Halifax
Regional Centre for Education

RFP #4273

Heating Distribution System Upgrades
Inglis Street Elementary School

RFP Closing Date:	**Thursday, July 03rd, 2025**
RFP Closing Time:	**2:00 PM (ATL)**
Submission Email:	**hrcetenders@hrce.ca**
Ready-for-Takeover Date:	**Aug 29, 2025 (Boiler Room Work)** **Dec 19, 2025 (Remaining Distribution Work)**

HRCE Procurement Contact:
Don Walpola, Buyer
Tel: (902) 464-2000 ext 2223
Email: dwalpola@hrce.ca

Operations Contact:
Patrick Ross, Project Manager
Tel: (902) 399-4345 (W)
Email: Patrick.Ross@hrce.ca

School Location:
Inglis St Elementary
5985 Inglis St, Halifax, NS
B3H 1K7

Mandatory Site Meeting for Bidders:
Monday June 23rd, 2025, at 3:00pm
Inglis St Elementary
Please meet at School Entrance

RFP submissions are to be submitted by email to: hrcetenders@hrce.ca

RFP documents are available for download from the HRCE's Website:
https://www.hrce.ca/about-hrce/financial-services/tenders/tender-listing

In the light of COVID-19 and future pandemics, all vendors are required to follow the guidelines set in place by Nova Scotia Health Authority. Potential risks such as restricted accessibility to schools and buildings of the Halifax Regional Centre for Education (HRCE), inability to complete work on a timely manner due to social distancing, disabled supply chains which will result in delivery delays of raw materials and finished goods, labour shortages and additional storage costs should be clearly communicated with the HRCE Personnel on a timely manner to ensure an amicable solution can be agreed between the HRCE and the vendor/contractor. The HRCE will not be liable for any direct or indirect loss incurred due to a pandemic.

The Terms and Conditions of the RFP Package, including but not limited to the Contract Type and Supplementary Conditions have been modified.

It is the Proponent's Responsibility to review all sections of the RFP prior to submitting a Proposal/Bid.

TECHNICAL SPECIFICATIONS ..... # Of Pages

END OF SECTION 00 00 10

SECTION 00 00 15 - DESCRIPTION OF WORK & LIST OF DRAWINGS

1. General

1.1 The work of this contract includes the provision of all materials, labour and equipment necessary to complete the **Heating distribution upgrades at Inglis St. School**, to expand the building automation system coverage, and to remove and/or abandon in place existing steam distribution as noted on the drawings and specifications prepared by **EastPoint Engineering.**

1.1.1 Base Scope Works (summary of work, full details provided with the drawing package):

1.1.1.1 Removal of the existing steam piping, distribution, condensate pumps, and other steam components within the boiler room ONLY. Note: This work shall only be completed after the steam-to-hot water heat exchanger and all terminal devices are installed sufficiently to decommission the existing steam heating distribution. Steam and condensate piping outside of the mechanical room to be capped and abandoned in place. This is described herein.

1.1.1.2 Installation of a new steam to hot water heat exchanger, pump sets, and hot water distribution piping throughout the school.

1.1.1.3 Installation of new hot water convectors and cabinet/unit heaters throughout the school complete with new electronic actuators and valves.

1.1.1.4 Installation of new steam and condensate piping, c/w control devices to tie-into existing steam-to-glycol exchanger (HX-2) for AHU coil heating.

1.1.1.5 Modify existing controls to suit new boiler room components. Existing BAS is: Alerton as supplied by AEM Controls. All new modifications and BAS expansion shall utilize the Alerton system.

1.1.1.6 Expansion of Zone Heating Controls:

1.1.1.6.1 Removal of existing pneumatic control distribution throughout the building.

1.1.1.6.2 Removal of all existing pneumatic control valves,

1.1.1.6.3 Installation of new electronic control valves with all appurtenances.

1.1.1.6.4 Provision of all control devices, including but not limited to space thermostats and/or wall temperature sensor plates and programming to control terminal unit heating devices, AHU valves, and heat exchanger control valves.

1.1.1.6.5 Renewal of the existing system including the following:

1.1.1.6.5.1 Point- to-point recommissioning, with PID tuning.

1.1.1.6.5.2 Update controller firmware, replace field controller batteries.

1.1.1.6.5.3 Backup trend database, and renew.

1.1.1.6.5.4 Complete a full review of existing setpoints, schedules and alarm logs, update defaults and advise the owner of any issues.

1.1.1.6.5.5 Update all graphics and optimize all sequences and reset schedules.

1.2 It is the intent of the Halifax Regional Centre for Education (HRCE) to **have all primary mechanical room work completed, to the point of Ready-for-Takeover, prior to August 29, 2025**. It is expected that a timely award of this contract will enable the Contractor to facilitate shop drawing review and ordering of materials to allow commencement of work immediately after contract execution. HRCE anticipates that the existing steam distribution and new hot water distribution system will be operated in tandem to facilitate demolition and installation of new radiators and zone controls throughout the school year during after-hours / weekend work. HRCE expects the contractor to clearly illustrate their plan to HRCE and will receive higher scoring for proposals that prioritize work over the summer and minimal interruptions during the school year. **All work is anticipated to be completed before December 19th, 2025.**

1.3 The whole of the work shall agree in all particulars with the levels, measurements and details contained in the drawings accompanying this specification and with such other drawings or information as may from time to time be supplied by the HRCE or may be supplied by the Contractor and reviewed by the HRCE.

1.4 In relation to the hours of work: Work for the HRCE is to be completed during hours when the schools are unoccupied, unless otherwise authorized in writing by the Project Manager (Operations Contact person) or designate. Hours of work shall comply with the local ordinances and bylaws for each site. (Refer Section 00 41 13, Section 3.7)

2. Drawings

END OF SECTION

SECTION 00 05 00 - LIST OF CONSULTANTS

Owner:

Halifax Regional Centre for Education
33 Spectacle Lake Drive
Dartmouth, NS B3B 1X7

Don Walpola, Buyer
Office: (902) 464-2000 ext 2223
dwalpola@hrce.ca

Consultant:

EastPoint
Suite 1800
1801 Hollis Street,
Halifax, NS B3J 3N4

Justin MacDonald
Office: 902-292-6909
justin.macdonald@eastpoint.ca

END OF SECTION

SECTION 00 21 13 – INFORMATION FOR PROPONENTS

Invitation:

1. Proposal Call

1.1. The Halifax Regional Centre for Education (HRCE) will receive offers in the form of a two-file proposal from proponents which is signed and electronically received on or before the date and time specified on the cover sheet of this document. The email address to submit submissions and amendments is **hrcetenders@hrce.ca**. Both files should be submitted in Adobe (.pdf) format. If the electronic submission is larger than 20MB, proponents have the option of sharing files from google drive to **hrcetenders@gnspes.ca.** If you encounter difficulties kindly contact the HRCE Procurement team for further clarification.

1.2. Proposals received after the closing time will not be considered. The HRCE deems the submission date and time to be the email received date and time. Please ensure to allow sufficient time for your submission to be received by the HRCE before the 2pm close. Please consider that large files may require more time.

1.3. Proponents are to submit completed Request for Proposal (RFP) documents by email.

The technical submission electronic file should be named:

"**Technical Submission_4273_Proponent Name**".

The second file (Price Submission) should be named:

"**Price Submission_4273_Proponent Name**".

There must be no reference to the bid price within the technical submission.

Proponents can refer to item 11 in this section for more detailed submission instructions.

1.4. Proposals will be opened at the time indicated on the cover sheet of this document. Public openings are no longer held for any Tenders or RFPs relating to goods, services or construction for the HRCE. **The technical submission will be the only file opened during the RFP closing.** All proposal submissions are subject to evaluation after opening and before award of contract. The successful proponent and award amount will be posted on the Procurement Services website (http://novascotia.ca/tenders/tenders/ns-tenders.aspx) after award.

1.5. Amendments to the submitted offer will be permitted if received by email prior to bid closing and if endorsed by the same party or parties who signed and executed the offer.

If the amendment relates to the technical submission, the electronic file should be named

"Technical Submission Amendment_4273_Proponent Name".

If the amendment relates to the price submission, the file should be named:

"Price Submission Amendment_4273_Proponent Name".

The price amendment file submission should be the signed Price Amendment Form (Section 00 41 73) and shall not disclose either the original or revised total price.

1.6. Bid submissions **will not** be accepted by fax, mail, courier or hand delivery.

2. Intent

2.1. The intent of this Request for Proposals (RFP) is to obtain an offer to perform all work associated with ***RFP #4273, Heating Distribution Upgrades*** at ***Inglis St. Elementary*** for a Stipulated Price Contract in accordance with the Contract Documents.

2.2. The HRCE will use the CCDC-2, 2020 for this work. A copy of the Standard Construction Contract CCDC 2 – 2020 is available upon request and will form part of the contract documents.

2.3. The HRCE Supplementary General Conditions for the CCDC-2, 2020, applicable to this work is available for review under Section 0073 00 of the RFP document.

2.4. Ready-for-Takeover (RFT) of the project is to be achieved on or before **the dates provided in SECTION 00 00 15 – Section 1.2**, provided the contract is awarded within fifteen (15) business days after the RFP closing.

2.4.1. If the contract is not awarded within fifteen (15) business days of closing, the Ready-for-Takeover Date will be extended by one (1) business day, for every business day that passes, until the contract has been awarded.

2.4.2. Receipt of the award letter by the successful contractor does not constitute approval to begin work on site.

2.5. The HRCE does not guarantee the award of all areas, phases or any portion thereof.

2.6. The HRCE reserves the right to award individual areas or phases to one contractor or between multiple contractors.

2.7. The HRCE reserves the right to reduce the scope of work if the stipulated bid amount exceeds the budget for the relevant project.

3. Scope of work

3.1. Refer to Section 00 00 15 – Description of Work and List of Drawings and Section 01 11 00 Summary of Work.

4. Availability

4.1. RFP documents are available for download on the HRCE website: https://www.hrce.ca/about-hrce/financial-services/tenders/tender-listing

4.2. RFP documents are made available only for the purpose of obtaining offers for this project. Their use does not confer a license or grant for other purposes.

4.3. The HRCE is not responsible for accuracy of documents obtained from any other source.

5. Examination

5.1. RFP documents are provided to the Construction Association of Nova Scotia (CANS).

5.2. Upon receipt of RFP documents, proponents are to verify that documents are complete.

5.3. Bidders are responsible to retrieve all RFP documents from the HRCE website and fully review the RFP requirements prior to the preparation of a bid submission.

6. Clarification and Addenda

6.1. Proponents must notify Don Walpola, Buyer, by email at dwalpola@hrce.ca no less than **five (5)** working days before the RFP Closing regarding any questions, omissions, errors or ambiguities found in the documents. If HRCE considers that correction, explanation or interpretation is necessary, an addendum will be posted on the HRCE website.

6.2. Addenda will be issued no less than three (3) business days before the RFP closing date and will form part of the Contract Documents.

6.3. All RFP information must be confirmed by written addenda. The HRCE and its representatives shall not be bound by or be liable for any representation or information provided verbally. Information obtained by any other source is not official and will not bind the HRCE.

6.4. Proponents are to complete Price Submission Form (section 00 41 13) acknowledging each addendum that was issued.

6.5. Where the HRCE publishes an Addendum modifying the terms of the posting documents, or changing the Project or Contract Documents in any manner, the HRCE shall not be liable for any expense, cost, loss, or any form of damage or damages incurred or suffered; whether directly or indirectly, by any Supplier or any other person in connection with or in any way relating to or resulting from the publication of an Addendum, regardless of whether the publication occurs prior to or after a Supplier has submitted their bid submission.

6.6. All Addenda issued by HRCE shall be become part of the Contract Documents, unless specifically excluded from the Contract Documents in writing. Addenda shall be allowed for in determining the total contract price.

7. Product/System Options

7.1. Alternatives to specified products and systems will only be considered during the bidding period in the manner prescribed below.

7.1.1. Where the RFP documents stipulate a particular product, alternatives may be considered by the Consultant up to five (5) working days before the RFP closing date and time. Bidders must forward their written requests by email to Don Walpola,

Buyer, by email at dwalpola@hrce.ca. Requests will be forward to the appropriate person(s) for review.

7.2. The submission must provide sufficient information to enable the Consultant to determine acceptability of such products. Request for an alternate product/system must be accompanied with:

7.2.1. information about how the request affects other work in order to accommodate each alternate;

7.2.2. the dollar amount of additions to or reductions from the Price Submission, including revisions to other work.

7.2.3. A later claim by the bidder for an addition to the contract price because of changes in work necessitated by use of alternates shall not be considered.

7.3. When a request to substitute a product is made and pursuant to consultation with the Consultant, HRCE may approve or disapprove the substitution. The bidder making the request will be notified of the HRCE's decision and if the alternate is approved, the HRCE will issue an addendum.

7.4. Alternates must be submitted in the above manner; otherwise, they will not be accepted.

8. Mandatory Bidders' Site Meeting (Site Assessment)

8.1. Bidders will be deemed to have familiarized themselves with the existing project site, working conditions and all other conditions which may affect performance of the Contract. No plea of ignorance of such conditions as a result of failure to make all necessary examinations will be accepted as a basis for any claims for extra compensation or an extension of time.

8.1.1. A mandatory bidders' site meeting has been scheduled as per the information on the cover sheet of this document. All bidders are required to attend. Representatives of HRCE and the Consultant will be in attendance.

8.1.2. Bidders must register their presence with the HRCE stating the name of the contractor they represent. Failure to attend and register will lead to non-acceptance of the proposal by HRCE. HRCE recommends that interested bidders ensure that their proposed subcontractors attend the mandatory site meeting.

9. Bidders Registration

9.1. The successful contractor and sub-contractors must comply with the Nova Scotia Corporations Registration Act and/or Partnerships and Business Name Registration Act, or equivalent, before a contract is awarded.

10. Qualifications (Subcontractors/Other Tradespersons/Individuals)

10.1. Bidders are fully responsible to the HRCE for the acts/omissions of subcontractors and of persons directly or indirectly employed or retained by them. Nothing contained in the contract documents shall create any contractual relation between any subcontractor and the HRCE. Subcontracting the contract shall not relieve the Bidder from any contractual obligations.

10.2. Bidders must provide subcontractors with a copy of the RFP documents making subcontractors aware that the HRCE is not responsible for any payments to subcontractors, and that all actions, directions or claims are solely between the bidder and the subcontractor.

10.3. The Contract, or any portion thereof, shall not be assigned nor sub-contracted without the prior written approval of HRCE, which approval may be withheld in the HRCE's sole discretion. When sub-contracting, successful bidder(s) must be prepared, if requested, to provide copies of billings from subcontractors.

10.4. Successful bidder(s) shall only use additional subcontractors during the course of the contract with the prior written approval of the HRCE.

10.5. The successful bidder(s) shall not re-assign the role of Project Manager to another individual other than the proposed Project Manager as indicated in the technical submission, without prior written approval from the HRCE.

10.6. The successful bidder(s) shall at all times enforce strict discipline and good order among their employees and subcontractors and shall avoid any unfit person or any person not skilled in the work assigned to the employee.

10.7. HRCE reserves the right to reject a proposed sub-contractor for a reasonable cause.

10.8. Refer to GC 3.6 of CCDC-2020.

11. PROPOSAL SUBMISSION

11.1. RFP Proposal Package - A complete proposal package is comprised of the elements below:

11.2. Technical Submission and Price Submission - General

11.2.1. Each proposal shall include a signed technical submission file and a signed price submission file, clearly labelled as previously instructed in Section 00 21 13, item 1.3.

11.2.2. Both the Technical Submission files, and the separate Price Submission file, shall be submitted simultaneously.

11.2.3. The Technical Submission file contents must not contain any reference to the bid price being offered for this project.

11.2.4. The email subject line or body must identify the name of the proponent/company and the RFP name and number.

11.2.5. Proponents shall be solely responsible for the delivery of their proposals in the manner and time prescribed.

11.3. Technical Submission Contents

11.3.1. Technical submissions shall be submitted in a legible format, not to exceed 20 pages. Submissions will be on the proponent's letterhead and shall contain an authorized signature. Proposals shall be submitted in English, and shall be specifically prepared to meet the requirements of this project.

Total RFP Scoring:

Phase A – Technical Score	30 Points
Phase B – Pricing Score	70 Points
Phase C - Total RFP Score	100 Points

The technical submission response shall be organized into four sections:

Section I.	**Project Experience and References**
Section II.	**Team Composition**
Section III.	**Management of Project Specific Risk**
Section IV.	**Schedule of Work**

I. PROJECT EXPERIENCE AND REFERENCES.

The proponent is required to provide a detailed summary of their company's experience within the past sixty (60) months, by describing three (3) Heating Upgrade projects for an educational/commercial institution.

These projects should be within a 100 km radius of the Halifax Regional Municipality. These projects should be similar in nature, complexity and value to the requirements specified in this RFP (see Section 00 00 15). Preference is given to projects involving steam distribution to hot water conversions would be considered of higher importance, and in replacing terminal heating devices within an operational facility.

If a proponent has completed projects for the HRCE, they are required to include <u>the two most recent HRCE projects</u> in this section (regardless of the

date completed). It is the bidder's responsibility to source HRCE project information requested in this section.

Please note if the proponent fails to include relevant HRCE projects, this will negatively impact their technical score. **If a proponent has not completed prior work (at any time) for the HRCE, then they may select projects of their choosing within the other stipulated parameters.**

> For each of the three projects listed, the proponent is asked to provide:

1) the company name,
2) a brief description of the project,
3) the name of the project manager,
4) the dollar value of the project.
5) A reference contact name and title for this project, and
6) their email and phone number.

For HRCE projects, please provide the HRCE Project Manager's name; prior consent is not required.

Please ensure that non-HRCE references are aware they will be contacted, and that prior consent to be a reference was obtained.

RFP Scoring for this section:

SECTION I. PROJECT EXPERIENCE, BASED ON REFERENCE FEEDBACK		
Project 1	Project met budget and schedule.	**2.00**
	Good quality work and product.	**1.00**
	Well managed project and good communications.	**2.00**
	Total Points Available for this Project	**5.00**

Project 2	Project met budget and schedule.	**2.00**
	Good quality work and product.	**1.00**
	Well managed project and good communications.	**2.00**
	Total Points Available for this Project	**5.00**

Project 3	Project met budget and schedule.	**2.00**
	Good quality work and product.	**1.00**
	Well managed project and good communications.	**2.00**
	Total Points Available for this Project	**5.00**

Total Points Available for Section I.	**15.00**

II. TEAM COMPOSITION.

The proponent is required to identify the key personnel who will be assigned to this project, these key personnel must remain with the project until completion. Please provide each employee's name, title/role, and years of related experience.

Proponents are required to provide a detailed resume for the proposed Project Manager outlining professional qualifications and years of experience.

Please indicate the percentage of their time that will be committed to this project. Please identify any other projects that these resources will be working on at the same time. HRCE anticipates that a site foreman will be dedicated to this project.

An ***example*** of a time commitment for this project could be:

Commitment	Key Personnel
100%	Foreman
50%	Site Supervisor
20%	Project Manager

RFP Scoring for this section is:

SECTION II. TEAM COMPOSITION	Score
Does the Project Manager have a minimum of 3 years of relevant experience?	2.00
Was a listing of key team members provided?	1.00
Was the percentage of commitment indicated and adequate?	2.00
Total Points Available for Section II.	5.00

III. MANAGEMENT OF PROJECT SPECIFIC RISK

Proponents shall identify a minimum of three (3) risks associated with this specific project. Risks that their company could be faced with related to the scope of work for this project. Proponents shall state the risk, risk mitigation strategy, responsible parties, and the impact to schedule or budget.

An example of a Project Specific Risk could be:

Risk Register Example			
Risk	**Mitigation**	**Responsibility**	**Impact**
Specified materials have long lead times.	1. Expedite delivery if available. 2. Source alternative equivalent materials that are readily available.	Contractor. Client and Consultant approval required.	Expedited delivery or alternative materials may increase cost and impact budget. Without mitigation the schedule will be impacted.

Standard safety risks covered by Safe Work Practices are not to be referenced here. The HRCE is looking for assurances that risks identified through the mandatory site meeting are identified and will be mitigated, and that potential delays or other risks are disclosed in the proposal.

RFP Scoring for this section is:

SECTION III. MANAGEMENT OF RISKS ASSOCIATED WITH THIS SPECIFIC PROJECT	Score
Did the proponent detail the 3 Project Specific Risks with mitigation strategies?	3.00
Are risk management responsibilities clearly identified and assigned?	1.00
Were appropriate risk impacts provided for the 3 stated risks?	1.00
Total Points Available for Section III.	5.00

IV. SCHEDULE OF WORK

Please provide a Gantt Chart that includes an appropriate amount of detail around the planning and scheduling needs for this project. The Gantt Chart should contain all the key activities and align with the work schedule. A successfully prepared Gantt Chart provides a clear visual representation of how the project and required tasks will be completed.

If the Ready for Takeover Date cannot be met, please communicate this to procurement as an RFI well before RFP close.

The HRCE expects to award this work within 15 days of close. Please ensure that the proposed schedule of work aligns with that timeframe.

RFP Scoring for this section is:

SECTION IV. SCHEDULE OF WORK	Score
Does the Gantt Chart include all required components? Is the schedule reasonable?	**2.00**
Does the schedule indicate project completion *before* the Ready for Takeover date? ***If the Ready for Takeover date cannot be met, please submit a RFI prior to RFP close.***	**3.00**
Total Points Available for Section IV.	**5.00**

11.4. Price Submission Contents

11.4.1 The Price Submission is to be submitted on the forms provided by the HRCE (Section 00 41 13 – Price Submission Form). These forms are to be completed in full, with an authorized signature and corporate seal as applicable. The completed form shall be without interlineations, alterations or erasures.

Proponents are advised that the HRCE may request original documents be sent to the HRCE office for further review. Price submissions sent by fax, mail or hand delivered will not be accepted.

11.4.2 The pricing details are to be clearly indicated. The total contract price in both numbers (dollars and cents) and written words must be entered. Should there be a discrepancy between the two, the written words shall prevail.

11.4.1. The executed pricing offer is to be submitted on the forms **together with a scanned copy of the required bid security** by email.

11.4.2. Improperly completed information, and/or irregularities in the bid security, may be cause to declare the submission non-compliant.

The omission of bid security from the bid submission will result in the submission being deemed as non-compliant (Refer Section 14.1.10).

11.5. Proposal Evaluation

11.5.1. Evaluation Process – Compliant proposals will be evaluated, first during Phase A, and those meeting the minimum qualifying score under Phase A will then be evaluated in Phase B, with a final score determined in Phase C.

Phase A – Technical Score	30 Points
Phase B – Pricing Score	70 Points
Phase C - Total RFP Score	100 Points

11.5.2. Proposals that do not meet the minimum qualifying score for Phase A will not be given further consideration.

11.5.3. Proposals will be evaluated and scored by an evaluation team comprised of a minimum of three (3) representatives of the HRCE. The degree to which a proposal meets the proposal requirements will be determined at the sole discretion of the HRCE evaluation team.

11.5.4. Phase A – Technical Submission – The Technical Submission for compliant proposals will be evaluated using the evaluation criteria set out in the table below. Scores will be recorded for each criterion (rounded to two (2) decimal points) and a total qualifying score will be determined.

Refer 11.3.1	Phase A - Evaluation Criteria Technical Submission	Score
Section I.	Project Experience and References	15.00
Section II.	Team Composition	5.00
Section III.	Management of Project Specific Risks	5.00
Section IV.	Schedule of Work	5.00
Total Phase A - Potential total score - Technical Submission		30.00
	Minimum score needed to pass technical	15.00

A minimum qualifying score of 15.00 points is required in Phase A for the proposal to be given further consideration.

All technical submissions that have met the minimum qualifying score will proceed to Phase B - Price Submission.

Technical submissions that score below the minimum qualifying score will not proceed further in the RFP evaluation process.

11.5.5. Phase B - Price Submission - Price Submission files for proponents whose Technical Submission have received fifteen (15.00) points or greater will be opened.

The Price Submission will have a weight of seventy (70.00) points.

Price submissions will be evaluated, and a Phase B score will be assigned to each proponent by using a proximity to lowest price method. In this method, proponents will be awarded points based on how close their total price submitted compares with the lowest cost of all total submissions.

Price Submissions will be Evaluated based on the Proponent's Lump Sum Price.

For example:
Formula: Price Score = % value of score x (Low bid ÷ Your bid)

Example for calculation: Bid Pricing Received

Company P	Company Q	Company R	Company S	Company T
$115,000	$135,000	$185,000	$165,000	$180,000

Calculation of Pricing Score for Company S:
Phase B Score = 70 points x ($115,000 ÷ $165,000) = 48.79 points

The Total Score (Phase C) will be calculated by adding together Phase A + Phase B scores.

11.5.6. The proponent who has the highest **TOTAL SCORE** (Phase C calculation), will be deemed to be the successful proponent, subject to other provisions herein, including Section 16.5.

Phase A – Technical Score	30 Points
Phase B – Pricing Score	70 Points
Phase C - Total RFP Score	100 Points

12. Conditions of the RFP Process

12.1. Proponents shall take full cognizance of content of all Contract Documents in preparation of their proposal. Section 00 41 13 – Price Submission Form, Subsection 5.0 references a complete list of Contract Documents.

13. Amendment or Withdrawal of Proposals

13.1. Proposal packages may be **withdrawn** from the RFP process in writing by email notification sent to the submission email address, prior to date and time of closing.

13.2. As previously stated in Section 00 21 13, item 1.6 - Amendments to the submitted offer will be permitted if received by email prior to the RFP closing time and if endorsed by the same party or parties who signed and executed the offer. If the amendment relates to the technical submission, it must be labeled "Technical Submission Amendment" along with the RFP number of the project and the company name. If the amendment relates to the price submission, it must be labeled "Price Submission Amendment" along with the RFP number of the project and the company name. The price amendment file must include the signed "Price Amendment Form" (Section 00 41 73).

13.3. A single page Price Amendment Form is provided immediately following the Price Submission Forms (Section 00 41 73).

13.3.1.1. The Price Amendment Form provided is the standard master form for submission of any price amendments for this project.

13.3.1.2. The Price Amendment Form must be copied and completed, as directed, for any price amendments submitted.

13.4. Price amendments shall not disclose either original or revised total price.

14. Proposal Ineligibility (Reason for Rejection)

14.1. HRCE may reject a proposal which has been received prior to the closing time where:

14.1.1. The two file (electronic) system (Technical Submission and Price Submission) is not followed.

14.1.2. The price submission is not submitted on the required forms (Section 00 41 13) included herein.

14.1.3. The proposal is submitted by facsimile or regular mail or hand delivery.

14.1.4. There are omissions of information that the HRCE in its sole discretion deems to be significant.

14.1.5. The technical submission or price submission form is not signed as required.

14.1.6. The proposal has conditions attached which are not authorized by the invitation to bid**.**

14.1.7. The proposal fails to meet one or more standards specified in the invitation to bid.

14.1.8. All addenda have not been acknowledged.

14.1.9. Any other defect which, in the opinion of the HRCE brings the meaning of the proposal into question.

14.1.10. The required bid security is not provided within the Price Submission file.

14.1.11. Proponent failed to attend bidders' mandatory site meeting.

14.1.12. Proponent failed to list relevant HRCE project(s) in their Technical submission.

15. Communications Affecting Bids

15.1. Transmissions, including, but not limited to facsimile transmission:

15.1.1. The technical submission or price submission forms submitted by mail, fax or courier will not be accepted.

16. Right to Accept or Reject any Proposal

16.1. The HRCE reserves the right to reject any proposal in its sole and absolute discretion for any reason whatsoever and the HRCE will not necessarily accept the lowest bid.

16.2. The HRCE specifically reserves the right to reject all proposals if none are considered to be satisfactory in the HRCE's sole and absolute discretion and, in that event, at its option, to call for additional proposals.

16.3. Without limiting the generality of any other provision herein, the HRCE reserves the right to accept or reject any proposal in accordance with item #14 above (Proposal Ineligibility).

16.4. Notwithstanding the above, the HRCE shall be entitled, in its sole and absolute discretion, to waive any irregularity, informality or non-conformance with these instructions in any proposal received by the HRCE. The HRCE reserves the right to reject any or all proposals, or to accept any proposal, or portion thereof, deemed in its best interest.

16.5. In the event that more than one proponent achieves an identical final total score within two decimal places in Phase C, the HRCE will flip a coin to determine the successful contractor.

16.6. No term or condition shall be implied, based upon any industry or trade practice or custom or in a practice or policy of the HRCE or otherwise, which is inconsistent or conflicts with the provisions contained in these instructions.

17. Right to Cancel Competition/No Award

17.1. Issuing a RFP/RFT implies no obligation on HRCE to accept any submission, or a portion of any submission. The lowest or any RFP/RFT submission will not necessarily be accepted.

17.2. Without limiting the generality of the foregoing, an RFP/RFT may be cancelled in whole or in part by HRCE in its sole discretion, whether before or after the time for RFP/RFT submissions has closed, when:

17.2.1. The RFP/RFT submission price exceeds the funds allocated for the purchase;

17.2.2. There has been a material change in the procurement requirements after the RFP/RFT has been issued;

17.2.3. Information has been received by HRCE after issuance of the RFP/RFT that HRCE believes has materially altered the procurement or the need of HRCE for the procurement; or

17.2.4. There was insufficient competition in order to provide the level of service, quality of goods or pricing required.

17.3. If no compliant RFP/RFT submission is received in response to an RFP/RFT, the HRCE reserves the right to enter into negotiations with one or more suppliers in order to complete the procurement or to reject all Bids and re-issue the RFP/RFT on new or modified RFP/RFT Documents.

17.4. HRCE will be the sole judge of whether there is sufficient justification to cancel any RFP/RFT.

17.5. No action or liability will lie or reside against HRCE in its exercise of its rights under this section

18. Construction Contract Guidelines

18.1. The printed policies of the Nova Scotia Construction Guidelines dated May 18, 2006 (or latest revisions) are applicable to these RFP documents.

19. Submission and Security Forms – Signatures

19.1. All Price Submission forms, bid security forms and performance assurance forms **must** bear the Bidder's original signature and name HRCE as the insured.

20. Bid Security

20.1. Proponents must submit within the sealed Price Submission file, one of the following: bid security in the form of a certified cheque, Irrevocable Letter of Credit, or Bid Bond on CCDC Form 220, in the amount of ten percent (10%) of the Bid Price made payable to or naming HRCE (as obligee). This bid security **must** accompany the Price Submission as an electronic file. HRCE will request an original hard copy from the successful proponent as required.

20.2. Where bid bond is provided as bid security:

20.2.1. The bond must be provided on the standard CCDC Bid Bond Form (latest version) in the amount of not less than ten percent (10%) of the Bid Price.

20.2.2. The bond must be submitted by the general contractor bidder, signed and sealed by the principal (Contractor) and Surety and shall be with an established Surety Company satisfactory to and approved by the HRCE.

20.2.3. The cost of providing the Bid Bond must be included in the Bid Price.

20.2.4. A legible scanned copy of the bid bond or an electronic bid bond shall be submitted with the bid via email. If requested by the HRCE, the vendor will provide the original bid bond without delay.

20.3. Where a certified cheque or a bank draft is provided as bid security:

20.3.1. The certified cheque or bank draft must be endorsed in the name of HRCE, for a sum not less than ten percent (10%) of the amount of the Bid Price.

20.3.2. The cost of providing the certified cheque or bank draft must be included in the Bid Price.

20.4. Where the Irrevocable Standby Letter of Credit is used as bid security:

20.4.1. The letter must be endorsed in the name of HRCE, for a sum not less than ten percent (10%) of the Bid Price

20.4.2. The Irrevocable Standby Letter of Credit shall be issued by a certified financial institution subject to the Uniform Custom and Practices for Documentary Credit (1993 revision or latest revision), International Chamber of Commerce (Publication No. 500).

20.4.3. The cost of providing the letter must be included in the Bid Price.

20.4.4. **A legible scanned copy of the bid bond or an electronic bid bond can be submitted with the bid via email. If requested by the HRCE, the vendor is required to provide the original bid bond without delay.**

20.5. Return of Bid Security:

20.5.1. The bid security of the unsuccessful proponents will be returned to them after the contract has been signed, or previous to such time, at the discretion of HRCE.

20.5.2. If no contract is awarded, all bid security will be returned.

21. Contract Security (Performance Assurance) – Required for contracts valued over $100,000

21.1. The performance assurance forms must bear the bidder's original signature and name HRCE as the insured.

21.2. The successful contractor shall maintain performance assurance in force for a period of not less than twelve (12) months after Ready-for-Takeover is achieved.

21.3. Performance Assurance must be endorsed as specified for bid security.

21.4. Should it become apparent that the final cost of the project will exceed the total amount payable by more than 20%, the bidder shall arrange to have their bonds reissued based on the projected final cost.

21.5. Section 00 72 13 – General Conditions GC11.2 and Section 00 73 00 – Supplementary General Conditions for form of Contract Security. Proponents should reference the project documents for the amount of Contract Security and the alternate type of Contract Security if applicable.

21.6. Performance Assurance must be submitted as one of the following:

21.6.1. Where a Bid Bond was used as bid security:

21.6.1.1. Within ten (10) days after notification of award of the Contract, the successful contractor must provide a Performance Bond and a Labour & Material Payment Bond, each in an amount equal to fifty percent (50%) of the amount of the Contract, naming HRCE.

21.6.1.2. Performance Bond and Labour and Material Payment Bonds, submitted by the bidders, shall be provided at the expense of the

bidder and shall be with an established Surety Company satisfactory to and approved by the HRCE.

21.6.2. Where a certified cheque or bank draft is used as Contract Security:

21.6.2.1. The certified cheque or bank draft submitted during the bid period will be cashed and the amount retained by the HRCE shall serve as Performance Assurance**,** including the payment of all obligations arising under the Contract.

21.6.2.2. The value of the certified cheque or bank draft will be retained in lieu of the Performance Bond and Labour and Material Bonds, providing that, at Contract award, the successful contractor shall supplement their certified cheque or bank draft to maintain an amount of ten (10%) of the total amount payable (Contract Price plus HST) under the contract.

21.6.2.3. The amount remaining will be returned without interest after a period of not less than twelve (12) months after Ready-for-Takeover is achieved.

21.6.2.4. Where certified cheque or bank draft is used as Performance Assurance, the cost of providing the certified cheque or bank draft in the Contract price.

21.6.3. Where an Irrevocable Standby Letter or Credit is used as Contract Security:

21.6.3.1. The Irrevocable Standby Letter of Credit submitted during the bid period will be retained by the HRCE and shall serve as performance assurance, including the payment of all obligations arising under the contract. The Irrevocable Standby Letter of Credit shall be issued by a certified financial intuition subject to the Uniform Customs and Practices for Documentary Credit (1993 revision) International Chamber of Commerce (Publication No. 500).

21.6.3.2. Where an Irrevocable Standby Letter of Credit is used as Performance Assurance, the cost of providing this letter should be included in the Contract Price. The contractor shall provide to the HRCE documentation throughout the duration of the contract that the Irrevocable Standby Letter of Credit remains in full effect at all times as specified.

21.6.3.3. Upon expiry of the Irrevocable Standby Letter of Credit, a separate Irrevocable Standby Letter of Credit shall be provided for work requiring extended warranties for such amounts as are required by the contract.

21.6.3.4. The Irrevocable Standby Letter of Credit is to be in effect for a period of not less than twelve (12) months after the Ready-for-Takeover is achieved.

22. Insurance

22.1. Proponents shall refer to project documents for the amount of insurance, the duration of coverage and alternate type of insurance; if applicable.

Section 00 72 13 -General Conditions of Contract,
Section GC 11.1 – Insurance, and
Section 00 73 00 – Supplementary General Conditions for form of Insurance.

22.2. The contractor shall carry such insurance as is required to protect the contractor, any sub-contractor, the HRCE, their agents and employees from all claims which may arise from the operations under this contract. The amounts of such insurance shall not be less than 22.3 below.

22.3. The General Contractor shall secure and maintain, at its expense, during the term of the insurance:

22.3.1. Wrap-Up Liability insurance must insure the general contractor(s) and all sub-contractors on this project:

22.3.1.1. including but not limited to, products liability and completed operations, contractual liability, owners and contractors' liability, attached machinery extension endorsement, and independent contractor, for a combined single limit of no less than $5,000,000 (five million dollars) per occurrence.

22.3.1.2. Wrap-Up Liability insurance is to include 24 months (2 years) of completed operations.

22.3.2. Commercial Auto Liability insurance covering all owned, non-owned and hired vehicles for a minimum combined single coverage of $2,000,000 (two million dollars) per occurrence.

22.3.3. Builders Risk: All risks in the amount of the contract Stipulated Bid Price. Insurance requirements as stipulated in the CCDC 2-2020.

22.3.4. Workers' Compensation to meet statuary requirements and/or Employers Liability, with limits of not less than $2,000,000 (two million dollars).

22.3.5. Contractors Pollution Liability Insurance limits of not less than $2,000,000 (two million dollars) per occurrence

22.4. Primary Insurance: The Contractor agrees that the insurance as required shall be primary and non-contributory.

22.5. No Limitation: The Contractor is responsible for determining whether the minimum insurance coverage amounts contained in this RFP are adequate to protect its interests. These minimum coverage amounts do not constitute limitations upon Supplier's Liability.

22.6. Endorsements – For the policies in item 22.3 above, there shall contain an endorsement naming the Halifax Regional Centre for Education and its affiliates as Additional Insured, and eliminating and removing any exclusion of liability for:

22.6.1. injury, including bodily injury and death to an employee of the insured or of the Halifax Regional Centre for Education, or

22.6.2. any obligation of the insured to indemnify, hold harmless, defend, or otherwise make contribution to the Halifax Regional Centre for Education because of damage arising out of injury, including bodily injury and death, to an employee of Halifax Regional Centre for Education.

22.7. The Contractor shall provide a certificate of insurance evidencing the above prior to work being performed. The HRCE also requires a complete copy of the Builder's Risk and Wrap-Up Liability policies, in addition to the Certificate of Liability Insurance.

22.8. Furthermore, HRCE must receive, in writing, at least thirty (30) days' notice of cancellation or modification of the above insurances. All insurance policies or certification documents shall specify coverage being applicable to this contract. The Contractor shall not do or omit to do or suffer anything to be done or omitted to be done which will in any way impair or invalidate such policy or policies of insurance.

22.9. Insurance documents (certificate and policies) shall be provided to the Purchasing Department within the timeframe indicated on the award letter. These documents are required before a purchase order will be issued. Work is not authorized and shall not commence until receipt of the purchase order.

23. Proof of Competency of Proponent

23.1. Any bidder may be required to furnish evidence satisfactory to the owner that he and his proposed sub-contractors have sufficient means and experience in the types of work called for to assure completion of the contract in a satisfactory manner.

