, Ontario.

The purpose of the investigation was to identify the quantity, location, and condition of designated substances within specified areas which may be impacted as part of the aforementioned project.

# 2.0 SCOPE OF WORK

The scope of work followed during the assessment was completed in accordance with the scope of work agreed upon by GEC and the Client. The survey specifically included identification and sampling (where appropriate) of the eleven designated substances in Ontario as follows:

- Acrylonitrile
- Arsenic
- Asbestos
- Benzene
- Coke oven Emissions
- Ethylene Oxide
- Isocyanates
- Lead
- Mercury
- Silica
- Vinyl Chloride

All work was completed in accordance with provincial regulations (O. Reg 490/09 and 278/05), the PSPC Asbestos Management Standard and the Canada Labour Code.

Project locations were identified based on the project drawings provided by COSMEL. The survey program was non-destructive in nature and was limited to areas with free and clear access.

Additional details regarding the methodology and scope of work can be found in **Appendix D**.

# 3.0 FINDINGS

A summary of the designated substance survey results is presented in **Table 1**.

**TABLE 1 – SUMMARY OF FINDINGS AND RECOMMENDATIONS**
LCDC BUILDING – 100 EGLANTINE DRIVEWAY, OTTAWA ONTARIO

**SITE SURVEYOR: HAYDEN KETTLEWELL** **DATE OF ASSESSMENT: SEPTEMBER 13TH, 2023**
**PROJECT SCOPE: PERIMETER HEATING REPLACEMENT DSR**

| Item of Concern | Comments | Conclusions & Recommendations | Photos Appendix C |
|---|---|---|---|
| Asbestos | Based on the on-site assessment, historical sampling and laboratory results, the following materials within the project area have been determined to be ***asbestos containing:***<br><br>• **Pipe Insulation (Historical Sample ID: LCDC-1457 A21a-c):** Not observed during the site survey but may be concealed within the project areas.<br><br>**NOTE:** No additional suspected asbestos-containing materials were identified within the project areas that are anticipated to be disturbed by the project activities. ACMs have been identified within the subject building outside of the current project area. Should the current project scope change to include additional areas, further investigation may be required.<br><br>A summary of sample results, descriptions, locations and results, including descriptions and locations of materials confirmed to not contain asbestos can be found in **Appendix A** | All asbestos-containing materials that will be or have the potential to be impacted during the course of this project must be abated by a licenced abatement contractor following the procedures outlined in Ontario Regulation 278/05, PSPC Asbestos Management Standard and the Canada Labour Code as applicable to each material.<br><br>If asbestos-containing pipe insulation is encountered as part of the project, a minimum of Type 2 asbestos precautions are required for abatement, and Type 3 precautions are required if disturbance of more than 1 $m^2$ is required.<br><br>Suspect materials, identified herein and/or identified during future projects not discussed in this report, should be treated as ACMs unless proven otherwise through material specific sampling and analysis in accordance with the requirements of Ontario Regulation 278/05, PSPC Asbestos Management Standard and the Canada Labour Code.<br><br>The roles and responsibility of "the owner" as stipulated in Section 8 of Ontario Regulation 278/05 must be recognized and adhered to including, but not limited to, notification to occupiers and workers as well as training.<br><br>General recommendations for asbestos can be found in Section 2.1 of **Appendix D**. | **Figure 1:** Representative photograph of non-asbestos containing cement parging at pipe penetrations within the Ground Floor Mechanical Room (Room 1457). Cement parging is confirmed to be non-asbestos containing (Sample ID: AS-01A-C)<br><br>**Figure 2:** Representative photograph of non-asbestos containing black tar on cork board observed within the 2nd Floor ceiling space (Sample ID: AS-02A-C).<br><br>**Figure 3:** Representative |

**TABLE 1 – SUMMARY OF FINDINGS AND RECOMMENDATIONS**

LCDC BUILDING – 100 EGLANTINE DRIVEWAY, OTTAWA ONTARIO

**SITE SURVEYOR: HAYDEN KETTLEWELL** **DATE OF ASSESSMENT: SEPTEMBER 13TH, 2023**
**PROJECT SCOPE: PERIMETER HEATING REPLACEMENT DSR**

| Item of Concern | Comments | Conclusions & Recommendations | Photos Appendix C |
|---|---|---|---|
| Lead | A paint finish is considered lead-containing, with a concentration of lead more than 1,000 ppm (µg/g) based on the Environmental Abatement Council of Canada (EACC) Guidelines, October 2014. The collected paint samples listed was below the EACC limit of 1000ppm and Federal Regulation SOR/2016-193) limit of 90 ppm.<br><br>• 2nd Floor Gray Wall Paint (Sample ID: LP-01, 8ppm)<br>• 2nd Floor adjacent Office Area Blue Wall Paint (Sample ID: LP-02, <5ppm)<br>• 1st Floor Gray Wall Paint (Sample ID: LP-03, 5ppm)<br><br>Based on the age of the building and historical applications, lead is assumed to also be present on **solder on joints of copper piping, cast iron joint caulking and electrical wiring** (where observed within the project areas).<br><br>A summary of sample results, descriptions and locations can be found in **Appendix B** | The Ontario Ministry of Labour Guideline - Lead on Construction Projects dated April 2011 does not require removal of lead paint or lead-containing materials unless work on these materials is likely to produce lead fumes or dust, for example, during welding, torch cutting, grinding, sanding, or sand blasting. Copper pipes can be cut a short distance (at least 5 cm) from the solder joint to avoid disturbing potential lead in the solder.<br><br>In the event that any work is conducted that has the potential to create airborne lead, every employer shall take all necessary measures and procedures by means of engineering controls, work practices and hygiene practices and facilities to ensure that the time-weighted average exposure of a worker to airborne lead, except tetraethyl lead, shall not exceed 0.05 milligrams lead per cubic metre of air, and in the case of exposure to tetraethyl lead 0.10 milligrams lead per cubic metre of air. O. Reg. 490/09, as amended.<br><br>General recommendations for lead can be found in Section 2.2 of **Appendix C**. | photograph of wall plaster (white and gray layers) observed behind drywall throughout the project areas. Drywall joint compound is confirmed to be non-asbestos (Sample ID: AS-03A-D).<br><br>**Figure 4:** Representative photograph of drywall joint compound (blue arrow) observed in "Poor Condition" on the 2nd Floor at pipe penetrations. Drywall joint compound was sampled and confirmed to be non-asbestos containing (Sample ID: |