23.1.1. The successful contractor must be a member in good standing with CRCA, RCANS or NBRCA; and Nova Scotia Construction Safety Association or approved recognized association or program.

23.2. Proposal Signing

23.2.1. The Technical Submission and the Price Submission form must be signed and under seal (as applicable) by a duly authorized signing officer(s) in their normal signatures.

23.3. Contract Time

23.3.1. The bidder, in submitting an offer, agrees to achieve Ready-for-Takeover of the work by the date indicated in the contract documents.

24. Offer Acceptance / Rejection

24.1. Duration of offer

24.1.1. Proposals shall remain open to acceptance and shall be irrevocable for a period of ninety (90) days after the RFP closing date.

24.2. Award/Selection/Acceptance of Offer

24.2.1. In the evaluation of a proposal, HRCE will consider, but not be limited to, the following criteria:

24.2.1.1. Compliance with proposal requirements

24.2.1.2. Proposal Evaluation Criteria as stated in Section 11.5

24.2.2. The Owner's evaluation of any and all proposals will be final

24.3. After acceptance by HRCE, the successful bidder shall be notified in writing of acceptance of the bid by way of an award letter.

25. Agreement

25.1. After acceptance, the HRCE and the successful proponent will enter into a CCDC-2, standard form of contract for the execution of the work.

25.2. A purchase order will be issued to the successful bidder once the contract has been signed and executed.

26. Post Award Submissions

26.1. Upon receipt of the award letter, the successful contractor will provide the following documents within five (05) business days:

26.1.1. A current Certificate of Recognition or Letter of Good Standing - The Contractor will supply a Certificate of Recognition issued jointly by the Workers' Compensation Board of Nova Scotia and an occupational health and safety organization approved by the Workers' Compensation Board of Nova Scotia (such as the Nova Scotia Construction Safety Association). These approved organizations are currently listed on the Workers' Compensation Board of Nova Scotia website (www.wcb.ns.ca). The contractor shall remain in good standing for the duration of the contract.

The Contractor shall supply the following:

26.1.1.1. Worker's Compensation Coverage – The Contractor shall supply a clearance letter from the Worker's Compensation Board of Nova Scotia, indicating the Contractor is assessed and in good standing;

26.1.1.2. All required contract security and insurance documentation;

26.1.1.3. A completed Schedule of Values (see Section 01 37 00);

26.1.1.4. A completed Safety Plan; and,

26.1.1.5. A detailed listing of subcontractors to be used.

26.1.2. In the event that any such certification during the term of the contract expires, the obligation remains with the Contractor to provide the updated required certificates.

26.1.2.1. The Contractor and subcontractors (if applicable) shall remain in good standing for the duration of the contract.

27. Taxes

27.1. The General Conditions of the Contract state that the Contractor is to pay all Harmonized Sales Tax (HST).

27.2. The HRCE is not exempt from HST. As a result, the aggregate amount of the bid for contracts is subject to HST; however, **prices submitted shall not include HST.**

27.3. The HST payable by the HRCE will be added as a separate item during the processing of progress payments and therefore **HST will not appear as a cost in the aggregate amount of the bid amount.**

27.4. Proponents are advised that they may be eligible to claim an Input Tax Credit (ITC) for a portion of the HST paid in relation to the contract requirement of the Government of Canada.

27.5. Proponents are to note that prices indicated on the Price Submission Form and the amendments to the Price Submission Form shall not include Provincial Sales Taxes, the Federal Goods and Services Tax or the Harmonized Sales Tax.

27.6. Refer to CCDC-2 (Section 00 72 13) and Supplementary General Conditions (Section 00 73 00).

28. Proponent Debriefing

28.1. HRCE will, if requested by a proponent within fifteen (15) days of notice of RFP award, arrange a debriefing for the purpose of informing the bidder why their proposal was not selected. At least two (2) HRCE staff shall attend the de-briefing.

The purpose of the de-briefing will be to discuss the proponent's scoring, answer questions and identify any weak areas in the proponent's submission in order for the proponent to improve future bid submissions. HRCE will not divulge details contained in any proponent's proposal with other proponents or overall ranking.

29. Purchase Orders

29.1. The purchase order will be issued by the HRCE Purchasing Department once the CCDC-2 Contract Documents have been fully executed by all parties.

30. Invoices

30.1. The purchase order number and HST number shall be noted on any/all invoices related to all work performed under this contract.

30.2. Applications for progress payments should be submitted to HRCE's consultant and cc'd to operations-invoices@hrce.ca as well as HRCE's Project Manager (Operations Contact) identified on the RFP cover page.

END OF SECTION 00 21 13

SECTION 00 31 26 – EXISTING HAZARDOUS MATERIALS INFORMATION

The following report is attached for bidders' information and reference:

INGLIS ST SCHOOL – HAZMAT SURVEY

END OF SECTION 00 31 26

SECTION 00 41 13 – PRICE SUBMISSION FORM

1. Salutation:

To: **HALIFAX REGIONAL CENTRE FOR EDUCATION**
33 SPECTACLE LAKE DRIVE, DARTMOUTH, NS B3B 1X7
ATTN: DON WALPOLA, BUYER

For: **#4273 Heating Distribution Upgrade – Inglis St. Elementary School**

Organization Name:	
Street Address:	
Email Address:	
Telephone:	
Authorized Signing Authority:	
Position Title:	

2. Proponent Declares:

2.1. That this submission was made without collusion or fraud.

2.2. That the proposed work was carefully examined.

2.3. That the Proponent is familiar with local conditions.

2.4. That Contract Documents and Addenda were carefully examined.

2.5. That all the above were taken into consideration in preparation of this RFP.

3. Proponent Agrees:

3.1. To provide all necessary equipment, tools, labour, incidentals and other means of construction to do all the work and furnish all the materials of the specified requirements which are necessary to complete the work in accordance with the Contract and agrees to accept, therefore, as payment in full the Lump Sum Price stated in Subsection 6 hereunder.

3.2. The have carefully examined the site of the work described herein; have become familiar with local conditions and the character and the extent of the work; have carefully examined every part of the proposed Contract and thoroughly understand its stipulations, requirements and provisions.

3.3. The have determined the quality and quantity of materials required; have investigated the location and determined the source of supply of the materials required; have investigated labour conditions; and have arranged for the continuous prosecution of the work herein described.

3.4. To be bound by the award of the Contract and if awarded the Contract on this bid price, to execute the required contract within ten (10) days after notice of award.

3.5. They have noted that the Harmonized Sales Tax is excluded from the "Contract Price".

3.6. The Contractor's employees shall always report to the main office of a school, indicate who they are, and state their purpose on site prior to starting any work in the school.

3.7. To the hours of work, defined as: Work for the HRCE is to be completed during hours when schools are unoccupied, unless otherwise authorized in writing by the Project Manager (Operations Contact person) or designate. Hours of work shall comply with local ordinances and bylaws for each site.

3.7.1. No work shall be conducted on weekends or statutory holidays without specific written approval from the Operations Manager or designate.

3.7.2. In the event that work is requested by HRCE during hours when schools are occupied, the work will be limited to work that is not disruptive to the school. There shall be no mechanical removals, no drilling, screwing or torch work during occupied hours without prior written approval from HRCE.

4. Owner Agrees

4.1. To examine this proposal and in consideration, therefore, the proponent hereby agrees not to revoke this bid:

4.1.1. until some other proponent has entered into the Contract with the HRCE for the performance of the work and the supply of the materials specified in the notice inviting proposals; or in the Information to Proponents, or

4.1.2. until ninety (90) days after the time fixed in the Information to Proponents for receiving bids has expired, or

4.1.3. Whichever first occurs; provided, however, that the Proponent may revoke this proposal at any time before the time fixed as indicated in the section 00 21 13, item 13.1.

5. Contract Documents include:

The HRCE will use the CCDC-2, 2020 for this work. A copy of the Standard Construction Contract CCDC 2 – 2020 is available upon request and will form part of the Contract Documents.

The HRCE Supplementary General Conditions for the CCDC-2, 2020 application to this Work is available for review under Section 0073 00 of the RFP document.

5.1.1. Cover Page
5.1.2. Table of Contents – Section 00 00 10
5.1.3. Description of Work & List of Drawings – Section 00 00 15
5.1.4. List of Consultants – Section 00 05 00
5.1.5. Information for Proponents – Section 00 21 13
5.1.6. Price Submission Form – Section 00 41 13
5.1.7. Price Amendment Form (if applicable) – Section 00 41 73
5.1.8. Agreement Between Owner and Contractor (CCDC 2) – Section 00 52 00
5.1.9. Definitions (CCDC 2) – Section 00 52 13
5.1.10. General Conditions of the Stipulated Contract Price (CCDC 2) – Section 00 72 13
5.1.11. Supplementary General Conditions – Section 00 73 00
5.1.12. Specifications of Work (all applicable sections)
5.1.13. Drawing(s) – as applicable
5.1.14. Addenda issued by HRCE
5.1.15. Post Bid Addenda issued by the HRCE, where applicable.
5.1.16. Executed Contract

6. Price Submission - Contract Price:

6.1. The undersigned Proponent, having carefully read and examined the aforementioned Contract Documents prepared by the Consultant, for the Halifax Regional Centre for Education, hereby accepts the same as part and parcel of the Contract herein referred to, and having carefully examined the locality and site of works and having full knowledge of the work required and of the materials to be furnished and used, does hereby propose and offer to enter into a contract to perform and complete, the whole of the said works and provide all necessary labour, plant, tools, materials and equipment and pay all applicable taxes, as set forth and in strict accordance with

the Specifications, Drawings and other Contract Documents and to do all therein called for on the terms and conditions and under the provisions therein set forth for the following:

6.2 LUMP SUM PRICE

#4273 Heating Distribution Upgrades – Inglis St. Elementary School

_____ /100 Dollars ($_____)

(HST Excluded)

6.3 OPTIONAL ALTERNATE SCOPE OF WORK AND PRICING

For 6.3 Pricing, the proponent is to fully articulate the scope changes proposed for this optional consideration and clearly identify any changes as presented within the drawings and specifications package provided within the RFP. Any impacts to schedule should also be provided for a fully transparent review by HRCE.

_____ /100 Dollars ($_____)

(HST Excluded)

Contract Price to be completed in written form on the lines provided above, with cents expressed as numerical fraction of a dollar. Contract price to be completed in numerical form on the line bounded by parenthesis above, with cents expressed as a decimal of a dollar.

Price Submissions will be Evaluated based on the Proponent's Lump Sum Price.

WHERE THERE IS A CONFLICT, WRITTEN WORD WILL GOVERN.

Award will be subject to Budget Availability.

The HRCE reserves the Right to:

Award to one or more contractors who bid.

Accept bids on any or all sections of this work.

Reduce the Scope of Work if the Bid amount Exceeds the Available Budget.

7. Completion Date:

7.1. The proponent agrees to achieve Ready-for-Takeover on or before the following date:

7.1.1.1. **Mechanical Room Works and Hot Water distribution piping, including rough-ins for all new hot water terminal devices – August 29th, 2025.**

7.1.1.2. **Terminal Heating Devices and Zone Controls (remaining work not completed before August 29th, 2025) – December 19th, 2025.**

7.1.1.3. **The proponent shall maintain the existing steam heating distribution system up until the point where all new hot water distribution and terminal devices are installed and functional.**

7.1.1.4. The undersigned Proponent agrees, if awarded the Contract, to achieve the Ready-for-Takeover Date providing the contract is awarded within fifteen (15) business days of RFP closing time.

8. Addenda Acknowledgement

We have received and noted the following addenda:

Addendum #	Dated	# of Pages
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Signature * The undersigned Proponent declares that this bid is made without connection to any other person(s) submitting pricing for the same work and is in all respects fair and without collusion or fraud.

RFP #4273 Heating Distribution Upgrades – Inglis St. Elementary School

SIGNATURE:

SIGNED AND DELIVERED
in the presence of:

_____
Witness

CONTRACTOR

_____
Company name

_____
Signature of Signing Officer

_____
Name and Title (printed)

_____
Date

9. Acknowledgement of Student Safety

The Halifax Regional Centre for Education (HRCE) is directly responsible for the safety of its students and staff. Should contractors be required to work in or on school property while children are present, it is a **mandatory HRCE requirement** that contractors assign the work to employees and/or sub-contractors who do not have a criminal record and who are not listed on the Child Abuse Registry. Failure to comply with this requirement may result in immediate contract termination.

The HRCE reserves the right to demand, at any time, during the full term of the project a Criminal Record Check and/or a Child Abuse Registry Check, on any personnel authorized by the Contractor to be on HRCE work/school sites.

By signing below, you are confirming that you understand and will abide by this mandatory HRCE requirement.

_____
Company name

_____
Witness

_____
Signature of Signing Officer

_____
Name and Title (printed)

_____
Date

END OF SECTION 00 41 13

SECTION 00 41 73 - PRICE AMENDMENT FORM
#4273 Heating Distribution Upgrades
Inglis St. Elementary School

Note: to be completed and forwarded for each Price amendment prior to RFP closing time and date as detailed on the cover sheet of the RFP document and any applicable addenda.

Lump Sum Price Amendment – Section 00 41 13 Price Submission form, Article 6.1. Contract Price

Increase Price by		**Decrease Price By**	
Amount (excluding HST)	**$**	**Amount** (excluding HST)	**$**

It is the Proponent's responsibility to ensure the table above is legible.

Submitted by:

_____

Company Name (please print as it appears on original RFP file)

_____

Authorized Proponent's Name (please print as it appears on Price Submission Form)

_____

Authorized Proponent's Signature

Date

_____

END OF SECTION 00 41 73

SECTION 00 52 00 - AGREEMENT BETWEEN OWNER AND CONTRACTOR

CCDC 2 – 2020

(A copy of Section 00 52 00, Standard Construction Contract CCDC 2 – 2020 (5 pages) is available upon request, otherwise, will form part of the contract sets to the successful bidder)

END OF SECTION 00 52 00

SECTION 00 52 13 - DEFINITIONS

CCDC 2 - 2020

(A copy of section 00 52 13, Standard Construction Contract CCDC 2 – 2020 (2 pages) is available upon request, otherwise, will form part of the contract sets to the successful bidder)

END OF SECTION 00 52 13

SECTION 00 72 13 - GENERAL CONDITIONS

OF THE STIPULATED PRICE CONTRACT

CCDC 2 - 2020

(A copy of section 00 72 13, Standard Construction Contract CCDC 2 – 2020 (22 pages) is available upon request, otherwise, will form part of the contract sets to the successful bidder)

END OF SECTION 00 72 13

SECTION 00 73 00 - SUPPLEMENTARY GENERAL CONDITIONS CCDC2 – 2020

The Canadian Standard Construction Document for Stipulated Price Contract (CCDC 2, 2020 version), Definitions and General Conditions governing same, shall be used by the project. The following Supplementary General Conditions (the "**Supplementary Conditions**") are intended to Supplement or Amend the General Conditions, and where conflicts occur, the Supplementary Conditions shall take precedence.

Where a General Condition or paragraph of the General Conditions of the Stipulated Price Contract is Deleted by these Supplementary Conditions, the numbering of the remaining General Conditions or paragraphs shall remain unchanged, and the numbering of the Deleted item will be retained, unused.

2 ARTICLE A-5 PAYMENT

Change 5.2.1 to delete the letter "s" from the word "rates".

Change 5.2.1(1) to read: "1% per annum above the prime rate."

Delete 5.2.1(2) in its entirety.

Delete 5.2.2. in its entirety.

DEFINITIONS

Add the following defined term to the Definitions:

Submittals

Submittals are documents or items required by the Contract Documents to be provided by the Contractor, such as:

1. Shop Drawings, samples, models, mock-ups to include details or characteristics, before the portion of the Work that they represent can be incorporated into the Work; and

2. As-built drawings and manuals to provide instructions to the operation and maintenance of the Work.

3 GC 1.1 CONTRACT DOCUMENTS

Add to the end of subparagraph 1.1.6.2:

1.1.6.2 Except where the Consultant shall be indemnified as a third- party beneficiary as provided in subparagraphs 9.2.7.4, 9.5.3.4 and in 13.1.1.3.

Add subparagraph 1.1.4.1:

1.1.4.1 Notwithstanding GC 1.1.4, should one or more conflict exist between Contract Documents and any work is done without consulting the Consultant for correction, Additional information, or a finding, the Contractor shall assume full and sole responsibility for any Additional costs incurred related to the conflict(s).

4 GC 2.4 DEFECTIVE WORK

Add new subparagraphs 2.4.1.1 and 2.4.1.2:

2.4.1.1 The Contractor shall rectify, in a manner acceptable to the Owner and the Consultant, all defective work and deficiencies throughout the Work, whether or not they are specifically identified by the Consultant.

2.4.1.2 The Contractor shall prioritize the correction of any defective work which, in the sole discretion of the Owner, adversely affects the day to day operation of the Owner.

5 PART 3 EXECUTION OF THE WORK

6 GC 3.1 CONTROL OF THE WORK

Add new paragraphs 3.1.3 and 3.1.4:

3.1.3 Prior to commencing individual procurement, fabrication, and construction activities, the Contractor shall verify, at the Place of the Work, all relevant measurements and levels necessary for proper and complete fabrication, assembly and installation of the Work and shall further carefully compare such field measurements and conditions with the requirements of the Contract Documents. Where dimensions are not included or contradictions exist, or exact locations are not apparent, the Contractor shall immediately notify the Consultant before proceeding with any part of the affected work.

3.1.4 The Contractor shall make all reasonable efforts to ensure that the Work is carried out in a continuous manner. The Contractor shall not knowingly permit Construction Equipment and/or Products to be stored at the Place of Work when they are not being used in connection with or implemented into the Work, except in accordance with paragraph 3.7.7.1.

7 GC 3.6 SUBCONTRACTORS AND SUPPLIERS

Add the following paragraph 3.6.7:

3.6.7 A copy of the agreement between Contractor and any subcontractor(s) shall be provided to the Owner and the Consultant, if so requested.

8 GC 3.7 LABOUR AND PRODUCTS

Add the following paragraph 3.7.4:

3.7.4 The Contractor is responsible for the safe on-site storage of Products and their protection (including Products supplied by the Owner and other contractors to be installed under the Contract) in such ways as to avoid dangerous conditions or contamination to the Products or other persons or property and in locations at the Place of the Work to the satisfaction of the Owner and the Consultant. The Owner shall provide all relevant information on the Products to be supplied by the Owner.

Add the following paragraph 3.7.5:

3.7.5 The Contractor shall confine Construction Equipment, Temporary Work, storage of Products, waste products and debris, and operations of employees and Subcontractors to limits indicated by laws, ordinances, permits, or the Contract Documents and shall not unreasonably encumber the Place of the Work.

Add the following paragraph 3.7.6:

3.7.6 The Contractor shall maintain the Work in a safe and tidy condition and free from accumulation of waste products and debris.

Add the following paragraphs 3.7.7.1 and 3.7.7.2:

3.7.7 .1 The Contractor shall not permit Products or Construction Equipment to be stored at the Place of Work unless:

(i) the Products and/or Construction Equipment are used within fourteen (14) days of their arrival at the Place of Work; or

(ii) the Owner provides written permission for Products and/or Construction Equipment to be stored at the Place of Work, in which case the Contractor shall comply with the written instructions provided by the Owner in that regard, and said permission may be withdrawn by the Owner upon five (5) business days' notice, in which case the Contractor will be solely responsible for any costs, losses, or damages the Contractor incurs in connection the withdrawal of said permission;

.2 Notwithstanding any other provision of the Contract Documents, and subject only to the provisions of any Payment Legislation, the Owner shall not be liable to pay any amount greater than 25% of the actual cost of any Products and/or costs associated with Construction Equipment that is/are stored at the Place of Work and not used within 14 days of their arrival at the Place of Work. The Owner shall only become liable to pay for the remainder of said Products and/or costs of said Construction Equipment after those Products and/or Construction Equipment are actually used at the Place of Work and is/are invoiced in accordance with the terms of the Contract Documents.

Add the following paragraphs 3.7.8.1., 3.7.8.2, 3.7.8.3, and 3.7.8.4:

3.7.8 The Contactor shall:

.1 furnish competent and adequate labour and staff, who shall be in attendance at the Place of Work at all times, as necessary, for the proper administration, co-ordination, supervision, and superintendence of the Work;

.2 organize the procurement of all Products and Construction Equipment so that labour and staff will be available at the requisite times to complete the Work in accordance with GC 3.4 Construction Schedule;

.3 keep an adequate force of skilled workers at the Place of Work, as necessary, to complete the Work in accordance with all requirements of the Contract Documents and in accordance with GC 3.4 Construction Schedule; and

.4 provide the Owner, Project Manager, and Consultant, with the names, work addresses, and telephone numbers of the appointed representative of the Contract and other responsible field persons who may be contacted during non-working hours.

9 GC 3.8 SHOP DRAWINGS AND OTHER SUBMITTALS

Add the words “AND OTHER SUBMITTALS” to the Title after SHOP DRAWINGS in GC 3.8.

Add “and Submittals” after each instance of the words “Shop Drawings” in paragraphs 3.8.1, 3.8.2, 3.8.3, 3.8.3.2, 3.8.5, 3.8.6, and 3.8.7.

Add the following paragraph 3.8.1.1:

3.8.1.1 Prior to the first application for payment, the Contractor and the Consultant shall jointly prepare a schedule of the dates for submission and return of Shop Drawings and any Submittals.

Add the following subparagraph 3.8.4.1:

3.8.4.1 The following paragraph shall apply to each Shop Drawing and Submittal reviewed in connection with the project. The Consultant’s review conducted pursuant to GC 3.8.3 shall not imply that the Consultant has approved the detailed design inherent in the Shop Drawings or Submittals, responsibility for which shall remain with the Contractor submitting same. The Contractor is responsible for information that pertains solely to fabrication processes or to techniques of construction and installation, and for coordination of the work of all sub trades.

Delete the following words in paragraph 3.8.7:

3.8.7 “with reasonable promptness so as to cause no delay in the performance of the Work” and replace those words with: “within ten (10) working days or such longer period as may be reasonably required”.

Add new GC 3.10 as follows:

10 GC 3.10 PERFORMANCE BY CONTRACTOR

GC 3.10 In performing the Work and all its services and obligations under the Contract, the Contractor shall exercise a standard of care, skill and diligence that would normally be provided by an experienced and prudent contractor supplying similar services for similar projects. The Contractor acknowledges and agrees that throughout the Contract, the Contractor's obligations, duties and responsibilities shall be interpreted in accordance with this standard. The Contractor shall exercise the same standard of due care and diligence in respect of any products, personnel, or procedures which it may recommend to the Owner.

The Contractor further represents, covenants and warrants to the Owner that:

1. The personnel it assigns to the Project are appropriately experienced;

2. It has sufficient staff of qualified and competent personnel to replace its designated supervisor and project manager, subject to the Owner's approval, in the event of death, incapacity, removal or resignation.

11 GC 4.1 CASH ALLOWANCES

Delete paragraph 4.1.7 in its entirety and substitute:

4.1.7 At the commencement of the Work, the Contractor shall prepare for the review and acceptance of the Owner and the Consultant a schedule indicating the times, within the construction schedule referred to in GC 3.4, at which items called for under cash allowances and items that are specified to be purchased by the Owner and installed or hooked up by the Contractor are required to be at the Place of the Work to avoid delaying the progress of the Work.

Add new paragraph 4.1.8:

4.1.8 The *Owner* reserves the right to call, or to have the Contractor call, for competitive bids for portions of the Work, to be paid for from cash allowances.

12 GC 5.1 FINANCING INFORMATION REQUIRED OF THE OWNER

Delete section GC 5.1 in its entirety.

13 GC 5.2 APPLICATION FOR PROGRESS PAYMENT

Add to paragraph 5.2.1, ", the Project Manager, " after the word "Owner".

Add the following at the end of paragraph 5.2.2:

5.2.2 Such applications shall be accompanied by one or more of the following documents: a Statutory Declaration, Waiver of Lien, or receipt, stating that the holdback monies claimed have been paid to the particular party or parties so named or referred to therein. The form of the Statutory Declaration, Waiver of Lien, or receipt shall meet the approval of the Consultant.

Add the following paragraph 5.2.9:

5.2.9 The reference to payment for Products delivered to the Place of the Work in Article 5.2.8 shall not be construed as covering day-to-day financing of the Project. Products delivered to the Place of the Work shall be construed to mean major items of equipment or quantities of items that are essential for the expedient conduct of the Work.

Add the following paragraph 5.2.10:

5.2.10 The Contractor shall submit all applications for payment and invoices (with supporting documents as required by the Contract Documents) to the Owner via the following email address: operations-invoices@hrce.ca.

14 GC 5.3 PAYMENT

Supplement paragraph 5.3.1 by adding the following:

5.3.1 A holdback percentage of ten (10) percent (%) shall apply to progress payments. The sworn statement by the Contractor for release of holdback monies shall be in the form of a Statutory Declaration meeting the approval of the Consultant. Amounts as certified by the Consultant to rectify deficiency items, or incomplete portions of individual work items, may be retained by the Owner after Substantial Performance has been obtained, pending Total Performance of the work or other authorization for release by the Consultant.

Amend subparagraph 5.3.1.2 as follows:

5.3.1.2 Delete "28" and replace with "30."

15 GC 5.4 SUBSTANTIAL PERFORMANCE OF THE WORK AND PAYMENT OF HOLDBACK

Add the following paragraph 5.4.7:

5.4.7. Before the Contractor submits his application for Substantial Performance of the Work, all Operations and Maintenance Manual materials shall be submitted in accordance with the Contract Documents. The Certificate of Substantial Performance will not be issued until this requirement is met.

Add the following subparagraph 5.4.8:

5.4.8 After the issuance of a certificate of Substantial Performance of the Work by the Consultant, the Contractor shall promptly submit to the Consultant and the Owner (i) a Certificate from a barrister stating that there are no Builders' Liens filed relating to the Work and (ii) a Clearance Letter from the Workers' Compensation Board.

16 GC 5.5 FINAL PAYMENT

Add the following subparagraphs 5.5.1.1, 5.5.1.2, 5.5.1.3, and 5.5.1.4:

5.5.1.1 The Contractor's application for final payment is considered to be valid only when all of the following have been performed:

1. Work has been completed and inspected for compliance with Contract Documents, and the Consultant is satisfied that all the requirements of the Contract have been fulfilled by the Contractor.

2. Defects have been corrected, deficiencies have been completed, and the Place of Work is (i) free of waste products and debris, and (ii) clean and suitable for use or occupancy by the Owner.

3. Equipment and systems have been tested, adjusted and balanced and are fully operational, and written reports as outlined in the Contract Documents have been provided to the Consultant.

4. Certificates required by Utility companies, manufacturer's representative and inspectors have been submitted.

5. Spare parts, maintenance materials, warranties and bonds have been provided.

5.5.1.2 If Work is deemed incomplete by the Consultant, the Contractor shall complete outstanding items and request re-inspection.

5.5.1.3 If, within sixty (60) days after the issuance by the Consultant of the Certificate of Substantial Performance, the Contractor has not corrected all the deficiencies, the Owner will retain sufficient money to cover the cost of completing said deficiencies, as determined by the Consultant, in addition to holding monies retained in accordance with the Contract Documents and subject to the provisions of the Builders' Lien legislation of Nova Scotia.

5.5.1.4 Neither the final certificate nor the payment thereunder, nor any provision in the Contract Documents shall relieve the Contractor from responsibility for faulty material or workmanship which shall appear within a period of one (1) year from the date when Ready-For-Takeover has been attained and the Contractor shall promptly remedy any defects due thereto and pay for any damage to other Work resulting therefrom which shall appear within such period of one year. The Owner shall give notice of observed defects reasonably promptly. This article shall not be deemed

to restrict any liability of the Contractor arising out of any law in force in the Province of Nova Scotia.

17 GC 6.2 CHANGE ORDER

Add the following paragraphs 6.2.3, 6.2.4, 6.2.5, 6.2.5, 6.2.6, 6.2.7, and 6.2.8:

6.2.3 All contemplated changes in the work shall be issued by the Consultant on a "Contemplated Change Order" form.

6.2.4 For lump sum pricing, the Contractor shall, upon receipt of the Contemplated Change Order, submit to the Consultant for approval within seven (7) days, a quotation for changes in the work. The Contractor acknowledges that failure to do so will result in foreseeable delay to the approval and payment of changes in the Work and foreseeable Additional costs to the Owner.

6.2.5 Quotation for changes shall be priced in sufficient detail (GC 6.6 applies).

6.2.6 Consultant shall, within five (5) working days, notify the Contractor whether estimates are accepted by Owner or further information is required. Acceptance of the Owner shall be indicated in writing, and a signed copy of the Contemplated Change Order form shall be returned to the Contractor.

6.2.7 The Contractor shall take reasonable measures to stop Work or minimize the Work in areas affected by or related to the contemplated change(s).

6.2.8 For each change in the Work, the Contract Price shall be increased by the net cost of that change in the Work, plus the following mark-ups for all overhead and profits:

a. a 10% mark-up on the direct cost of the net change in the Work for change work performed by the Contractor's own forces; and

b. a 5% mark-up on the change work performed by Subcontractors.

Credits for reduced or Deleted portions of the Work shall be the actual cost of that Work, without Addition or subtraction of any amount by the Contractor for overhead and profit, and shall be included in the actual cost of the net change.

18 GC 6.3 CHANGE DIRECTIVE

Delete paragraph 6.3.6.3 of GC 6.3 and replace with:

6.3.6.3. The Contractor's percentage fee referred to in paragraphs 6.3.6.1 and 6.3.6.2 shall be calculated and determined applying the following percentage mark-ups for overhead and profit:

a. a 10% mark-up on the direct cost of the net change in the Work for change work performed by the Contractor's own forces; and

b. a 5% mark-up on the change work performed by Subcontractors.

Add to GC 6.3 the following paragraphs 6.3.14 and 6.3.15:

6.3.14 If unit prices are set out in the Contract or subsequently agreed upon, then the unit process alone shall govern in relation to determining the cost of any item for a Change Directive.

6.3.15 Payment of the cost of performing work attributable to a Change Directive shall be made only if and to the extent that the Contractor has taken all reasonable steps to mitigate and minimize the impact of the change and the resulting cost.

19 GC 6.4 CONCEALED OR UNKNOWN CONDITIONS

Add new paragraph 6.4.5:

6.4.5 The *Contractor* confirms that, prior to bidding the *Project*, it carefully investigated the Place of the Work and applied to that investigation the degree of care and skill described in paragraph 3.10, given the amount of time provided between the issue of the bid documents and the actual closing of bids, the degree of access provided to the Contractor prior to submission of bid, and the sufficiency and completeness of the information provided by the Owner. The Contractor is not entitled to compensation or to an extension of the Contract Time for anything which could reasonably have been ascertained by the Contractor by such careful investigation undertaken prior to the submission of the bid.

20 GC 6.5 DELAYS

Delete the period at the end of paragraph 6.5.1 and substitute the following words:

6.5.1 ", but excluding any consequential, indirect or special damages."

Add new paragraph 6.5.6:

6.5.6 If the Contractor is delayed in the performance of the Work by any act or omission of the Contractor or anyone employed or engaged by the Contractor directly or indirectly, or by any cause within the Contractor's control, then the Contract Time shall be extended for such reasonable time as the Consultant may decide in consultation with the Contractor. The Owner shall be reimbursed by the Contractor for all reasonable costs incurred by the Owner as the result of such delay, including all services required by the Owner from the Consultant as a result of such delay by the Contractor and, in particular, the cost of the Consultant's services during the period between the Ready-for-Takeover date stated in Article A-1 herein (subject to any adjustment in accordance with the Contract Documents) and any later, actual date Ready-for-Takeover is attained by the Contractor.

Add new paragraph 6.5.7:

6.5.7 The Consultant shall not, except by written notice to the Contractor, stop or delay any part of the Work pending decisions or proposed changes.

21 GC6.6 CLAIMS FOR A CHANGE IN CONTRACT PRICE

Add the following to the end of paragraph 6.6.1, deleting the "." after the word "Consultant":

> "in no case more than 10 Working Days from the event or series of events giving rise to the claim".

Amend paragraph 6.6.5 as follows:

6.6.5 Add the words "as noted in paragraph 6.6.3" after the words "of the claim" and add the words "and the consultant", at the end.

Add the following paragraph 6.6.7:

6.6.7 If the Contractor claims for an increase in the Contract Price pursuant to this GC 6.6, the amount of any such claim shall be limited to the amount determined in accordance with the methods of quantification set out in paragraphs 6.3.6, 6.3.7, and 6.3.14 of GC 6.3, and the Contractor shall promptly submit a detailed breakdown of all labour, materials, overhead, and profits claimed, including those of Subcontractors. Contemporaneous records are required to support a claim for an increase in the Contract Price, and the Owner retains the right to verify all submitted records through an independent audit. The Owner is not liable for costs not so substantiated. Any mark-up for overhead and profit on the claimed amount under this GC 6.6 shall be limited to the amounts provided for under GC 6.3.6.3, as Amended by these Supplementary Conditions.

22 GC 8.3 NEGOTIATION, MEDIATION, AND ARBITRATION

Add the following paragraphs 8.3.9, 8.3.10, 8.3.11, 8.3.12, 8.3.13, 8.3.14, and 8.3.15:

8.3.9 Within five (5) days of receiving a Notice in Writing requesting arbitration, the party receiving the notice shall give the Consultant a written notice containing:

a. a copy of the Notice in Writing requesting arbitration;

b. a copy of supplementary conditions 8.2.9 to 8.2.14 of this contract, and;

c. a concise description of any claims or issues which the Contractor or the Owner, as the case may be, wishes to raise in relation to the Consultant arising out of the issues in dispute in the arbitration.

8.3.10 The Owner and the Contractor agree that the Consultant may elect, within ten (10) days of receipt of the notice under paragraph 8.3.9, to become a full party to the arbitration under paragraph 8.3.6 if the Consultant:

a. has a vested or contingent financial interest in the outcome of the arbitration;

b. gives the notice of its election to the Owner and the Contractor before the arbitrator is appointed;

c. agrees to be a party to the arbitration within the meaning of the rules referred to in paragraph 8.3.6, and;

d. agrees to be bound by the arbitral award made in the arbitration.

8.3.11 If an election is made under paragraph 8.3.10, the Consultant may participate in the appointment of the arbitrator and, notwithstanding the rules referred to in paragraph 8.3.6, the time period for reaching agreement on the appointment of the arbitrator shall begin to run from the date the respondent receives a copy of the notice of arbitration.

8.3.12 The arbitrator in the arbitration in which the Consultant has elected under paragraph 8.3.10 to become a full party may:

a. on application of the Owner or the Contractor, determine whether the Consultant has satisfied the requirements of paragraph 8.3.10, and;

b. make any procedural order considered necessary to facilitate the Addition of the Consultant as a party to the arbitration.

8.3.13 The provisions of paragraph 8.3.9 shall apply mutatis mutandis to written notice to be given by the Consultant to any sub-consultant.

8.3.14 In the event of notice of arbitration given by the Consultant to a sub-consultant, the sub-consultant is not entitled to any election with respect to the proceeding as outlined in 8.3.10, and is deemed to be bound by the arbitration proceeding.

8.3.15 An application for arbitration shall be accompanied by security in the amount of $1,000 to apply to the cost of arbitration. Any claims of excess costs must be submitted in writing to the Consultant within two weeks of completion or alleged completion of the work. No claims shall be accepted after this date and, also, no claims shall be accepted for disputed work unless the Consultant has been notified as specified.

23 GC 9.1 PROTECTION OF WORK AND PROPERTY

Delete subparagraph 9.1.1.1 in its entirety and substitute the following new paragraph 9.1.1.1:

9.1.1.1 errors or omissions in the Contract Documents which the Contractor could not have discovered applying the standard of care described in paragraph 3.10.

Delete paragraph 9.1.2 in its entirety and substitute the following new paragraph 9.1.2:

9.12 Before commencing any Work, the Contractor shall determine the locations of all underground utilities and structures indicated in the Contract Documents, or that are discoverable by applying to an Inspection of the Place of the Work exercising the degree of care and skill described in paragraph 3.10.

24 GC 9.2 TOXIC AND HAXARDOUS SUBSTANCES

Add in paragraph 9.2.6 after the word "responsible", the following new words:

9.2.6 Or whether any toxic or hazardous substances or materials already at the Place of the Work (and which were then harmless or stored, contained or otherwise dealt with in accordance with legal and regulatory requirements) were dealt with by the Contractor or anyone for whom the Contractor is responsible in a manner which does not comply with legal and regulatory requirements, or which threatens human health and safety or the environment, or material damage to the property of the Owner and others,

Add in subparagraph 9.2.7.4:

9.2.7.4 "and the Consultant" after "Contractor":

Add in paragraph 9.2.8 after the word "responsible", the following new words:

9.2.8 or that any toxic or hazardous substances or materials already at the Place of the Work (and which were then harmless or stored, contained or otherwise dealt with in accordance with legal and regulatory requirements) were dealt with by the Contractor or anyone for whom the Contractor is responsible in a manner which does not comply with legal and regulatory requirement, or which threatens, human health and safety or the environment, or material damage to the property of the Owner or others,

25 GC 9.4 Construction Safety

Add to the end of paragraph 9.4.1:

The Contractor shall be responsible for and ensure the safety of not only the workers, Subcontractors, tradespeople, and Suppliers, and their equipment, but also of all other persons who enter the Place of Work whether during working hours or not, and for that purpose shall erect such hoardings and signs and shall employ such safety measures as may be necessary to ensure the safety of such persons.

Delete paragraph 9.4.5 and replace with:

The Contractor shall be responsible for the cost to comply with any public health order(s) affecting the performance of the Work issued pursuant to the Health Protection act (Nova Scotia) or pursuant to any similar legislation, whether Federal or Provincial.

26 GC 9.5 MOULD

Add in subparagraph 9.5.3.4:

9.5.3.4 "and the Consultant" after "Contractor"

27 GC 10.1 TAXES AND DUTIES

Add the following paragraph 10.1.3:

10.1.3 The Contractor shall indicate on each application for payment as a separate amount, the appropriate Harmonized Sales Tax the Owner is legally obliged to pay. This amount will be paid to the Contractor in Addition to the amount certified for payment under the Contract. The Contractor's HST registration number must appear on all invoices.

28 GC 10.2 LAWS, NOTICES, PERMITS AND FEES

Delete from the first line of paragraph 10.2.5 the word, "The" and substitute the words:

10.2.5 "Subject to paragraph 3.10, the"

29 GC 10.4 WORKERS' COMPENSATION

Add the following paragraphs 10.4.2, 10.4.3, 10.4.4, and 10.4.5:

10.4.2 The contractor is referred to regulations, as applicable, under the Worker's Compensation Act of Nova Scotia.

10.4.3 The Contractor's registration with the Worker's Compensation Board shall be continuous during the contract. Should registrations be scheduled to expire during the contract period, the Contractor shall submit a copy of its registration renewal one month prior to the expiration of the current certificate.

10.4.4 The Contractor shall furnish evidence of coverage under the Worker's Compensation Act of Nova Scotia and a clearance Certificate providing proof of registration with the Worker's Compensation Board prior to commencement of the Work. (A photocopy of the Contractors registration certificate is acceptable proof). On-going proof of good standing with the Worker's Compensation Board during the term of the contract is required.

10.4.5 The Contractor shall also maintain a Certificate of Recognition (COR) from a safety audit company recognized by the Workers' Compensation Board, such as the Nova Scotia Construction Safety Association, for the duration of the Contract. The Contractor shall provide a copy of its COR to the Owner and Consultant prior to commencement of the Work and shall provide a copy of its COR to the Owner or Consultant upon request.

GC 11.1 INSURANCE

Delete sentences and replace with the following in subparagraph 11.1.1.1:

11.1.1.1 **Delete**: "General liability insurance shall be maintained from the commencement of the Work until one year from the date of Ready-for-Takeover. Liability coverage shall be provided for completed operations hazards from the date of Ready-for-Takeover on an ongoing basis for a period of 6 years following Ready-for-Takeover" **and replace with**: " General Liability Insurance or Wrap- Up Liability Insurance, (as detailed in the Information to Tenders section under "Insurance Requirements"), shall be maintained from the commencement of the Work until final completion and acceptance of the Work including the making good of faulty work or materials, except that coverage of completed operations liability shall in any event be maintained for twelve (12) months from date of Ready-for-Takeover".

Add the following subparagraphs 11.1.1.1.1, 11.1.1.1.2, and 11.1.1.2.1:

11.1.1.1.1 The general liability insurance to be maintained by the Contractor shall include Commercial General Liability Insurance covering Premises and Operations Liability, elevators, broad form property damage, broad form automobile, owners and contractors protective, blanket contractual, personal injury, completed operations liability contingent employers liability, cross liability clause, non-owned automobile liability, and a 30 day notice of cancellation clause.

11.1.1.1.2 All liability insurance policies shall be written in such terms as will fully protect the Contractor and The Halifax Regional Centre for Education as an Additional named insured.

11.1.1.2.1 Liability coverage of not less than ten million dollars ($10,000,000) is required with regard to operations of owned and non-owned automobiles.

Delete subparagraph 11.1.1.4 in its entirety and insert the following subparagraphs:

11.1.1.4 Broad Form (All Risks) Builders Risk Coverage - Prior to the commencement of any Work the Contractor shall maintain and pay for Broad Form (All Risks) Builders Risk Coverage in the joint names of The HRCE and the Contractor totaling not less than one hundred percent (100%) of the total value of the Work to be done and materials delivered on the site (contract value), so that any loss under such policies of insurance will be payable to The HRCE and the Contractor as their respective interests appear. The Builders Risk Insurance shall include all materials related to the Work while in transit or at other locations.

11.1.1.4.1 Should a loss be sustained under the Builders Risk Coverage, the Contractor shall act on behalf of The HRCE and Contractor for the purpose of adjusting the amount of such loss with the insurance companies. As soon as such adjustment has been satisfactorily completed, the Contractor shall proceed to repair the damage and complete the Work and

shall be entitled to receive from The HRCE in Addition to any sum due under the Contract, the amount at which The HRCE interest has been appraised in the adjustment made with the insurance companies as referred to above, said amount to be paid to the Contractor as the Work of restoration proceeds. Any loss or damage which may occur shall not affect the rights and obligations of either party under the Contract except as aforesaid and except that the Contractor shall be entitled to a reasonable extension of time for the performance of the Work, as The HRCE may decide.

11.1.1.4.2 Upon Ready-for-Takeover being attained, the Contractor's obligation to maintain Builder Risk Insurance shall cease and The HRCE shall assume full responsibility for insuring the whole of the Work against loss or damage.

11.1.1.4.3 "Broad form" property insurance in the joint names of the *Contractor*, the *Owner* and the *Consultant*. The policy shall include as insureds all *Subcontractors*. The Broad form" property insurance shall be provided from the date of commencement of the Work until the earliest of:

11.1.4.3.1 Ten (10) Calendar days after Ready-for-Takeover;

11.1.4.3.2 on the commencement of use or occupancy of any part or section of the *Work* unless such use or occupancy is for construction purposes, habitational, office, banking, convenience store under 465 square meter in area, or parking purposes, or for the installation, testing and commissioning or equipment forming part of the *Work*; and

11.1.4.3.3 when left unattended for more than thirty (30) consecutive calendar days or when construction activity has ceased for more than thirty (30) consecutive calendar days.

Paragraph 11.1.2 is supplemented as follows:

11.1.2 In addition, within seven (7) working days after notification of award or in any event prior to payment of the first progress claim, the Contractor shall submit certified true copies of each insurance policy to the Owner's Contract Authority. Such copies shall be exclusive of information pertaining to premium or premium bases used by the insurer to determine the cost of the insurance. Prior to the commencement of any work, the Contractor shall file with the Owner a certified copy of each insurance policy and certificate required.

Delete 11.1.5 in its entirety and replace with the following:

11.1.5 Insurance contracts shall be procured from and the premiums paid to a resident agent of an insurance Company licensed to underwrite insurance in the Province of Nova Scotia.

Add the following paragraph 11.1.9:

11.1.9 All of the insurance policies shall contain a clause stating that no change in terms and conditions or cancellation may at any time be made without the full knowledge and consent of the Owner.

30 GC 11.2 CONTRACT SECURITY

Add the following paragraphs 11.2.1, 11.2.2, and subparagraph 11.2.2.1:

11.2.1 The Contractor shall, prior to commencement of the *Work* or within the specified time, provide to the *Owner* and the Consultant the *Contract* security specified in the *Contract Documents*.

11.2.2 If the *Contract Documents* require surety bonds to be provided, such bonds shall be issued by a duly licensed surety company authorized to transact the business of suretyship in the province or territory of the *Place of the Work* and shall be maintained in good standing until the fulfillment of the *Contract*. The form of such bonds shall be in accordance with the latest edition of the CCDC approved bond forms, or in such other form as specified by the Owner.

11.2.2.1 "Bonds shall be procured from a Nova Scotia resident agent of an insurance company licensed to do business in Nova Scotia and shall be maintained in good standing and held by the Owner until one (1) year after Ready-for-Takeover.

Add the following paragraph 11.2.3:

11.2.3 If a Certified Cheque is held as contract security it shall be in an amount equal to ten (10) percent (%) of the Contract Price. The Contract shall supplement the Certified Cheque as necessary to maintain the amount equal to ten (10) percent (%) of the total amount payable (Contract Price plus HST).

.1 The Certified Cheque will be deposited at the chartered bank holding The HRCE deposits.

.2 The HRCE will return the cheque amount to the Contractor upon satisfactory completion of the contract and duration as specified in the Tender documents.

.3 Should Contractor default, total amount payable under the Certified Cheque will be the face value of the cheque plus all accrued interest.

.4 Payment for completion of work, due to failure of performance of the Contractor, shall include all reasonable obligations under the Contract, including architectural and engineering costs arising because of the default of the Contractor.

.5 Payment for labour and materials shall be limited to those who have a direct contract with the Contractor for the provision of labour and/or material (which includes equipment rental).

31 GC 12.3 WARRANTY

In paragraph 12.3.2, delete from the first line the word, “The” and substitute the words:

12.3.2 “Subject to paragraph 3.10, the...”

Add the following paragraph 12.3.7:

12.3.7 Warranty repairs or replacements which arise during warranty period which affect the operation of the system shall be attended to immediately upon notification from the Consultant.

32 GC 13.3 INDEMNIFICATION

Add the following paragraph 13.1.1.3:

13.1.1.3 The Contractor shall indemnify and hold harmless the Consultant, its agents and employees from and against claims, demands, losses, costs, damages, actions, suits, or proceeding by third parties that arise out of, or are attributable to, the Contractor's performance of the Contract, provided such claims are attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property, and caused by negligent acts or omissions of the Contractor or anyone for whose acts the Contractor may be liable, and made in writing within a period of six (6) years from t Ready-for-Takeover, or within such shorter such period as may be prescribed by any limitation statute or the province or territory of the Place of the Work.

END OF SECTION 00 73 00

SECTION 01 11 00 - HRCE SUMMARY OF WORK

1. Project Location & General Scope

1.1. Inglis St. Elementary School, Halifax, NS

1.2. Scope: Refer to Section 00 00 15 for scope and schedule information.

2. Contract Documents

2.1. Work will be performed under CCDC-2 contract.

3. General Conditions

3.1. Halifax Regional Centre for Education and CCDC-2 form an integral part of this Project Manual, a copy of which is bound herein.

4. Project Manual

4.1. Sections of the Project Manual are numbered in conformance with the Master List of Section Titles and Numbers, CSC Document 004E, published jointly by Construction Specifications Canada and The Construction Specifications Institute (USA). Sections are arranged in their standard format.

4.2. Sections are written as units of the Work which have been assigned numbers in conformance with the CSC/CSI system. They are arranged in sequence for this Manual. Gaps in the order of numerical sequence do not indicate that a section has been inadvertently omitted from this Manual, but, rather that a Section is not required for completion of the Work.

4.3. Wherever the project location building name occurs in the Contract Documents it shall be taken to mean all work included in the Contract.

4.4. Wherever in the Contract Documents the words "approval", "approved", "direction", "directed", "selection", "selected", "request", "requested", "report", and similar words are used, such approvals, directions, selections, requests and reports shall be given by the HRCE unless specifically stated otherwise.

4.5. Wherever in the Contract Documents the word "provide" is used in any form, it shall mean that the Work concerned shall include both supply and installation of the products required for completion of that part of the Work.

4.6. Wherever in this Project Manual it is specified that Work is to proceed or to meet approval, direction, selection or request of jurisdictional authorities or others, such approval, direction, selection or request shall be in writing.

5. Errors & Omissions

5.1. If errors or omissions are observed in the Contract Documents, immediately notify the HRCE Procurement Contact in writing of all such errors or omissions. In the event no such notice is given, the Contractor will be held responsible for the results of any such error or omission and the cost of rectifying the same.

6. Division 1

6.1. The provisions of all Sections of **Division 1** shall apply to each Section of this Specification**.**

7. Wage Rates

7.1. Pay all employees engaged on the Work a wage not less than the minimum wage per hour as set out by the Province of Nova Scotia. For overtime work beyond 48 hours in any one week, pay no employee at a rate of less than one and one-half times the minimum wage per hour noted above. Provide for these wage rates in tendered contract amount.

8. Work Performed Under Separate Contracts

8.1. Work not to be included in the Contract, as noted "NIC" on the Drawings, shall be governed by Article 37, Separate Contracts, of General Conditions of Contract.

8.2. Furniture installation will be carried out by others.

8.3. Computer installation will be carried out by others.

9. Project Schedule

9.1. Refer to Section 00 00 15 Description of Work.

9.2. Existing services (mechanical & electrical) will need to be maintained through the renovations.

9.3. During construction, all life safety systems as well as mechanical and electrical systems must be in active, usable condition to permit the school to operate or alternate methods used to ensure the safe operation of the school as directed by HRCE project representative.

9.4. As construction progresses revise the schedule to compensate for any delays or unforeseen activities so as to maintain the contract completion date. Each schedule submission is to be complete with a statement indicating the changes made, the reason they were changed and confirmation that the project completion date will not change. The above schedule information is to be submitted monthly or more often if necessary.

10. Site Progress Records

10.1. Maintain at site a permanent written record of progress of Work. Make the record available at all times with copies provided when requested. Include in record each day:

10.1.1. Commencement and completion dates of the Work of each trade in each area of Project.

10.1.2. Attendance of Contractor's and Subcontractor's Work forces at Project and a record of the work they perform.

10.1.3. Visits to site by representatives of the Owner, Engineer, jurisdictional authorities, Contractor, Subcontractors, and suppliers.

10.2. Maintain a progress chart in approved format. Show on chart proposed Work schedule and progress of Work by Contractor and Subcontractor.

11. Examination

11.1. Site:

11.1.1. Examine site, and ensure that site conditions have been examined, that all are fully informed on all particulars which affect Work thereon and at the place of construction, and in order that construction proceeds competently and expeditiously.

11.1.2. Ensure by examination that all physical features, and working restrictions and limitations which exist are known.

11.2. Previously Completed Work:

11.2.1. Verify dimensions of existing Work in place before construction of Work to be incorporated with it.

11.2.2. Verify that previously executed Work and surfaces are satisfactory for construction, and that performance of subsequent Work will not be adversely affected.

11.2.3. Commencement of Work will constitute acceptance of site conditions and previously executed Work as satisfactory.

11.2.4. Report to Engineer defects in prior Work which will affect quality of subsequent Work, or construction schedule.

11.3. Construction Measurements:

11.3.1. Before commencing installation of Work, verify that its layout is accurate in accordance with intent of Drawings, and that locations, elevations, and clearances to adjacent infrastructure are maintained.

11.3.2. If Work is installed in wrong location, rectify it before other Work concerned proceeds.

12. PROTECTION OF WORK, PROPERTY & PERSONS

12.1. Include in Work necessary methods, materials, and construction to ensure that no damage or harm to Work, materials, property and persons results from the Work of this Contract. Temporary facilities relating to protection are specified in Section 01 52 00.

12.2. Protect, and if damaged make good, adjacent private and public property.

12.3. Keep surfaces, on which finish materials will be applied, free from grease, oil, and other contamination which would be detrimental in any way to the application of finish materials.

12.4. Protect finished surfaces of completed Work from damage by restriction of access or by use of physical means suitable to the material and surface location. Establish with each Subcontractor the suitability of such protection in each case.

12.5. Protect existing underground infrastructure, mechanical, electrical, telephone and similar services from damage. If necessary, relocate active services to ensure that they function continuously in safety and without risk of damage.

12.6. Cap off and remove unused utility services encountered during Work after approval is given by the utilities concerned or jurisdictional authorities, whichever may apply. Relocation, removal, protection and capping of existing utility services shall be performed only by the applicable utility and of other services by licensed mechanics.

12.7. To prevent soiling or damage to finish flooring where pedestrian traffic occurs after the flooring has been installed, install and maintain 6 mil. polyethylene membrane or reinforced kraft paper temporary protection, secured in place and with joints sealed by reinforced pressure sensitive tape.

12.8. Install plywood panels of minimum ¼" thickness over completed finish flooring materials, on which further construction Work is performed by other trades or delivery of products is made, or both. Seal joints between panels with reinforced pressure sensitive tape.

12.9. Prevent spread of dust beyond the construction zone by wetting, or by other approved means, as it accumulates.

12.10. The outside work area shall be appropriately demarked and/or surrounded by rigid chain link panels or fencing (at the cost of the contractor) to prevent unauthorized entry to the work area. All waste disposal bins are to be fenced in using the same type of fencing as indicated above during working hours. After working hours, all waste disposal bins shall be located a minimum of 25 feet from any structure. Any windows where the debris chute is located are to be covered. All workers shall contain their activity to the work site area. Access to the school shall only be allowed as planned in coordination with HRCE Operations and the school administration.

12.11. All security on site shall be coordinated through HRCE using an HRCE preferred vendor.

12.12. The contractor is responsible for the cost of security for all project materials.

12.13. If access to the project site is required inside the building, HRCE will provide security personnel at its own cost.

12.14. The contractor shall keep the work site free from accumulated debris caused by the employees or work and shall remove all debris at the end of each work shift. Debris shall not be deposited in HRCE controlled garbage and/or recycling containers.

12.15. All waste materials and debris created during demolition and/or construction shall be disposed of in a dumpster provided by the contractor, to be removed at the end of the construction project, using a methodology that is in compliance with the applicable HRM solid waste by laws. Otherwise, the material must be removed and disposed of off-site at the end of each working day. The waste materials may not be stored on site unless they are held in an approved project dumpster no closer than twenty five (25) feet from any structure.

12.16. All temporary structures such as portable washroom facilities, materials storage trailer, work trailer, debris dumpster, vehicles, etc., shall be located a minimum of (25) twenty-five feet from the school building.

12.17. Where applicable, a hot work permit will be required to be completed and approved by HRCE prior to commencement of work and all conditions of the permit must be maintained until completion of hot work. A copy of the hot work permit signed by the contractor representative shall be provided to HRCE upon completion of each hot work session. Contractor must assign a designated fire watch as noted on the permit document who shall remain on site for three hours after completion of each hot work session.

12.18. A school washroom will be designated for use where appropriate. However, protection of the surfaces as indicated above must be maintained. It should also be noted that access to the building during summer months will be limited for security reasons. Contractor is responsible to provide temporary portable washroom facilities for general use of contractor staff.

12.19. Access to Interior of School - All interior access is to be scheduled with the PM. This will allow for notice to the school admin., custodial and possible scheduling of a security guard for after hour access.

12.20. Adhesives / Torch Work - All adhesive use and torch work must be completed after school hours. Contractor must assign a designated fire watch as indicated above in 12.17.

13. Cleaning

13.1. Ensure that during and after construction the public streets and existing asphalt parking lot are cleaned as required.

14. Salvage

14.1. Unless otherwise specified, salvaged material resulting from construction, and surplus materials and construction debris shall become property of Contractor, who must dispose of

it away from Site.

15. Site Limitations

15.1. Since the existing building will be occupied during the Work (in accordance with the Phasing Schedule) HRCE will designate the precise areas on the site which may be utilized for work and storage, and where personnel will be permitted to be present. Refer also to Drawings. Allow for hoarding to secure construction areas from occupied portions of the Building and Site.

15.2. All access to the construction site is to be coordinated with the Project Manager for HRCE and communicated at the pre-construction meeting.

15.3. Any Work carried out in the building is to be carried out during hours approved by the School Administration.

15.4. Any disruption to services within the building must occur during hours approved by School Administration.

15.5. Any Work which may have an adverse effect on the occupancy functions, must have prior approval of the School Administration and **may** require scheduling during off-hours.

16. Security Regulations

16.1. Perform Work in conformance to the security regulations of the building as directed by the Project Manager for HRCE.

17. Project Identification

17.1. No project sign is required on this Project.

18. Owner's Occupancy

18.1. The Owner reserves the right to occupy and use portions of the Project, whether partially or entirely completed, or whether completed on schedule or not, provided such occupancy does not interfere with the Contractor's continuing Work.

18.2. Partial occupancy or installation by the Owner of his equipment shall not imply acceptance of the Project in whole, or in part, nor shall it imply acknowledgement that terms of the Agreement are fulfilled.

END OF SECTION 01 11 00

SECTION 01 11 25 - PRICES

1. General

1.1. Prices included in the Contract shall be complete for the applicable Work, and shall include for each price:

1.1.1. Expenditures for wages and for salaries of workmen, engineers, superintendents, draftsmen, foremen, timekeepers, accountants, expeditors, clerks, watchmen and such other personnel as may be approved, employed directly under the Contractor and while engaged on the applicable Work at the site and expenditures for travelling and HRCE allowances of such employees when required by location of the applicable Work or when covered by trade agreements and when approved; provided, however, that nothing shall be included for wages or salary of the Contractor if an individual, or of any member of the Contractor's firm if the Contractor is a firm or the salary of any officer of the Corporation if the Contractor is a corporation, unless otherwise agreed to in writing.

1.1.2. Expenditures for material used in or required in connection with the construction of the applicable Work including material tests and required by the laws or ordinances of any authority having jurisdiction and not included under Subparagraph .9.

1.1.3. Expenditures for preparation, inspection, delivery, installation and removal of materials, equipment, tools and supplies.

1.1.4. Temporary facilities as required for the applicable Work.

1.1.5. Travelling expenses properly incurred by the Contractor in connection with the inspection and supervision of the applicable Work or in connection with the inspection of materials prepared or in course of preparation for the applicable Work and in expediting their delivery.

1.1.6. Rentals of all equipment whether rented from the Contractor or others, in accordance with approved rental agreements including any approved applicable insurance premiums thereon and expenditures for transportation to and from the site of such equipment, costs of loading and unloading, cost of installation, dismantling and removal thereof and repairs or replacements during its use on the applicable Work, exclusive of any repairs which may be necessary because of defects in the equipment when brought to the Work or appearing within thirty (30) days thereafter.

1.1.7. The cost of all expendable materials, supplies, light, power, heat, water and tools (other than tools customarily provided by tradesmen) less the salvage value thereof at the completion of the applicable Work.

1.1.8. Assessments under the Workmen's Compensation Act, the Unemployment Insurance Act, Canada Pension Act, statutes providing for government hospitalization, vacations

with pay or any similar statutes; or payments on account of usual vacations made by the Contractor to his employees engaged on the applicable Work at the site, to the extent to which such assessments or payments for vacations with pay relate to the Work covered by the specified price; and all sales taxes or other taxes where applicable.

1.1.9. The amounts of all Subcontracts related to the specified price.

1.1.10. Premiums on all insurance policies and bonds called for under this Contract as related to the specified price.

1.1.11. Royalties for the use of any patented invention on the applicable Work.

1.1.12. Fees for licenses and permits in connection with the applicable Work. No Building Permit is required for the project.

1.1.13. Duties and taxes imposed on the applicable Work.

1.1.14. Such other expenditures in connection with the applicable Work as may be approved.

1.1.15. Provided always that except with the consent of the Owner, the above items of cost shall be at rates comparable with those prevailing in the locality of the Work.

END OF SECTION 01 11 25

SECTION 01 11 41 - PROJECT COORDINATION

1. Requirements Included

1.1. Each Trade Contractor's responsibilities include the coordination of Work within his own Contract and with the Work of other Contracts.

2. Related Requirements

2.1. Project Meetings: Section 01 31 19

2.2. Submittals: Section 01 33 00

3. Description

3.1. Coordinate Work on which subsequent Work depends to facilitate mutual progress, and to prevent conflict between parts of the work.

3.2. Ensure that each Section makes known for the information of the Construction Manager and other Sections, the environmental and surface conditions required for the execution of its Work, and the sequence of others Work required installation of its Work.

3.3. Ensure that each Section, commencing Work, and that each Section is assisted in the execution of its preparatory Work by Sections depending upon its preparation.

3.4. Deliver materials supplied by one Section to be installed by another well before the installation begins.

3.5. Sections giving installation information in error, or too late to incorporate in the Work, shall be responsible for having Work done which was thereby additionally made necessary.

3.6. Coordinate warranty conditions of interconnected Work to ensure that full coverage is obtained.

3.7. Remove work installed in error which is unsatisfactory for subsequent Work.

4. Cutting And Patching

4.1. Include under Work of this Section all cutting and patching of asphalt required by the Work.

4.2. Finish new surfaces flush with existing surfaces.

4.3. Cut and patch as required making work fit.

4.4. Make cuts with clean, true, smooth edges.

4.5. Patching of existing or new asphalt shall be performed only by workmen with expertise in that particular trade and who normally perform that Trade.

4.6. Replace, and otherwise make good, damaged or defective Work. If required by the Construction Manager.

4.7. Do not endanger Work or property by cutting, digging, or similar activities. No Section shall cut or alter the Work of another Section unless approved by the Section which has installed it.

4.8. Cut and drill with true smooth edges and to minimum suitable tolerances.

4.9. If required, before cutting, drilling, or sleeving structural load bearing elements, obtain approval of location and methods.

4.10. Cutting, drilling and sleeving of Work shall be done only by the Section which has installed it. The Section requiring drilling and sleeving shall inform the Section performing the Work of the location and other requirements for drilling and sleeving. The Contractor shall directly supervise performance of cutting and patching.

4.11. Cutting and Patching for Holes Required by Mechanical & Electrical Work:

4.11.1. Include under Work of Mechanical Divisions cutting or provision of holes up to 8" in diameter and related patching.

4.11.2. Include under Work of this Section holes and other openings required by the work of Mechanical Divisions which are larger than 8" in diameter or least dimension, and chases, bulkheads, furring and required patching. This Section shall be responsible for determination of Work required for holes in excess of 8" diameter or least dimension.

4.11.3. Include under the Work of Electrical Divisions all cutting or provision of holes and related patching for the Work of that Division.

4.12. Include under Work of this Section all other cutting and patching required by the Work except as described in Clause .11 above.

4.13. Patching or replacement of damaged Work shall be done by the Subcontractor under whose Work it was originally executed, and at the expense of the Subcontractor who caused the damage.

4.14. Make patches invisible in final assembly.

5. Quality Assurance

5.1. Requirements of Regulatory Agencies:

5.1.1. Make known and coordinate the requirements of jurisdictional authorities, as made explicit by the Contract Documents, and by representatives of such authorities

5.2. Source Quality Control:

5.2.1. Ensure that Work meets specified requirements

5.2.2. Schedule, supervise and administer inspection and testing as specified in Section 01 45 00.

5.3. Job Records:

5.3.1. Maintain job records and ensure that such records are maintained by subcontractors.

Submittals

5.4. Prepare a Project schedule in accordance with Section 01 33 00, and ensure that all subcontractors and suppliers are aware of the details of this schedule, and progressively of their general compliance with the schedule.

5.5. Become aware of the required submittals specified in each Section, and expedite submission of such submittals so as not to hinder the Project Schedule.

5.6. Review submittals and make comments as specified in Section 01 33 00.

6. Job Conditions

6.1. Ensure that Work proceeds under conditions meeting specified environment and job safety requirements

6.2. Ensure that protection of adjacent property and the Work is adequately provided and maintained to meet specified requirements.

7. Product Delivery, Storage And Handling

7.1. Site has limited spaces for storage, only delivery of materials agreed upon by the Construction Manager will be allowed. Comply with Construction Manager's allocations. Any requirement for modifications to the building in order to allow delivery and storage of the materials to complete this work is the responsibility of the contractor.

7.2. Schedule delivery of products & removal of material with Construction Manager.

7.3. Make available areas for storage of products and construction equipment to meet specified requirements, and to ensure a minimum of interference with progress of the Work and relocations.

7.4. Trade Contractor to provide flag persons, traffic signals, barricades and Flares/lights/lanterns as required to perform the Work and to protect the public.

7.5. Material and Waste - Deliveries and Removals - Must be coordinated to be completed 30 minutes after school dismissal where applicable.

END OF SECTION 01 11 41

SECTION 01 31 19 – PROJECT MEETINGS

1. Pre-Award Meeting

1.1. A Pre-award meeting will be held at which time the following will be addressed:

- **1.1.1.** Owner and HRCE's functions.
- **1.1.2.** The Consultant and the Consultant's functions.
- **1.1.3.** The General Contractor and the General Contractor's functions.
- **1.1.4.** Documentation requirements from the General Contractor.
- **1.1.5.** Obligee for Performance and Payment Bonds from Sub-contractors.
- **1.1.6.** Progress Claims.
- **1.1.7.** CO's & CCO's.
- **1.1.8.** Construction Schedule.
- **1.1.9.** Project Start-up.
- **1.1.10.** Job Meetings.
- **1.1.11.** Superintendent – General Contractor's Representative.
- **1.1.12.** Design / Administration authority.
- **1.1.13.** Owner's Representative.
- **1.1.14.** Special Consultants.
- **1.1.15.** Quality of Workmanship.
- **1.1.16.** Accountability.
- **1.1.17.** Harmonized Sales Tax.
- **1.1.18.** Contract Close-out Documentation.

2. Preconstruction Meeting

2.1. Within fifteen (15) days after award of Contract, arrange a meeting between the Consultant, Subcontractors, Project Superintendents, Inspection and Testing Company Representatives, and representatives of others whose coordination is required during construction.

2.2. Discuss at the meeting the means by which full cooperation and coordination of the participants during construction can be achieved.

2.3. Document the responsibilities and necessary activities of the participants during construction as discussed and distribute to each participant.

2.4. Establish procedures for maintenance and completion of Project record drawings specified in Section 01 77 00.

2.5. Review and establish methods of maintaining life safety and egress for the school occupants. Communicate these methods thoroughly with the School Principal.

3. Progress Meeting

3.1. Invite representatives of HRCE, to attend twice monthly site meetings called by the Contractor during the progress of the Work.

3.2. Inform HRCE of each meeting and of proposed agenda a minimum of five (5) days before meeting.
3.3. Submit proposed schedule of site meetings to Engineer and Owner.
3.4. Record, prepare and distribute minutes of each meeting to HRCE and to each other participant within 72 hours of meeting.
3.5. Ensure that all representatives who attend meetings have the authority to conduct business on behalf of firms they represent.
3.6. Details of Progress Meetings to be discussed at the project start-up meeting.

4. Suggested Agendum (Preconstruction Meeting)

4.1. Distribution and discussion of:
4.1.1. List of major subcontractors and suppliers.
4.1.2. Projected Construction Schedules.
4.2. Critical work sequencing.
4.3. Major equipment deliveries and priorities.
4.4. Project Coordination:
4.4.1. Designation of responsible personnel.
4.5. Procedures and Processing of:
4.5.1. Field decisions
4.5.2. Proposal requests
4.5.3. Submittals
4.5.4. Change orders
4.5.5. Applications for Payment.
4.6. Adequacy of distribution of Contract Documents.
4.7. Procedures for maintaining Record Documents.
4.8. Use of premises:
4.8.1. Office, work and storage areas.
4.8.2. Owner's requirements.
4.9. Construction facilities, controls and construction aids.
4.10. Safety/Tool Box Meetings.
4.11. Security procedures.
4.12. Housekeeping procedures.
4.13. Egress/life safety procedures

5. Suggested Agendum (Progress Meetings)

5.1. Review and approval of minutes of previous meeting.
5.2. Safety meeting minutes.
5.3. Review of work progress since previous meeting.
5.4. Field observations, problems, conflicts.
5.5. Problems which impede Construction Schedule.
5.6. Review of off-site fabrication, delivery Schedules.

5.7. Corrective measures and procedures to regain projected schedules.
5.8. Revisions to Construction Schedules.
5.9. Maintenance of quality standards.
5.10. Pending changes and substitutions and effect on Construction Schedule.
5.11. Other Business.

6. Attend, with representatives of HRCE weekly meetings with the School Administration to review construction activities and concerns of Building Occupants.
7. Quarterly meetings with Contractor and the HRCE / User during Warranty Period including major sub-trade contractors.
8. Dates for meetings will be set at time of completion.

END OF SECTION 01 31 19

SECTION 01 33 00 – SUBMITTAL PROCEDURES

1. General Requirements

1.1. Make submittals specified in this Section to Consultant unless otherwise specified, with additional submissions made, in manner that they direct, to other parties involved with construction of the Project as their interests are concerned. These parties are, but shall not be restricted to, consultants, jurisdictional authorities, and Subcontractors whose Work must be coordinated with Work related to Submittals.

1.2. Ensure that submissions are made to allow sufficient time for review without the construction schedule being delayed.

2. Document Submissions Required

2.1. At Commencement of Contract:

- **2.1.1.** Performance and Payment Bonds.
- **2.1.2.** Public Liability and Property Damage Insurance Certificates.
- **2.1.3.** List of Subcontractors by firm name.
- **2.1.4.** Construction Schedule and other required schedules and estimates.
- **2.1.5.** Site Specific Safety Plan/Safety Policy.
- **2.1.6.** Workers' Compensation Board status.

2.2. During Construction:

- **2.2.1.** Weekly progress reports.
- **2.2.2.** Job meeting reports and minutes.
- **2.2.3.** Updated construction schedules.
- **2.2.4.** Shop drawings as required.
- **2.2.5.** Inspection and test reports.
- **2.2.6.** Daily communication of Hot Work Permits as needed.

2.3. Submissions at completion of Work are specified in Section 01 77 00, Contract Closeout.

3. Administrative

3.1. Submit to 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 no claim for extension by reason of such default will be allowed.

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

3.3. Present shop drawings, product data, samples and in Imperial units.

3.4. Review submittals prior to submission to Consultant. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been

checked and 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.

3.5. Notify Consultant in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

3.6. Verify field measurements and affirm that affected adjacent work is coordinated.

3.7. Contractor's responsibility for errors and omissions in submission is not relieved by Consultant's review of submittals.

3.8. Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Consultant's review.

3.9. Keep one review copy of each submission on site.

4. Construction Schedules

4.1. Submit proposed construction schedule at beginning of Project, as specified in Project Documents.

4.2. As construction progresses, submit up-dated construction schedules as specified in Project documents.

5. Shop Drawings And Product Data

5.1. 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.

5.2. Submit drawings stamped and signed by professional consultant registered or licensed in Province of Nova Scotia of Canada.

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

5.4. Allow seven (7) days for Consultant's review of each submission. Do not proceed with work involving relevant products until completion of shop drawing review.

5.5. Adjustments made on shop drawings by Consultant are not intended to change Contract Price. If adjustments affect value of work, state such in writing to Consultant prior to proceeding with work.

5.6. Make changes in shop drawings as Consultant may require, consistent with Contract Documents. When resubmitting, notify Consultant in writing of revisions other than those requested.

Accompany submission with transmittal letter, in duplicate, containing:

5.6.1. Date

5.6.2. Project title and number

5.6.3. Contractor's name and address

5.6.4. Identification and quantity of each shop drawing, product data and sample.

5.6.5. Other pertinent data.

5.7. Submission to include:

5.7.1. Date and revision dates.

5.7.2. Project title and number.

5.7.3. Name and address of:

5.7.3.1. Subcontractor.

5.7.3.2. Supplier.

5.7.3.3. Manufacturer.

5.7.4. Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.

5.7.5. Details of appropriate portions of Work as applicable:

5.7.5.1. Fabrication.

5.7.5.2. Layout, showing dimensions, including identified field dimensions, and clearances.

5.7.5.3. Setting or erection details.

5.7.5.4. Capacities.

5.7.5.5. Performance characteristics.

5.7.5.6. Standards.

5.7.5.7. Relationship to adjacent work.

5.8. After Consultant's review, distribute copies.

5.9. Submit for review one electronic copy in PDF file format of shop drawings for each requirement requested in specification Sections and as Consultant may reasonably request.

5.10. Submit electronic copies of product data sheets for brochures for requirements requested in specification Sections and as requested by Consultant where shop drawings will not be prepared due to standardized manufacture of product.

5.11. Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Consultant.

5.11.1. Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.

5.11.2. Testing must have been within three (3) years of date of contract award for project.

5.12. Documentation of testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

5.13. Delete information not applicable to project.

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

5.14.1. If upon review by 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.

5.14.2. Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for coordination of work of sub-trades.

5.15. Shop Drawings are required for all components shown in the stamped engineering drawings.

6. SAMPLES

6.1. Submit for review samples in duplicate as requested in respective specification Sections, as requested by the Consultant. Label samples with origin and intended use.

6.2. Deliver samples prepaid to Consultant's business address.

6.3. Notify Consultant in writing, at time of submission of deviations in samples from requirements of Contract Documents.

6.4. Adjustments made on samples by Consultant are not intended to change.

6.5. Make changes in samples which Consultant may require, consistent with Contract Documents.

6.6. Reviewed and accepted samples will become standard of workmanship and material against which installed work will be verified.

6.7. Refer to Mechanical & Electrical Divisions for sample requirements in those Trades.

7. Record Drawings

7.1. Record, as the Work progresses, changes and deviations in the location of Work concealed by the finished Work, and such other approved changes that occur during progress of Work, to ensure that an accurate record is provided for future maintenance and alterations.

7.2. White prints will be provided by the HRCE for use in preparing record drawings. Record changes in the Work on these prints in red ink.

7.3. Dimension location of concealed Work in reference to building walls, and elevation in reference to floor elevation. Indicate at which point dimension is taken to conceal Work. Dimension all terminations and offsets of runs of concealed work.

7.4. Record work constructed differently than shown on Contract Documents, changes in the work caused by site conditions, by Owner, Consultant, Contractor and Subcontractor originated changes, and by site instructions, supplementary instructions, field orders, change orders, addenda, correspondence and directions of jurisdictional authorities.

7.5. Record location of mechanical and electrical services, piping, valves, conduits, pull boxes, junction boxes and similar work not clearly in view, and position of which is required for maintenance, alteration work and future additions. Do not conceal critical work until its location has been recorded.

7.6. Identify record drawings as a "Project Record Copy". Maintain in good condition, do not use for construction purposes and make available to Consultant at all times.

7.7. Submit record drawings at completion of Work. Final acceptance of the Work will be predicated on receipt and approval of record drawings.

8. Extra Stock

8.1. Supply extra stock at completion of Project as specified in other Sections of the Project Manual.

8.2. Deliver extra stock as directed by HRCE to location they designate.

1. Maintenance Manual & Operating Instructions

1.1. Submit three (3) copies of Maintenance Manual with application for completion certificate.

1.2. Include in Maintenance Manual one (1) copy of each final approved shop drawing issued for Project on which have been recorded changes made during fabrication and installation caused by unforeseen conditions.

1.3. Submit extended guarantees together in one (1) report binder.

1.4. The Manuals shall:

1.4.1. Consist of a hard-cover, black, vinyl-covered, loose-leaf, letter-size binder.

1.4.2. Have a title sheet, or sheets preceding data on which shall be recorded Project name, Project number, date, list of contents, and Contractor's and Subcontractors' names.

1.4.3. Be organized into applicable Sections of Work with each Section separated by hard paper dividers with plastic covered tabs marked by Section.

1.4.4. Contain only typed or printed information and notes, and neatly drafted drawings.

1.4.5. Contain maintenance and operating instructions on all building, and mechanical and electrical equipment.

1.4.6. Contain maintenance instructions as specified in various Sections.

1.4.7. Contain brochures and parts lists on all equipment.

1.4.8. Contain sources of supply for all proprietary products used in the Work.

1.4.9. Contain lists of supply sources for maintenance of all equipment in Project of which more detailed information is not included above.

1.4.10. Contain finished hardware schedule.

1.4.11. Contain charts, diagrams and reports specified in Mechanical & Electrical Divisions.

2. Extended Warranties

2.1. Submit the extended warranties listed in this Article and as specified in each applicable Section of this Project Manual.

2.2. Extended warranties shall commence on termination of the standard one-year warranty granted in this Contract.

2.3. Submit each extended warranty on a standard Form of Warranty, a sample of which is included in this Section.

2.4. Secure each extended Warranty by a Maintenance Bond in an amount indicated.

3. Inspection Laboratory Reports

3.1. Submit copies of inspection and test reports obtained by the Contractor and Subcontractors for their Work or for Jurisdictional Authorities, if requested by Consultant.

3.2. Submit reports in accordance with requirements specified in Section 01 41 00.

4. Documentation On Suppliers & Manufacturers

4.1. Provide information under headings identifying the following: Associated Technical Section, Manufacturer, Supplier, Contact Name, and Phone Numbers.