**TABLE 1 – SUMMARY OF FINDINGS AND RECOMMENDATIONS**

LCDC BUILDING – 100 EGLANTINE DRIVEWAY, OTTAWA ONTARIO

**SITE SURVEYOR: HAYDEN KETTLEWELL** **DATE OF ASSESSMENT: SEPTEMBER 13TH, 2023**
**PROJECT SCOPE: PERIMETER HEATING REPLACEMENT DSR**

| Item of Concern | Comments | Conclusions & Recommendations | Photos Appendix C |
|---|---|---|---|
| Silica | Silica is assumed to be present in concrete components, drywall (gypsum) and drywall joint compound. | Silica dust can be generated by drilling, coring, blasting, grinding, crushing and sandblasting silica-containing materials.<br><br>Should the above noted manipulation of the potential silica-containing materials be completed, ensure that all necessary measures and procedures by means of engineering controls, work practices and hygiene practices and facilities are implemented to ensure that the TWAEV of a worker to silica is reduced to the lowest practical level and , in any event, shall not exceed 0.05 milligrams per cubic metre of air by volume for cristobalite and tridymite, and 0.10 milligrams silica per cubic metre of air by volume for quartz and tripoli.<br><br>General recommendations for silica can be found in Section 2.3 of **Appendix C**. | AS-04A-C). Fibreglass insulation (red arrow) was sampled as per client request and confirmed to be non-asbestos containing (Sample ID: AS-06A-C).<br><br>**Figure 5:** Representative photograph of cementitious debris observed at pipe penetrations on the 2nd Floor adjacent to the |

**TABLE 1 – SUMMARY OF FINDINGS AND RECOMMENDATIONS**

LCDC BUILDING – 100 EGLANTINE DRIVEWAY, OTTAWA ONTARIO

**SITE SURVEYOR: HAYDEN KETTLEWELL** **DATE OF ASSESSMENT: SEPTEMBER 13TH, 2023**
**PROJECT SCOPE: PERIMETER HEATING REPLACEMENT DSR**

| Item of Concern | Comments | Conclusions & Recommendations | Photos Appendix C |
|---|---|---|---|
| Other Designated Substances | The following Designated Substances were not identified in quantities or forms which are anticipated to be impacted as part of the current project scope of work:<br><br>Acrylonitrile<br>Arsenic<br>Benzene<br>Coke Oven Emissions<br>Ethylene Oxides<br>Isocyanates<br>Mercury<br>Vinyl Chloride | No recommendations warranted. | Kitchen. The cementitious debris was sampled and confirmed to be non-asbestos containing (Sample ID: AS-05A-C).<br><br>**Figure 6:** Representative photograph of non-asbestos containing vinyl baseboard/mastic observed throughout the project areas (Sample ID: AS-07A-C). Gray wall paint was also sampled from this location and is confirmed to be non-lead containing (Sample ID: LP-01, 8ppm). |

# 4.0 SURVEY LIMITATIONS

This report reflects the observations of accessed areas only, as they relate to the current scope of work. It is possible that additional designated substances and hazardous materials exist outside the survey area, but they are beyond the scope of this survey.

**GEC cannot warrant against the discovery of additional ACMs concealed in wall cavities, closed bulkheads and closed ceilings etc. due to the non-destructive nature of this survey.**

Various building materials that may contain asbestos were not sampled during the survey due to accessibility (i.e., require dismantling or demolishing). These include, but are not limited to; underground mechanical piping, high voltage wiring, building exterior, various adhesives, bell fittings, components and wiring within motors and lights, and mechanical gaskets.

No access was obtained into the following areas of the building:

- Concealed ceiling and wall cavities.

GEC cannot warrant against the discovery of additional designated substances and hazardous materials in inaccessible wall cavities, pipe penetrations, closed bulkheads, and ceilings due to the non-intrusive nature of this assessment. If suspect materials are discovered in areas not accessed during the survey (i.e., within fire doors, beneath carpets, etc.), they should be treated as asbestos-containing materials until proven otherwise through sampling and subsequent laboratory analysis.

This report was not intended to provide direction or procedures for the handling of designated substances and hazardous materials. Only persons with documented, current training in the safe handling of the designated substances and hazardous materials should handle them. Persons handling any of the designated substances and/or hazardous materials identified in this survey, or conducting work in the vicinity of these materials are advised to consult this survey and individuals with appropriate experience and training, prior to doing so.

# 5.0 CLOSURE

This report has been prepared for the sole benefit of the Client and their intended use. The report may not be relied upon by any other person or entity without the written consent of Greenough Environmental Consulting Inc. (GEC), and the Client.

GEC accepts no responsibility for any use that an outside party makes of this report and any reliance on decisions made based on it, are the responsibility of such parties.

The conclusions presented represent the best judgment of the assessor based on current environmental standards. Due to the nature of the investigation and the limited data available, the assessor cannot warrant against undiscovered environmental liabilities.