SAMPLE FORM OF WARRANTY FOLLOWS THIS PAGE

Sample Form for Warranty

Date .....

Client .....

Project .....

.....

Warranty .....

(title of work)

We hereby undertake to warrant all materials supplied and installed under our Contracts and include the providing of necessary materials and labour to cover the result of faulty materials or workmanship. Upon written notification from Client or the Architect that the above work is defective any repair or replacement work required shall be to the Architect's satisfaction at no cost to the Client. This Warranty shall not apply to defects caused by the work of others, maltreatment of materials, negligence or Acts of God. This Warranty shall remain in effect for the total period from the acceptance of the Work to (....date....), irrespective of the date of completion or the beneficial use by the Owner.

Signature .....

Authorized Signing Officer .....

Name of Firm .....

Address .....

END OF SECTION 01 33 00

SECTION 01 35 13 – APPENDIX A - SPECIAL PROJECT PROCEDURES

1. Introduction

1.1. School construction, renovation and maintenance projects are scheduled every year as a normal and necessary course of business by operations departments in each Nova Scotia Centre for Education. Building modifications, repairs and additions/demolitions to buildings may impact the school environment without appropriate controls. With increased controls based primarily on the CSA standards implementation, proper scheduling and clear communication on adequate controls can be put into place to eliminate/minimize the impact to all occupants.

1.2. Projects of this nature may generate varying levels of dusts, noises and odors. It is possible, unknown/unforeseeable environmental contaminants, such as spills, mold, fumes, lead or asbestos exposure maybe identified.

1.3. To successfully complete work within the school environment, it is necessary to plan and implement appropriate containment and control strategies. This document is developed to provide a minimum standard for contaminant controls for various types of projects in schools. These standards are in addition to and should complement all legislated protocols for working with regulated materials such as asbestos, lead paints, PCB's etc.

1.4. Executing a successful project will depend primarily on clear, concise communication. This may involve a number of parties (Project Manager, Operations staff, School Administration and Health & Safety staff and Joint Occupational Health & Safety Committee).

2. Communication Plan

2.1. The most critical element of any project management plan is effective communication between all stakeholders. Communication between the Operations project manager/supervisor, the contractor and school administrators before the start of a project is very important. This meeting is meant to explain the scope, schedule and risk assessment for the project. The meeting will also help establish clear expectations when managing planned and unplanned exposure risks associated with contaminant controls.

2.2. The communication plan shall include:

2.2.1. A description of potential contaminants, which may include but is not limited to:

2.2.1.1. Particulates (dirt, concrete/silica, steel, fiberglass, wood dust, ash, cellulose, etc.)

2.2.1.2. Moisture: external water infiltration, internal system leaks (domestic water, sanitary, storm, sprinkler)

2.2.1.3. Noise from equipment/tool operation,

2.2.1.4. Fumes/odors from equipment exhaust, boiler exhaust, septic waste, chemical/adhesives, etc.

2.2.1.5. Hazardous materials including, asbestos, PCB, mercury, lead, fuel oil, fungi/mould, etc.

2.2.1.6. Excessive heat/cold

2.2.2. A description of the control measure which may include but not be limited to:

2.2.2.1. Isolation within an enclosure (water, noise, hazardous materials)

2.2.2.2. Ventilation and filtration

2.2.2.3. Dehumidifiers/blowers (moisture)

2.2.2.4. Personal protective equipment

2.2.2.5. Schedule outside or inside school hours

2.2.2.6. Sound dampeners

2.2.2.7. Monitoring

2.2.2.8. Security

2.2.3. Other Hazards created by the work, including but not limited to fire safety and the need to alter fire safety plans.

2.3. For small routine work orders the communication plan may only involve one tradesperson and the school principal or designate. This communication is equally as important for management of contaminant controls.

3. Contaminant Control Management

3.1. Regardless of the contaminant or control measure used, the following procedures shall apply for every project:

3.1.1. Every project, including all routine work requests, shall be assessed, as per this document, by appropriate personnel for potential contaminant risk.

3.1.2. Clear lines of communication must be established between project personnel, site supervisor or project manager and the school administration.

3.1.3. Control strategies as per this document, shall be, communicated to workers as well as the site JOHSC and implemented prior to starting the work.

3.1.4. Where isolation is used as a control, all entry points must be clearly posted to describe the purpose of the enclosure and limitations of access.

3.1.5. During the execution of the project, the control measures must be regularly inspected and maintained before the start of each work shift, and throughout the shift as required.

3.1.6. A process for stop work and remediation orders must be established to ensure the project manager; site supervisor and school administrator have a means to cease project operations when a contaminant control breach may impact the school environment. Breached control measures must be reported immediately to HRCE project manager upon discovery. He/she will be responsible to communicate to the school principal or designate. Work shall be stopped immediately until the control measures are re-established.

3.1.7. Access to the controlled work site is only permitted by authorized personnel. The project supervisor or designate shall determine appropriate personal protective equipment (PPE) and necessary worker orientation.

4. Particulate Control

4.1. Exposure to minimal levels of dust is a normal condition in most outdoor and indoor environments and is typically controlled inside a building through building ventilation, filtration and routine housekeeping measures. However, as noted, construction projects generally create elevated dust levels in work areas, whether inside or outside of a building.

4.2. Operational Services Managers must ensure maintenance staff and contracted service providers implement dust control measures appropriate for the type and scope of work being performed. This will include assessing the type and amount of dust being created as well as the location of the work being conducted.

4.2.1. Interior Construction Projects:

4.2.2. Construction projects may be described as projects that may include window replacement, wall creation/demolition, etc.

4.3. As a minimum for these types of construction projects, all interior entry points into a construction zone must be effectively sealed. The barrier must prevent contaminants from the work area to be distributed to other areas of the school. Appropriate signage must be posted to indicate only authorized persons are permitted access.

4.4. Entrance design could range from a two flap plastic tarp door to a fully constructed sealed entry door with negative hepa-filtered ventilation on the construction side of the barrier.

4.5. Exterior Construction Projects:

4.5.1. Exterior work shall be performed so as not to affect the safety of building occupants. It will also provide controls to avoid impact to adjacent properties. Depending up on the results identified in the risk assessment, at a minimum consideration must be given to prevent dust from entering into the school environment. This may be controlled through isolation, dampening application, closing building AHU and window/door openings.

5. Noise Control

5.1. Hearing plays an essential role in communication, speech and language development and learning within a school environment. During construction the contractor is responsible for ensuring acceptable noise levels will be adhered to for the HRCE staff and students within the building. Noise related to a project may prove to be very distracting for staff and students. To minimize distractions and interruptions in student learning the following are important to consider:

5.1.1. Contractors are responsible to ensure appropriate noise control measures are taken

5.1.2. "No work" periods may need to be incorporated into construction schedules

5.1.3. Work causing a noise disruption may need to take place during unoccupied times and/or during pre-determined acceptable times of the day (i.e. before and after class times)

5.1.4. It may be necessary for the School Administrator to make a request to the HRCE Project Manager or the Contractor to exclude undertaking certain noisy activities during particular periods and/or activities.

6. Moisture Control

6.1. Moisture levels are to be controlled during construction and maintenance activities. Moisture levels above normal may impact the air in the room and/or building and may also penetrate building materials giving the potential to lead to mould growth.

6.2. Certain activities (i.e. tape and mud of drywall, painting, pressure washing, concrete cutting with water or other water-based dust-suppression) introduce high amounts of moisture into the room environment and ventilation and or drying is required to control local moisture.

6.3. An enclosure properly set-up to contain other contaminants will similarly contain/control high levels of airborne moisture. A wet-vac should be available on-site for activities which have a risk of water spillage of more than 5 gallons at any instance.

6.4. Standing and or stagnate water must be avoided on construction sites, for a number of reasons, including, but not limited to; insects breed in these bodies of water, the water may give off odours, it is a nuisance to walk through, and it may be an ice hazard in cold weather.

6.5. It is important that all water leaks and flooding are reported immediately to the HRCE's project manager and building supervisor. Where works to existing "plumbing" is to occur the water lines (potable, heating, fire suppression) must be isolated and drained (de- energized/de-pressurized) following Lock Out - Tag Out procedure. Adequate supplies such as buckets and absorbents should be present when drains are not available to drain a line.

6.6. When an interruption to the water supply, potable or service, is to occur then the "owner's representative" and building supervisor should be notified 24 hours in advance. Bottled water provision may be required.

7. Fumes

7.1. Fumes may be produced on a project site for a variety of reasons such as use of motorized equipment, off gassing of sealants, adhesives and finish products, cutting/torching processes, exposure of sanitary systems, process ignition gases such as propane and acetylene, proximity of project temporary washrooms, radon, etc.

7.2. The impact of fumes on occupants may range from discomfort to health risk, to life safety risk.

7.3. The project manager or supervisor must ensure that all potential fume sources are identified and remedial or control measures included in the scope of work by the contractor.

7.4. Monitoring equipment may be required to determine for example radon exposure or safety of confined space access.

8. Activity Assessment

8.1. Activities that may produce contaminants which require control may be considered as low, medium and high impact.

8.2. Low impact activities include routine maintenance and repairs that may create localized dust or odors or brief periods of noise which are not considered harmful to occupants but may be a nuisance which requires minimal control. These may include activities such as opening ceiling tiles or gyproc walls, replacing a plumbing fixture, paint touch ups, drilling through a wall, etc.

8.3. Medium impact activities include larger repair jobs or longer duration projects that will create more wide spread levels of contaminant which must be controlled to prevent exposure to building occupants. Boiler cleaning, ceiling replacement, long periods of hammer drilling, etc.

8.4. High impact activities include large demolition and construction projects, or jobs with exposure to contaminants that are a risk to health or life safety such as asbestos remediation, mould abatement, lead paint clean up, etc.

9. Hazard Assessment

9.1. A hazardous assessment is required to be completed for each job to ensure hazards are identified and corresponding controls are implemented. Depending upon the circumstances at the site it may be necessary to upgrade and/or add other precautions.

9.2. Determine the most appropriate hazard classification and apply the corresponding protocols. The attached hazard assessment identifies the minimum controls that must be in place during the corresponding activities. Depending on the specific circumstances at a site further controls may be required. When the hazards are deemed to be in the C or F category the form including specific controls must be submitted to the HRCE for review, prior to commencing work. The contractor may still be required to complete their own hazard assessment of the job/work.

10. Contaminant Controls Procedure for initiating work for all Contaminant Controls:

10.1. Contaminant Control I

10.1.1. The tradesperson or project manager for the HRCE will discuss the details, including the scope and any impacts of the job/project with the principal.

10.1.2. Ensure fire exiting requirements and life safety systems are addressed or adequate mitigating plans are implemented for the building, construction staff and building occupants.

10.1.3. Presence of lead paint or ACM's (Asbestos Containing Materials) must be determined prior to the start of any job. Specific protocols or Codes of Practice may apply.

10.1.4. Consideration will be given for work that is anticipated to generate significant noise, odours or VOC's (Volatile Organic Compounds) and this will be scheduled outside of school hours or during times when the noise will not disrupt occupant activities. This will require coordination with the Principal.

10.1.5. The work area shall be isolated where possible. This may be achieved at varying levels, by closing doors and opening outside windows for ventilation or by installing appropriate hoarding and negative pressure units to ensure contaminants are not circulated throughout the school causing further health and safety concerns.

10.1.6. Dust shall be minimized during the activity. When drilling, sanding or cutting is taking place, wetting the area may be necessary to reduce dust.

10.1.7. Good housekeeping practices shall be maintained at all times on the work site. Bag and remove dust and debris from the building as soon as possible.

10.1.8. Possible environmental impacts shall be managed and minimized. If work uncovers environmental contaminants or suspected contaminants such as oil spills (current or

historic) or potentially friable asbestos materials (check the school asbestos audit) that may be disturbed, this information shall be brought to the attention of the HRCE's employee responsible for the project so that appropriate actions can be taken.

10.1.9. When the activity is completed the work area shall be inspected and cleaned. Dust and debris shall be removed from the area and all efforts will be made to return items to their pre-maintenance activity location.

10.1.10. The Principal shall be notified that the work is completed.

10.2. Contaminant Control II - All Contaminant Control I measures shall apply, as well as;

10.2.1. Cover furniture, bookshelves and teaching materials with plastic sheets.

10.2.2. Water misting while performing dust generating activities may be required.

10.2.3. Seal un-used doors. Seal wall penetrations, electrical outlets, or any other source of air leaks in the construction area.

10.2.4. Seal exhaust air vents in construction area and open the windows. If possible shut down air handling system in the area for duration of project.

10.2.5. A walk out mat at exterior of exit door to trap dust may be required.

10.3. Contaminant Control III - All Contaminant Control I and II measures shall apply, as well as;

10.3.1. Install an impermeable dust barrier from the true ceiling to the floor consisting of two layers of 6 mil fire retardant polyethylene or solid wall and sealed door. The wall shall remain in place until the job is finished and the clean-up is completed.

10.3.2. Seal all wall penetrations.

10.3.3. Seal off all return and supply air handling ducts and close all windows.

10.3.4. Turn off the air handling system in the area of construction.

10.3.5. Maintain negative air pressure in the construction area using HEPA filter equipped exhaust ventilation. The pressure differential between the project area of contamination and the building's occupied areas shall be demonstrable by a means approved by the HRCE employee responsible for the project.

10.3.6. Ensure that the air is exhausted directly outside and away from intake vents.

10.3.7. Vacuum all horizontal surfaces including drop cloths with a hepa vacuum.

10.3.8. Remove drop cloths.

10.3.9. Vacuum again all horizontal surfaces with HEPA Vacuum.

10.3.10. Restore ventilation.

10.3.11. Remove enclosure and equipment.

10.4. Control IV: (External Work)

10.4.1. External work may impact building interior or occupants.

10.4.2. To reduce the impact to building interior or occupants, it may be necessary to contain the work area from impacting building interior. This may include closing or opening windows, tarping ceilings to capture debris or water, temporary relocation of occupants or ventilation controls.

10.4.3. The job supervisor shall consider weather conditions and forecast to reduce the effect of any weather impacts to the building materials or building occupants.

10.4.4. It may be necessary to use protective tarps and ground cover sheets below equipment and work areas to contain building debris such as paint chips, materials, dust or oil from equipment.

10.4.5. When the job is completed and the tarps have been lifted, inspect the ground around the job for debris and clean as necessary.

Fire Protection

10.5. Type V: General Fire Protection

10.5.1. Ensure fire exiting requirements and life safety systems are addressed or adequate mitigating plans are implemented for the building, construction staff and building occupants. Staff must be aware of temporary modifications to fire safety plans.

10.5.2. MSDSs for all materials to be used must be reviewed and available on site.

10.5.3. Construction materials stored outside must be a minimum distance of ten feet from the building and be in a secured area.

10.5.4. Flammable or Combustible liquids must be stored as per Fire Code requirements. All flammable and combustible liquids or materials must be kept in a secure area at all times.

10.6. Control VI: Fire Protection (minor hot work) - All Contaminant Control V shall apply as well as;

10.6.1. Notify the Principal that a risk of fire has increased and the area in which the hot work will occur.

10.6.2. Refer and implement the HRCE's hot work permit process. At a minimum the following should be considered;

10.6.2.1. Sweep the work area and remove all unnecessary materials in the vicinity; particularly all combustible and flammable materials and liquids shall be removed from the area (35 feet).

10.6.2.2. Have an appropriate size fire extinguisher available.

10.6.2.3. Inspect the work location for areas (such as a hole in the wall) where hot material or sparks could fall and smolder and close them off so that any hot debris can only fall within your field of view.

10.6.2.4. If it is possible that the flame will go past the object being welded or soldered and excessively heat a flammable or combustible material, then either protect that material with a non-flammable material or wet the material and keep it wetted during the use of heat or grinding.

10.6.2.5. Remain in the area while the joint and/or heated materials cool to room temperature (ambient) while checking for the smell or appearance of smoke in the area.

10.6.2.6. Stay in the area for at least 2 hours and then re-inspect for any smell or appearance of smoke.

10.6.2.7. Ask another staff person to inspect the area for the smell or appearance of smoke. Record who you asked to do the final inspection.

10.6.3. Type VII: Fire Protection (hot work w fire watch) - All Contaminant Control V and VI shall apply as well as;

10.6.4. Notify the Principal that a risk of fire has increased and the area in which the hot work will occur. If any life safety system components (sprinkler, detectors, fire alarms) are not function, hot work should not proceed until these systems are functioning unless fire watch procedures for life systems are followed. See Activation of Fire Watch for Life Safety Systems checklist. Appendix…XX

10.6.5. Refer and implement the HRCE's hot work permit process. At a minimum the following should be considered;

10.6.5.1. Cover all floor openings with fire stop material. Seal duct work openings with metal covers or blankets and close all doors.

10.6.5.2. Ensure that there are no potentially explosive atmospheres in the area.

10.6.5.3. Hot work on vessels, pressure tanks or boilers, use only contractors who are qualified by nationally or internationally recognized boiler and pressure vessel code.

10.6.5.4. Notify the local fire department of the type of work and the work schedule.

10.6.5.5. Before hot work is started, designate one employee responsible to complete the fire watch: while work is in progress, during lunch breaks and other breaks and for one hour after all flames are extinguished for the day and monitor the area for an additional two hours. After three hours after the last flame has been extinguished, have a second employee do a final survey of the area for smells or evidence of smoldering or fire and record the inspection.

APPENDIX
Fire Watch Activation Checklist

1. Documentation (identify locations to be checked on an hourly basis, provide contact information for relevant HRCE staff and outside agencies} HRCE provided template to be used for documentation.
2. Procedure reviewed with Custodian or individual responsible for fire watch. Any high-risk areas shall be identified to be highlighted on the documentation page and checked during the rounds.
3. Staff working in the building have been notified of the Fire Watch and that they are responsible to monitor areas for signs of fire or smoke and have been reminded of required actions to take according to the school fire safety plan.
4. Staff responsible for fire watch have been trained in how to use a fire extinguisher. (PASS)
5. Staff responsible for the fire watch have a means of communication (cell phone or walkie-talkies)
6. Staff responsible for the fire watch are aware of the procedure for initiating fire alarm and what systems are functioning. i.e. systems (sprinklers, alarm panel or if school has monitoring company or if calling 911 is required)
7. The School Insurance Program (SIP) Emergency Information Line has been notified 1-902-448-2840
8. All relevant information has been documented in the school's fire books. Including date, time and reason for fire watch.

Fire Watch De-Activation Checklist

1. Document the date, time and actions taken to remedy the deficiency requiring the fire watch.
2. School Insurance Program (SIP) has been notified.
3. Copy of the Fire Watch documentation is kept in the fire book and the original is sent to the HRCE Project Representative.

END OF SECTION 01 35 13

SECTION 01 35 29 - OCCUPATIONAL HEALTH & SAFETY REQUIREMENTS

1. References

1.1. CSA S269.1-1975 Falsework for Construction Purposes.

2. CONSTRUCTION SAFETY MEASURES

2.1. Observe construction safety measures of:

2.1.1. National Building Code 2010, Part 8

2.1.2. National Fire Code of Canada

2.1.3. Provincial Government, including but not limited to the:

2.1.3.1. Occupational Health & Safety Act revised Statutes of Nova Scotia 1996, Chapter 7 and regulations.

2.1.3.2. Workers' Compensation Act

2.1.3.3. Fire Protection Act

2.1.3.4. Dangerous Goods Transportation Act

2.2. In case of conflict or discrepancy the more stringent requirement shall apply.

2.3. Ensure that employees working on this specific project have met training requirements as legislated by the Nova Scotia Occupational Health & Safety Act and its regulations.

2.4. Where reference is made to jurisdictional authorities, it shall mean all authorities who have within their constituted powers the right to enforce the laws of the place of the building.

3. Equipment & Tools

3.1. Each user of equipment or tools shall be responsible to examine for sufficiency before use. Make equipment and tools safe if necessary.

4. WHMIS

4.1. Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of material safety data sheets.

4.2. Have a copy of WHMIS data sheets available at the workplace on delivery of materials.

5. Hazardous Material

5.1. Should material resembling hazardous materials other than those identified with the Contract Documents, including but not limited to spray or trowel applied asbestos, be encountered in course of work; stop work immediately. Do not proceed until written instructions have been received from Consultant.

5.2. Where work entails use, storage, or disposal of toxic or hazardous materials, chemicals and or explosives, or otherwise creates a hazard to life, safety, health, or the environment; work shall be in accordance with the Jurisdictional Authority.

6. Site Cleaning

6.1. Except where special permission is obtained, maintain clear access on public sidewalks and roads.

6.2. Maintain walks and roads clear of construction materials and debris, including excavated material. Clean walks and roads as frequently as required to ensure that they are cleared of materials, debris and excavated material.

7. Fire Safety Requirements

7.1. Enforce fire protection methods, good housekeeping and adherence to local and Underwriter's fire regulations including, but not limited to, Fire Protection Act and the Provincial Building Code Act. Provide UL approved fire extinguishers, and other fire- fighting services and equipment, except where more explicit requirements are specified as the responsibility of individual Sections.

7.2. Smoking is not permitted on school property.

7.3. Advise Fire Chief in the area of Work of any work that would impede fire apparatus response, including but not limited to violation of minimum overhead clearance prescribed by the fire chief, erecting of barricades and digging of trenches and in areas where work is being done.

7.4. Ensure nothing subverts the integrity of fire protection provided for the building structure.

8. Reporting Fires

8.1. Know the location of the nearest fire alarm box and telephone, including the emergency phone number.

8.2. Report immediately all fire incidents to the fire department as follows:

8.2.1. Activate nearest fire alarm box, or

8.2.2. Telephone local fire department

8.2.3. Where fire alarm box is exterior to building, the person activating the fire alarm box shall remain at the box to direct Fire Department to scene of the fire.

8.2.4. When reporting a fire by telephone, give location of fire, name or number of building and be prepared to verify the location.

9. Safety Document Submission

9.1. Ensure Safety Document Submission applies to Work of this specific project and site.

9.2. Submit two (2) copies of Project Safety Document at the Pre-Construction Meeting. Do not commence Work nor deliver material on-site prior to submission.

9.3. Include in Safety Document submission specific information detailing the methods and procedures to be implemented ensuring adherence to the acts, regulations, codes and policies specified in this section and to:

9.3.1. Ensure the Health & Safety of persons at or near the Work; including, but not limited to, the Public.

9.3.2. Ensure the measures and procedures of the regulatory agencies specified are carried out.

9.3.3. Ensure every employee, self-employed person and employer performing Work under this contract complies with the regulatory agencies specified.

9.3.4. Where changes to the methods and procedures in the execution of work change submitted safety methods and procedures, modify submitted Safety Documentation and submit modifications, in writing to the Consultant and Owner prior to implementation.

10. Safety Document Organization

10.1. Organize information in the form of an instructional manual as follows:

10.1.1. Place in binders of commercial quality, accommodating 8½" x 11" paper size.

10.1.2. Cover: Identify binder with typed or printed title ‘Project Safety Document’ and list the title of project.

10.1.3. Provide tabbed fly leaf for each separate heading, with typed heading on tab.

10.1.4. Where drawings are within the safety document, provide with reinforced punched binder tab. Bind in with text; fold in larger drawings to size of text pages.

10.1.5. Arrange content under Safety Document headings specified herein.

11. Safety Document Headings

11.1. Employee Safety Training

11.1.1. Place, under this heading, a statement indicating employees working on this specific project have met specified training requirements, if required.

11.2. Company Safety Policy

11.2.1. Place, under this heading, information pertaining to the company's policy and commitment to Occupational Health & Safety, including the responsibilities of management, supervisors and workers.

11.3. Company Safety Rules in General Terms

11.3.1. Place, under this heading, information of a general, global nature, applying to every work environment where the company has staff and pertaining to rules directing compliance to policy. For example state company safety rules with respect to use of hard hats, safety glasses, safety foot ware, CSA approval on such items, and use of alcohol or non-prescription drugs.

11.4. Hazard Assessment

11.4.1. Place, under this heading, information identifying possible hazards specific to this project and identify safe methods and procedures for the execution of work to ensure safety in the workplace.

11.4.2. Arrange contents of this heading by technical section number of the project manual.

11.5. Emergency Action Plan

11.5.1. Place, under this heading, information detailing action to be taken in the event of various emergencies.

11.5.2. Arrange content under the following sub-headings:

11.5.2.1. First Aid

11.5.2.1.1. Include information concerning establishment of a First Aid Station, related supplies, staff awareness of location and staff training in First Aid Care of Casualties.

11.5.2.2. Contact of Emergency Support Groups:

11.5.2.2.1. Include relative information including phone location for emergency use, the emergency telephone numbers and their location for the various organizations which must be contacted in case of an emergency, and staff training in procedures.

Cessation of Work:

11.5.2.2.2. Include relative information how work cessation during emergencies is handled and communicated to persons present on site.

11.6. Joint Occupational Health & Safety Committee/Representative:

11.6.1. Place under this heading information detailing membership and terms of reference.

OCCUPATIONAL HEALTH & SAFETY SUMMARY FOLLOWS THIS PAGE

Occupational Health & Safety Summary (to be submitted with each monthly Progress estimate)

The following information summarizes Occupational Health & Safety activities on the project conducted by the Contractor during the month and includes activities of Subcontractors. Activities include all matters prescribed by the Occupational Health & Safety Act and Regulations and the submitted Occupational Health & Safety Document for the Project.

Indicate the applicable # number below:

#_____new contractors on site,
#_____orientations
#_____toolbox talks
#_____safety meetings
#_____Joint Occupational Health and Safety Committee meetings
#_____hazard assessments
#_____formal written inspections
#_____warnings issued to employees or subcontractors
#_____other, explain_____

List new Contractors on Site below:

_____
_____
_____
_____
_____
_____

The Contractor certifies that the above noted activity list is accurate and that during the month:

Check

☐ All activities on the Project were found to be in compliance with the Occupational Health & Safety Act and Regulations

☐ Some activities on the Project were not found to be in compliance with the Occupational Health & Safety Act and Regulations but were adequately corrected in an appropriate time frame. Explain

_____

Prepared by

_____
(Contractor Project Manager)

Certified by

_____
(Contractor Senior Management)

END OF SECTION 01 35 29

SECTION 01 37 00 - SCHEDULE OF VALUES

1. Related Documents

1.1. General Conditions of Contract.

2. General

2.1. Submit to the Architect, and Owner, Schedule of Values, within twenty (20) days after signing Agreement.

2.2. Use Schedule of Values as basis for Contractor's Progress Claim.

3. Form Of Submittal

3.1. Form included at end of this Section.

4. Preparing Schedule Of Values

4.1. Itemize separate line item cost for work required.

4.2. Round off figures to nearest ten (10) dollars.

4.3. The sum of all values listed in the schedule shall equal the total contract sum.

5. Review And Submittal

5.1. After review by Architect and Owner, revise and resubmit Schedule as directed.

5.2. The form shall be completed and supported by such evidence as to its correctness as the Architect may reasonably direct.

SCHEDULE OF VALUES

Project Name *#4273 – Heating Distribution Upgrades Inglis St. Elementary School*

Architect .....

Contractor .....

Date .....

Halifax Regional Centre for Education – Schedule of Values		
Contract Item	**Percentage**	**Dollar Value**
Mobilization, bonding / insurance, safety	5	
Demolition	20	
Mechanical Room works	15	
Heating distribution piping	20	
All terminal heating devices and BAS zone controls are installed	20	
Close out documentation including copy of warranty and signed off commissioning deficiency list	20	
Total	**100 %**	

END OF SECTION 01 37 00

SECTION 01 41 00 - REGULATORY AGENCIES

1. Jurisdictional Authorities

1.1. Where reference is made to jurisdictional authorities, it shall mean all authorities who have within their constituted powers the right to enforce the laws of the place of building.

2. Definitions

2.1. The "Constructor" named in the Construction Safety Act, Chapter 52, Revised Statutes of Nova Scotia, as amended by 1972, Chapter 25; and Construction Safety Regulations, pursuant to Chapter 52 R.S.N.S., including any amendments, shall mean the "Contractor" for the Work performed under this Specification.

3. Fire Prevention, Safety & Protection

3.1. General Construction Safety Measures:

3.1.1. Observe safety measures of the

3.1.1.1. National Building Code 2010, Part 8.

3.1.1.2. National Fire Code of Canada.

3.1.1.3. Provincial Government, including but not limited to the Occupational Health & Safety Act Revised Statutes of Nova Scotia 1996, Chapter 320, and the Construction Safety & Industrial Safety Regulations made pursuant to the Occupational Health and Safety Act, 1996.

3.1.1.4. Workers'/Workmen's Compensation Board.

3.1.2. In case of conflict or discrepancy the more stringent requirement shall apply.

3.1.3. Maintain clear emergency exit paths for personnel.

3.2. Except where special permission is obtained, maintain clear access on public sidewalks and roads.

3.3. Maintain walks and roads clear of construction materials and debris, including excavated materials. Clean walks and roads as frequently as required to ensure that they are cleared of materials, debris and excavated materials.

3.4. WHMIS:

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

3.4.2. Have a copy of WHMIS data sheets available at the workplace on delivery of materials.

Blockage of Roadways

3.5. Advise Fire Chief of any work that would impede fire apparatus response. This includes violation of minimum overhead clearance, as prescribed by fire chief, erecting of barricades and the digging of trenches.

4. Smoking Precautions

4.1. Observe, at all times, smoking regulations.

5. Rubbish And Waste Materials

5.1. Rubbish and waste materials are to be kept to a minimum.

5.2. The burning of rubbish is prohibited.

6. Flammable And Combustible Liquids

6.1. The handling, storage and use of flammable and combustible liquids are to be governed by the current National Fire Code of Canada.

6.2. Flammable and combustible liquids such as gasoline, kerosene and naphtha will be kept for ready use in quantities not exceeding 45 litres provided they are stored in approved safety cans bearing the Underwriter's Laboratory of Canada or Factory Mutual seal of approval. Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes, requires the permission of the Fire Chief.

6.3. Transfer of flammable and combustible liquids is prohibited within buildings or jetties.

6.4. Transfer of flammable and combustible liquids will not be carried out in the vicinity of open flames or any type of heat-producing devices.

6.5. Flammable liquids having a flash point below 38°C such as naphtha or gasoline will not be used as solvents or cleaning agents.

6.6. Flammable and combustible waste liquids, for disposal, will be stored in approved containers located in a safe ventilated area. Quantities are to be kept to a minimum and the Fire Department is to be notified when disposal is required.

7. Hazardous Substances

7.1. Work entailing the use of toxic or hazardous materials, chemicals and/or explosives, otherwise creates a hazard to life, safety or health, will be in accordance with the National Fire Code of Canada.

7.2. Where flammable liquids, such as lacquers or urethanes are to be used, proper ventilation will be assured and all sources of ignition are to be eliminated. The Fire Chief is to be informed prior to and at the cessation of such work.

8. Questions and/or Clarification

8.1. Direct any questions or clarification on Fire Safety in addition to above requirements to Fire Chief.

9. Fire Inspection

9.1. Site inspections by Fire Chief will be coordinated through HRCE Project Manager.

9.2. Allow Fire Chief unrestricted access to the work site.

9.3. Co-operate with the Fire Chief during routine fire safety inspection of the Work site.

9.4. Immediately remedy all unsafe fire situations observed by the Fire Chief.

10. Reference Standards

10.1. Where edition date is not specified, consider that references to manufacturer's and, published codes, standards and specifications are made to the latest edition, (revision) approved by the issuing organization, current at the date of this Specification.

10.2. Reference standards and specifications are quoted in this Specification to establish minimum standards. Work which in quality exceeds these minimum standards shall be considered to conform.

10.3. Should the Contract Documents conflict with specified reference standards or specifications the General Conditions of the Contract shall govern.

10.4. Where reference is made to manufacturer's directions, instructions or specifications they shall include full information on storing, handling, preparing, mixing, installing, erecting, applying, or other matters concerning the materials pertinent to their use and their relationship to materials with which they are incorporated.

10.5. Have a copy of each code, standard and specification, and manufacturer's directions, instructions and specifications, to which reference is made in this Specification, always available at construction site.

10.6. Standards, specifications, associations, and regulatory bodies are generally referred to throughout the specifications by their abbreviated designations:

AA	The Aluminum Association
AISI	American Iron and Steel Institute
ANSI	American National Standards Institute
ARI	Air Conditioning & Refrigeration Institute
ASTM	American Society for Testing & Materials
CCA	Canadian Construction Association
CGSB	Canadian General Standards Board
CSA	Canadian Standards Association
NSDTIR	Department of Transportation & Infrastructure Renewal, Province of Nova Scotia
IAO	Insurers Advisory Organization
NBC	National Building Code
NFPA	National Fire Protection Association
CANS	Construction Association of Nova Scotia
ULC	Underwriters Laboratories of Canada
WHMIS	Workplace Hazardous Materials Information System

END OF SECTION 01 41 00

SECTION 01 45 00 - QUALITY CONTROL

1. Section Includes

1.1. Inspection and testing, administrative and enforcement requirements

1.2. Tests and mix designs.

1.3. Mock-ups.

1.4. Mill tests.

1.5. Equipment and system adjust and balance.

1.6. Verification by affidavits and certificates that specified products meet requirements of reference standards: In applicable Sections of the Specification.

1.7. Testing, balancing and adjusting of equipment: In applicable Mechanical and Electrical Sections of the Specification.

1.8. Cutting & Patching: Section 01 11 41.

2. Related Sections

2.1. Section 01 33 00 Submittal Procedures: Submission of samples to confirm product quality.

2.2. Section 01 61 00 Material & Equipment: Material and workmanship quality – reference standards.

2.3. Section 01 77 00 Contract Closeout.

3. REVIEW OF WORK

3.1. The Owner shall have access to the Work. If part of the Work is in preparation at locations other than the Place of the Work, access shall be given to such work whenever it is in progress.

3.2. Give timely notice to the Owner's Representative, requesting review of the Work as indicated in the Contract Documents.

3.3. If the Contractor covers or permits to be covered Work that has been designated for review by the Owner before such is made, uncover such Work, have the review satisfactorily completed and make good such Work at no extra cost to Owner.

4. Inspection, Special Tests, Approvals

4.1. Engage the services of appropriate inspection testing agencies ensuring the Work meets codes, acts and regulations, and lows in force at the place of Work. Include such costs in the Contract Price.

4.2. Give timely notice requesting inspection to those required to provide inspections, special tests, or approvals, where Work is designated, by the Owner's instructions or the law of the place of Work, for special tests.

4.3. If the Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have the inspections or tests satisfactorily completed and make good such Work at no extra cost to the Owner.

4.4. The Owner may order any part of the Work to be examined if the Work is suspected to be not in accordance with the Contract Documents. If, upon examination such Work is found not in accordance with the Contract Documents, correct such Work and pay the cost of examination and correction. If such Work is found in accordance with the Contractor Documents, the Owner shall pay the cost of examination and replacement.

5. Independent Inspection Agencies

5.1. Independent Inspection/Testing Agencies may be engaged by the Owner for the purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by the Owner.

5.2. Provide access to the Work, and equipment required for executing inspection and testing by the appointed agencies.

5.3. Employment of inspection/testing agencies does not relax the Contractor's responsibility to perform Work, or carry out his own inspections and testing in accordance with the Contract Documents.

5.4. If defects are revealed during inspection and/or testing, the appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Owner at no cost to the Owner. Pay costs for retesting and reinspection.

6. Access To Work

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

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

7. Procedures

7.1. Notify the appropriate agency and Owner in advance of the requirement for tests, in order that attendance arrangements can be made.

7.2. Submit samples and/or materials required for testing, at specifically requested in specifications. Submit with reasonable promptness and in an orderly sequence so as not to cause delay in the Work.

7.3. Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

8. Rejected Work

8.1. Remove defective Work, whether the result of poor workmanship, use of defective products or damage and whether incorporated in the Work or not, which has been rejected, including (but not limited to) defective Work rejected by the Owner as failing to conform to the Contract Documents. Replace or re-execute in accordance with the Contract Documents.

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

8.3. If in the opinion of the Owner, it is not expedient to correct defective Work or Work not performed in accordance with the Contract Documents, the Owner may deduct from the Contract Price the difference in value between the Work performed and that called for by the Contract Documents, the amount of which shall be determined by the Owner.

9. Reports

9.1. Submit four (4) copies of inspection and test reports to the Owner.

9.2. Provide copies to Contractor's Consultant and Subcontractor of Work being inspected or tested.

10. Tests and Mix Designs

10.1. Furnish test results and mix designs as may be requested.

10.2. The cost of tests and mix designs beyond those called for in the Contract Documents or beyond those required by law of the Place of Work shall be appraised by the Owner and may be authorized as recoverable.

11. Mock-Up

11.1. Prepare mock-up for Work for each finish in the Work and other work specifically requested in the specifications. Include for Work of all Sections required to provide mock-ups. Provide a mock-up of terminal heating devices and distribution piping for review and HRCE approval prior to the first installation.

11.2. Construct in all locations as specified in specific Section.

11.3. Prepare mock-up for Owner's review with reasonable promptness and in an orderly sequence, so as not to cause any delay in the Work.

11.4. Failure to prepare mock-up in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

11.5. If requested the Owner will assist in preparing a schedule fixing the dates for preparation.

11.6. Mock-ups may remain as part of the Work, unless specified otherwise in the Contract Documents.

12. Mill Tests

12.1. Submit mill test certificates as may be requested.

13. Equipment And Systems

13.1. Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.

13.2. Refer to Contract Documents for definitive requirements.

END OF SECTION 01 45 00

SECTION 01 52 00 – CONSTRUCTION & TEMPORARY FACILITIES

1. General

1.1. Include in the Work construction and temporary facilities required as construction aids or by jurisdictional authorities or as otherwise specified. Install to meet needs of construction as Work progresses. Maintain construction and temporary facilities during use, relocate them as required by the Work, remove them at completion of need and make good adjacent Work and property affected by their installation.

1.2. Include in the Work construction and temporary facilities to provide for construction safety such as: fences, barricades, bracing, supports, storage, sanitation and first aid facilities, fire protection, stand pipes, electrical supply, construction equipment with its supports and guards, stairs, ramps, platforms, runways, ladders, scaffolds, guardrails, temporary flooring, rubbish chutes, and walkway, morality and guard lights, and as otherwise required of the Constructor by the Construction Safety Act, of the Province of Nova Scotia, as well as all other applicable regulations or jurisdictional authorities.

1.3. Construct temporary Work of new materials unless use of second-hand materials is approved.

1.4. Ensure that structural, mechanical, and electrical characteristics of temporary facilities are suitable and adequate for use intended. Be responsible that no harm is caused to persons and property by failure of temporary facilities because of placing, location, stability, protection, structural sufficiency, removal, or any other cause.

1.5. Locate temporary facilities as directed and coordinated with School Administration and HRCE.

1.6. Relocate construction and temporary facilities as required by the Progress of the Work, and remove at completion of Work.