We trust that the report meets your current requirements. Should you have any questions or concerns regarding the above, please do not hesitate to contact the undersigned.

Yours truly,

**GREENOUGH ENVIRONMENTAL CONSULTING INC.**

Reported By:

Hayden Kettlewell
Environmental Technician

Reviewed By:

David Koning, P. Eng.
Senior Project Manager

# APPENDIX A

## SUMMARY OF RESULTS & CERTIFICATES OF LABORATORY ANALYSIS:

## ASBESTOS

# Summary of Results & Certificates of Laboratory Analysis: Asbestos

The sampling completed for the purpose of this Project-Specific DSR is outlined in **Table 2** below.

| **TABLE 2 – RESULTS OF ASBESTOS ANALYSIS**<br>LCDC BUILDING – 100 EGLANTINE DRIVEWAY, OTTAWA ONTARIO | | | | |
|---|---|---|---|---|
| **Sample Reference** | **Building Material Description** | **Application of Material** | **Location of Sample** | **Result & Type** |
| GEC Sampling September 13th, 2023 | | | | |
| AS-01A | Parging Cement at Pipe Penetrations | Walls | Ground Floor Mechanical Room | ND |
| AS-01B | | | | ND |
| AS-01C | | | | ND |
| AS-02A | Black Tar on Corkboard | Misc. | 2nd Floor Ceiling Space | ND |
| AS-02B | | | | ND |
| AS-02C | | | | ND |
| AS-03A | Wall Plaster – White | Walls | Concealed behind Drywall throughout the Project Area | ND |
| | Wall Plaster - Grey | | | ND |
| AS-03B | Wall Plaster – White | | | ND |
| | Wall Plaster - Grey | | | ND |
| AS-03C | Wall Plaster – White | | | ND |
| | Wall Plaster - Grey | | | ND |
| AS-03D | Wall Plaster – White | | | ND |
| | Wall Plaster - Grey | | | ND |
| AS-04A | Drywall Joint Compound | Walls | 2nd Floor adjacent Kitchen | ND |
| AS-04B | | | | ND |
| AS-04C | | | | ND |
| AS-05A | Cementitious Debris | Debris | 2nd Floor at Pipe Runs | ND |
| AS-05B | | | | ND |
| AS-05C | | | | ND |
| AS-06A | Fibreglass Insulation | Mechanical | 2nd Floor Ceiling Space within Office Area | ND |
| AS-06B | | | | ND |
| AS-06C | | | | ND |

| TABLE 2 – RESULTS OF ASBESTOS ANALYSIS<br>LCDC BUILDING – 100 EGLANTINE DRIVEWAY, OTTAWA ONTARIO | | | | |
|---|---|---|---|---|
| **Sample Reference** | **Building Material Description** | **Application of Material** | **Location of Sample** | **Result & Type** |
| AS-07A | Baseboard Mastic | Wall/Floor | 2nd Floor adjacent Kitchen | ND |
| AS-07B | | | | ND |
| AS-07C | | | | ND |
| BluMetric Environmental Historical Sampling (2021) | | | | |
| **LCDC-1457 A21a** | **Pipe Insulation** | **Mechanical** | **Room 1457** | **20% CH** |
| **LCDC-1457 A21b** | | | | **PS** |
| **LCDC-1457 A21c** | | | | **PS** |
| LCDC-3447 A21a | Plaster (on wire mesh) | Walls | Room 3447 | ND |
| LCDC-3447 A21b | | | | ND |
| LCDC-3447 A21c | | | | ND |

**Notes:**

**ND = No Asbestos Detected.**
**CH = Chrysotile Asbestos, TR = Tremolite Asbestos, AM = Amosite Asbestos**
**PS = Positive Stop: Not Analysed - Asbestos Detected In A Previous Sample Within The Series.**
**<MDL = Below Method Detection Limit – Trace Asbestos Detected Below 0.5% - Not Considered Asbestos Containing Per O.Reg 278/05.**
An "Asbestos-containing material," as defined by the Ontario Ministry of Labour Regulation 278/05, is any material found to contain 0.5% or greater asbestos by dry weight.

Based on historical sampling by BluMetric (2021) and on-site observations, the following ***Asbestos containing materials were identified*** during the survey:

- **Pipe Insulation (Historical Sample ID: LCDC-1457 A21a-c, 20% Chrysotile):** Not observed during the site survey but may be concealed within the project areas.

Based on the on-site assessment and laboratory results, the following non-asbestos containing materials were identified within the project areas.

- Parging Cement at Pipe Penetrations (Sample ID: AS-01 A-C);
- Black Tar on Corkboard (Sample ID: AS-02A-C);

- Wall Plaster – White& Grey Layers (Sample ID: AS-03A-D);
- Drywall Joint Compound (Sample ID: AS-04 A-C);
- Cementitious Debris (Sample ID: AS-05 A-C);
- Fibreglass Insulation (Sample ID: AS-06 A-C);
- Baseboard Mastic (Sample ID: AS-07 A-C);

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Phone: (613) 792-4125
Fax:
Collected:
Received: 9/19/2023
Analyzed: 9/25/2023

**Proj:** LCDC-33381

## Summary Test Report for Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05

***Client Sample ID:*** AS-01A **Lab Sample ID:** **672302859-0001**
***Sample Description:*** Mechanical Room Parging at Pipe Penetration

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/22/2023 | Gray | 0.0% | 100.0% | None Detected | |

***Client Sample ID:*** AS-01B **Lab Sample ID:** **672302859-0002**
***Sample Description:*** Mechanical Room Parging at Pipe Penetration

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/22/2023 | Gray | 0.0% | 100.0% | None Detected | |

***Client Sample ID:*** AS-01C **Lab Sample ID:** **672302859-0003**
***Sample Description:*** Mechanical Room Parging at Pipe Penetration

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/25/2023 | Gray | 0.0% | 100.0% | None Detected | |

***Client Sample ID:*** AS-02A **Lab Sample ID:** **672302859-0004**
***Sample Description:*** Black Tar on Curboard Above Ceiling on 2nd Floor

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/22/2023 | Black | 0.0% | 100.0% | None Detected | |

***Client Sample ID:*** AS-02B **Lab Sample ID:** **672302859-0005**
***Sample Description:*** Black Tar on Curboard Above Ceiling on 2nd Floor

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/22/2023 | Black | 0.0% | 100.0% | None Detected | |

***Client Sample ID:*** AS-02C **Lab Sample ID:** **672302859-0006**
***Sample Description:*** Black Tar on Curboard Above Ceiling on 2nd Floor

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/25/2023 | Black | 0.0% | 100.0% | None Detected | |

***Client Sample ID:*** AS-03A-Skim Coat **Lab Sample ID:** **672302859-0007**
***Sample Description:*** Wall Plaster (Concealed behind DJC)

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/22/2023 | White | 0.0% | 100.0% | None Detected | |

# EMSL Canada Inc.

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EMSL Canada Order 672302859
Customer ID: 55GREE63
Customer PO:
Project ID:

## Summary Test Report for Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05

***Client Sample ID:*** AS-03A-Base Coat ***Lab Sample ID:*** **672302859-0007A**
***Sample Description:*** Wall Plaster (Concealed behind DJC)

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Asbestos Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/22/2023 | Gray | 0.0% | 100.0% | None Detected | |

***Client Sample ID:*** AS-03B-Skim Coat ***Lab Sample ID:*** **672302859-0008**
***Sample Description:*** Wall Plaster (Concealed behind DJC)

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Asbestos Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/22/2023 | White | 0.0% | 100.0% | None Detected | |

***Client Sample ID:*** AS-03B-Base Coat ***Lab Sample ID:*** **672302859-0008A**
***Sample Description:*** Wall Plaster (Concealed behind DJC)

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Asbestos Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/22/2023 | Gray | 0.0% | 100.0% | None Detected | |

***Client Sample ID:*** AS-03C-Skim Coat ***Lab Sample ID:*** **672302859-0009**
***Sample Description:*** Wall Plaster (Concealed behind DJC)

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Asbestos Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/22/2023 | White | 0.0% | 100.0% | None Detected | |

***Client Sample ID:*** AS-03C-Base Coat ***Lab Sample ID:*** **672302859-0009A**
***Sample Description:*** Wall Plaster (Concealed behind DJC)

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Asbestos Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/22/2023 | Gray | 0.0% | 100.0% | None Detected | |

***Client Sample ID:*** AS-03D-Skim Coat ***Lab Sample ID:*** **672302859-0010**
***Sample Description:*** Wall Plaster (Concealed behind DJC)

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Asbestos Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/25/2023 | White | 0.0% | 100.0% | None Detected | |

***Client Sample ID:*** AS-03D-Base Coat ***Lab Sample ID:*** **672302859-0010A**
***Sample Description:*** Wall Plaster (Concealed behind DJC)

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Asbestos Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/25/2023 | Gray | 0.0% | 100.0% | None Detected | |

***Client Sample ID:*** AS-04A ***Lab Sample ID:*** **672302859-0011**
***Sample Description:*** DJC

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Asbestos Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/22/2023 | White | 0.0% | 100.0% | None Detected | |

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EMSL Canada Order 672302859
Customer ID: 55GREE63
Customer PO:
Project ID:

## Summary Test Report for Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05

***Client Sample ID:*** AS-04B ***Lab Sample ID:*** **672302859-0012**
***Sample Description:*** DJC

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Asbestos Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/22/2023 | White | 0.0% | 100.0% | None Detected | |

***Client Sample ID:*** AS-04C-Joint Compound ***Lab Sample ID:*** **672302859-0013**
***Sample Description:*** DJC

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Asbestos Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/25/2023 | White | 0.0% | 100.0% | None Detected | |

***Client Sample ID:*** AS-04C-Plaster ***Lab Sample ID:*** **672302859-0013A**
***Sample Description:*** DJC

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Asbestos Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/25/2023 | Gray | 0.0% | 100.0% | None Detected | |

***Client Sample ID:*** AS-05A-Plaster ***Lab Sample ID:*** **672302859-0014**
***Sample Description:*** Cementitious Debris

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Asbestos Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/22/2023 | White | 0.0% | 100.0% | None Detected | |

***Client Sample ID:*** AS-05A-Cement ***Lab Sample ID:*** **672302859-0014A**
***Sample Description:*** Cementitious Debris

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Asbestos Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/22/2023 | Gray | 0.0% | 100.0% | None Detected | |

***Client Sample ID:*** AS-05B ***Lab Sample ID:*** **672302859-0015**
***Sample Description:*** Cementitious Debris

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Asbestos Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/22/2023 | Gray | 0.0% | 100.0% | None Detected | |

***Client Sample ID:*** AS-05C ***Lab Sample ID:*** **672302859-0016**
***Sample Description:*** Cementitious Debris

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Asbestos Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/25/2023 | Gray | 0.0% | 100.0% | None Detected | |

***Client Sample ID:*** AS-06A ***Lab Sample ID:*** **672302859-0017**
***Sample Description:*** Fiberglass Insulation (requested by client)

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Asbestos Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/22/2023 | White/Yellow | 65.0% | 35.0% | None Detected | |

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EMSL Canada Order 672302859
Customer ID: 55GREE63
Customer PO:
Project ID:

## Summary Test Report for Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05

***Client Sample ID:*** AS-06B ***Lab Sample ID:*** **672302859-0018**
***Sample Description:*** Fiberglass Insulation (requested by client)