1.7. Do not permit construction personnel to use new washroom and toilet facilities.

1.8. Interior work zones to be complete with temporary negative air ventilation units to be functioning at all times to control dust migration to occupied areas.

1.9. Refer also to HRCE Policies & Guidelines contained in Appendix A of Section 01 35 13.

2. Services

2.1. Temporary Electric Power:

2.1.1. The Contractor will provide a source of electric power for all construction purposes.

2.1.2. Coordinate with the Building Operator locations of power sources and arrange to connect under his direction.

2.1.3. Install electric service distribution conductors and necessary components. Determine anticipated demand which will be placed on service during normal peak periods and obtain approval on this basis before making installation. Supply power of characteristics required by the Work. Install a power centre for miscellaneous tools

and equipment for each major building floor area with distribution box, a minimum of four 20 amp grounded outlets, and circuit breaker protection for each outlet. Make connections available to any part of the Work within distance of a 100'-0" extension.

2.2. Temporary Lighting:

2.2.1. Install lighting for

2.2.1.1. emergency evacuation, safety and security throughout the Project at intensity levels required by jurisdictional authorities.

2.2.1.2. performance of Work throughout Work areas as required, evenly distributed, and at intensities to ensure that proper installations and applications are achieved.

2.2.1.3. performance of finishing Work in areas as required, evenly distributed and of an intensity of at least 15 foot candles.

2.2.2. Permanent fluorescent lighting may be used during construction, provided that fixtures, lamps and lenses are completely cleaned. Incandescent sources may be used during construction to the extent of 20% of the total. Electrical Division Contractor to provide 20% spare lamps to the Owner for replacement purposes.

2.3. Temporary Sanitary Facilities:

2.3.1. Provide sanitary facilities for persons on the Work site. Facilities in areas of the building are only to be used under extraordinary circumstances and with prior approval.

2.4. Maintain fire protection as required by jurisdictional authorities. The Contractor is responsible for de-activating and re-activating Fire Alarm zones as required by the Work of the Contract and to maintain protection in the existing building.

3. Construction Aids

3.1. Hoists & Cranes:

3.1.1. Select, operate and maintain hoisting equipment and cranes as may be required. Operate such equipment only by qualified hoist or crane operators. Make hoist available for Work of each Section.

3.2. Building Enclosure:

3.2.1. Include in Work temporary enclosure for building as required to protect it, in its entirety or in its parts, against the elements, to maintain environmental conditions

required for Work. Design enclosures to withstand wind pressures required for the building by jurisdictional authorities. Erect enclosures to allow complete accessibility for installation of materials during the time enclosures remain in place.

3.3. Scaffolding:

3.3.1. Each user of scaffolding shall be responsible for its examination and testing for sufficiency before using it. He shall make it secure if necessary, or shall notify the Contractor in writing that he will not commence work until it is made secure; otherwise he will be held responsible for accidents due to its insufficiency.

4. Barriers

4.1. Install barricades for traffic control, and to prevent damaging traffic over exterior and interior finished areas, as well as safety barricades and otherwise, as may be required.

4.2. Construct hoardings and walkways as required by HRCE or jurisdictional authorities.

5. Protection

5.1. Protect roofs and podiums by substantial temporary construction to ensure that no damage occurs. Provide protection by materials of sufficient thickness to prevent all damage to structure and finish, and to waterproofing qualities of membranes, whenever each of these individual components are exposed. Damage shall include harm resulting from all construction work, such as falling objects, wheel and foot traffic, failure to remove debris, operation of machinery and equipment, and scaffolding and hoisting operations. Positively secure protection to prevent displacement from any cause.

5.2. Box with wood or otherwise protect from damage, by continuing construction, finished sills, jambs, corners, and the like.

END OF SECTION 01 52 00

SECTION 01 61 00 - MATERIAL & EQUIPMENT

1. General

1.1. Products refer to materials, manufactured components and assemblies, fixtures and equipment incorporated in the Work.

1.2. Use only products of Canadian manufacture unless such products are not manufactured in Canada, are specified otherwise, or are not competitive.

1.3. Products for use in the Project and on which the Tender was based shall be in production at that time, with a precise model and shop drawings available for viewing.

1.4. Where equivalent products are specified, or where alternatives are proposed under "substitution of products", these products claimed by the Contractor as equivalent shall be comparable in construction, type, function, quality, performance, and, where applicable, in appearance, as approved. Where specified equivalents are used in the tendered bulk sum price for the Work, they shall be subject to final approval.

1.5. Incorporate products in the Work in strict accordance with manufacturers' directions unless specified otherwise.

1.6. Products delivered to the Project site for incorporation in the Work shall be considered the property of the Owner. Maintain protection and security of products stored on the site after payment has been made for them.

1.7. Do not install permanently incorporated labels, trademarks and nameplates, in visible locations unless required for operating instructions or by jurisdictional authorities.

2. Specified Products

2.1. Products specified by manufacturer's name, brand name or catalogue reference shall be the basis of the bid and shall be supplied for the Work without exception in any detail, subject to allowable substitutions as specified.

2.2. Where several proprietary products are specified, any one of the several will be acceptable.

2.3. For products specified by reference standards, the onus shall be on the supplier to establish that such products meet reference standard requirements. The Architect may require affidavits from the supplier, as specified in Section 01 33 00, or inspection and testing at the expense of the supplier, or both, to prove compliance. Products exceeding minimum requirements established by reference standards will be accepted for the Work if such products are compatible with and harmless to Work with which they are incorporated.

3. Substitution Of Products During Progress Of Work

3.1. Products substituted for those specified or approved, or both, shall be permitted only if the listed product cannot be delivered to maintain construction schedule and if the delay is caused by conditions beyond the Contractor's control.

3.2. Obtain approval for substitutions. Application for approval of substitutions shall be made only by Contractor. Process proposals for substituted Work in accordance with procedures established for changes in the Work.

3.3. Submit, with request for substitution, documentary evidence that substituted products are equal to, or superior to, approved products, and a comparison of price and delivery factors for both specified or approved products, and proposed substitute.

3.4. Ensure that substituted products can be both physically and dimensionally incorporated in the Work with no loss of intended function, performance, space or construction time, and that spare parts and service are readily available. The Contractor shall be responsible for additional installation costs, including architectural and engineering fees, required by incorporation of substituted products, and for adaptations made otherwise necessary to ensure that above requirements are satisfied.

4. Product Handling

4.1. Manufacture, pack, ship, deliver and store products so that no damage occurs to structural qualities and finish appearance, nor in any other way detrimental to their function or appearance, or both.

4.2. Ensure that products, while transported, stored or installed, are not exposed to an environment which would increase their moisture content beyond the maximum specified.

4.3. Schedule early delivery of products to enable Work to be executed without delay. Before delivery, arrange for receiving at site.

4.4. Deliver package products, and store until use, in original unopened wrapping or containers, with manufacturer's seals and labels intact.

4.5. Label packaged products to describe contents, quantity and other information as specified.

4.6. Product handling requirements may be repeated and additional requirements specified, in other Sections.

5. Storage & Protection

5.1. Coordinate material delivery to ensure that areas within or on building are available to receive them.

5.2. Store manufactured products in accordance with manufacturer's instructions, when such instructions are attached to products or submitted by him.

5.3. Store finished products and woodwork under cover at all times.

5.4. Store and handle flammable liquids and other hazardous materials in approved safety containers and as otherwise prescribed by safety authorities. Store no flammable liquids or other hazardous materials in bulk within the Project.

5.5. Storage and special protection requirements may be repeated, and additional requirements specified, in other Sections.

6. Defective Products & Work

6.1. Products and Work found defective; not in accordance with the Specifications; or defaced or injured through negligence of the Contractor, his employees or subcontractors, or by fire, weather or any other cause will be rejected for incorporation in the Work.

6.2. Remove rejected products and Work from the premises immediately.

6.3. Replace rejected products and Work with no delay after rejection. Provide replacement products and execute replacement Work precisely as required by the Specification for the defective Work replaced. Previous inspection and payment shall not relieve the Contractor from the obligation of providing sound and satisfactory Work in compliance with this Project Manual.

7. Workers, Suppliers & Subcontractors

7.1. Assign Work only to workers, suppliers, and Subcontractors who have complete knowledge, not only of the conditions of this Project Manual, but of jurisdictional requirements, and reference standards and specifications.

7.2. Give preference to use of local workers, suppliers, and Subcontractors wherever possible.

Workmanship

7.3. Unless otherwise specified in a more detailed manner, workmanship shall be of the highest quality recognized by trade executing the Work in accordance with standard practices, by the best methods recommended by the manufacturer of the Product, and as approved by the Architect.

END OF SECTION 01 61 00

SECTION 01 77 00 – CONTRACT CLOSEOUT

1. Section Includes

1.1. Final cleaning.

1.2. Spare parts and maintenance materials.

1.3. Take over procedures.

2. Related Sections

2.1. Individual Specifications Sections: Specific requirements for operation and maintenance data.

3. Final Cleaning

3.1. Refer to the General Conditions of Contract.

3.2. Before final inspection, replace glass and mirrors broken, damaged and etched during construction, or which are otherwise defective.

3.3. In addition to requirements for cleaning-up specified in General Conditions of the Contract, include in Work final cleaning by skilled cleaning specialists on completion of construction.

3.4. Remove temporary protections and make good defects before commencement of final cleaning.

3.5. Remove waste products and debris other than that caused by the Owner, other contractors or their employees, and leave the Work clean and suitable for occupancy by Owner.

3.6. Remove surplus products, tools, construction machinery and equipment. Remove waste products and debris other than that caused by the Owner or other Contractors.

3.7. Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.

3.8. Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors and ceilings.

3.9. Vacuum clean and dust building interiors, behind grilles, louvres and screens as affected by Work.

3.10. Wax, seal, shampoo, buff or prepare floor finishes, as recommended by the manufacturer. Use products compatible with products used by building maintenance staff.

3.11. Broom clean and wash all horizontal and vertical surfaces as affected by Work.

3.12. Clean up and make good exterior grades, lawns, planting and surfaces after removal of temporary access and facilities.

3.13. Removing of visible labels left on materials, components, and equipment.

3.14. Maintain cleaning until Owner has taken possession of building or portions thereof.

4. Spare Parts And Maintenance Materials

4.1. Spare parts and maintenance materials provided shall be new, not damaged or defective, and of the same quality and manufacture as Products provided in the Work. If requested, furnish evidence as to type, source and quality of Products provided.

4.2. Defective Products will be rejected, regardless of previous inspections. Replace products at own expense.

4.3. Store spare parts and maintenance materials in a manner to prevent damage, or deterioration.

4.4. Provide spare parts, special tools, maintenance and extra materials in quantities specified in individual specification Sections.

4.5. Provide items of same manufacture and quality as items in the Work.

5. Demonstration Of Systems & Equipment

5.1. Give a complete demonstration of all systems and equipment in the presence of the Consultant at the following times:

5.2. When each is 100% completed at the request of the Contractor.

5.3. At time of inspection to validate final completion.

5.4. At final completion for the benefit of the maintenance staff for the Project.

5.5. Responsible personnel representing the Subcontractor responsible for the Work being demonstrated shall be present at each demonstration.

6. Submittals

6.1. Submit with application for substantial performance certificate.

6.1.1. Certificate of Substantial Performance inspection report from electrical utility or inspection.

6.1.2. Certificate of verification of fire alarm system.

6.1.3. Certificate from the Fire Marshal's Office and I.A.O. of final inspection of sprinkler system.

6.1.4. Air balance reports.

6.1.5. Other reports required or specified.

6.1.6. Maintenance Manuals and Operating Instructions.

6.2. Submit with application for release of final payment:

6.2.1. Final project record drawings.

6.2.2. Extra stock.

6.2.3. Performance bonds which shall remain in effect for one (1) year after take-over date.

6.2.4. Completed Liability Insurance Policy extended for one (1) year from take-over date.

6.2.5. Written guarantee covering all workmanship and materials used in the Work.

6.2.6. Maintenance bonds as specified.

6.2.7. Extended Warranties as specified

6.2.8. Certificate from Workers' Compensation Board.

6.2.9. Certificate from Health Services Tax Division.

7. Final Inspection Procedures

7.1. Schedule, make arrangements for and administer final inspections and close out in the following stages.

7.2. Contractor's Inspection:

7.2.1. Determination that Project meets requirements for substantial performance and inspection is the responsibility of the Contractor.

7.2.2. The Contractor and all Subcontractors shall conduct an inspection of the work, identify deficiencies and defects; repair as required. Notify the Consultant in writing of satisfactory completion of the contractor's Inspection and that corrections have been made. Request a Consultant's Substantial Performance Inspection.

7.3. Consultant's Inspection: Consultants and the Contractor will perform an inspection of the Work to identify obvious defects or deficiencies. The contractor shall correct Work accordingly.

7.4. Substantial Performance Inspection:

7.4.1. When the items noted above are complete, request a substantial performance inspection of the Work by the Consultant, and the Contractor. If Work is deemed incomplete by the Consultant, complete the outstanding items and request a re-inspection.

7.4.2. Substantial performance inspections shall be scheduled to begin within eight working days of the Contractor's request.

7.4.3. Present at the substantial performance inspection will be:

7.4.3.1. The Consultant and his Sub-consultants that he requires and notifies.

7.4.3.2. The Owner's representatives, upon notification by the Consultant.

7.4.3.3. The Contractor and such Subcontractors that he considers are required.

7.4.3.4. The Contractor will compile a substantial performance deficiency list at this inspection and issue it to the Consultant and Owner.

7.4.3.5. The Contractor shall correct substantial performance deficiencies before a date agreed upon by the Contractor and Consultant.

7.4.3.6. Upon the Consultant's approval of substantial performance, the Contractor shall submit an application for a substantial performance certificate.

7.4.3.7. When the Contractor has satisfied himself that these corrections have been completed in a satisfactory manner by his inspection he shall schedule a final Contractor's inspection by the Consultant, and the Owner's representatives if required, within five working days of the Contractor's request.

7.4.3.8. Upon the Consultant's approval of completion, the Contractor shall submit an application for a completion certificate.

8. Substantial Performance

8.1. The Consultant will issue a Certificate of Substantial Performance when satisfied outstanding deficiencies noted during inspections prior to the Substantial Performance inspection have been corrected, the Work is substantially complete and is so certified by the Owner.

8.2. A list of remaining deficiencies to be rectified before final acceptance will be attached to the Certificate of Substantial Performance.

8.3. Make submissions specified in Subparagraph 1.06 of this Section.

9. Certificate For Release Of Amount Due At Substantial performance

9.1. The Consultant will issue to the Owner a certificate for release of money in an amount equal to the amount due the Contractor under the Contract Documents provided the Consultant is satisfied the Work has been substantially completed.

9.2. The certificate shall indicate the date of substantial performance.

9.3. Payment shall be due in accordance with GC 5.4 and the Contract Documents.

10. Completion Certificate

10.1. The Consultant will issue a Certificate of Completion (DSS Document DC670-92) when he is satisfied that outstanding deficiencies noted during inspections have been corrected and the Work is completed and is so certified by the Owner.

10.2. The date of the completion certificate will commence the required sixty (60) day period before release of final payment.

11. Certificate For Release Of Final Payment

11.1. Subject to the provisions of the Contract Documents, the Consultant will issue to the Owner a certificate for release of final payment sixty (60) days after date of completion certificate providing he is satisfied the Work has been completed.

11.2. The certificate will be in an amount equal to the remaining money due the Contractor under the Contract, and shall indicate the date of final completion.

11.3. Payment shall be due upon date of final completion.

12. Warranties

12.1. Establishment of Warranties:

12.1.1. Warranties shall commence on the Ready-for-Takeover date.

12.2. Warranty Period:

12.2.1. The Owner will advise the Consultant of defects observed during warranty periods.

12.2.2. The Consultant will notify the Contractor of defects observed during warranty period and request him to remedy the defects in accordance with the Contractor documents.

12.2.3. Thirty (30) days before expiration of warranties the Owner's representatives, the Consultant and the Contractor will inspect the Work as arranged by the Contractor noting defects of products and workmanship.

12.2.4. The Contractor shall immediately remedy such noted defects.

END OF SECTION 01 77 00

CONTRACTOR'S CHECKLIST

Pre-Closing Reminder to Proponents:

- This Request for Proposals (RFP) is a **two-file process.**
  Please ensure that the submission instructions are followed carefully as noted in Section 00 21 13 – Information to Proponents to ensure your submission is compliant.

- Required Bid Security – (10% of the Contract price before HST)
- Please include a copy of your bid security in with your Price Submission file.

- Please submit your proposal to the submission email address: hrcetenders@hrce.ca

- The HRCE will use the CCDC-2, 2020 for this work. A copy of the Standard Construction Contract CCDC 2 – 2020 is available upon request and will form part of the contract documents.

- The HRCE Supplementary General Conditions for the CCDC-2, 2020 applicable for this work is available for review under Section 0073 00 of the RFP document.

Post Award Document Requirements:

- Certificate of Recognition from a safety audit organization, jointly signed with the WCB.
- Workers' Compensation Board Letter of Good Standing.
- Contractors Association of Nova Scotia.
- Contract Security documentation – if required
- Insurance Certificate – As identified in the RFP.
- Schedule of Values
- Site Specific Safety Plan
- Hazard Assessment
- Listing of subcontractors
- Warranty information

The award letter will list the specific documents required and provide a submission timeframe.

A purchase order will be issued only after receipt of all required items.

Work is not authorized until purchase order is issued.

PROJECT EXPERIENCE AND REFERENCES FORM

Refer Technical Submission Requirements in Section 11.3.1 Section I.

Project #1 – The most recent HRCE project, if applicable.

Company Name	
Brief Project Description	
Project Manager Name	
Project Dollar Value $	
Reference Name **and Position Title**	
Reference Contact Info **- Email Address** **- Phone Number**	

PROJECT EXPERIENCE AND REFERENCES FORM

Refer Technical Submission Requirements in Section 11.3.1 Section I.

Project #2 – The next most recent HRCE project, if applicable

Company Name	
Brief Project Description	
Project Manager Name	
Project Dollar Value $	
Reference Name **and Position Title**	
Reference Contact Info **- Email Address** **- Phone Number**	

PROJECT EXPERIENCE AND REFERENCES FORM

Refer Technical Submission Requirements in Section 11.3.1 Section I.

Project #3 – Any recent project

Company Name	
Brief Project Description	
Project Manager Name	
Project Dollar Value $	
Reference Name **and Position Title**	
Reference Contact Info **- Email Address** **- Phone Number**	

PROJECT SAFETY PLAN OUTLINE

During the planning of each project, environmental and occupational health and safety issues will be assessed like any other key project component.

Prior to beginning a new project, tendering contractors shall examine the work area to identify potentially hazardous site specific situations.

Once identified, these hazards should be prioritized on this Hazard Assessments/Project Safety Plan Outline and corrective *actions* noted to eliminate or control each hazard. The dates of when and names of the persons who are responsible for completing the *action* should also be assigned.

Copies of the completed Safety Plan Outline shall be submitted post award, sent to the HRCE Operations Services Regional Manager, made available on the job site and communicated to the workers.

Project Name: _____

Project Location: _____

Project Start date: _____

Project End date: _____

Company Name: _____

Completed by: _____
(Contractor's project manager)

Date: _____

Copy to: _____

PLANNING:

Does the Contractor's Occupational Health and Safety Program deal with the work activities associated with this project? ☐ Yes ☐ No

Describe tasks to be undertaken:_____

_____

_____

_____

HAZARDS ASSESSMENT:

Identify the hazards that could present themselves on this project (e.g. live electrical wires, over water, confined space, etc) and describe what steps will be taken to prevent an incident (e.g. cover up, de-energize, safe work practices, netting, etc). Prioritize from #1 as needing immediate action.

#	Hazard	Required Action	Completed by	Date
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

ENVIRONMENTAL ASSESSMENT:

Identify the environmental issues that could present themselves on this project (e.g. oil spills, asbestos, etc.) and describe the action that will betaken to eliminate or reduce the risk of occurrence (e.g. mop kits, air sampling, etc.)

#	Hazard	Required Action	Completed by	Date
1				
2				
3				
4				
5				

EMERGENCY RESPONSE:

In the event of an incident, pre-plan the response and write up the procedures. Minimally, the following list should be completed and posted on site:

Contact	Phone #	Contact	Phone #
Fire	911	Poison Control	428-8161
Ambulance	911	Dangerous Goods	1-800-565-1633
Doctor	911	Waste Disposal	
Police	911	Insurance	
HRCE Office	493-5110	Min/Dept of Labour	1-800-952-2687
Min./Dept.ofTransport.		Min/Dept of Environment	1-800-565-1633

- Identify and arrange source of first aid, ambulance and rescue.
- Accidents will be reported to: _____
- Accidents will be investigated by: _____
- Back-up call to: _____
- HRCE # emergency/after hours: day 902-493-5110 after 4:00 pm 902-442-2476

SAFETY MEETINGS:

On this project, given the nature of the work and the anticipated size of the work force, the following frequency will apply:

Site meetings _____

Site Audits _____

Follow up with HRCE Manager: _____

SITE IMPLEMENTATION:

- Health and Safety Rep & Safety Committee:
  Establish liaison between HRCE, contractor, site administration First Aid, PPE, other safety items as required.

- Documentation:
  Applicable MSDS Safety program

  Applicable work procedures Permits

  First Aid Certification

TRAINING:

The following training/testing will be mandatory on site:

1) _____

_____

2) _____

_____

3) _____

_____

Halifax
Regional Centre for Education

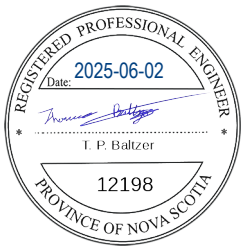
382009

Inglis St Elementary Heating System Upgrades

Issued for Tender

June 2, 2025

EASTPOINT

Discipline	**Seal**
Mechanical Mike Nicholson, P.Eng.	
Electrical Thomas Baltzer, P. Eng.	
Structural Jacob Tucker, P. Eng.	

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 Canadian Construction Documents Committee (CCDC):

.1 CCDC 2-2008, Stipulated Price Contract.

1.2 PROJECT CLEANLINESS

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

.2 Remove waste materials from site at regularly scheduled times or as directed.

.3 Make arrangements with and obtain permits from Authorities Having Jurisdiction for disposal of waste and debris.

.4 Provide containers for collection of waste materials and debris.

.5 Provide and use marked separate bins for recycling.

.6 Dispose of waste materials and debris 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 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - 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 SUMMARY

.1 This Section includes requirements for management of construction waste and disposal, which forms the Contractor's commitment to reduce and divert waste materials from landfill and includes the following:

.1 Preparation of a Construction Waste Management Plan that provides guidance on a how to manage common construction wastes in a manner that prioritizes reuse and recycling, and diversion from landfill to the greatest extent possible.

.2 Owner has established that this Project shall generate the least amount of waste possible and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors be employed by the Contractor.

1.2 DEFINITIONS

.1 Clean Waste: Untreated and unpainted; not contaminated with oils, solvents, sealants, or similar materials.

.2 Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, re-modeling, repair, and demolition operations.

.3 Hazardous: Exhibiting the characteristics of hazardous substances including properties such as ignitability, corrosiveness, toxicity, or reactivity.

.4 Non-hazardous: Exhibiting none of the characteristics of hazardous substances, including properties such as ignitability, corrosiveness, toxicity, or reactivity.

.5 Non-toxic: Not poisonous to humans either immediately or after a long period of exposure.

.6 Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

.7 Recycle: To remove a waste material from the Project site to another site for remanufacture into a new product for reuse by others.

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

.9 Return: To give back reusable items or unused products to vendors for credit.

.10 Reuse: To reuse a construction waste material in some manner on the Project site.

.11 Salvage: To remove a waste material from the Project site to another site for resale or reuse by others.

.12 Sediment: Soil and other debris that has been eroded and transported by storm or well production run off water.

.13 Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

.14 Toxic: Poisonous to humans either immediately or after a long period of exposure.

.15 Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

.16 Volatile Organic Compounds (VOCs): Chemical compounds common in and emitted by many building products over time through outgassing:

.1 Solvents in paints and other coatings;

.2 Wood preservatives, strippers, and household cleaners; and

.3 Adhesives in particleboard, fiberboard, and some plywood and foam insulation.

.17 Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

.18 Construction Waste Management Plan: A project related plan for the collection, transportation, and disposal of the waste generated at the construction site; the purpose of the plan is to ultimately reduce the amount of material being landfilled.

1.3 REFERENCE STANDARDS

.1 ASTM International (ASTM):

.1 ASTM E1609 01, Standard Guide for Development and Implementation of a Pollution Prevention Program.

.2 Recycling Certification Institute (RCI):

.1 RCI Certification Construction and Demolition Materials Recycling.

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Coordination: Coordinate waste management requirements with all Divisions of the Work for the Project, and ensure that requirements of the Construction Waste Management Plan are followed.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit required information in accordance with Section 01 33 00 - Submittal Procedures.

.2 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Draft Construction Waste Management Plan (Draft CWM Plan): Submit a preliminary listing of anticipated construction or demolition waste streams that have potential to generate the most volume of material indicating methods that will be used to divert construction waste from landfill and source reduction strategies.

.2 Construction Waste Management Plan (CWM Plan): Submit a CWM Plan for this Project before any waste removal from site and that includes the following information:

.1 Material Streams: Analysis of the proposed jobsite waste being generated, including material types and quantities forming a part of identified material streams in the Draft CWM Plan; materials removed from site destined for alternative daily cover at landfill sites and land clearing debris cannot be considered as contributing to waste diversion and will be included as a component of the total waste generated for the site.

.2 Recycling Haulers and Markets: Investigate local haulers and markets for recyclable materials, and incorporate into CWM Plan.

.3 Alternative Waste Disposal: Prepare a listing of each material proposed to be salvaged, reused, recycled, or composted during the course of the Project and the proposed local market for each material.

.4 Landfill Materials: Identify materials that cannot be recycled, reused, or composted and provide explanation or justification; energy will be considered as a viable alternative diversion strategy.

.5 Materials Handling Procedures: A description of the means by which any recycled waste materials will be protected from contamination and a description of the means to be employed in recycling the above materials consistent with requirements for acceptance by designated facilities.

1.6 PROJECT CLOSEOUT SUBMITTALS

.1 Record Documentation: Submit as constructed information in accordance with Section 01 78 00 - Closeout Submittals as follows:

.1 Construction Waste Management Report (CWM Report): Submit a CWM Report for this Project that includes the following information:

.1 Accounting: Submit information indicating total waste produced by the Project. By providing a summary of the disposal certificates/disposal facility receipts.

.2 Composition: Submit information indicating types of waste material and quantity of each material.

.3 Diversion Rate: Submit information indicating total waste diverted from landfill as a percentage of the total waste produced by the Project.

1.7 QUALITY ASSURANCE

.1 Resources for Development of Construction Waste Management Report (CWM Report): The following sources may be useful in developing the Draft Construction Waste Management Plan:

.1 Recycling Haulers and Markets: Investigate local haulers and markets for recyclable materials and incorporate into CWM Plan.

.2 Waste-to-Energy Systems: Investigate local waste-to-energy incentives where systems for diverting materials from landfill for reuse or recycling are not available.

.2 Certifications: Provide proof of the following during the course of the Work:

.1 Compliance Certification: Provide proof that recycling center is third party verified and is listed as a Certified Facility through the registration and certification requirements of the Recycling Certification Institute.

1.8 DELIVERY, STORAGE, AND HANDLING

.1 Storage Requirements: Implement a recycling/reuse program that includes separate collection of waste materials as appropriate to the Project waste and the available recycling and reuse programs in the Project area.

.2 Handling Requirements: Clean materials that are contaminated before placing in collection containers and ensure that waste destined for landfill does not get mixed in with recycled materials:

.1 Deliver materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to recycling process.

.2 Arrange for collection by or delivery to the appropriate recycling or reuse facility.

.3 Hazardous Waste and Hazardous Materials: Handle in accordance with applicable regulations.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 (CWM PLAN) IMPLEMENTATION

.1 Manager: Contractor is responsible for designating an on site party or parties responsible for instructing workers and overseeing and documenting results of the CWM Plan for the Project.

.2 Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, composting, and return methods being used for the Project to Subcontractors at appropriate stages of the Project.

.3 Separation Facilities: Lay out and label a specific area to facilitate separation of materials for potential recycling, salvage, reuse, composting, and return:

.1 Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials.

.2 Hazardous wastes shall be separated, stored, and disposed of in accordance with local regulations.

3.2 SUBCONTRACTOR'S RESPONSIBILITY

.1 Subcontractor's shall cooperate fully with the Contractor to implement the CWM Plan.

.2 Failure to cooperate may result in the Owner not achieving their environmental goals and may result in penalties being assessed by the Contractor to the responsible Subcontractors.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 Canadian Environmental Protection Act (CEPA):

.1 SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Pre-warranty Meeting:

.1 HRCE Representative to establish communication procedures for:

.1 Notifying construction warranty defects.

.2 Determine priorities for type of defects.

.3 Determine reasonable response time.

.2 Contact information for bonded and licensed company for warranty work action: provide name, telephone number, and address of company authorized for construction warranty work action.

.3 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Two weeks before Substantial Performance of the Work, submit to the HRCE Representative, four final copies of operating and maintenance manuals in English.

.3 Provide spare parts, maintenance materials, and special tools of same quality and manufacture as products provided in Work.

.4 Provide evidence, if requested, for type, source, and quality of products supplied.

1.4 FORMAT

.1 Organize data as instructional manual.

.2 Binders: Vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.

.3 When multiple binders are used correlate data into related consistent groupings:

.1 Identify contents of each binder on spine.

.4 Cover: Identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.

.5 Arrange content by systems, under Section numbers and sequence of Table of Contents.

.6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

.7 Text: manufacturer's printed data or typewritten data.

.8 Drawings: Provide with reinforced punched binder tab:

.1 Bind in with text; fold larger drawings to size of text pages.

1.5 CONTENTS - PROJECT RECORD DOCUMENTS

.1 Table of Contents for Each Volume:

- .1 Provide title of project;
- .2 Date of submission;
- .3 Names, addresses, and telephone numbers of Consultant and Contractor with name of responsible parties; and
- .4 Schedule of products and systems, indexed to content of volume.

.2 For each product or system:

- .1 List names, addresses, and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

.3 Product Data: mark each sheet to identify specific products and component parts and data applicable to installation; delete inapplicable information.

.4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

.5 Typewritten Text: As required to supplement product data:

- .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

.6 Training: Provide training records and sign in sheets for all demonstration sessions offered.

1.6 AS-BUILT DOCUMENTS AND SAMPLES

.1 Maintain at site one record copy of:

- .1 Contract Drawings.
- .2 Specifications.
- .3 Addenda.
- .4 Change Orders and other modifications to Contract.
- .5 Reviewed shop drawings, product data, and samples.
- .6 Site test records.
- .7 Inspection certificates.
- .8 Manufacturer's certificates.

.2 Store record documents and samples in site office apart from documents used for construction:

- .1 Provide files, racks, and secure storage.

.3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual:

- .1 Label each document "PROJECT RECORD" in neat, large, and printed letters.

.4 Maintain record documents in clean, dry, and legible condition:

- .1 Do not use record documents for construction purposes.

.5 Keep record documents and samples available for inspection by the HRCE Representative.

1.7 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

.1 Record information on set of black line opaque drawings, and in a copy of the Project Manual.

.2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.

.3 Record information concurrently with construction progress:

.1 Do not conceal Work until required information is recorded.

.4 Contract Drawings and shop drawings: mark each item to record actual construction, including:

.1 Measured depths of elements of foundation in relation to finish first floor datum.

.2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

.3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.

.4 Site changes of dimension and detail.

.5 Changes made by change orders.

.6 Details not on original Contract Drawings.

.7 Referenced Standards to related shop drawings and modifications.

.5 Specifications: mark each item to record actual construction, including:

.1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.

.2 Changes made by Addenda and change orders.

.6 Other Documents: Maintain manufacturer's certifications, inspection certifications, and site test records, required by individual specifications Sections.

.7 Provide digital photos, if requested, for site records.

1.8 EQUIPMENT AND SYSTEMS

.1 For each item of equipment and each system include description of unit or system, and component parts:

.1 Give function, normal operation characteristics, and limiting conditions.

.2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

.2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.

.3 Include installed colour coded wiring diagrams.

.4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences:

.1 Include regulation, control, stopping, shut-down, and emergency instructions.

.2 Include summer, winter, and any special operating instructions.

.5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

.6 Provide servicing and lubrication schedule, and list of lubricants required.

.7 Include manufacturer's printed operation and maintenance instructions.

.8 Include sequence of operation by controls manufacturer.

.9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

.10 Provide installed control diagrams by controls manufacturer.

.11 Provide Contractor's coordination drawings, with installed colour coded piping diagrams.

.12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

.13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

.14 Include test and balancing reports as specified in Section 01 45 00 - Quality Control and Section 01 91 13 - General Commissioning Requirements.

.15 Underground storage tank inspection documentation, registration, forms, decommissioning, and removal in accordance with CEPA SOR/2008-197.

.16 Additional requirements: As specified in individual specification Sections.

1.9 MATERIALS AND FINISHES

.1 Building products, applied materials, and finishes: Include product data, with catalogue number, size, composition, and colour and texture designations:

.1 Provide information for re-ordering custom manufactured products.

.2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.3 Moisture-protection and weather-exposed products: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.4 Additional requirements: As specified in individual specifications Sections.

1.10 MAINTENANCE MATERIALS

.1 Spare Parts:

.1 Provide spare parts, in quantities specified in individual specification Sections.

.2 Provide items of same manufacture and quality as items in Work.

.3 Deliver to site; place and store.

.4 Receive and catalogue items:

.1 Submit inventory listing to HRCE Representative.

.5 Obtain receipt for delivered products and submit before final payment.

.2 Extra Stock Materials:

.1 Provide maintenance and extra materials, in quantities specified in individual specification Sections.

.2 Provide items of same manufacture and quality as items in Work.

.3 Deliver to site; place and store.

.4 Receive and catalogue items:

.1 Submit inventory listing to HRCE Representative.

.5 Obtain receipt for delivered products and submit before to final payment.

.3 Special Tools:

.1 Provide special tools, in quantities specified in individual specification Section.

.2 Provide items with tags identifying their associated function and equipment.

.3 Deliver to site; place and store.

1.11 DELIVERY, STORAGE, AND HANDLING

.1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.

.2 Store in original and undamaged condition with manufacturer's seal and labels intact.

.3 Store components subject to damage from weather in weatherproof enclosures.

.4 Store paints and freezable materials in a heated and ventilated room.

.5 Remove and replace damaged products at own expense and for review by HRCE Representative.

1.12 WARRANTIES AND BONDS

.1 Develop warranty management plan to contain information relevant to Warranties.

.2 Submit warranty information made available during construction phase, to HRCE Representative for approval before each monthly pay estimate.

.3 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:

.1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.

.2 List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

.3 Obtain warranties and bonds, executed in duplicate by Subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.

.4 Verify that documents are in proper form, contain full information, and are notarized.

.5 Co-execute submittals when required.

.6 Retain warranties and bonds until time specified for submittal.

.4 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.

.5 Conduct joint 4 month and 9 month warranty inspection, measured from time of acceptance, by HRCE Representative.

.6 Include information contained in warranty management plan as follows:

.1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, Subcontractors, manufacturers, or suppliers involved.

.2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, and commissioned systems.

.3 Provide list for each warranted equipment, item, feature of construction or system indicating:

.1 Name of item.

.2 Model and serial numbers.

.3 Location where installed.

.4 Name and phone numbers of manufacturers or suppliers.

.5 Names, addresses, and telephone numbers of sources of spare parts.

.6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.

.7 Cross-reference to warranty certificates as applicable.

.8 Starting point and duration of warranty period.

.9 Summary of maintenance procedures required to continue warranty in force.

.10 Cross-Reference to specific pertinent Operation and Maintenance manuals.

.11 Organization, names, and phone numbers of persons to call for warranty service.

.12 Typical response time and repair time expected for various warranted equipment.

.4 Contractor's plans for attendance at 4 and 9 month post-construction warranty inspections.

.5 Procedure and status of tagging of equipment covered by extended warranties.

.6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.

.7 Respond in timely manner to oral or written notification of required construction warranty repair work.

.8 Written verification to follow oral instructions:

.1 Failure to respond will be cause for the HRCE Representative to proceed with action against Contractor.

1.13 WARRANTY TAGS

.1 Tag, at time of installation, each warranted item. Provide durable, oil- and water-resistant tag approved by the HRCE Representative.

.2 Attach tags with copper wire and spray with waterproof silicone coating.

.3 Leave date of acceptance until project is accepted for occupancy.

.4 Indicate the following information on tag:

.1 Type of product/material.

.2 Model number.

.3 Serial number.

.4 Contract number.

.5 Warranty period.

.6 Inspector's signature.

.7 Construction Contractor.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 General requirements relating to commissioning of projects components and systems, specifying general requirements to FPT of components, equipment, sub-systems, systems, and integrated systems.

.2 Related Requirements:

.1 Section 01 91 31 - Commissioning Plan.

.2 Section 01 91 33 - Commissioning Forms.

.3 Section 01 91 41 - Commissioning Training Requirements.

.3 Reference Standards:

.1 ASHRAE Guideline 1.1-2007 HVAC&R Technical Requirements for the Commissioning Process.

.2 ASHRAE Guideline 0-2005 The Commissioning Process.

.3 CAN/CSA 22.1-15 Canadian Electrical Code.

.4 NBCC-15 National Building Code of Canada.

.4 Acronyms:

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

.2 Cx - Commissioning.

.3 EMCS - Energy Monitoring and Control Systems.

.4 O&M - Operation and Maintenance.

.5 PFT Checklists - Pre-Functional Testing Checklists.

.6 FPT - Functional Performance Testing.

.7 TAB - Testing, Adjusting, and Balancing.

1.2 GENERAL

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

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

.2 Effectively train O&M staff.

.2 Contractor assists in Cx process, operating equipment and systems, troubleshooting and making adjustments as required:

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

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

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

.4 AFD managed projects the term HRCE Representative in Cx specifications to be interpreted as AFD Service Provider.

1.3 COMMISSIONING OVERVIEW

.1 For Cx responsibilities refer to Section 01 91 31 - Commissioning Plan.

.2 Cx to be a line item of Contractors cost breakdown.

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

.4 HRCE Representative will issue Interim Acceptance Certificate when:

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

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

.3 O&M training has been completed.

.5 In general, systems to be commissioned (Cx) include but are not limited to (Refer to Commissioning Plan for further scope details):

.1 Mechanical:

.1 HVAC.

.2 Controls.

.3 Inter-connection/integration of systems.

.2 Electrical:

.1 Power Distribution.