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Asbestos Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/22/2023 | White/Yellow | 65.0% | 35.0% | None Detected | |

***Client Sample ID:*** AS-06C ***Lab Sample ID:*** **672302859-0019**
***Sample Description:*** Fiberglass Insulation (requested by client)

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Asbestos Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/25/2023 | White/Yellow | 65.0% | 35.0% | None Detected | |

***Client Sample ID:*** AS-07A-Baseboard ***Lab Sample ID:*** **672302859-0020**
***Sample Description:*** Baseboard/Mastic

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Asbestos Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/22/2023 | Gray | 0.0% | 100.0% | None Detected | |

***Client Sample ID:*** AS-07A-Mastic ***Lab Sample ID:*** **672302859-0020A**
***Sample Description:*** Baseboard/Mastic

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Asbestos Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/22/2023 | Clear | 0.0% | 100.0% | None Detected | |

***Client Sample ID:*** AS-07B-Baseboard ***Lab Sample ID:*** **672302859-0021**
***Sample Description:*** Baseboard/Mastic

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Asbestos Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/25/2023 | Gray | 0.0% | 100.0% | None Detected | |

***Client Sample ID:*** AS-07B-Mastic ***Lab Sample ID:*** **672302859-0021A**
***Sample Description:*** Baseboard/Mastic

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Asbestos Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/22/2023 | Clear | 0.0% | 100.0% | None Detected | |

***Client Sample ID:*** AS-07C-Baseboard ***Lab Sample ID:*** **672302859-0022**
***Sample Description:*** Baseboard/Mastic

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Asbestos Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/25/2023 | Gray | 0.0% | 100.0% | None Detected | |

***Client Sample ID:*** AS-07C-Mastic ***Lab Sample ID:*** **672302859-0022A**
***Sample Description:*** Baseboard/Mastic

| TEST | Analyzed Date | Color | Non-Asbestos Fibrous | Non-Asbestos Non-Fibrous | Asbestos | Comment |
|---|---|---|---|---|---|---|
| PLM | 9/25/2023 | Clear | 0.0% | 100.0% | None Detected | |

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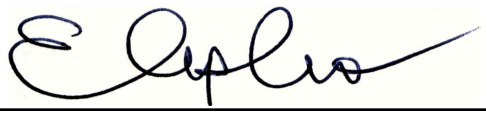
EMSL Canada Order 672302859
Customer ID: 55GREE63
Customer PO:
Project ID:

## Summary Test Report for Asbestos Analysis of Bulk Materials for Ontario Regulation 278/05

**Analyst(s):**

| | |
|---|---|
| Shawn Ryan | PLM (21) |
| Simon Parent | PLM (10) |

**Reviewed and approved by:**



Ewa Krupinska, Laboratory Manager
or Other Approved Signatory

None Detected = <0.1%. EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This is a summary report; official reports are available on LabConnect or upon request and relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted. The above analyses were performed in general compliance with Appendix E to Subpart E of 40 CFR (previously EPA 600/M4-82-020 "Interim Method") but augmented with procedures outlined in the 1993 ("final") version of the method. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis. Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample. Estimation of uncertainty is available on request.

Samples analyzed by EMSL Canada Inc. Ottawa, ON NVLAP Lab Code 201040-0

Initial report from: 09/25/202311:30:53

# APPENDIX B

## SUMMARY OF RESULTS & CERTIFICATES OF LABORATORY ANALYSIS:

## LEAD

# Summary of Results & Certificates of Laboratory Analysis: Lead

**Table 3** provides a summary of the lead analytical results collected for the purpose of this survey. The analytical results follow this table.

| **TABLE 3 – SUMMARY OF LEAD ANALYTICAL RESULTS**<br>LCDC BUILDING – 100 EGLANTINE DRIVEWAY, OTTAWA, ONTARIO | | | |
|---|---|---|---|
| **Sample Reference** | **Item/Location** | **Surface Colour** | **Results (µg/g Lead)** |
| GEC Sampling (September 13th, 2023) | | | |
| LP-01 | 2nd Floor Wall | Gray | 8 |
| LP-02 | 2nd Floor Wall adjacent Office Area | Blue | <5 |
| LP-03 | 1st Floor Wall | Gray | 5 |

A paint finish is considered lead-containing, with a concentration of lead more than 1,000 ppm (µg/g) based on the Environmental Abatement Council of Canada (EACC) Guidelines, October 2014. The collected paint samples listed were below the EACC limit of 1000ppm and Federal Regulation SOR/2016-193) limit of 90 ppm.

- 2nd Floor Gray Wall Paint (Sample ID: LP-01, 8ppm)
- 2nd Floor adjacent Office Area Blue Wall Paint (Sample ID: LP-02, <5ppm)
- 1st Floor Gray Wall Paint (Sample ID: LP-03, 5ppm)

Based on the age of the building and historical applications, lead is assumed to be present in **cast iron drainpipe caulking, solder on the joints of copper piping and electrical wiring** (where observed within the project areas).

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# Certificate of Analysis

**Greenough Environmental Consulting Inc.**

29 Capital Drive
Ottawa, ON K2C 0E7
Attn: Dave Koning

Client PO: LCDC
Project: 33381
Custody:

Report Date: 25-Sep-2023
Order Date: 19-Sep-2023

**Order #: 2338168**

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

| Paracel ID | Client ID |
|---|---|
| 2338168-01 | LP01 (grey wall paint, 2nd) |
| 2338168-02 | LP02 (2nd blue wall paint) |
| 2338168-03 | LP03 (grey paint) |

Approved By: Mark Foto

Mark Foto, M.Sc.
Lab Supervisor

Certificate of Analysis

Report Date: 25-Sep-2023

**Client: Greenough Environmental Consulting Inc.**

Order Date: 19-Sep-2023

**Client PO: LCDC**

**Project Description: 33381**

## Analysis Summary Table

| Analysis | Method Reference/Description | Extraction Date | Analysis Date |
|---|---|---|---|
| Metals, ICP-MS | EPA 6020 - Digestion - ICP-MS | 22-Sep-23 | 25-Sep-23 |

**Qualifier Notes:**

None

**Sample Data Revisions**

None

**Work Order Revisions/Comments:**

None

**Other Report Notes:**

n/a: not applicable
ND: Not Detected
MDL: Method Detection Limit
Source Result: Data used as source for matrix and duplicate samples
%REC: Percent recovery.
RPD: Relative percent difference.

Certificate of Analysis

**Client: Greenough Environmental Consulting Inc.**

**Client PO: LCDC**

Report Date: 25-Sep-2023

Order Date: 19-Sep-2023

**Project Description: 33381**

## *Sample Results*

### Lead

**Matrix: Paint**

| Paracel ID | Client ID | Sample Date | Units | MDL | Result |
|---|---|---|---|---|---|
| 2338168-01 | LP01 (grey wall paint, 2nd) | 13-Sep-23 | ug/g | 5 | 8 |
| 2338168-02 | LP02 (2nd blue wall paint) | 13-Sep-23 | ug/g | 5 | <5 |
| 2338168-03 | LP03 (grey paint) | 13-Sep-23 | ug/g | 5 | 5 |

## *Laboratory Internal QA/QC*

| Analyte | Result | Reporting Limit | Units | Source Result | %REC | %REC Limit | RPD | RPD Limit | Notes |
|---|---|---|---|---|---|---|---|---|---|
| **Matrix Blank** | | | | | | | | | |
| **Lead** | **ND** | **5** | **ug/g** | | | | | | |
| **Matrix Duplicate** | | | | | | | | | |
| **Lead** | **79.9** | **5** | **ug/g** | **87.2** | | | **8.75** | **50** | |
| **Matrix Spike** | | | | | | | | | |
| Lead | 52.5 | 5.00 | ug/g | ND | 97.9 | 70-130 | | | |

PARACEL LABORATORIES LTD. | TI RI RI

**Paracel ID: 2338168**

| Paracel Order Number (Lab Use Only) | Chain Of Custody (Lab Use Only) |
|---|---|
| 2338168 | |

| | | |
|---|---|---|
| Client Name: Greenough Environmental Consulting Inc | Project Ref: 33381 | Page 1 of 1 |
| Contact Name: David Koning | Quote #: | **Turnaround Time** |
| Address: 29 Capital Drive | PO #: LCDC | ☐ 1 day ☐ 3 day |
| | E-mail: dkoning@greenough.ca / hkettlewell@greenough.ca | ☐ 2 day ☒ Regular |
| Telephone: 613-792-4125 | | Date Required: |

☐ REG 153/04 ☐ REG 406/19

☐ Table 1 ☐ Res/Park ☐ Med/Fine
☐ Table 2 ☐ Ind/Comm ☐ Coarse
☐ Table 3 ☐ Agri/Other
☐ Table
For RSC: ☐ Yes ☐ No

**Other Regulation**

☐ REG 558 ☐ PWQO
☐ CCME ☐ MISA
☐ SU - Sani ☐ SU - Storm
Mun:
☐ Other:

**Matrix Type:** S (Soil/Sed.) GW (Ground Water) SW (Surface Water) SS (Storm/Sanitary Sewer) P (Paint) A (Air) O (Other)

**Required Analysis**

| | Sample ID/Location Name | Matrix | Air Volume | # of Containers | Sample Taken: Date | Sample Taken: Time | PHCs F1-F4+BTEX | VOCs | PAHs | Metals by ICP | Hg | CrVI | B (HWS) | LEAD | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | LP01 (grey wall Paint, 2nd) | P | | | 09/13 | | | | | | | | | X | | | | |
| 2 | LP02 (2nd blue wall Paint) | P | | | 09/13 | | | | | | | | | X | | | | |
| 3 | LP03 (grey paint) | P | | | 09/13 | | | | | | | | | X | | | | |
| 4 | | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | |

Comments:

Method of Delivery: Paracel Courier

| | | | |
|---|---|---|---|
| Relinquished By (Sign): | Received at Depot: | Received at Lab: | Verified By: Hina |
| Relinquished By (Print): Hayden Kettlewell | Date/Time: | Date/Time: Sept 19 2023 14:03 | Date/Time: Sept 19, 23 15:24 |
| Date/Time: 9-19-2023 | Temperature: °C | Temperature: | pH Verified: ☐ By: |

# APPENDIX C

## REPRESENTATIVE PHOTOGRAPHS

# Representative Photographs

**Figure 1:** Representative photograph of non-asbestos containing cement parging at pipe penetrations within the Ground Floor Mechanical Room (Room 1457). Cement parging is confirmed to be non-asbestos containing (Sample ID: AS-01A-C)

**Figure 2:** Representative photograph of non-asbestos containing black tar on cork board observed within the 2nd Floor ceiling space (Sample ID: AS-02A-C).

**Figure 3:** Representative photograph of wall plaster (white and gray layers) observed behind drywall throughout the project areas. Drywall joint compound is confirmed to be non-asbestos (Sample ID: AS-03A-D).