1.4 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

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

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

1.5 PRE-CX REVIEW

.1 Before Construction:

.1 Review Contract Documents, confirm by writing to HRCE Representative:

.1 Adequacy of provisions for Cx.

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

.2 During Construction:

.1 Co-ordinate provision, location, and installation of provisions for Cx.

.3 Before start of Functional Performance Testing:

.1 Have completed Cx Plan up-to-date.

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

.3 Fully understand Cx requirements and procedures.

.4 Have Cx documentation shelf-ready.

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

.6 Submit complete start-up documentation to HRCE Representative.

.7 Have Cx schedules up-to-date.

.8 Ensure As-Built system schematics are available.

.9 Inform HRCE Representative in writing when pre-functional installation verification is complete and are ready to begin Functional Performance Testing.

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

1.6 CONFLICTS

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

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

1.7 ACTION AND INFORMATIONAL SUBMITTALS

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

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

.1 Preliminary Cx task within the construction schedule.

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

.3 Submit proposed Cx procedures to HRCE Representative 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 HRCE Representative.

1.8 COMMISSIONING DOCUMENTATION

.1 Refer to Section 01 91 31 - Commissioning Plan and Section 01 91 33 - Commissioning Forms: PFT checklists and template FPT Forms for requirements and instructions for use.

.2 The HRCE Representative may request further documentation necessary for the commissioning process.

.3 Typically this will include detailed manufacturer installation and start-up, operating, troubleshooting, and maintenance procedures, full details of any owner-contracted tests, fan and pump curves, full factory testing reports, if any, and full warranty information,

including all responsibilities of the Owner to keep the warranty in force clearly identified. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the HRCE Representative.

.4 HRCE Representative to review and approve Cx documentation.

.5 Provide completed and reviewed Cx documentation to HRCE Representative.

.6 Contractor's responsibility for deviations in submittals from requirements of the Contract Documents is not relieved by the HRCE Representative's review.

1.9 COMMISSIONING SCHEDULE

.1 Provide detailed Cx schedule as part of construction:

.1 Detailed Cx schedule to be broken down by commissioned systems and their associated equipment.

.2 Detailed Cx schedule to included phasing, if applicable.

.3 Refer to Section 01 91 31 - Commissioning Plan for an example of the level of detail required for commissioning schedule.

.2 Provide adequate time for Cx activities prescribed in technical sections and commissioning sections including:

.1 Approval of Cx reports.

.2 Verification of reported results.

.3 Repairs, retesting, re-commissioning, and re-verification.

.4 Training.

1.10 COMMISSIONING MEETINGS

.1 Convene Cx meetings following project meetings.

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

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

.4 At 75% construction completion stage. HRCE Representative to call a separate Cx scope meeting to review progress, discuss schedule of equipment start-up activities, and prepare for Cx. Issues at meeting to include:

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

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

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

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

.7 Ensure Subcontractors and relevant manufacturer representatives are present at 60% and subsequent Cx meetings and as required.

1.11 STARTING AND TESTING

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

1.12 WITNESSING OF STARTING AND TESTING

.1 Provide 28 days notice prior to commencement.

.2 HRCE Representative may witness major equipment start-up and testing.

.3 HRCE Representative may be present at tests performed and documented by sub-trades, suppliers, and equipment manufacturers.

1.13 MANUFACTURER'S INVOLVEMENT

.1 Factory testing: manufacturer to:

.1 Coordinate time and location of testing.

.2 Provide testing documentation for approval by HRCE Representative.

.3 Arrange for HRCE Representative to witness tests.

.4 Obtain written approval of test results and documentation from HRCE Representative before delivery to site.

.2 Obtain manufacturers installation, start-up, and operations instructions prior to start-up of components, equipment, and systems and review with HRCE Representative:

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

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

.3 Integrity of warranties:

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

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

.4 Qualifications of manufacturers 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, and 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 PFT forms.

.2 Visual inspection of quality of installation.

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

.3 Operational testing: document equipment performance.

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

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

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

.4 Document require tests on approved FPT forms.

.5 Failure to follow accepted start-up procedures will result in re-evaluation of equipment by an independent testing agency selected by HRCE Representative. If results reveal that equipment start-up was not in accordance with requirements, and resulted in damage to equipment, implement following:

.1 Minor equipment/systems: implement corrective measures approved by HRCE Representative.

.2 Major equipment/systems: if evaluation report concludes that damage is minor, implement corrective measures approved by HRCE Representative.

.3 If evaluation report concludes that major damage has occurred, HRCE Representative shall reject equipment:

.1 Rejected equipment to be remove from site and replace with new.

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

1.15 START-UP DOCUMENTATION

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

.2 Start-up documentation to include, where applicable, but not limited to:

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

.2 Pre-start-up inspection reports.

.3 Signed installation/start-up check lists.

.4 Contractor and Manufacturer Start-up reports.

.5 TAB Report.

.6 PFT Checklists.

.7 Control verification reports.

.8 Step-by-step description of complete start-up procedures, to permit HRCE Representative to repeat start-up at any time.

1.16 OPERATION AND MAINTENANCE OF EQUIPMENT AND SYSTEMS

.1 After start-up, operate, and maintain equipment and systems as directed by equipment/system manufacturer.

.2 With assistance of manufacturer develop written maintenance program and submit HRCE Representative for approval before implementation.

.3 Operate and maintain systems for length of time required for commissioning to be completed.

.4 After completion of commissioning, operate and maintain systems until issuance of certificate of interim acceptance.

1.17 TEST RESULTS

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

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

1.18 START OF COMMISSIONING

.1 Notify HRCE Representative at least 10 days prior to start of Cx.

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

1.19 INSTRUMENTS/EQUIPMENT

.1 Submit to HRCE Representative for review and approval:

.1 Complete list of instruments proposed to be used.

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

.3 As per TAB requirements, calibration certificates to be completed within the past 3 month.

.2 Provide the following equipment as required:

.1 2-way radios.

.2 Calibrated temperature and humidity meter.

.3 Ladders.

.4 Equipment as required to complete work.

1.20 COMMISSIONING FUNCTIONAL PERFORMANCE TESTING (FPT)

.1 Carry out Cx:

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

.2 On independent systems and interacting systems.

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

.3 Follow equipment manufacturers operating instructions.

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

.5 HRCE Representative to direct and document activities and results.

.6 Address assigned issues from functional performance testing. Notify HRCE Representative once they have been addressed along with photos, so they can be verified.

1.21 WITNESSING COMMISSIONING

.1 HRCE Representative may witness activities and verify results.

1.22 AUTHORITIES HAVING JURISDICTION

.1 Where specified start-up, testing, or commissioning procedures duplicate verification requirements of Authority Having Jurisdiction, arrange for authority to witness

procedures so as to avoid duplication of tests and to facilitate expedient acceptance of facility.

.2 Obtain certificates of approval, acceptance, and compliance with rules and regulation of Authority Having Jurisdiction.

.3 Provide copies to HRCE Representative within 5 days of test and with Cx report.

1.23 COMMISSIONING CONSTRAINTS

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

1.24 EXTRAPOLATION OF RESULTS

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

1.25 EXTENT OF VERIFICATION

.1 Elsewhere:

.1 Provide manpower and instrumentation to verify up to 100% of reported results, unless specified otherwise in other sections.

.2 Number and location to be at discretion of HRCE Representative.

.3 Conduct tests repeated during verification under same conditions as original tests, using same test equipment and instrumentation.

.4 Review and repeat commissioning of systems if inconsistencies found in more than 20% of reported results.

.5 Perform additional commissioning until results are acceptable to HRCE Representative.

1.26 REPEAT VERIFICATIONS

.1 Assume costs incurred by HRCE Representative and for third and subsequent verifications where:

.1 Verification of reported results fail to receive HRCE Representative’s approval.

.2 Repetition of second verification again fails to receive approval.

.3 HRCE Representative deems Contractor’s request for second verification was premature.

1.27 SUNDRY CHECKS AND ADJUSTMENTS

.1 Make adjustments and changes which become apparent as Cx proceeds.

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

1.28 DEFICIENCIES, FAULTS, AND DEFECTS

.1 Correct deficiencies found during start-up and Cx to satisfaction of HRCE Representative.

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

1.29 COMPLETION OF COMMISSIONING

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

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

.3 Cx to be considered complete when contract Cx deliverables have been submitted and accepted by HRCE Representative.

1.30 ACTIVITIES UPON COMPLETION OF COMMISSIONING

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

1.31 TRAINING

.1 In accordance with Section 01 91 41 - Commissioning Training Requirements.

1.32 MAINTENANCE MATERIALS, SPARE PARTS, AND SPECIAL TOOLS

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

1.33 OCCUPANCY

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

1.34 INSTALLED INSTRUMENTATION

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

.1 Accuracy complies with these specifications.

.2 Calibration certificates have been deposited with HRCE Representative.

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

1.35 PERFORMANCE VERIFICATION TOLERANCES

.1 Application tolerances:

.1 Specified range of acceptable deviations of measured values from specified values or specified design criteria. Except for special areas, to be within +/- 10% of specified values.

.2 Instrument accuracy tolerances:

.1 To be of higher order of magnitude than equipment or system being tested.

.3 Measurement tolerances during verification:

.1 Unless otherwise specified actual values to be within +/- 2% of recorded values.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

.1 Enclosed is a Commissioning Plan describing requirements and processes pertaining to the commissioning process of this project. The Contractor shall cooperate during the commissioning process and provide materials and equipment as described. The attached Commissioning plan is a DRAFT; however, it represents the current commissioning process of this project.

.2 The Commissioning Plan is a living document and if changes are required, the change will be discussed with the commissioning team before the changes are incorporated. These changes will be summarized and submitted to the commissioning team for final review. The team will have two (2) weeks to provide comments or request adjustments. After this time, CxP will issue an updated version of the plan to the commissioning team for their records incorporating these changes.

.3 The plan will be in draft form until the end of the project. At this point, it will be updated with any changes to the project's commissioning process. It will be submitted to the owner for their records.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

EASTPOINT

EastPoint Project No. 382009

May 30, 2025

DRAFT COMMISSIONING PLAN – V0
INGLIS STREET ELEMENTARY SCHOOL – HEATING SYSTEM UPGRADES
5985 INGLIS ST, HALIFAX, NS B3H

Image from HRCE website: https://ise.hrce.ca/

Report Submitted to:

Halifax Regional Centre for Education

Matt Flewwelling
33 Spectacle Lake Dr,
Dartmouth, NS B3B 1X7

By:
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Table of Contents

1.0 INTRODUCTION

Commissioning is a quality assurance process to help ensure all building systems perform interactively and according to the design intent and the owner's operational requirements. Commissioning is conducted by a team independent of the design and construction teams. It provides the owner with a means to independently verify the project's planning, design, construction, and operational process. The commissioning process seeks to provide optimized energy efficiency, system maintainability, and indoor air quality.

Relevant Commissioning Guidelines/Standards:

- ASHRAE Guideline 0 – The Commissioning Process

The commissioning process, during both the design and construction phases, has the following steps:

- Establish the commissioning team
- Develop commissioning specifications
- Develop a preliminary commissioning (Cx) plan:
    - Develop: Pre-functional testing forms
    - Develop: Functional Testing Forms
    - Develop: Training Plan
    - Develop: Draft Cx Schedule
- Review contractor submittals against Cx Plan, OPR, and BOD
- Conduct and chair commissioning meetings
- Review the installing contractors pre-functional testing process and documents
- Direct the installing contractors & manufacturers' representatives through functional performance testing process
- Verify training of staff by installing contractors & manufacturers' representatives.
- Review O&M documents

1.1 DEFINITIONS

In order to understand the Commissioning Plan, the following terms have been defined. Any reference to these terms carries the stated and associated working definition outlined herein.

American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) - an American professional association seeking to advance heating, ventilation, air conditioning and refrigeration systems design and construction.

Basis of Design (BOD) - The information necessary to accomplish the owners project requirements, including system description, indoor environment quality criteria, design assumptions, and reference of applicable codes, standards, regulations and guidelines.

Commissioning Plan - Defines the scope and approach to the Total Building commissioning program that is to be executed for the project.

Commissioning Providers - The internal technical resource staff of the CxP that will be responsible for the execution of the on-site testing activities.

Commissioning Team - Personnel that will be directly involved in the building commissioning process. The commissioning team consists of the owner's representatives, CxP, Contractors, Consultants and O&M Staff.

Functional Performance Testing - Systems performance tests are specific hands-on tests, used to verify the Functional Performance Testing at the equipment and associated systems meet the specified design parameters and operate as fully integrated components or systems through their respective level of automation. This testing also confirms the capabilities of each system to meet the requirements of the facility and the Owner's Project Requirements.

Owner's Project Requirements (OPR) – A written document that details the ideas, concepts and criteria determined by the owner to be important to the success of the project.

Pre-Functional Performance Testing - Are specific hands-on tests, used to verify the non-powered Performance Testing at the equipment and associated systems meet the specified design parameters. This testing also confirms the capabilities of each system to meet the requirements of the facility and the Owner's Project Requirements.

2.0 BUILDING INFORMATION

Project Name:	**Inglis Street Elementary School – Heating System Upgrades**
Location:	**Halifax, NS**
Building Type:	**Elementary School**
School Size:	**N/A**

3.0 COMMISSIONING TEAM AND RESPONSIBILITIES

Table 1: Commissioning Team

Title	Company	Contact Name(s)	Contact Information
Operator	***(Company Name)*** ***(Company Address)***	***(First Name / Surname)***	***(Phone Number)*** ***(Email Address)***
Owner's Project Manager	**HRCE**	**Matt Flewwelling** Capital Project Manager	Phone: TBD Email: TBD
Commissioning Providers	**EastPoint**	**Keith Estey** Senior Commissioning Engineer **Michael MacDonald** Senior Commissioning Engineer	Phone: TBD Email: TBD Phone: TBD Email: TBD
Mechanical Designer	**EastPoint**	**Mike Nicholson** Mechanical Engineer	Phone: TBD Email: TBD
Electrical Designer	**EastPoint**	**Thomas Baltzer** Senior Electrical Engineer **Dyland Mason** Electrical EIT	Phone: TBD Email: TBD Phone: TBD Email: TBDa
General Contractor	TBD	TBD	TBD
Mechanical Contractor	TBD	TBD	TBD
Electrical Contractor	TBD	TBD	TBD
Controls Contractor	TBD	TBD	TBD

Table 2: Commissioning Team Responsibilities

	Design Team Lead	Owner Project Manager	Commissioning Provider	Discipline Designers	General Contractor + Subcontractors	User/Operator
Plan and schedule design meetings	☒	☒	☐	☐	☐	☒
Plan and schedule construction meetings	☐	☐	☐	☐	☒	☐
Plan and schedule site inspections and operation tests	☐	☒	☒	☐	☐	☐
Develop Commissioning plan and edit as necessary	☐	☐	☐	☒	☐	☐
Review and comment on Commissioning plan	☐	☒	☐	☐	☒	☒
Prepare Specifications	☒	☐	☒	☒	☐	☐
Review Contractor Submittals	☒	☐	☒	☒	☐	☐

	Design Team Lead	Owner Project Manager	Commissioning Provider	Discipline Designers	General Contractor + Subcontractors	User/Operator
Develop Cx Schedule	☐	☐	☒	☐	☒	☐
Develop Pre-Functional Testing Forms	☐	☐	☒	☐	☐	☐
Execute Pre-Functional Testing Forms	☐	☐	☐	☐	☒	☐
Evaluate TAB Reports	☒	☐	☒	☒	☐	☐
Organize O&M manual	☐	☐	☐	☐	☒	☐
Review O&M manuals	☒	☐	☒	☒	☐	☒
Determine requirements of operator training	☒	☒	☒	☒	☐	☐
Conduct / Witness operator training	☐	☒	☐	☐	☒	☒
Update Systems Manual	☐	☐	☐	☐	☐	☐

4.0 COMMUNICATION AND REPORTING OF THE COMMISSIONING PROCESS

The Commissioning Team shall follow the process outlined in Table 3, using this as an identification tool for proper management, communication, and reporting throughout the commissioning process. The Commissioning Team shall understand the following to ensure their responsibilities in the event an issue arises.

Table 3: Communication and reporting of the commissioning process

Issue	Process
For requests for information (RFI) or formal documentation requests.	The Commissioning Provider (CxP) goes first to the Owners Project Manager. (Copy to Construction Mgr.).
For verbal information or clarification.	The CxP goes directly to the informed party.
For notifying contractors of deficiencies.	The CxP documents deficiencies through the CxP's Issues log and notifies Owner's Project Manager/Responsible Party.
For scheduling monthly commissioning meetings	The CxP shall specify the times for monthly commissioning meetings. Typically, in concert with General progress meetings. General Contractor is ultimately responsible scheduling trades.
For scheduling systems tests or training.	The CxA can suggest times and durations for functional testing and training but scheduling the appropriate trades is ultimately the responsibility of the General Contractor.
For making requests for significant changes.	The CxP has no authority to issue change orders, this is the responsibility of the Owner's Project Manager.
Subcontractor disagreement with requests or interpretations by the CxP.	The subcontractor shall try to resolve with the CxP through review of project contract documents. If resolution is not achieved, the Owner's Project Manager shall be informed to assist resolution.

5.0 COMMISSIONING SYSTEMS

The following systems will be the list of all systems included in the Commissioning process. The following systems will be commissioned by CxP:

Mechanical Systems

- New heating distribution and terminal equipment
- Updated building controls

Electrical Systems

- Power Distribution to new equipment.

6.0 DOCUMENTATION UPDATING

The following commissioning documents listed in Table 4 are to be delivered as part of the commissioning process, and should be updated throughout the life of the building by operation and maintenance staff, especially after recommissioning has occurred and with the installation of new systems as the building ages.

Table 4: List of Commissioning Documents

List of Expected Work Products
Training Program
Commissioning Schedules
Pre-Functional and Functional Commissioning Procedures
Project Commissioning Specifications
Final Commissioning Plan
Commissioning Meeting Minutes
Site Observation Reports and Issues Logs
Functional Performance Testing Reports
Final Commissioning Issues Log (issues and resolutions)

7.0 COMMISSIONING OVERVIEW

7.1 START UP MEETING

At roughly 75% completion of construction, a start-up meeting shall be called by the Commissioning Provider to engage the mechanical and electrical disciplines. In attendance shall be the Owners Project Manager, Mechanical and Electrical Designers, general contractor representative, and all other designated subcontractors.

These meetings will review the reporting structure, lines of communication, the different parties' responsibilities, and the general schedule for site inspections, startup of equipment, and training. CxP will use this opportunity to go through the Commissioning Schedule in detail and update it using the input from the project team. An example commissioning schedule that can be utilized by the Construction team is included in **Appendix A**.

The desired outcome of these meetings is that all involved parties have a good understanding of the commissioning process and their individual responsibilities.

Minutes from these meetings will be included in **Appendix B** when the plan is finalized at the end of the project.

7.2 COMMISSIONING PLAN

Following the Start Up commissioning meeting, the Commissioning Provider will update the commissioning plan. The commissioning schedule that was discussed during the Start Up meeting will be added to the plan. It will then be submitted for approval by the Owners Project Manager. The Commissioning Plan is a live document and can be updated throughout the Commissioning procedure. Each time the Commissioning Plan is updated it must be submitted for the Owner's Approval and then distributed among the Commissioning Team members.

7.3 SUBMITTALS

The Commissioning Provider shall provide the General Contractor and all subcontractors responsible for commissioned equipment with a list of the documentation required for the commissioning process. This list will be delivered through the Owners Project Manager.

The data required for Commissioning Provider review is typically similar to the requirements of the Designers. It will include installation and startup procedures, O&M data, performance data and controls drawings. The Commissioning Provider will review the documents to ensure they meet the requirements of the basis of design and commissioning related items mentioned in the contract documents. The Commissioning Provider reviews for energy efficiency, system operability and maintainability and compliance with the Owner's Project Requirements.

The recommendations from these reviews will be formally documented by the Commissioning Provider and will be forwarded to the Owner's Project Manager.

7.4 SITE MEETINGS / REVIEW

The Commissioning Provider will suggest times for the Project Commissioning Meetings as required. These meetings will be scheduled by the Owners Project Manager or General Contractor.

At these meetings, the General Contractor will have the opportunity to report on the construction progress as it relates to commissioning and share any information that will affect the commissioning schedule or equipment / systems to be commissioned. CxP will use this opportunity to update the commissioning status. CxP will chair and minute these meetings.

Any deficiencies will be documented in the CxP issues log, which an example of the log can be found in **Appendix C**.

7.5 PRE-FUNCTIONAL TESTING

Prior to the startup of the equipment, all shall be inspected, and the correct installation be verified by the installing contractor by filling out appropriate pre-functional checklists and provision of required sign-off reports. This is done to reduce delays and damage during initial startup. There is to be no sampling at this step (100% sampling rate). The Commissioning Provider does not need to be present during each test and has the right to inspect a sample of equipment of their choosing.

All deficiencies are to be recorded and corrected before Startup check and ultimately Functional Performance testing can begin.

Sample forms can be found in **Appendix D.**

7.6 START-UP CHECK

The startup check is the checkpoint to ensure each specific piece of equipment is operating independently as designed. The completion of this phase will be denoted by a fully filled set of Pre-Functional Commissioning forms along with all prerequisite contractor documentation provided.

All deficiencies are to be recorded and corrected prior to commencing Functional Performance Testing.

7.7 FUNCTIONAL PERFORMANCE TESTING (FPT)

The Functional Test is not only the testing of each piece of equipment but is also a check that the pieces of equipment together produce the proper final result.

The Commissioning Provider is not responsible for coordinating the functional tests but will give suggestions. It is ultimately the responsibility of the General Contractor to schedule these tests

It is the responsibility of the Commissioning Provider to document all results of the Functional Performance Tests. Any deficiencies are to be corrected by the subcontractor and retesting will be scheduled by the General Contractor, if required. Any disputes regarding the requirement of retesting between the Commissioning Provider and the subcontractor shall be handled by the Owner's Project Manager.

Following the General Contractor and all subcontractors FPT and are satisfied with system operations the Owners Project Manager is to be notified.

An example FPT form can be found in **Appendix E**. Once the controls shop drawings are reviewed by the consultant team, the CxP will develop all of the testing procedures and provide them to the team for review.

7.8 TRAINING

The CxP and the Owners Project Manager will determine all systems for which formalized training is required. This will happen during the design phase. CxP will then develop the Operator Training signoff forms to be approved by the Owners Project Manager with all stakeholders input. The training package will then be provided to the general contractor for execution. An example training plan and sign off forms can be found in **Append F**.

Appendix A – Example Commissioning Schedule

Description	Area/Floor	Location	Phase	Installation Complete	Static/Dynamic Reviews Complete	Start-up Complete	Balancing Complete	Controls Verification Complete	Ready for CxA Testing (i.e, No Open Issues)	Pre-Functional Review Complete (Cx Documentation, Installation Verification)	Functional Performance Testing Complete	FPT Issue Reports Submitted	Cx Issues Resolved	Training Complete	Handover Complete (Systems Manual, Seasonal/Deferred Testing, Warranty Review)	Comments
Responsibility				(Contractor)	(Contractor)	(Contractor / OEM)	(Contractor)	(Contractor)	(Contractor)	(EastPoint)	(EastPoint)	(EastPoint)	(Contractor)	(Contractor / OEM)	(EastPoint)	
Ventilation																
Heating																
Plumbing																

EASTPOINT

Description	Area/Floor	Location	Phase	Installation Complete	Static/Dynamic Reviews Complete	Start-up Complete	Balancing Complete	Controls Verification Complete	Ready for CxA Testing (i.e, No Open Issues)	Pre-Functional Review Complete (Cx Documentation, Installation Verification)	Functional Performance Testing Complete	FPT Issue Reports Submitted	Cx Issues Resolved	Training Complete	Handover Complete (Systems Manual, Seasonal/Deferred Testing, Warranty Review)	Comments
Fire Protection																
Electrical																
Responsibility																
Panels																
Distribution																

Appendix B – Commissioning Meeting Minutes

PROJECT MANAGEMENT SYSTEM

EP Project No: _____
EP Project Title: _____
EP Project Manager: _____

Client Project No: _____
Client Name: _____
Client Contact: _____

Attachments: _____

Meeting Name: _____
Meeting #: _____

Meeting Date: _____
Start Time: _____
End Time: _____
Timezone: _____
Meeting Location: _____

Scheduled Attendees:

Person	Company	Phone	Email	Present	Absent	Minutes Approval Requested?	Minutes Approved?	Minutes Comments
Michael MacDonald	EastPoint			☐	☐	No	N/A	
Keith Estey	EastPoint			☐	☐	No	N/A	
				☐	☐	No	N/A	
				☐	☐	No	N/A	
				☐	☐	No	N/A	
				☐	☐	No	N/A	
				☐	☐			
				☐	☐			
				☐	☐			
				☐	☐			
				☐	☐			
				☐	☐			

Agenda:

1- INTRODUCTION

	Agenda #	Meeting Origin	Title	Assignment	Due Date	Priority	Status	Old/New?
	1.1	1	General Safety Reminders	Keith Estey	5/1/2023	High	Closed	Old

PROJECT MANAGEMENT SYSTEM

EP Project No: _____
EP Project Title: _____
EP Project Manager: _____

Client Project No: _____
Client Name: _____
Client Contact: _____

Attachments: _____

Meeting Name: _____
Meeting #: _____

Meeting Date: _____
Start Time: _____
End Time: _____
Timezone: _____
Meeting Location: _____

Scheduled Attendees:

Official Documented Meeting Minutes:								
	1.2	2	Housekeeping	Information Only	6/1/203	Low	Open	Old
	1.3	3	Safety Observations	Information Only	7/1/203	Medium	Open	New

2- COMMISSIONING SCHEDULE

	Agenda #	Meeting Origin	Title	Assignment	Due Date	Priority	Status	Old/New?
	2.1		General Safety Reminders	Keith Estey	5/1/2023	High	Closed	Old
	2.2		General Safety Reminders	Keith Estey	5/1/2023	High	Closed	Old

EASTPOINT ENGINEERING

PROJECT MANAGEMENT SYSTEM

EP Project No: _____
EP Project Title: _____
EP Project Manager: _____

Client Project No: _____
Client Name: _____
Client Contact: _____

Attachments: _____

Meeting Name: _____
Meeting #: _____

Meeting Date: _____
Start Time: _____
End Time: _____
Timezone: _____
Meeting Location: _____

Scheduled Attendees:

	2.3		General Safety Reminders	Keith Estey	5/1/2023	High	Closed	Old
	2.3		General Safety Reminders	Keith Estey	5/1/2023	High	Closed	Old

3- INSTALLATION VERIFICATION (INCL. CX SOFTWARE)

	Agenda #	Meeting Origin	Title	Assignment	Due Date	Priority	Status	Old/New?
	3.1			Information Only				
	3.2		General Safety Reminders	Keith Estey	5/1/2023	High	Closed	Old
	3.3		General Safety Reminders	Keith Estey	5/1/2023	High	Closed	Old

PROJECT MANAGEMENT SYSTEM

EP Project No: _____
EP Project Title: _____
EP Project Manager: _____

Client Project No: _____
Client Name: _____
Client Contact: _____

Attachments: _____

Meeting Name: _____
Meeting #: _____

Meeting Date: _____
Start Time: _____
End Time: _____
Timezone: _____
Meeting Location: _____

Scheduled Attendees:

4- FUNCTIONAL PERFORMANCE TESTING

	Agenda #	Meeting Origin	Title	Assignment	Due Date	Priority	Status	Old/New?
	4.1		General Safety Reminders	Keith Estey	5/1/2023	High	Closed	Old
	4.2		General Safety Reminders	Keith Estey	5/1/2023	High	Closed	Old
	4.3		General Safety Reminders	Keith Estey	5/1/2023	High	Closed	Old

EASTPOINT ENGINEERING

PROJECT MANAGEMENT SYSTEM

EP Project No: _____
EP Project Title: _____
EP Project Manager: _____

Client Project No: _____
Client Name: _____
Client Contact: _____

Attachments: _____

Meeting Name: _____
Meeting #: _____

Meeting Date: _____
Start Time: _____
End Time: _____
Timezone: _____
Meeting Location: _____

Scheduled Attendees:

5- INTEGRATED SYSTEMS TESTING (CAN/ULC-S1001)

	Agenda #	Meeting Origin	Title	Assignment	Due Date	Priority	Status	Old/New?
	4.1		General Safety Reminders	Keith Estey	5/1/2023	High	Closed	Old
	4.2		General Safety Reminders	Keith Estey	5/1/2023	High	Closed	Old
	4.3		General Safety Reminders	Keith Estey	5/1/2023	High	Closed	Old

6- COMMISSIONING ISSUES LOG

	Agenda #	Meeting Origin	Title	Assignment	Due Date	Priority	Status	Old/New?
	6.1		General Safety Reminders	Keith Estey	5/1/2023	High	Closed	Old

PROJECT MANAGEMENT SYSTEM

EP Project No: _____
EP Project Title: _____
EP Project Manager: _____

Client Project No: _____
Client Name: _____
Client Contact: _____

Attachments: _____

Meeting Name: _____
Meeting #: _____

Meeting Date: _____
Start Time: _____
End Time: _____
Timezone: _____
Meeting Location: _____

Scheduled Attendees:

	6.2		General Safety Reminders	Keith Estey	5/1/2023	High	Closed	Old
	6.3		General Safety Reminders	Keith Estey	5/1/2023	High	Closed	Old

7- TRAINING

	Agenda #	Meeting Origin	Title	Assignment	Due Date	Priority	Status	Old/New?
	7.1		General Safety Reminders	Keith Estey	5/1/2023	High	Closed	Old
	7.2		General Safety Reminders	Keith Estey	5/1/2023	High	Closed	Old

PROJECT MANAGEMENT SYSTEM

EP Project No: _____
EP Project Title: _____
EP Project Manager: _____

Client Project No: _____
Client Name: _____
Client Contact: _____

Attachments: _____

Meeting Name: _____
Meeting #: _____

Meeting Date: _____
Start Time: _____
End Time: _____
Timezone: _____
Meeting Location: _____

Scheduled Attendees:

	7.3		General Safety Reminders	Keith Estey	5/1/2023	High	Closed	Old

8- GENERAL

	Agenda #	Meeting Origin	Title	Assignment	Due Date	Priority	Status	Old/New?
	8.1		General Safety Reminders	Keith Estey	5/1/2023	High	Closed	Old
	8.2		General Safety Reminders	Keith Estey	5/1/2023	High	Closed	Old
	8.3		General Safety Reminders	Keith Estey	5/1/2023	High	Closed	Old

PROJECT MANAGEMENT SYSTEM

EP Project No: _____
EP Project Title: _____
EP Project Manager: _____

Client Project No: _____
Client Name: _____
Client Contact: _____

Attachments: _____

Meeting Name: _____
Meeting #: _____

Meeting Date: _____
Start Time: _____
End Time: _____
Timezone: _____
Meeting Location: _____

Scheduled Attendees:

SHOULD ANY DISCREPANCIES OR INCONSISTENCIES BE NOTED, NOTIFY THE UNDERSIGNED IN WRITING WITHIN 5 (FIVE) WORKING DAYS OF RECEIVING THESE MINUTES. IF NO NOTIFICATIONS ARE RECEIVED AND/OR RECORDED, ALL SHALL DEEM THE MINUTES ACCEPTABLE.

MINUTES WRITTEN BY:

_____ _____ DATE: _____

(PRINTED - NAME & TITLE) (SIGNATURE)

Appendix C – Pre-Functional Testing Forms

Pre-Functional Performance Testing Forms - Electrical

Disconnects

Project / 1st Floor / Div. 26 Electrical

Disconnect Switch

Not Started

Design	Proposed	Final	Units

DISCONNECTS WORK

Sign-Off

When the assigned party (or parties) has verified that all items on the associated checklist have been completed, they are to sign/date this form.

Name:	Title/Role:	Company:	Date Completed:
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Not Started

Assigned to Keith.Estey@eastpoint.ca
Created by Keith.Estey@eastpoint.ca on 5/28/2025 2:32:28 PM

Pre-Functional Checklists

Verify the following

Verify	Pass	Fail	N/A	Notes
General Installation:	----	----	----	----
Verify All Equipment Is Identified With Lamicoid Nameplates	☐	☐	☐	----
Provision For Locking In Off Position	☐	☐	☐	----
Accessories As Shown On Drawing	☐	☐	☐	----
Cable Lugs Torqued	☐	☐	☐	----
Cleaned and free from damage	☐	☐	☐	----
Adequate Clearance In Front	☐	☐	☐	----
Sufficient Service Access	☐	☐	☐	----
----	----	----	----	----
Operational Check:	☐	☐	☐	----

Pre-Functional Performance Testing Forms - Electrical

Verify	Pass	Fail	N/A	Notes
Verify Operates As Per Manufacturers Test (Attach)	☐	☐	☐	----
Adjust Circuit Breakers To Minimum Setting In Accordance With Manufacturers Recommendations	☐	☐	☐	----
Verify The Disconnecting Means On Combination Starters Operate As Expected	☐	☐	☐	----
Verify The Connected Load Is Operating As Expected (I.E. Rotation)	☐	☐	☐	----
Vendor startup report completed and reported issued (attached?)	☐	☐	☐	----
Verify Pilot Lights Are Operational Of The Proper Color	☐	☐	☐	----
Overload Field Adjustments	☐	☐	☐	----
MCP Field Adjustments	☐	☐	☐	----
Fed From Breaker/Fuse Size_____ (As Specified)	☐	☐	☐	----
Panel Feeding_____ (As Specified)	☐	☐	☐	----
Proper Grounding Installed For Components And Unit	☐	☐	☐	----
Safeties In Place, Set And Operable	☐	☐	☐	----
All Building Control System Interlocks Hooked Up With Packaged Controls or Design Sequences And Functional	☐	☐	☐	----
Manual speed control functional	☐	☐	☐	----
Bypass functional w/ correct fan rotation?	☐	☐	☐	----
----	----	----	----	----
Field Measurements:	☐	☐	☐	----
Voltage	☐	☐	☐	----
L1-L2_____	----	----	----	----
L2-L3_____	----	----	----	----
L1-L3_____	----	----	----	----
Current	☐	☐	☐	----
L1_____	----	----	----	----
L2_____	----	----	----	----
L3_____	----	----	----	----

Not Started

Assigned to Keith.Estey@eastpoint.ca

Created by Keith.Estey@eastpoint.ca on 5/28/2025 2:36:50 PM

Distribution Panels

Project / 1st Floor / Div. 26 Electrical

Panelboards

Not Started

Design	Proposed	Final	Units

DISTRIBUTION PANELS WORK

Sign-Off

When the assigned party (or parties) has verified that all items on the associated checklist have been completed, they are to sign/date this form.

Name:	Title/Role:	Company:	Date Completed:
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Not Started

Assigned to Keith.Estey@eastpoint.ca
Created by Keith.Estey@eastpoint.ca on 5/28/2025 2:32:29 PM

Pre-Functional Checklists

Verify the following

Verify	Pass	Fail	N/A	Notes
Equipment installed per manufacturer's instructions and specifications voltage drop, per manufacturer recommendations.	☐	☐	☐	----
All circuit breakers, lock devices installed and sized as specified	☐	☐	☐	----
Have load balance checks been completed by contractor and been accepted?	☐	☐	☐	----
Panel fillers installed	☐	☐	☐	----
Surge devices installed as specified	☐	☐	☐	----
Wiring roughed in and terminated.	☐	☐	☐	----
All bolts torqued as specified	☐	☐	☐	----
Panel keys supplied to operator or located with panel	☐	☐	☐	----
Verify circuit breakers supplying emergency, exit, fire alarm, sprinkler system, and night lighting are labelled and installed as specified	☐	☐	☐	----

Pre-Functional Performance Testing Forms - Electrical

Verify	Pass	Fail	N/A	Notes
Permanent labels affixed using lamicoid nameplates showing panel number, voltage and phase characteristics or as specified	☐	☐	☐	----
CSA arc flash labels are installed	☐	☐	☐	----
All equipment attached to walls and ceiling/floor and shall be held firmly in place, plumb true and square to adjoining surfaces.	☐	☐	☐	----
Maintenance access acceptable for unit and components	☐	☐	☐	----
Clean up of equipment completed per contract documents	☐	☐	☐	----
A typed panel schedule placed under a transparent cover located in each panel.	☐	☐	☐	----
Water shedding shields installed in sprinklered building	☐	☐	☐	----
Neutral conductors connected to common ground bus with neutral identified	☐	☐	☐	----
Cables installed in walls to be EMT or as specified	☐	☐	☐	----
Megger test completed (attached)?	☐	☐	☐	----
GFCI breakers, if applicable, operate correctly.	☐	☐	☐	----

Not Started

Assigned to Keith.Estey@eastpoint.ca

Created by Keith.Estey@eastpoint.ca on 5/28/2025 2:37:21 PM

Variable Frequency Drives

Project / 1st Floor / Div. 26 Electrical

VFDs (Elec Dist)

Not Started

Design	Proposed	Final	Units

VARIABLE FREQUENCY DRIVES WORK

Sign-Off

When the assigned party (or parties) has verified that all items on the associated checklist have been completed, they are to sign/date this form.

Name:	Title/Role:	Company:	Date Completed:
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Not Started

Assigned to Keith.Estey@eastpoint.ca

Created by Keith.Estey@eastpoint.ca on 5/28/2025 2:32:29 PM

Documentation

Documentation

Verify	Pass	Fail	N/A	Notes
Contractor to ensure correct equipment Manufacturer is installed.	☐	☐	☐	----
Contractor to ensure correct equipment Model is installed. (Attach picture of nameplate if accessible or fill in fields below)	☐	☐	☐	----
Installed equipment model number:	☐	☐	☐	----
Installed equipement serial number:	☐	☐	☐	----
Does the installed equipment match the requirements of the approved shop drawings and contract documents?	☐	☐	☐	----
Has the Installation and startup manual been provided?	☐	☐	☐	----
Have factory tests results been received and reviewed?	☐	☐	☐	----
----	☐	☐	☐	----

Pre-Functional Performance Testing Forms - Electrical

Not Started
Assigned to Keith.Estey@eastpoint.ca
Created by Keith.Estey@eastpoint.ca on 5/28/2025 2:32:47 PM

Pre-Functional Checklists

Installer - When contractor has verified all items on the pre-functional checklist, set overall status to 'Complete', indicating the system is ready for functional performance testing.