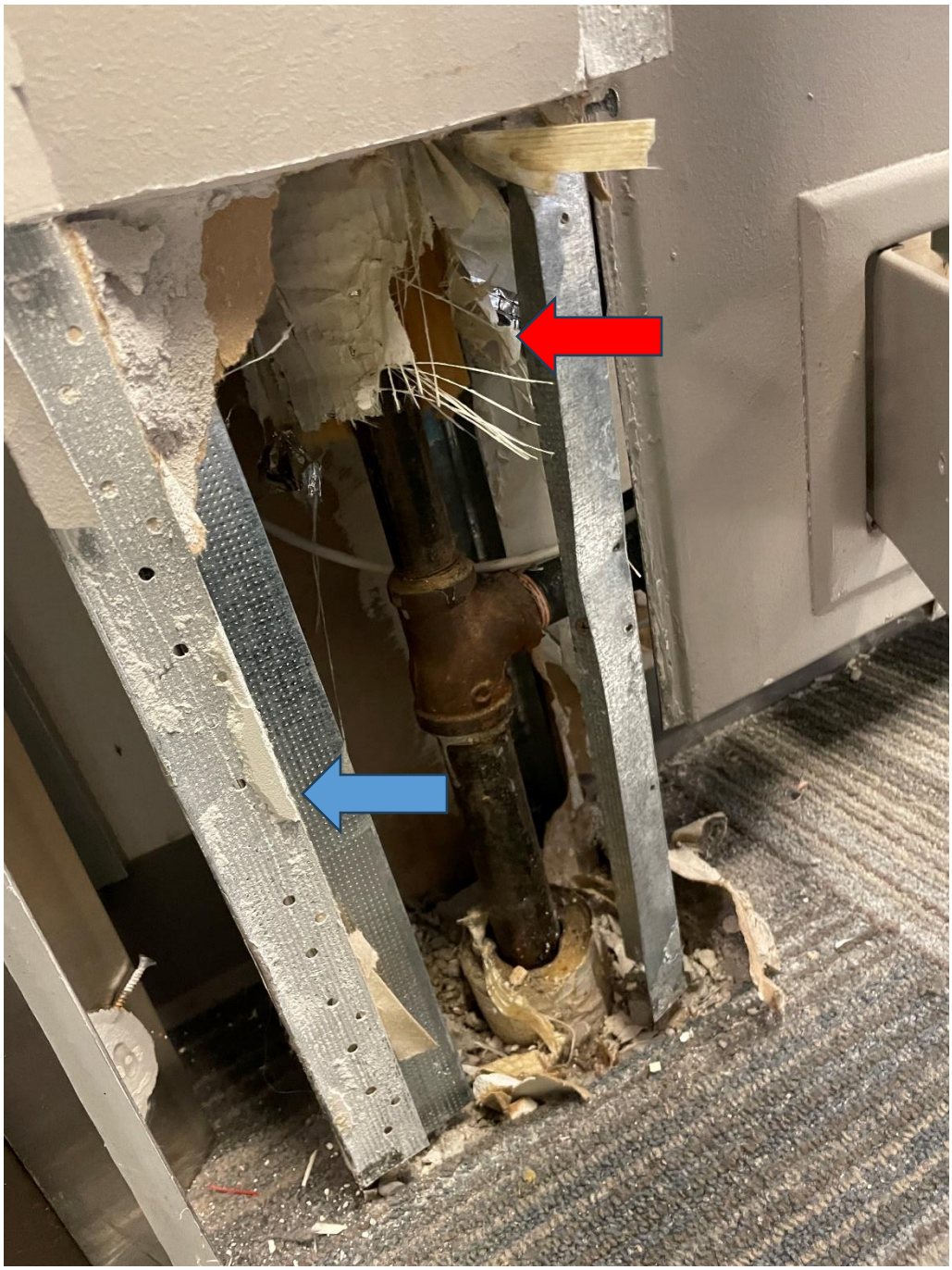

**Figure 4:** Representative photograph of drywall joint compound (blue arrow) observed in "Poor Condition" on the 2nd Floor at pipe penetrations. Drywall joint compound was sampled and confirmed to be non-asbestos containing (Sample ID: AS-04A-C). Fibreglass insulation (red arrow) was sampled as per client request and confirmed to be non-asbestos containing (Sample ID: AS-06A-C).

**Figure 5:** Representative photograph of cementitious debris observed at pipe penetrations on the 2nd Floor adjacent to the Kitchen. The cementitious debris was sampled and confirmed to be non-asbestos containing (Sample ID: AS-05A-C).

**Figure 6:** Representative photograph of non-asbestos containing vinyl baseboard/mastic observed throughout the project areas (Sample ID: AS-07A-C). Gray wall paint was also sampled from this location and is confirmed to be non-lead containing (Sample ID: LP-01, 8ppm).

# APPENDIX D

## BACKGROUND DOCUMENTATION:

## METHODOLOGY & GENERAL RECOMMENDATIO

# Background Documentation: Methodology & General Recommendations

## 1.0 Background Documentation

### 1.1 Methodology

Analytical results reflect the sampled materials at the specific sample locations. Visually similar materials were referenced to specific analysed samples (where applicable).

Materials suspected to contain designated substances, were visually identified based on the surveyor's knowledge as well as historical application of building components. Where permitted, visual identification of materials suspected to contain asbestos was supported by the collection and analysis of representative samples. Asbestos sampling was performed by GEC in order to meet the current minimum sampling requirements of Ontario Regulation 278/05 - Designated Substance - Asbestos on Construction Projects and in Buildings and Repair Operations (O. Reg. 278/05), as amended.