Verify	Pass	Fail	NA	Notes
Unit secured as required by manufacturer and specifications	☐	☐	☐	----
Adequate clearance around unit for service	☐	☐	☐	----
All components are accessible for maintenance	☐	☐	☐	----
Drive to motor leads are in grounded metal conduit	☐	☐	☐	----
All electrical connections are tight	☐	☐	☐	----
All electrical components are grounded	☐	☐	☐	----
Unit labeled and is easy to see	☐	☐	☐	----
Overloads are set	☐	☐	☐	----
Correct rotation	☐	☐	☐	----
Manual Speed control functional	☐	☐	☐	----
bypass functional w/ correct rotation	☐	☐	☐	----
Local and remote switch operates.	☐	☐	☐	----
Startup is complete and report has been submitted (attached)	☐	☐	☐	----

Not Started
Assigned to Keith.Estey@eastpoint.ca
Created by Keith.Estey@eastpoint.ca on 5/28/2025 2:37:45 PM

Pre-Functional Checklists

Controls - When contractor has verified all items on the pre-functional checklist, set overall status to 'Complete', indicating the system is ready for functional performance testing.

Verify	Pass	Fail	NA	Notes
Control panel accessible and labeled properly	☐	☐	☐	----
Low voltage control signals are shielded and in own conduit	☐	☐	☐	----
Auxiliary safeties (F/A shutdown, etc.) are installed and operational	☐	☐	☐	----
Point to point checks completed	☐	☐	☐	----
Sequencing has been checked against design documents and are complete	☐	☐	☐	----

Not Started
Assigned to Keith.Estey@eastpoint.ca
Created by Keith.Estey@eastpoint.ca on 5/28/2025 2:37:45 PM

Pre-Functional Checklists

Supplier - When contractor has verified all items on the pre-functional checklist, set overall status to 'Complete', indicating the system is ready for functional performance testing.

Verify	Pass	Fail	NA	Notes
Unit is free from physical damage	☐	☐	☐	----
All components present	☐	☐	☐	----
Installation and startup manual provided	☐	☐	☐	----
Wiring schematics (electrical & controls) for this application attached	☐	☐	☐	----
Unit tags affixed	☐	☐	☐	----
Manufacturer's ratings readable/accurate	☐	☐	☐	----
Unit labeled and is easy to see	☐	☐	☐	----
Wiring schematic inside enclosure and includes bypass section	☐	☐	☐	----

Not Started
Assigned to Keith.Estey@eastpoint.ca
Created by Keith.Estey@eastpoint.ca on 5/28/2025 2:37:45 PM

Pre-Functional Performance Testing Forms - Mechanical

Expansion Tanks

Project / 1st Floor / Div. 23 HVAC

Expansion Tank

Not Started

Design	Proposed	Final	Units

EXPANSION TANKS WORK

Sign-Off

When the assigned party (or parties) has verified that all items on the associated checklist have been completed, they are to sign/date this form.

Name:	Title/Role:	Company:	Date Completed:
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Not Started

Assigned to Keith.Estey@eastpoint.ca
Created by Keith.Estey@eastpoint.ca on 5/28/2025 2:32:28 PM

Documentation

Documentation

Verify	Pass	Fail	N/A	Notes
Contractor to ensure correct equipment Manufacturer is installed.	☐	☐	☐	----
Contractor to ensure correct equipment Model is installed. (Attach picture of nameplate if accessible or fill in fields below)	☐	☐	☐	----
Installed equipment model number:	☐	☐	☐	----
Installed equipement serial number:	☐	☐	☐	----
Does the installed equipment match the requirements of the approved shop drawings and contract documents?	☐	☐	☐	----
Has the Installation and startup manual been provided?	☐	☐	☐	----
Have factory tests results been received and reviewed?	☐	☐	☐	----
----	☐	☐	☐	----

Not Started
Assigned to Keith.Estey@eastpoint.ca
Created by Keith.Estey@eastpoint.ca on 5/28/2025 2:32:47 PM

Pre-Functional Checklists

Mechanical Contractor - Once pre-fucntional testing checklist is complete, change checklist from in progress to complete

Verify	Pass	Fail	N/A	Notes
Level gauge Installed, if specified.	☐	☐	☐	----
Pressure relief installed.	☐	☐	☐	----
Drain installed.	☐	☐	☐	----
Presure gauge installed, if specified.	☐	☐	☐	----
Piping supports installed.	☐	☐	☐	----
Isolation valves installed.	☐	☐	☐	----
Tank installed as per project drawings and details.	☐	☐	☐	----
Sufficient access for maintenance.	☐	☐	☐	----
Compressed air connection installed and accessible, if applicable.	☐	☐	☐	----

Not Started
Assigned to Keith.Estey@eastpoint.ca
Created by Keith.Estey@eastpoint.ca on 5/28/2025 2:33:04 PM

Heat Exchangers

Project / 1st Floor / Div. 23 HVAC

Heat Exchanger

Not Started

Design	Proposed	Final	Units

HEAT EXCHANGERS WORK

Sign-Off

When the assigned party (or parties) has verified that all items on the associated checklist have been completed, they are to sign/date this form.

Name:	Title/Role:	Company:	Date Completed:
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Not Started

Assigned to Keith.Estey@eastpoint.ca
Created by Keith.Estey@eastpoint.ca on 5/28/2025 2:32:28 PM

Documentation

Documentation

Verify	Pass	Fail	N/A	Notes
Contractor to ensure correct equipment Manufacturer is installed.	☐	☐	☐	----
Contractor to ensure correct equipment Model is installed. (Attach picture of nameplate if accessible or fill in fields below)	☐	☐	☐	----
Installed equipment model number:	☐	☐	☐	----
Installed equipement serial number:	☐	☐	☐	----
Does the installed equipment match the requirements of the approved shop drawings and contract documents?	☐	☐	☐	----
Has the Installation and startup manual been provided?	☐	☐	☐	----
Have factory tests results been received and reviewed?	☐	☐	☐	----
----	☐	☐	☐	----

Pre-Functional Performance Testing Forms - Mechanical

Not Started

Assigned to Keith.Estey@eastpoint.ca
Created by Keith.Estey@eastpoint.ca on 5/28/2025 2:32:46 PM

Pre-Functional Checklists

Mechanical - When contractor has verified all items on the pre-functional checklist, set overall status to 'Complete', indicating the system is ready for functional performance testing.

Verify	Pass	Fail	N/A	Notes
General appearance good, no apparent damage	☐	☐	☐	----
Installation is per manufacturer's instructions	☐	☐	☐	----
Piping installed per the drawings and details	☐	☐	☐	----
Verified that valves for equipment isolation have been provided per the drawings and specs	☐	☐	☐	----
Piping, fittings, valves and equipment properly supported and seismically anchored per the details	☐	☐	☐	----
Equipment label permanently affixed	☐	☐	☐	----
Pipes are supported independently of the heat exchanger	☐	☐	☐	----
Provisions in place for expansion compensation	☐	☐	☐	----
Piping, fittings and valves insulated per specification	☐	☐	☐	----
In-line equipment insulated per specification	☐	☐	☐	----
In-line equipment labeled per specification with flows indicated in the correct direction	☐	☐	☐	----
Heat Exchanger pressure tested per manufacturers recommendations.	☐	☐	☐	----
Heat Exchanger properly flushed and cleaned per manufacturers recommendations (report attached)	☐	☐	☐	----
Heat exchanger detail checked against the drawings and all devices gages and appurtenances are in place	☐	☐	☐	----
Strainers and low-point drains opened and verified to be clean	☐	☐	☐	----
Construction strainers removed	☐	☐	☐	----
Test plugs (P/T) installed near all control sensors and as per spec	☐	☐	☐	----
Chemical treatment system or plan installed	☐	☐	☐	----
No leaking apparent	☐	☐	☐	----
Air vents and bleeds at high points of systems functional	☐	☐	☐	----
Isolation valves and balancing valves installed	☐	☐	☐	----
Adequate maintenance clearance is provided	☐	☐	☐	----
Valve installation per manufacturer's instructions	☐	☐	☐	----
Manual isolation valves checked for proper seal and found to travel freely	☐	☐	☐	----
Valves installed in proper direction	☐	☐	☐	----
Valves tagged and valve schedule submitted and displayed as required	☐	☐	☐	----

Verify	Pass	Fail	N/A	Notes
Adequate maintenance clearance is provided for valves and they are accessible	☐	☐	☐	----
Unions installed to allow for easy removal of control valves	☐	☐	☐	----
Temperature, pressure and flow gauges and sensors installed	☐	☐	☐	----
----	☐	☐	☐	----

Not Started
Assigned to Keith.Estey@eastpoint.ca
Created by Keith.Estey@eastpoint.ca on 5/28/2025 2:33:25 PM

Pre-Functional Checklists

Test and Balance - When contractor has verified all items on the pre-functional checklist, set overall status to 'Complete', indicating the system is ready for functional performance testing.

Verify	Pass	Fail	N/A	Notes
Flow Rate measure and recorded, gpm	☐	☐	☐	----
Inlet pressure (ft) / Outlet pressure (ft) measured and recorded	☐	☐	☐	----
All measurements recorded in balancing report and submitted for approval	☐	☐	☐	----

Not Started
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Pre-Functional Checklists

Controls - When contractor has verified all items on the pre-functional checklist, set overall status to 'Complete', indicating the system is ready for functional performance testing. General Installation

Verify	Pass	Fail	N/A	Notes
Wiring labeled inside panels for this piece of euqipment	☐	☐	☐	----
Controlled components for this piece of equipment, labeled/tagged	☐	☐	☐	----
BAS connection made to labeled terminal(s) as shown on drawings	☐	☐	☐	----
Shielded wiring used on electronic sensors as needed per device and equipment manufacturer's specifications.	☐	☐	☐	----
Piping gauges, BAS and associated panel temperature and pressure readouts match.	☐	☐	☐	----
Control valves provided and installed as per contract documents.	☐	☐	☐	----
Valves stroke fully and easily and spanning is calibrated (see calibration section below)	☐	☐	☐	----
Equipment alarms are programmed within the graphics as specified	☐	☐	☐	----
All user adjustable set points and schedules are operable directly from the interface for this equipment (not just in programming screens)	☐	☐	☐	----

Verify	Pass	Fail	N/A	Notes
Graphics complete per owner approved drafts for this piece of equipment.	☐	☐	☐	----
Integration with other equipment is complete, tested, and points are verified as per specifications.	☐	☐	☐	----
Controls point to point verification complete and documented	☐	☐	☐	----

Not Started
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Heating piping

Project / 1st Floor / Div. 23 HVAC

Heating Water Piping

Not Started

Design	Proposed	Final	Units

HEATING PIPING WORK

Sign-Off

When the assigned party (or parties) has verified that all items on the associated checklist have been completed, they are to sign/date this form.

Name:	Title/Role:	Company:	Date Completed:
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Not Started

Assigned to Keith.Estey@eastpoint.ca
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Pre-Functional Checklists

Mechanical - When contractor has verified all items on the pre-functional checklist, set overall status to 'Complete', indicating the system is ready for functional performance testing.

Verify	Pass	Fail	N/A	Notes
Piping is clean and free of damage prior to installation.	☐	☐	☐	----
Piping is free to expand and contract without noise or damage to hangers, joints, or the building.	☐	☐	☐	----
Piping is installed with sufficient pitch and arranged in a manner to ensure drainage and venting of the entire system.	☐	☐	☐	----
Manual air vents are provided at high points in closed water systems.	☐	☐	☐	----
Changes in pipe sizes are made with the proper size reducing fittings, reducing fittings, reducing elbow or reducing tees as specified.	☐	☐	☐	----
All piping supports and hangers meet criteria set in the construction documents.	☐	☐	☐	----
All fittings meet specification requirements.	☐	☐	☐	----
All equipment requiring maintenance is accessible (valves, junction boxes, etc.).	☐	☐	☐	----
Piping does not block access to equipment that is part of this system or another system (e.g., terminal units).	☐	☐	☐	----

Pre-Functional Performance Testing Forms - Mechanical

Verify	Pass	Fail	N/A	Notes
Piping is installed in a manner to ensure that insulation will not contact adjacent surfaces.	☐	☐	☐	----
All pipe openings are temporarily sealed to maintain piping system cleanliness.	☐	☐	☐	----
Record drawings have been updated to reflect any changes made.	☐	☐	☐	----
Nipples are made of the same material as the pipe.	☐	☐	☐	----
Connections between copper and steel pipes are made with dielectric fittings, where applicable.	☐	☐	☐	----
A union is provided ahead of each screwed valve, trap, or strainer, and on each side of each piece of equipment and whatever needed to dismantle piping, where applicable.	☐	☐	☐	----
Mechanical coupling if used is only used for piping and locations as described in the construction documents.	☐	☐	☐	----
The water system is installed with high pressure fittings, flanges and unions, or as specified.	☐	☐	☐	----
Auxiliary drain valves are provided at all low points in hose bib piping to facilitate seasonal draining.	☐	☐	☐	----
Strainers and low-point drains opened and verified to be clean.	☐	☐	☐	----
Construction strainers removed.	☐	☐	☐	----
Test plugs (P/T) installed near all control sensors and as per spec.	☐	☐	☐	----
Piping system properly flushed and cleaned and temporary piping removed.	☐	☐	☐	----
Piping pressure tested according to contract documents.	☐	☐	☐	----
Chemical treatment system or plan installed.	☐	☐	☐	----
No leaking apparent.	☐	☐	☐	----
ASME pressure vessel data sheet or certification tag posted and inspection complete for each expansion tank.	☐	☐	☐	----
Expansion tanks verified to not be air bound and system completely full of water. System completed purged of air	☐	☐	☐	----
Air vents and bleeds at high points of systems functional.	☐	☐	☐	----
Isolation valves provided at all branches and main takeoffs to facilitate isolation (as required by contract).	☐	☐	☐	----
Valve installation per manufacturer’s instructions.	☐	☐	☐	----
Valve manufacturer labels permanently affixed.	☐	☐	☐	----
Manual isolation valves checked for proper seal and found to travel freely.	☐	☐	☐	----
Valves installed in proper direction.	☐	☐	☐	----
Valves stroke fully and easily.	☐	☐	☐	----
Valves that require a positive shut-off are verified to not be leaking when closed at normal operating pressure.	☐	☐	☐	----
Valves tagged and valve schedule submitted and displayed as required.	☐	☐	☐	----
Chains and extended handles for valve actuation provided per specifications.	☐	☐	☐	----
Installation of system and balancing devices allowed balancing to be completed following specified NEBB or AABC procedures and contract documents.	☐	☐	☐	----
Piping insulation is installed as per contract documents.	☐	☐	☐	----
Pipes properly labelled as per contract documents.	☐	☐	☐	----

Pre-Functional Performance Testing Forms - Mechanical

Not Started

Assigned to Keith.Estey@eastpoint.ca

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Pumps

Project / 1st Floor / Div. 23 HVAC

Pumps

Not Started

Design	Proposed	Final	Units

PUMPS WORK

Sign-Off

When the assigned party (or parties) has verified that all items on the associated checklist have been completed, they are to sign/date this form.

Name:	Title/Role:	Company:	Date Completed:
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Not Started

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Documentation

Documentation

Verify	Pass	Fail	N/A	Notes
Contractor to ensure correct equipment Manufacturer is installed.	☐	☐	☐	----
Contractor to ensure correct equipment Model is installed. (Attach picture of nameplate if accessible or fill in fields below)	☐	☐	☐	----
Installed equipment model number:	☐	☐	☐	----
Installed equipement serial number:	☐	☐	☐	----
Does the installed equipment match the requirements of the approved shop drawings and contract documents?	☐	☐	☐	----
Has the Installation and startup manual been provided?	☐	☐	☐	----
Have factory tests results been received and reviewed?	☐	☐	☐	----
----	☐	☐	☐	----

Pre-Functional Performance Testing Forms - Mechanical

Not Started
Assigned to Keith.Estey@eastpoint.ca
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Pre-Functional Checklists

Mechanical - When contractor has verified all items on the pre-functional checklist, set overall status to 'Complete', indicating the system is ready for functional performance testing.

Verify	Pass	Fail	N/A	Notes
Unit is free from physical damage.	☐	☐	☐	----
All components present as identified in pump detail and specifications, or approved equivalents (e.g. isolation valves, suction diffusers, triple duty valve, pressure gauges, etc.).	☐	☐	☐	----
Unit tags affixed.	☐	☐	☐	----
Manufacturer’s ratings readable/accurate.	☐	☐	☐	----
Unit secured and mounted as required by manufacturer, details, and specifications.	☐	☐	☐	----
Adequate clearance around unit for service.	☐	☐	☐	----
All components accessible for maintenance.	☐	☐	☐	----
Unit can be removed from building.	☐	☐	☐	----
Unit labeled and is easy to see.	☐	☐	☐	----
Piping arranged for ease of unit removal.	☐	☐	☐	----
Piping supported as required by specifications.	☐	☐	☐	----
Piping is clean.	☐	☐	☐	----
Piping insulation complete and installed as per specifications.	☐	☐	☐	----
All valves and test ports are easily accessible.	☐	☐	☐	----
Valve tags attached, if required.	☐	☐	☐	----
Unit checked, aligned, and certified prior to startup and report submitted.	☐	☐	☐	----
Unit and motor lubricated before startup.	☐	☐	☐	----
Pump shaft rotates easily with power turned off.	☐	☐	☐	----
System starts and runs without any unusual noise or vibration.	☐	☐	☐	----
Seismic anchoring installed and functional, if applicable.	☐	☐	☐	----

Not Started
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Pre-Functional Checklists

Pre-Functional Performance Testing Forms - Mechanical

Pre-Functional Performance Testing Forms - Mechanical

Test and Balance - When contractor has verified all items on the pre-functional checklist, set overall status to 'Complete', indicating the system is ready for functional performance testing.

Verify	Pass	Fail	N/A	Notes
Flow Rate, gpm.	☐	☐	☐	----
Inlet pressure (ft) / Outlet pressure (ft).	☐	☐	☐	----
Motor rotation in the proper direction.	☐	☐	☐	----
Start-up strainer removed (after 24 hours).	☐	☐	☐	----

Not Started
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Pre-Functional Checklists

Electrical - When contractor has verified all items on the pre-functional checklist, set overall status to 'Complete', indicating the system is ready for functional performance testing.

Verify	Pass	Fail	N/A	Notes
All electrical connections are tight.	☐	☐	☐	----
All electrical components are grounded.	☐	☐	☐	----
Safety disconnect installed in an accessible location.	☐	☐	☐	----
Motor overload verified.	☐	☐	☐	----
Motor voltage and amps verified - each phase.	☐	☐	☐	----

Not Started
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Pre-Functional Checklists

Controls - When contractor has verified all items on the pre-functional checklist, set overall status to 'Complete', indicating the system is ready for functional performance testing. General Installation

Verify	Pass	Fail	N/A	Notes
General appearance is good, no phsyical damage to equipment.	☐	☐	☐	----
Equipment labels affixed.	☐	☐	☐	----
Wiring labeled inside panels for this piece of euqiupment.	☐	☐	☐	----
Controlled components for this piece of equipment, labeled/tagged.	☐	☐	☐	----
BAS connection made to labeled terminal(s) as shown on contract documents, as applicable.	☐	☐	☐	----
Shielded wiring used on electronic sensors as needed per device and equipment manufacturer's specifications.	☐	☐	☐	----

Pre-Functional Performance Testing Forms - Mechanical

Verify	Pass	Fail	N/A	Notes
Equipment alarms are programmed within the graphics, as specified.	☐	☐	☐	----
All user adjustable set points and schedules are operable directly from the interface for this piece of equipment (not just in programming screens).	☐	☐	☐	----
Graphics complete per owner approved drafts for this piece of equipment.	☐	☐	☐	----
Integration with other equipment is complete, tested, and points are verified as per specifications.	☐	☐	☐	----
----	☐	☐	☐	----

Not Started

Assigned to Keith.Estey@eastpoint.ca

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Appendix D – Functional Performance Testing Procedures

Functional Performance Testing - Form - Sample

Inglis Street Elementary - Heating System Upgrade

Project

PROJECT WORK

Functional Performance Testing

1. Preparation

1b. Pre-Requisite Checklist

Description	Pass	Fail	N/A	Notes
All control system functions for this and all interlocking systems are programmed and operable per contract documents, including final setpoints and schedules with debugging, loop tuning and sensor calibrations completed.	☐	☐	☐	----
(a) Verbal Confirmation from Controls Contractor	☐	☐	☐	----
(b) Date Confirmed	☐	☐	☐	----
Duct cleaning complete and required reports approved.	☐	☐	☐	----
Piping system flushing complete and required reports approved.	☐	☐	☐	----
Duct and pipe pressure testing complete and required reports approved.	☐	☐	☐	----
Water treatment system complete and operational.	☐	☐	☐	----
Test and balance (TAB) completed and approved for the Air, Hydronic, and VAV terminal units connected.	☐	☐	☐	----
Panel schedules are accurate.	☐	☐	☐	----
Electrical short-circuit, arc flash, & coordination study reviewed.	☐	☐	☐	----
All commissioning and design issues for this equipment corrected.	☐	☐	☐	----
These functional test procedures reviewed and approved by installing contractor and designer.	☐	☐	☐	----
Safeties and operating ranges reviewed.	☐	☐	☐	----
Test requirements and sequences of operation attached.	☐	☐	☐	----
Equipment is properly labelled.	☐	☐	☐	----
Schedules and setpoints attached (record current values and reset following testing).	☐	☐	☐	----
False loading equipment, system and procedures ready (boilers, preheat or reheat coils, control loops, over-ride on OSA dampers, etc.)	☐	☐	☐	----
Have all energy savings control strategies, setpoints and schedules been incorporated that this equipment and control system are capable of? If not, list recommendations in notes.	☐	☐	☐	----
Control Program Review. Review the software control program(s) for this equipment. Parameters, setpoints and logic sequences appear to follow the specified written sequences.	☐	☐	☐	----
Has Point Verification Report been submitted? If So, What is the name of the Controls Contractor?	☐	☐	☐	----

Functional Performance Testing - Form - Sample

Description	Pass	Fail	N/A	Notes
The following have been started up and startup reports and pre-functional checklists submitted and approved ready for functional testing: (insert associated equipment and systems).	☐	☐	☐	----
Miscellaneous site checks of the pre-functional checklist and startup reports completed successfully.	☐	☐	☐	----
Sampling rates have been defined (if applicable).	☐	☐	☐	----

1a. Participants

Description	Notes
Enter all participants (Party & Participation)	----
Enter Party filling out this form & witnessing.	----
Enter Date of Test	----

Not Started

Assigned to Keith.Estey@eastpoint.ca
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Functional Performance Testing

2. Calibration Checks

2a. Sensor Calibration Checks

Sensor ID	Associated Equipment	Location Ok? (Y/N)	1st Gauge or EMCS Value	Instr. Measured Value	Final Gauge or EMCS Value	Pass	Fail	Notes
----	----	----	----	----	----	☐	☐	----
----	----	----	----	----	----	☐	☐	----
----	----	----	----	----	----	☐	☐	----
----	----	----	----	----	----	☐	☐	----
----	----	----	----	----	----	☐	☐	----
----	----	----	----	----	----	☐	☐	----
----	----	----	----	----	----	☐	☐	----
----	----	----	----	----	----	☐	☐	----
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----	----	----	----	----	----	☐	☐	----
----	----	----	----	----	----	☐	☐	----
----	----	----	----	----	----	☐	☐	----
----	----	----	----	----	----	☐	☐	----

Sensor ID	Associated Equipment	Location Ok? (Y/N)	1st Gauge or EMCS Value	Instr. Measured Value	Final Gauge or EMCS Value	Pass	Fail	Notes
----	----	----	----	----	----	☐	☐	----
----	----	----	----	----	----	☐	☐	----

2b. Device Calibration Checks

Device or Actuator ID	Associated Equipment	Procedure / State	1st EMCS Value	Site Observation	Final EMCS Reading	Pass	Fail	Notes
----	----	----	----	----	----	☐	☐	----
----	----	----	----	----	----	☐	☐	----
----	----	----	----	----	----	☐	☐	----
----	----	----	----	----	----	☐	☐	----
----	----	----	----	----	----	☐	☐	----
----	----	----	----	----	----	☐	☐	----
----	----	----	----	----	----	☐	☐	----
----	----	----	----	----	----	☐	☐	----
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----	----	----	----	----	----	☐	☐	----
----	----	----	----	----	----	☐	☐	----
----	----	----	----	----	----	☐	☐	----

Not Started
Assigned to Keith.Estey@eastpoint.ca
Created by Keith.Estey@eastpoint.ca on 5/28/2025 2:47:55 PM

Functional Performance Testing

3. Sequence of Operation Review

Not Started
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Appendix E – Commissioning Issues Log

Commissioning Issues Log

Date: 5:41 PM

Revision: 0

Project: 0

No. of Issues Un Resolved: 0 **Total Items:** 0

Building: 0

OP - Open, indicates a resolution has not been agreed upon.
CL - Closed indicates that the resolution was verified to be incorporated.
IP - In Process indicates resolution agreed upon, but still to be confirmed in next design package.
CL+ - Issue closed, though recommendations were not incorporated.
IP+ - indicates In Progress, but needs additional discussion.

Distribution: **Owner's Representative -**

No. of Resolved Issues: 0

Legend

CxA – Commissioning Agent
OWN - Owner
ARCH - Architect
MD - Mechanical HVAC Designer
PD - Plumbing Designer
ED - Electrical Designer
CD - Controls Designer
FPD - Fire Protection Designer
SD - Security Designer
PCM - Prime Consultant
MC - Mechanical Contractor
PC - Plumbing Contractor
EC - Electrical Contractor
CC - Controls Contractor
FPC - Fire Protection Contractor
SC - Security Contractor

Issue ID	Project Stage	Dwg/Spec #	Equipment / System / Location	Action Required By	Originator Of Issue	Originator Initials	Deficiency/ Issue Description	Date Issued (MM/DD/YY)	Status	Date Resolved (MM/DD/YY)	Comments / Owner and CxA Reply	Reviewer Initals

Appendix F – Training Plan

OVERALL TRAINING and DEMONSTRATION PLAN and RECORD

Date: _____

Project:

Prepared By: _____

Reference: BCxA - Resources (2023)

Agenda #	Equipment/System (all trainings include equip, on-board ctrls and BAS ctrls)	Spec Section	Total Hrs [7]	Scope Code [5]	Audience [6]	Trainers' Companies	Hrs of Video	Agenda Sent?	Training Date(s)	Training Satisfactorily Complete
	Mechanical									
1	Heating Distribution and Terminal Equipment (heat exchangers, piping, baseboards, pumps, expansion tanks, etc.)									
2	Building Controls									
	Electrical									
1	Disconnect Switches / Starters									
2	Branch Distribution									
3	Variable frequency drives									
	TOTAL ALL DISCIPLINES	**TOTAL**								

EASTPOINT

Commissioning Training Check Sheet

Project Name: _____
Project Number: _____
System: _____
Commissioning Authority: _____
Company Name of Trainer(s): _____

Required Training Topics

		General Purpose of System (design intent)	Review of facility and occupancy profile	Functional Requirements	System philosophy, limitations of systems and emergency procedures	Review of system layout, equipment, components and controls	Equipment and system start-up, operation, monitoring, servicing, maintenance and shut-down procedures	System operating sequences, including start up, shut-down, oepration, adjustment of controls and emergency procedures	Maintenance and servicing	Troubleshooting diagnosis	Interaction among systems during integrated operation	Review of O&M documentation	OTHER TOPICS	Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at scheduled times, at the designated location	Instruct personnel in all phases of O&M using O&M Manuals as the basis of instruction	Review Contents of O&M in detail to explain all aspects of O&M. Insert additional data when the need is apparent	Total Hours	
Required Hours																		
Name of Trainee	**Company Name**	**Checkmark Box If Completed**																**Signature and Date**

By signing this document, I _____ declare that all training topics listed in the table have been addressed and that the information in the table is accurate.
Name of Trainer(s)

Page: _____ OF _____ Signed: _____ Date: _____

Part 1 General

1.1 SUMMARY OF SECTION

.1 Commissioning forms to be completed for equipment, system, and integrated system.

1.2 RELATED SECTIONS

.1 Section 01 91 13 - General Commissioning Requirements.

.2 Section 01 91 31 - Commissioning Plan.

.3 Section 01 91 41 - Commissioning Training Requirements.

.4 Requirements identified in product/system specification sections.

1.3 PRICE AND PAYMENT PROCEDURES

.1 Include the following data:

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

.2 Special procedures as specified in relevant technical sections.

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

.2 Equipment manufacturer's installation/start-up check lists are acceptable for use. If manufacturer’s installation/start-up checklist is to be used, provided to CxA and Designer to review and approve.

.3 Use check lists for equipment installation. Document checklist verifying checks have been made, indicate deficiencies and corrective action taken.

.4 Installer to sign check lists upon completion, certifying stated checks and inspections have been performed. Return completed check lists to HRCE Representative for inclusion in final commissioning plan at completion of project.

1.4 COMMISSIONING FORMS

.1 CxA will develop forms and provide to Contractor required project-specific Commissioning plan/check list/forms, see draft commissioning plan for samples.

.2 When Commissioning forms are completed, notify CxA to allow for review for completeness.

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

.4 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 Verified reported results.

.7 Form to bear signatures of recording technician.

.8 Reported results in true measured SI unit values.

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

1.5 EXAMPLE FORMS

.1 The appended forms found in the Draft Commissioning Plan are examples and show what type of information is expected to be filled out and provided when completing these forms.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 This Section specifies roles and responsibilities of Commissioning Training.

.2 Related Requirements

.1 Section 01 91 13 - General Commissioning Requirements.

.2 Section 01 91 31 - Commissioning Plan.

.3 Section 01 91 33 - Commissioning Forms.

.4 Requirements Identified in Product/System Specification Sections.

1.2 TRAINEES

.1 Trainees: personnel selected for operating and maintaining this facility. This includes building operators, maintenance staff, security staff, key staff, and technical specialists as required.

.2 Trainees will be available for training during later stages of construction for purposes of familiarization with systems.

1.3 INSTRUCTOR

.1 Contractor and certified factory-trained manufacturers' personnel: to provide instruction on the following:

.1 Start-up, operation, and shut-down of equipment, components, and systems.

.2 Control features, reasons for, results of, implications on associated systems of, and adjustment of set points of control and safety devices.

.3 Instructions on servicing, maintenance, and adjustment of systems, equipment, and components.

.2 Contractor and equipment manufacturer to provide instruction on:

.1 Start-up, operation, maintenance, and shut-down of equipment they have certified installation, started up, and carried out Functional Performance Tests.

1.4 TRAINING OBJECTIVES

.1 Training to be detailed and duration to ensure:

.1 Safe, reliable, cost-effective, and energy-efficient operation of systems in normal and emergency modes under all conditions.

.2 Effective on-going inspection and measurements of system performance.

.3 Proper preventive maintenance, diagnosis, and trouble-shooting.

.4 Ability to update documentation.

.5 Ability to operate equipment and systems under emergency conditions until appropriate qualified assistance arrives.

1.5 TRAINING MATERIALS

.1 Instructors to be responsible for content and quality.

.2 Contractor to be responsible for logging all training material.

.3 Training materials to include:

.1 "As-Built" Contract Documents.

.2 Operating Manual.

.3 Maintenance Manual.

.4 TAB and FPT Reports (Commissioning Issues Log).

.4 Training materials shall be provided in an electronic format that permits future training procedures to same degree of detail.

.5 Supplemental training materials may include:

.1 Multimedia presentations.

.2 Manufacturer's training videos.

.3 Equipment makes and models.

.6 Scheduling:

.1 Include a detailed training schedule within the Commissioning Schedule.

.2 Deliver system level training for commissioned equipment during regular working hours. If training duration is not outlined in specific specifications for commissioned system, one training sessions is to be provided and is to be no more than 3 (three) hours in length.

.3 Primary training to be completed prior to project acceptance.

.7 Responsibilities:

.1 Be responsible for:

.1 Implementation of training activities.

.2 Coordination among instructors.

.8 Training Content:

.1 Primary training to include demonstrations by Instructors using the installed equipment and systems.

.2 Content includes:

.1 Review of facility and occupancy profile.

.2 Functional requirements.

.3 System philosophy, limitations of systems, and emergency procedures.

.4 Review of system layout, equipment, components, and controls.

.5 Equipment and system start-up, operation, monitoring, servicing, maintenance, and shut-down procedures.

.6 System operating sequences, including step-by-step directions for starting up, shut-down, operation of valves, dampers, switches, adjustment of control settings, and emergency procedures.

.7 Maintenance and servicing.

.8 Troubleshooting diagnosis.

.9 Interaction among systems during integrated operation.

.10 Review of O&M documentation.

.3 Provide specialized training as specified in relevant Technical Sections of the construction specifications.

.9 Language:

.1 All training materials and sessions to be provided in English.

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 Section 03 20 00 - Concrete Reinforcing.

.2 Section 03 30 00 - Cast-in-Place Concrete.

1.2 REFERENCE STANDARDS

.1 CSA Group (CSA):

.1 CSA A23.1:19/A23.2:19, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CSA O86:19, Engineering Design in Wood.

.3 CSA O121-17, Douglas Fir Plywood.

.4 CSA O151-17, Canadian Softwood Plywood.

.5 CSA O153-13, Poplar Plywood.

.6 CSA O325-16, Construction Sheathing.

.7 CSA O437.0-93, OSB and Waferboard.

.8 CSA S269.1-16, Falsework and Formwork.

.2 ULC Standards (ULC):

.1 CAN/ULC-S701.1:20, Standard for Thermal Insulation, Polystyrene Boards.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Coordinate with:

.1 Section 03 20 00 - Concrete Reinforcing.

.2 Section 03 30 00 - Cast-in-Place Concrete.

.2 Pre-Installation Meetings: Conduct a site meeting, attended by HRCE Representative and related Subcontractors to:

.1 Verify project requirements.

.2 Review delivery, storage, and handling requirements.

.3 Review installation and substrate conditions.

.4 Coordinate with other Subcontractors.

.5 Review manufacturer’s instructions and warranty requirements.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer's instructions, product literature, and data sheets for proprietary materials used in formwork liners and coatings, including product characteristics, performance criteria, physical sizes, finishes, and limitations.

.2 Submit WHMIS Safety Data Sheet (SDS).

1.5 QUALITY ASSURANCE

.1 Retain a professional engineer registered or licensed in the Province of Nova Scotia, Canada with experience in formwork and falsework design of comparable complexity and scope to this Project to perform the following services as part of work of this section:

.1 Design of formwork and falsework.

.2 Review, stamp, and sign fabrication and erection shop drawings, design calculations, and amendments.

.3 Conduct on-site inspections. Prepare and submit inspection reports verifying this part of work is in accordance with Contract Documents and reviewed Shop Drawings.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store, and handle materials in accordance with Section 01 61 00 - Material & Equipment, and:

.1 Maintain formwork liners for architectural concrete without defects or damages that could affect concrete appearance or cause staining.

.2 Packaging Waste Management: Remove pallets, crates, padding, and packaging materials for reuse by manufacturer as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

.1 Formwork Materials:

.1 For concrete without special architectural features, use wood and wood product formwork materials to CSA O121 and CSA O86.

.2 Rigid insulation board: To CAN/ULC-S701.1.

.2 Tubular Column Forms: Sonotube Concrete Forms:

.1 Description: Multiple layers of 100 percent recycled paperboard, spirally wound, and laminated with adhesive.

.2 Interior Surface: Smooth with spiral seam. Alathon release and moisture barrier coating.

.3 Exterior Surface: Micryl moisture barrier coating.

.4 1-piece, 1-time-use forms.

.5 Recyclable.

.6 Inside Diameter: As indicated on the Drawings.

.3 Form Ties:

.1 For concrete not designated 'Architectural': Removable or snap-off metal ties, fixed or adjustable length, and free of devices leaving holes larger than 25 mm in diameter in concrete surface.

.4 Form Release Agent: Proprietary, non-volatile material that will not stain concrete or hinder the application of subsequent coatings, treatments, or flooring materials to the concrete surface.

.5 Falsework Materials: To CSA S269.1.

Part 3 Execution

3.1 PREPARATION

.1 Before placing concrete, clean formwork in accordance with CSA A23.1/A23.2.

3.2 FABRICATION AND ERECTION

.1 Verify lines, levels, and centres before proceeding with formwork/falsework. Confirm that dimensions match the Drawings.

.2 Fabricate and erect falsework in accordance with CSA S269.1.

.3 Do not place shores and mud sills on frozen ground.

.4 Provide site drainage to prevent washout of soil supporting mud sills and shores.

.5 Fabricate and erect formwork in accordance with CSA S269.1 to produce finished concrete conforming to shape, dimensions, locations, and levels indicated within tolerances required by CSA A23.1/A23.2.

.6 Align form joints and make watertight:

.1 Minimize the number of form joints used.

.7 Use 25 mm chamfer strips on external corners and 25 mm fillets at interior corners and joints, unless otherwise indicated on Drawings.

.8 Form chases, slots, openings, drips, recesses, and expansion and control joints as indicated.

.9 Build in anchors, sleeves, and other inserts required to accommodate work specified in other sections:

.1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

3.3 REMOVAL AND RESHORING

.1 Leave formwork in place after placing concrete for a minimum:

.1 7 days for walls, sides of beams, columns, footings, and abutments.

.2 Remove formwork when concrete has reached 70% of its 28-day design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.

.3 Provide necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.

.4 Space reshoring in each principal direction at not more than 3,000 mm apart.

.5 Reuse formwork and falsework subject to requirements of CSA A23.1/A23.2.

3.4 SITE QUALITY CONTROL

.1 Site Inspections:

.1 Professional engineer responsible for signing and stamping shop drawings to conduct on-site inspections and prepare and submit inspection reports verifying this part of the work is in accordance with Contract Documents and reviewed shop drawings.

.2 Perform inspections a minimum of one per month.

3.5 CLEANING

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

.2 Waste Management:

.1 Manage waste in accordance with Section 01 74 19 - Waste Management and Disposal, and:

.1 Once a form can no longer be used, deposit in an on-site recycling bin.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 30 00 - Cast-in-Place Concrete.

1.2 REFERENCE STANDARDS

.1 CSA Group (CSA):

.1 CSA A23.1:19/CSA A23.2:19, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CSA A283:19, Qualification Code for Concrete Testing Laboratories.

.3 CSA A23.3:19, Design of Concrete Structures.

.4 CSA G30.18-09, Carbon Steel Bars for Concrete Reinforcement.

.5 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.6 CSA W186:21, Welding of Reinforcing Bars in Reinforced Concrete Construction.

.2 Reinforcing Steel Institute of Canada (RSIC):

.1 RSIC-2020, Manual of Standard Practice.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Coordination:

.1 Coordinate with Section 03 30 00 - Cast-in-Place Concrete.

.2 Pre-Installation Meetings: Hold pre-concrete pouring meeting one week before pouring concrete:

.1 Ensure HRCE Representative and other key personnel attend:

.1 Verify project requirements.