In Ontario, a material is defined as an ACM if the material has a minimum asbestos content of 0.5% by dry weight. ACMs are divided into two categories: friable and non-friable materials. A friable ACM is a material that can be crumbled, powdered, pulverized or reduced to dust by hand or moderate pressure. Friable materials can readily release fibres when disturbed. Common applications of friable ACMs are sprayed or trowelled surfacing materials (e.g. sprayed fireproofing and textured coatings) as well as mechanical and thermal insulations. Non-friable materials will generally release fibres only when cut, broken or have deteriorated to the point where the binding agents of the material begin to fail. Common non-friable ACMs include drywall joint compound, plaster, textile products (gaskets etc.) and asbestos cement (transite). It must be noted that some materials, although non-friable intact, become friable upon manipulation (i.e. plaster, drywall joint compound, ceiling tiles etc.).

Paracel & EMSL is a fully accredited laboratory and is certified (#200812-0 & #201040-0) under National Voluntary Laboratory Accreditation Program (NVLAP) to perform asbestos analysis of bulk samples. Paracel has received its Certificate of Laboratory Proficiency from the Canadian Association of Environmental Analytical Laboratories (CAEAL) and has achieved accreditation from the Standard Council of Canada.

Analysis of paint chip samples is performed using MOE E3470 (which utilizes EPA Method 6020) which describes the multi-elemental determination of analyses by ICP-OES in environmental samples. The method measures ions produced by a radio-frequency inductively coupled plasma. Analyte species originating in a liquid are nebulized and the resulting aerosol is transported by argon gas into the plasma torch. The ions produced by high temperatures are entrained in the plasma gas and introduced, by means of an interface, into a mass spectrometer. The ions produced in the plasma are sorted according to their mass-to-charge ratios and quantified with a channel electron multiplier. Interferences must be assessed and valid corrections applied, or the data flagged to indicate problems. Interference correction must include

compensation for background ions contributed by the plasma gas, reagents, and constituents of the sample matrix. Prior to analysis, samples which require total values must be acid digested using appropriate sample preparation methods.

Inductively coupled plasma-optical emission spectrometry (ICP/OES) is applicable to the determination of sub-ug/L concentrations of a large number of elements in water samples and in waste extracts or digests. When dissolved constituents are required, samples must be filtered and acid-preserved prior to analysis. No digestion is required prior to analysis for dissolved elements in water samples. Acid digestion prior to filtration and analysis is required for groundwater, aqueous samples, industrial wastes, soils, sludges, sediments, and other solid wastes for which total (acid-leachable) elements are required.

# 2.0 General Recommendations

## 2.1 Asbestos

The following recommendations are made respecting Ontario Regulation 278/05:

- Suspect materials identified during renovation and/or demolition activities not discussed in this report herein should be treated as ACMs unless proven otherwise through material specific sampling and analysis in accordance with the requirements of Ontario Regulation 278/05 and the PSPC Asbestos Management Standard.

- Client should update their existing ACM inventory upon completion of the project.

- That the roles and responsibility of “the owner” as stipulated in Section 8 of Ontario Regulation 278/05 be recognized and adhered to including, but not limited to, notification to occupiers and workers as well as training.

- Ontario Regulation 490/09, as amended to O. Reg. 148/12 - Designated Substance - made under the Occupational Health and Safety Act states that airborne levels of asbestos fibres should not exceed 0.1 f/cc.

## 2.2 Lead

The Lead Regulation on Construction Projects (enforced by the Ministry of Labour) does not require removal of lead-containing materials unless work on these materials is likely to produce lead fumes or dust; for example, during welding, torch cutting, grinding, sanding or sandblasting.

In the event that such work is conducted at this facility, every employer shall take all necessary measures and procedures by means of engineering controls, work and hygiene practices to ensure that the time-weighted average exposure of a worker to airborne lead, except tetraethyl lead, shall not exceed 0.05 milligrams lead per cubic metre of air, and in the case of exposure to tetraethyl lead 0.10 milligrams lead per cubic metre of air, Ontario regulation 490/09.

The Occupational Health and Safety Branch of the Ontario Ministry of Labour have published *Guideline: Lead on Construction Projects*. This document classifies all lead disturbances as Type 1, Type 2a, Type 2b or Type 3 work, and assigns alternate levels of respiratory protection and work procedures for each type of task being performed.

If piping is removed during renovation activities, copper and/or drainage piping can be cut a small distance (e.g., 5cm) from the joints to avoid disturbance of the solder and joint caulking suspected to contain lead.

The work procedures outlined in the MOL document entitled *Guideline: Lead on Construction Projects* must be followed when disturbing the above noted lead-containing materials.

The OEL for airborne lead is prescribed by Ontario Regulation 490/09 *Designated Substances*, as amended. Work procedures and personal protective equipment must be used to ensure that workers are not exposed to airborne lead levels that exceed this Occupational Exposure Limit.

The disposal of construction waste containing lead is governed by O. Reg. 347- General – Waste Management, as amended. The transport of the waste to the disposal site is controlled by the federal Transportation of Dangerous Goods Act (TDGA), 1992.

### 2.3 Silica

Silica dust can be generated by drilling, coring, blasting, grinding, crushing and sandblasting silica-containing materials.

Work on silica-containing materials can be performed by any construction personnel. GEC recommends that all personnel involved with, or working in the area of, destructive activities on block, concrete, and other silica-containing building materials take the following precautions:

- Segregate the work area from the rest of the building to reduce the risk of exposing building occupants to silica dust. Workers leaving the work area should pass through a designated clean room where excess dust can be brushed off clothes and facilities are available to wash dust off skin.

- The work surface should be wetted regularly to limit dust released during striking and abrasion.

- Everyone in the work area should be provided with a half-face respirator equipped with HEPA filters.

- Ensure that all necessary measures and procedures by means of engineering control, work and hygiene practices are implemented to ensure that the TWAEV of a worker to silica is reduced to the lowest practical level and, in any event, shall not exceed 0.05 mg/$m^3$ of air for cristobalite and tridymite, and 0.10 mg/ $m^3$ of air for quartz and tripoli.