.2 Review reinforcing testing report.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit manufacturer’s instructions if available, product literature, and data sheets for proprietary materials used in concrete reinforcement. Include product characteristics, performance criteria, physical sizes, finishes, and limitations.

.2 Submit WHMIS Safety Data Sheet (SDS).

.3 Shop Drawings:

.1 Submit shop drawings stamped and signed by professional engineer registered or licensed in the Province of Nova Scotia, Canada.

.1 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice.

.2 Indicate placing of reinforcement and:

.1 Bar bending details.

.2 Quantities of reinforcement.

.3 Detail lap lengths and bar development lengths to CSA A23.3, unless otherwise indicated on Drawings:

.1 Provide Type B tension lap splices unless otherwise indicated on Drawings.

.4 Indicate position and size of openings in slabs and walls. Coordinate with the different trades requiring openings.

.5 Indicate the concrete cover dimension to the reinforcement.

.4 Test and Evaluation Reports:

.1 When requested, submit certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks before beginning reinforcing work.

.5 Source Quality Control Submittals:

.1 When requested, submit, in writing, proposed source of reinforcement material.

1.5 QUALITY ASSURANCE

.1 Qualifications:

.1 Testing Laboratory: Certified to CSA A283.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Perform in accordance with Section 01 61 00 - Material & Equipment.

.2 Package bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

.3 Storage and Handling Requirements:

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

Part 2 Products

2.1 MATERIALS

.1 Substitute different sized bars only if permitted in writing by HRCE Representative.

.2 Reinforcing Steel: Billet steel, grade 400, deformed bars to CSA G30.18, unless otherwise indicated.

.3 Cold-drawn annealed steel wire ties: To ASTM A1064/A1064M.

.4 Chairs, bolsters, bar supports, and spacers: To CSA A23.1/A23.2.

.5 Tie wire: 1.5 mm diameter annealed wire.

.6 Mechanical splices: Subject to approval from HRCE Representative.

.7 Plain round bars: To CSA G40.20/G40.21.

2.2 FABRICATION

.1 Fabricate reinforcing steel in accordance with CSA A23.1/A23.2 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.

.2 Obtain HRCE Representative's written approval for locations of reinforcement splices other than those shown on Contract Drawings and shop drawings.

Part 3 Execution

3.1 SITE BENDING

.1 Do not bend or weld reinforcement on site except where indicated or when authorized by HRCE Representative:

.1 If site bending is authorized, bend reinforcement without heat, applying slow and steady pressure.

.2 Replace reinforcement bars that develop cracks or splits.

3.2 PLACING REINFORCEMENT

.1 Place reinforcing steel as indicated on placing drawings in accordance with CSA A23.1/A23.2.

.2 Before placing concrete, obtain HRCE Representative's approval of reinforcing material and placement.

.3 Maintain minimum concrete cover to reinforcement during concrete placement.

3.3 SITE QUALITY CONTROL

.1 Site tests: When requested, Conduct tests on the following and submit report as described in ACTION AND INFORMATIONAL SUBMITTALS in Part 1 of this Section:

.1 Reinforcing steel and welded wire fabric.

.2 Inspection and testing of reinforcing and reinforcing materials carried out by testing laboratory for review to CSA A23.1/A23.2.

.3 Distribute test results for discussion at pre-pouring concrete meeting between testing laboratory and HRCE Representative.

.4 Contractor will pay for costs of tests.

.5 Inspection or testing by Owner does not augment or replace Contractor's quality control nor relieve Contractor of any contractual responsibility.

3.4 CLEANING

.1 Progress Cleaning: Clean in accordance with Section 01 74 00 - Cleaning.

.2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools, and equipment in accordance with Section 01 74 00 - Cleaning.

.3 Waste Management: Perform in accordance with Section 01 74 19 - Waste Management and Disposal:

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 10 00 - Concrete Forming and Accessories.

.2 Section 03 20 00 - Concrete Reinforcing.

1.2 ABBREVIATIONS AND ACRONYMS

.1 Portland Cement: Hydraulic cement, blended hydraulic cement (XXb-b denotes blended), and Portland-limestone cement types:

.1 GU, GUb, GUL, and GULb: General use cement.

.2 MS, MSb, and MSLb: Moderate sulphate-resistant cement.

.3 MH, MHb, MHL, and MHLb: Moderate heat of hydration cement.

.4 HE, HEb, HEL, and HELb: High early-strength cement.

.5 LH, LHb, LHL, and LHLb: Low heat of hydration cement.

.6 HS, HSb, and HSLb: High sulphate-resistant cement.

1.3 REFERENCE STANDARDS

.1 ASTM International (ASTM):

.1 ASTM C171-20, Standard Specification for Sheet Materials for Curing Concrete.

.2 ASTM C260/C260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.

.3 ASTM C494/C494M-17, Standard Specification for Chemical Admixtures for Concrete.

.4 ASTM C881/C881M-20a, Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.

.5 ASTM C1017/C1017M-13e1, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.

.2 CSA Group (CSA):

.1 CSA A23.1:19 /A23.2:19, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CSA A3000-18, Cementitious Materials Compendium.

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Installation Meetings: Conduct a site meeting 1 week before beginning work of this Section attended by the HRCE Representative, site supervisor, and other related key personnel and Subcontractors to:

.1 Verify project requirements.

.2 Review delivery, storage, and handling requirements.

.3 Review installation and substrate conditions.

.4 Coordinate with other Subcontractors.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 When requested, submit the following action submittals minimum 4 weeks before starting work of this Section:

.1 Product data: Product literature and data sheets for proprietary materials used in cast-in-place concrete and additives, including product characteristics, performance criteria, physical sizes, finishes, WHMIS SDS, and limitations.

.2 Source quality control submittals:

.1 Valid and recognized certificate from the plant delivering the concrete.

.2 Test data and certification by qualified independent inspection and testing laboratory, confirming materials and mix designs used in concrete mixture meet specified requirements.

.3 Site quality control submittals:

.1 Proposed quality control procedures for:

.1 Falsework erection.

.2 Hot weather concrete.

.3 Cold weather concrete.

.4 Curing.

.5 Finishes.

.6 Formwork removal.

.7 Joints.

.2 Quality control plan: Submit written report to the HRCE Representative verifying compliance that cast-in-place concrete meets performance requirements of concrete as established in PRODUCTS in this Section.

.3 Submit the following informational submittals as work progresses:

.1 Site quality control submittals:

.1 Testing and Inspection results and reports: Do not proceed without written acceptance when deviations from mix design or parameters are found.

.2 Concrete pours: Submit accurate records of poured concrete items indicating date and location of pour, quality, air temperature, and test samples taken as described in SITE QUALITY CONTROL in this Section.

.3 Concrete hauling time: Submit records of deviations exceeding the maximum allowable time of 120 minutes for concrete delivered to site of Work and discharged after batching.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store, and handle materials in accordance with Section 01 61 00 - Material & Equipment, and:

.1 Delivery and Acceptance Requirements:

.1 Concrete hauling time: Deliver to site of Work and discharge within 120 minutes after batching.

.2 Modifying maximum time limit before receiving written acceptance from the HRCE Representative and concrete producer, as described in CSA A23.1/CSA A23.2, is prohibited.

.3 Submit deviations for review by the HRCE Representative.

.4 Concrete delivery: Ensure continuous concrete delivery from plant meets CSA A23.1/CSA A23.2.

1.7 SITE CONDITIONS

.1 Placing concrete during rain or weather events that could damage concrete is prohibited.

.2 Protect newly placed concrete from rain or weather events in accordance with CSA A23.1/CSA A23.2.

.3 Cold Weather Protection:

.1 Maintain protection equipment in readiness on site.

.2 Use protection equipment when ambient temperature is below 5 °C, or when temperature may fall below 5 °C before concrete has cured.

.3 Placing concrete upon or against surface at temperature below 5 °C is prohibited.

.4 Hot Weather Protection:

.1 Protect concrete from direct sunlight when ambient temperature is above 27 °C.

.2 Prevent forms from getting too hot before concrete is placed. Apply accepted methods of cooling that will not negatively affect concrete.

.5 Protect concrete from drying.

Part 2 Products

2.1 DESIGN CRITERIA

.1 Alternative 1-Performance: To CSA A23.1/CSA A23.2, and as described in MIXES in this Section.

2.2 PERFORMANCE CRITERIA

.1 Quality Control Plan: Ensure concrete supplier meets performance criteria of concrete as established by the HRCE Representative and submit verification of compliance as described in ACTION AND INFORMATIONAL SUBMITTALS in this Section.

2.3 MATERIALS

.1 Portland Cement: GU.

.2 Blended Hydraulic Cement: Type GUb to CSA A3000 (specifically CSA A3001).

.3 Water: To CSA A23.1/CSA A23.2.

.4 Aggregates: To CSA A23.1/CSA A23.2.

.5 Admixtures:

.1 Air entraining admixture: To ASTM C260/C260M.

.2 Chemical admixture: To ASTM C494/C494M. The HRCE Representative to review accelerating or set retarding admixtures during cold and hot weather placing.

2.4 MIXES

.1 Alternative 1-Performance Method for Specifying Concrete: To meet HRCE Representatives performance criteria to CSA A23.1/CSA A23.2:

.1 Concrete supplier to meet performance criteria as established below and verify compliance in accordance with the quality control plan.

.2 Provide interior concrete mix to meet specified hard state requirements:

.1 Durability and class of exposure: N.

.2 Compressive strength at 28 days age: Minimum 25 MPa.

.3 Intended application: Interior Housekeeping Pads.

.4 Coarse aggregate size maximum 20 mm.

Part 3 Execution

3.1 PREPARATION

.1 Obtain HRCE Representatives written acceptance before placing concrete:

.1 Provide a minimum of 24 hours notice before placing of concrete.

.2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.

.3 During concreting operations:

.1 Prevent development of cold joints.

.2 Verify concrete delivery and handling facilitate placing with minimum amount of re-handling and without damage to existing structure or Work.

.4 Pumping of concrete permitted only after acceptance of equipment and mix.

.5 Disturbing reinforcement and inserts during concrete placement is prohibited.

.6 Before placing of concrete, obtain HRCE Representatives acceptance of proposed method for protection of concrete during placing and curing in adverse weather.

.7 Protect previous work from staining.

.8 Clean and remove stains before applying concrete finishes.

.9 Maintain accurate records of poured concrete items. Indicate date, location of pour, quality, workability, air content, temperature, and test samples taken.

3.2 INSTALLATION/APPLICATION

.1 Perform cast-in-place concrete work in accordance with CSA A23.1/CSA A23.2.

.2 Anchor Bolt Installation:

.1 Set anchor bolts to templates in coordination with appropriate Subcontractor before placing concrete.

.2 Grout anchor bolts in preformed holes or holes drilled after concrete has set only after receipt of written acceptance from the HRCE Representative:

.1 Drilled holes: To manufacturer's recommendations.

.3 Protect anchor bolt holes from water accumulation, and snow and ice build-ups.

.4 Set bolts and fill holes with epoxy grout.

.3 Finishing and Curing:

.1 Finish concrete to CSA A23.1/CSA A23.2.

.2 Use procedures reviewed by the HRCE Representative to remove excess bleed water. Ensure surface is not damaged.

.3 Cure concrete in accordance with CSA A23.1/CSA A23.2.

.4 Provide screed finish unless indicated otherwise.

.5 Rub exposed sharp edges of concrete with carborundum to produce a minimum 3 mm radius edges unless otherwise indicated.

3.3 TOLERANCES

.1 Concrete Surface Tolerance: To CSA A23.1/CSA A23.2 to Tolerance indicated on Drawings.

3.4 SITE QUALITY CONTROL

.1 Site Tests: Conduct tests and submit report as described in ACTION AND INFORMATIONAL SUBMITTALS in this Section:

.1 Concrete pours.

.2 Slump.

.3 Air content.

.4 Compressive strength.

.5 Air and concrete temperature.

.2 Inspection and testing of concrete and concrete materials carried out by testing laboratory designated by the HRCE Representative in accordance with CSA A23.1/CSA A23.2:

.1 Distribute test results for discussion at pre-pouring concrete meeting between the testing laboratory and HRCE Representative.

.3 Payment for Testing Laboratory Services: By Contractor.

.4 The Testing agency will take additional test cylinders during cold weather concreting. Cure cylinders on Project site under same conditions as concrete which they represent.

.5 Non-Destructive Methods for Testing Concrete: To CSA A23.1/CSA A23.2.

.6 Inspection or testing by the Consultant does not augment or replace Contractor's quality control or relieve the Contractor of contractual responsibility.

3.5 CLEANING

.1 Clean in accordance with Section 01 74 00 - Cleaning and:

.1 Provide appropriate area on Project site where concrete trucks can be safely washed.

.2 Manage waste in accordance with Section 01 74 19 - Waste Management and Disposal and:

.1 Divert unused concrete materials from landfill to local facility.

.2 Divert unused admixtures and additive materials (pigments, fibres, etc.) from landfill to official hazardous material collections site.

.3 Prevent disposal of unused admixtures and additive materials, concrete, concrete washwater, or cleaning materials and residues into sewer systems, lakes, streams, onto ground, or in other locations that pose a health or environmental hazard.

.4 Prevent admixtures and additive materials from entering drinking water supplies or streams.

.5 Collect liquid or solidify liquid with inert, non-combustible material and remove for disposal.

3.6 PROTECTION

.1 Do not place load upon new concrete until authorized by the HRCE Representative.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 This Section specifies fire stop and smoke seal systems and materials intended to fill gaps between fire separations, between fire separations and other construction assemblies, or used in or around items which fully or partially penetrate a fire separation, to restrict the spread of fire and smoke thus maintaining the integrity of a fire separation.

.2 This Section includes requirements for:

.1 Through-penetration fire stops:

.1 For openings created to allow a penetrating item such as piping, conduits, raceways, ducts, cable trays, cables, tubing, or structural components to pass completely through a fire separation or fire-resistance rated assembly.

.2 Membrane penetration fire stops:

.1 For openings where penetrating items such as piping, conduits, raceways, ducts, cable trays, cables, tubing, recessed components (e.g. panels, electric boxes, devices), or structural components pass through only one membrane of a fire separation or fire-resistance rated assembly.

.3 Blank opening fire stops:

.1 For openings created in a fire separation where the penetrating item has not yet been installed or has been removed.

.3 This Section includes fire stopping and smoke seal work for the entire Project including selection, installation, and inspection of all required fire stops.

1.2 DEFINITIONS

.1 Fire Blocking: materials, components, or system installed in a concealed space in the building to restrict the spread of fire and smoke in that concealed space or from that concealed space to an adjacent space.

.2 Fire Compartment: spaces within a building that are enclosed by exterior walls or separated from other parts of the building by enclosing Fire Separations having a Fire-Resistance Rating.

.3 Fire-Resistance Rating: time in minutes or hours that a material or assembly of materials will withstand the passage of flame and transmission of heat when exposed to fire, meeting the requirements of CAN/ULC-S101 or as determined by formal testing of material or assembly of materials, meeting requirements of CAN/ULC-S115, or an interpretation of information derived from formal testing in accordance with requirements of the Building Code and acceptable to the Authority Having Jurisdiction (AHJ).

.4 Fire Separation: assembly that acts as a barrier against the spread of fire, smoke, and noxious gases resulting from combustion as defined by the Building Code and includes the following assemblies having a Fire-Resistance Rating requiring Fire Stopping as follows:

.1 Penetration-Type Fire Stop systems located within loadbearing walls and partitions.

.2 Penetration-Type Fire Stop systems located within non-loadbearing walls and partitions.

.3 Penetration-Type located within floor assemblies.

.5 Fire Stop: material, component, or system and its means of support, used to protect gaps between fire separations, between fire separations and other construction assemblies, or used in openings where penetrating items wholly or partially penetrate fire separations, to restrict the spread of fire and smoke thus maintaining the fire-resistance continuity of a fire separation.

.6 Fire Stop System: a specific site erected construction consisting of the assembly, fire stop materials, any penetrating items and their means of support which have met the requirements for an F, FT, FH, FTH, and/or L rating when tested in a fire-resistance rated assembly in accordance with CAN/ULC-S115:

.1 F-Rating: the amount of time a fire stop system can remain in place without the passage of flame through the opening or the occurrence of flaming on the unexposed face of the fire stop.

.2 FT-Rating: a fire stop system with an F-Rating for the required time period which can also resists the transmission of heat through the fire stop during the same period and limit the rise in temperature on the unexposed face and/or penetrating item of the fire stop.

.3 FH-Rating: a fire stop system with an F-Rating for the required time period which can also resist the force of a hose stream without developing openings for a prescribed period.

.4 FTH-Rating: a fire stop system with an FT-Rating for the required time period which also passes the hose stream test for a prescribed period.

.5 L-Rating: largest test sample leakage rate, determined in accordance with the optional air leakage test in CAN/ULC-S115.

.7 Multi-penetration: two or more service penetrations through an opening in the fire separation.

.8 Non-rated Fire Separation: fire separation acting as a barrier to the spread of smoke until a response is initiated such as the activation of a fire suppression system.

.9 Single-penetration: single service penetration through an opening in the fire separation.

.10 System Design Listing: document providing proof of testing with technical details, specifications and requirements that leads to the application of a specific listed fire stop system.

1.3 REFERENCE STANDARDS

.1 ASTM International (ASTM):

.1 ASTM A1008/A1008M-13 Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable.

.2 ASTM C719-14, Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle).

.3 ASTM C920-14, Standard Specification for Elastomeric Joint Sealants.

.4 ASTM E84-21, Standard Test Method for Surface Burning Characteristics of Building Materials.

.5 ASTM E119-20, Standard Test Methods for Fire Tests of Building Construction and Materials.

.6 ASTM E136-19A, Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750 degrees.

.7 ASTM E595-15, Standard Test Method for Total Mass Loss and Collected Volatile Condensable Materials from Outgassing in a Vacuum Environment.

.8 ASTM E814-13a, Standard Test Method for Fire Tests of Penetration Firestop Systems.

.9 ASTM E1966 15, Standard Test Method for Fire Resistive Joint Systems.

.10 ASTM E2032-09, Standard Guide for Extension of Data From Fire Resistance Tests Conducted in Accordance with ASTM E 119.

.11 ASTM E2174-20A, Standard Practice for On-Site Inspection of Installed Firestops.

.12 ASTM E2393-20A, Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers.

.2 Firestop Contractors International Association (FCIA):

.1 FCIA Firestop Manual of Practice, 6th Edition 2015.

.3 Factory Mutual Approvals (FM):

.1 FM 4990-2009, Approval Standard for Fire Stopping.

.2 FM 4991-2013, Approval Standard for Firestop Contractors.

.4 International Accreditation Service (IAS):

.1 IAS AC291-19, Accreditation Criteria for Special Inspection Agencies.

.5 International Firestop Council (IFC):

.1 IFC Guidelines for Evaluating Engineering Judgments.

.2 IFC Guidelines for Evaluating Engineering Judgments-Perimeter Fire Barrier Systems.

.3 IFC Inspection Guidelines for Penetration Firestop Systems and Fire Resistive Joint Systems in Fire Resistance Rated Construction, 5th Edition.

.6 National Fire Protection Agency (NFPA):

.1 NFPA 251-2006, Standard Methods of Tests of Fire Endurance of Building Construction and Materials.

.7 National Research Council Canada (NRC):

.1 National Building Code of Canada (NBC) 2020.

.2 Best Practice Guide on Fire Stops and Fire Blocks and Their Impact on Sound Transmission 2007.

.8 ULC Standards (ULC):

.1 CAN/ULC-S101-14, Standard Method of Fire Endurance Tests of Building Construction and Materials.

.2 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

.3 CAN/ULC-S114-05, Standard Method of Test for Determination of Non-Combustibility in Building Materials.

.4 CAN/ULC-S115-11, Standard Method of Fire Tests of Firestop Systems.

.9 Underwriters Laboratories Inc. (UL):

.1 UL 1479-2015, Fire Tests of Penetration Firestops.

.2 UL Qualified Firestop Contractor Program.

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Sequencing:

.1 Proceed with installation only when submittals have been reviewed by the HRCE Representative.

.2 Install fire stops located in floor assemblies before interior partition erections.

.3 Metal deck bonding: Unless otherwise noted on system design listing and manufacturer's installation instructions, fire stopping to precede spray-applied fireproofing to ensure required bonding.

.4 Pipe and duct insulation: Certified fire stop system component:

.1 Ensure pipe and duct insulation installation precedes fire stopping.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Qualification Statement:

.1 Submit Contractor qualification statements and certificates demonstrating compliance with the qualification requirements of this Section, as described in PART 1 - QUALITY ASSURANCE, within ten (10) working days after award of contract and before starting Work.

.3 Product Data:

.1 Submit manufacturer's product data for each type of fire stopping and smoke seal. Submit complete product data for each individual component and include:

.1 Product name and product number.

.2 Product characteristics and performance criteria.

.3 Physical size, finish, and limitations.

.4 Technical data on out-gassing, off-gassing, and age testing.

.5 Curing time.

.6 Chemical compatibility to other construction materials.

.7 Shelf life.

.8 Life expectancy.

.9 Temperature range for installation.

.10 Humidity range for installation.

.11 Sound attenuation STC-Rating.

.2 Manufacture Product Certification:

.1 Submit manufacturer certification certifying products supplied comply with local regulations controlling use of Volatile Organic Compounds (VOCs) and are non-toxic to building occupants.

.2 Submit test reports showing compliance to ASTM E595.

.3 Submit one copy of WHMIS Safety Data Sheets (SDS) for each individual component.

.4 Submit a comprehensive list of all products and components included in submittal.

.4 Shop Drawings:

.1 Submit shop drawings showing system design listings for Project including proposed materials, reinforcement, anchorage, fastenings, and method of installation.

.2 Construction details to accurately reflect actual job conditions for each product and assembly.

.3 Submit details for materials and prefabricated devices.

.4 Submit an electronic copy of shop drawings and include:

.1 Title page, labelled "Fire and Smoke Stop System Listings". Include project name, date, and the names of the installation company and the manufacturer of proposed products. Insert title in front and spine of binder.

.2 Table of Contents at front of each binder.

.3 List of each proposed listed fire stop system and corresponding service penetration type or joint type in a matrix spreadsheet schedule, indicating floor and wall system, including rating for each.

.4 System Design Listings:

.1 Submit design listings for each listed fire stop system and each application identified in accordance with CAN/ULC-S115.

.2 When more than one product is specified for the listed fire stop system or more than one packing/damming material is indicated, identify the item that will be used on this Project.

.5 Certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Manufacturer's Instructions: Submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

.6 Quality Assurance Submittals: Submit the following in accordance with Section 01 45 00 - Quality Control:

.1 Test reports in accordance with CAN/ULC-S101, CAN/ULC-S102, and CAN/ULC-S115.

.1 Submit certified test reports from approved independent testing laboratories, indicating compliance of applied fire stopping with specifications for specified performance characteristics and physical properties.

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

.3 Manufacturer's Instructions: Submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

.7 Engineering Judgments (EJ):

.1 Where there is no specific tested listed fire stop system available from the manufacturer for a particular fire stop configuration, review systems from other manufacturers to obtain a listed fire stop system.

.2 Submit an EJ from the system manufacturer if there are no listed systems available from other manufacturers.

.3 Prepare and submit an EJ in accordance with best practices established in the following documents:

.1 IFC Guidelines for Evaluating Engineering Judgments.

.2 IFC Guidelines for Evaluating Engineering Judgments-Perimeter Fire Barrier Systems.

.4 For each EJ submitted, include:

.1 Project name, number, and location.

.2 A description of the proposed system with detailed drawing.

.3 Installation instructions.

.4 Complete descriptions of critical elements for the fire stop configuration.

.5 Copies of all referenced system design listings which EJ is based on.

.6 EJ issuer name and contact information.

.7 Date of issue of EJ with authorization signature of issuer.

.5 EJ shall only be issued by fire stop manufacturer's qualified technical personnel or in collaboration with the manufacturer by a knowledgeable registered Professional Engineer, a Fire Protection Engineer, or an independent testing agency that provides testing and listing services for fire stop systems similar to the EJ being contemplated.

.6 EJ shall be based upon interpolations of previously tested fire stop systems that are either sufficiently similar in nature or clearly bracket the conditions upon which the EJ is to be given. Additional knowledge and technical interpretations based upon accepted engineering principles, fire science and fire testing guidelines (e.g. ASTM E2032) may also be used as further support data.

.7 EJ shall be based upon knowledge of the elements of the construction to be protected and understanding of the probable behaviour of that construction and the recommended fire stop system protecting it were they to be subjected to the adequate standard fire test method for the required fire rating duration.

.8 EJ shall be limited to the specific conditions and configurations for which it was created and should be based upon reasonable performance expectations for the recommended fire stop system under those conditions.

.9 EJ shall be accepted only for a single specific job and location and should not be transferred to any other job or location without thorough and appropriate review of all aspects of the next job or location's circumstances:

.1 Manufacturer letter stating their opinion, with supporting justification, that the EJ will perform as a fire stop system when subjected to the appropriate standard fire test method for the required fire rating duration.

.10 Once the EJ has been reviewed, submit to the AHJ for final approval.

.8 Closeout Submittals:

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.9 Operation and Maintenance Data: Submit maintenance data for incorporation into manual, including:

.1 WHMIS Safety Data Sheets (SDS).

.2 Product data and manufacturer's installation and maintenance instructions for each product/system used on this project.

.3 Approved system design listings and EJs.

.4 Certifications.

.5 Warranty information on fire stop installations.

.6 Life expectancy of each product installed as part of Project. For each system, list the installation date of products and the expected expiration date (month/year).

1.6 QUALITY ASSURANCE

.1 Regulatory Requirements: Use materials and methods of determining required thickness of application that have the full acceptance of AHJ and that are tested in accordance with CAN/ULC-S115, and form a part of a ULC or cUL listed system, Engineered Judgement or Equivalent Fire Resistance Rated Assembly.

.2 Provide systems selection and analysis, installation and inspection of fire stop systems in accordance with the recommended practices detailed in the following guides:

.1 FCIA Firestop Manual of Practice (MOP).

.3 Qualifications:

.1 Contractor specializing in selection and installation of fire stops approved by manufacturer. Submit a list of five successfully completed projects of similar scale and type.

.2 The installers are recognized as a Member in Good Standing with the Firestop Contractors International Association (FCIA). Submit proof of current membership.

.3 Training: Workers, including site supervisor, to complete:

.1 Manufacturer training on the products/systems installed as part of this Section.

.2 Training under the FCIA Firestop Containment Worker Education Program.

.4 Certified Firestop Contractor: company certified with one of the following programs:

.1 ULC Qualified Firestop Contractor Program. Submit signed copy of certificate.

.2 FM 4991 Approved Firestop Contractor. Submit signed copy of FM Approval certificate.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling, and unloading:

.1 Perform in accordance with Section 01 61 00 - Material & Equipment.

.2 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer, ULC markings, manufacturing date, and shelf life expiry date.

.2 Storage and Protection:

.1 Store materials in a well-ventilated, dry indoor location and in accordance with manufacturer's instructions.

.2 Coordinate delivery of materials with scheduled installation dates to allow minimum storage time on site.

.3 Comply with recommended procedures, precautions and measures described in WHMIS Safety Data Sheets (SDS).

.3 Waste Management and Disposal:

.1 Perform in accordance with Section 01 74 19 - Waste Management and Disposal.

1.8 AMBIENT CONDITIONS

.1 Ambient Conditions:

.1 Install fire stops and smoke seals when ambient and substrate temperatures are within the limits prescribed by the manufacturer and when the substrate is dry and without risk of condensation.

.2 Maintain manufacturer's recommended ambient and substrate temperatures for 48 hours before and 72 hours after installation.

.2 Ventilate fire stops and smoke seals in accordance with manufacturers' instructions by natural means or, where this is inadequate or not available, use forced air circulation.

1.9 WARRANTY

.1 Extend 12 month warranty period to 24 months for Work of this Section.

.2 Manufacturers shall warrant work of this Section against defects and deficiencies in the product material for a period of 24 months. Promptly correct any defects or deficiencies which become apparent within warranty period at no expense.

.3 Contractor warrants workmanship on materials and installation for a period of 24 months. Promptly correct any defects or deficiencies which become apparent within warranty period at no expense.

Part 2 Products

2.1 MANUFACTURERS

.1 Provide products from a single manufacturer, to the greatest extent possible, to perform all fire stopping work. Materials of different manufacturers will not be permitted without authorization from the HRCE Representative.

.2 Provide a listed system from an alternative where there is no specific tested listed fire stop system available from the manufacturer for a particular fire stopping application to avoid providing an Engineering Judgment.

2.2 PERFORMANCE/DESIGN CRITERIA

.1 Fire stop and smoke seal systems consisting of a material or combination of materials installed to maintain the integrity of the fire-resistance rating of a fire separation in accordance with the requirements of the NBC.

.2 Performance Requirements: Manufacturer shall design proprietary assemblies to withstand the listed ratings in accordance with the NBC, ULC Standards, and AHJ, and as follows:

.1 Non-rated fire separations: Provide L-Rated smoke protection fire stop system for application on both sides of separation.

.2 Provide through-penetration fire stop and joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of penetrated assembly, such as:

.1 Fire-resistance rated loadbearing walls, including partitions, with fire protection rated openings.

.2 Fire-resistance rated non-loadbearing walls, including partitions with fire protection rated openings.

.3 Fire-resistance rated floor assemblies.

.3 “F” Rated Systems: Provide through-penetration fire stop systems with F-ratings indicated, as determined by CAN/ULC-S115 or ASTM E814, and equal to or exceeding the fire-resistance rating of the penetrations created during construction.

.4 “T” Rated Systems: Where fire stop systems protect penetrating items from potential contact with adjacent materials, provide through-penetration fire stop systems with T-ratings and F-ratings indicated, as determined by CAN/ULC-S115 or ASTM E814, for the following conditions:

.1 Penetrations located outside wall cavities.

.2 Penetrations located outside fire resistive shaft enclosures.

.3 Penetrations located in a construction containing fire protection rated openings.

.4 Penetrating items larger than a 100 mm diameter nominal pipe or 100 cm^2 in overall cross-sectional area.

.5 Fire stopping and Smoke Seal Systems Exposed to View: Provide products that after curing do not deteriorate when exposed to view, traffic, moisture, and physical damage both during and after construction, and as follows:

.1 Provide moisture resistant through-penetration fire stop systems for piping penetrations for plumbing and wet pipe sprinkler systems.

.2 Provide fire stopping and smoke seal systems capable of supporting anticipated floor loads either by installing floor plates or by other means for floor penetrations with annular spaces exceeding 100 mm in width and exposed to possible loading and traffic.

.3 Provide fire stopping and smoke seal systems not requiring removal of insulation for penetrations involving insulated piping.

.4 Provide products with flame-spread ratings of less than 25 and smoke-developed ratings of less than 50 for fire stopping, smoke seal, and joint systems exposed to view.

.5 Architectural considerations: When fire stop system is exposed to view, consider architectural finish, potential traffic, and exposure to moisture and heat.

.3 Insulated Pipes and Ducts: Design and test listed fire stop system with the actual insulation materials penetrating the fire separation, as indicated on the system design listing.

2.3 MATERIALS

.1 Compatibility: Under conditions of service and application, provide fire stopping and smoke seal systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating the systems, as demonstrated by fire stopping and smoke seal system manufacturer based on testing and site experience, and as follows:

.1 Asbestos-free materials and systems capable of maintaining an effective barrier against the passage of flame, smoke, and water and the transmission of heat in compliance with requirements of CAN-ULC-S115 and not to exceed opening sizes for which they are intended, as indicated on System Design Listing.

.2 Fire Stop System Rating: To match fire-resistance rating of fire separation as indicated on Drawings.

.3 Service penetration assemblies and fire stop components: Certified by testing laboratory to CAN/ULC-S115.

.4 Provide elastomeric seal or non-shrink foam cement mortar for fire and smoke stop systems at openings intended for re-entry, such as cables. Do not use cementitious or rigid seal at such locations.

.5 Provide elastomeric protection for fire and smoke stop systems at openings around penetrations for pipes, ductwork, and other mechanical items requiring sound and vibration control. Do not use a cementitious or rigid seal at such locations. Exemption for fire dampers.

.6 Provide elastomeric seal for fire and smoke seals behind and around mechanical and electrical boxes within wall, floor, and ceiling assemblies.

2.4 FILL MATERIALS

.1 General:

.1 Provide fire stopping and smoke seal systems containing the types of fill materials indicated in SCHEDULE in Part 3 of this Section by reference to the types of materials described in this Article. Fill materials are those referred to in directories of the referenced testing and inspecting agencies as fill, void, or cavity materials.

.2 Fire stopping and smoke seal systems shall be tested in accordance with CAN/ULC-S115 and be comprised of asbestos free materials and systems capable of maintaining an effective barrier against flame, smoke, and gases. Fire stopping and smoke seal systems not to exceed opening sizes for which they are intended for the ratings as indicated on Drawings.

.2 Latex Sealants: Single component latex formulations that after curing do not re-emulsify during exposure to moisture.

.3 Fire Stopping and Smoke Seal Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrating item.

.4 Cable Penetration Devices:

.1 Pre-manufactured intumescent blocks.

.2 Pre-manufactured sleeves, consisting of an adjustable core.

.3 Pre-manufactured cable management system, consisting of a system of intumescent inserts and adjustable cores.

.5 Intumescent Putties: Non-hardening dielectric, water resistant putties containing no solvents, inorganic fibres, or silicone compounds.

.6 Intumescent Spray Foam: Expanding spray-in-place intumescent foam sealant.

.7 Intumescent Wrap Strips: Single component intumescent elastomeric sheets with aluminum foil on one side.

.8 Intumescent, Latex Sealant: Single-component, intumescent, latex formulation.

.9 Job-Mixed Vinyl Compound: Prepackaged vinyl-based powder product for mixing with water at Project site to produce a paintable compound, passing ASTM E136, with flame-spread and smoke-developed ratings of zero per ASTM E84.

.10 Solvent-Release-Curing Intumescent Sealant: Solvent-release-curing, single-component, synthetic-polymer-based sealant of grade indicated below:

.1 Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces. Non-sag formulation for openings in vertical and other surfaces requiring a non-slumping/gunnable sealant, unless indicated fire stop system limits use non-sag grade.

.11 Mortars: Pre-packaged, dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogeneous mortar.

.12 Pillows/Bags: Reusable, heat-expanding pillows/bags consisting of glass fibre cloth cases filled with a combination of mineral fibre, water insoluble expansion agents and fire-retardant additives.

.13 Silicone Foams: Multi-component, silicone based liquid elastomers that, when mixed, expand and cure in-place to produce a flexible, non-shrinking foam.

.14 Silicone Sealants: Moisture curing, single component, silicone based, neutral curing elastomeric sealants of grade indicated below:

.1 Grade for Horizontal Surfaces: Pourable (self-levelling) formulation for openings in floors and other horizontal surfaces.

.2 Grade for Vertical Surfaces: Non-sag formulation for openings in vertical and other surfaces.

.15 Ceramic-Fibre and Mastic Coating: Ceramic fibres in bulk form formulated for use with mastic coating, and ceramic fibre manufacturer's mastic coating.

.16 Ceramic-Fibre Sealant: Single-component formulation of ceramic fibres and inorganic binders.

2.5 MIXING

.1 For those products requiring mixing before application, comply with fire stopping and smoke seal system manufacturer's instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

2.6 FIRE-RESISTIVE ELASTOMERIC JOINT SEALANTS

.1 Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer that comply with ASTM C920 requirements, including those referenced for Type, Grade, Class, and Uses, and requirements specified in this Section applicable to fire-resistive joint sealants.

.2 Single-Component, Neutral-Curing Silicone Sealant: Type S; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, G, A, and (as applicable to joint substrates indicated) O:

.1 Additional Movement Capability: When tested for adhesion and cohesion under maximum cyclic movement per ASTM C719, provide sealant with the capability to withstand the changes in joint width existing at the time of installation, and remain in compliance with other requirements of ASTM C920.

.3 Multicomponent, Non-sag, Urethane Sealant: Type M; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, A, and (as applicable to joint substrates indicated) O:

.1 Additional Movement Capability: When tested for adhesion and cohesion under maximum cyclic movement per ASTM C719, provide sealant with the capability to withstand the change in joint width existing at the time of installation, and remain in compliance with other requirements of ASTM C920.

.4 Single-Component, Non-sag, Urethane Sealant: Type S; Grade NS; Class 25; and Uses NT, M, A, and (as applicable to joint substrates indicated) O.

2.7 FIRE STOP IDENTIFICATION

.1 Identification Labels and Markings: Permanent for the expected service life of the installation.

.2 Fire Stopped Penetrations:

.1 Provide identification labels at each penetration.

.2 Identification labels: adhesive plastic stickers with the following information:

.1 Penetration number.

.2 Floor number.

.3 Room number.

.4 Product name and number.

.5 System design number.

.6 Fire rating required in hours.

.7 Fire stop Contractor's name and phone number.

.8 Installer's name.

.9 Date of installation.

.3 Indicate on label that fill material around the penetration is a fire stop system and shall not be disturbed except by authorized personnel.

2.8 ACCESSORIES

.1 Provide components for each fire stopping and smoke seal system needed to install fill materials. Use only components specified by fire stopping and smoke seal system manufacturer and approved by the qualified testing and inspecting agency for fire stopping and smoke seal systems indicated on Drawings.

.2 Primers: To manufacturer's recommendation for specific material, substrate, and end use.

.3 Water (if applicable): Potable, clean, and free from harmful amounts of deleterious substances.

.4 Metal Fire Stop: Commercial galvanized steel, to ASTM A1008/A1008M, zinc coating 260 g/m^2, minimum metal core thickness 0.912 mm.

.5 Packing/Damming Materials, Supports and Anchoring Devices: To manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to AHJ.

.6 Fire Stop Insulation: Pre-formed, semi-rigid, non-combustible mineral wool, pre-cut in 1,220 mm lengths to required depth and width.

.7 Junction Box/Outlet Sealing Putty: Intumescent putty, pre-formed in pads.

.8 Sealants: Good adhesion without use of primer, high visibility safety colours:

.1 Flame-spread rating: Maximum 25.

.2 Smoke development classification: Maximum 50.

.3 For vertical joints: Non-sagging.

.4 For horizontal joints: Single component, self-levelling.

Part 3 Execution

3.1 EXAMINATION

.1 Verify that conditions of substrates previously installed are acceptable for product installation in accordance with manufacturer's instructions and approved system design listings for each condition.

.2 Verify each opening/annular space to ensure it does not exceed the maximum and minimum dimensions indicated on the approved system design listing.

.3 Verify that all joints, service penetrating elements, and supporting devices/hangers have been properly installed as indicated on approved system design listings. Remove all temporary lines and markings to meet the approved system design listings.

.4 Verify that proposed fire stop system consists of components that are compatible with each other, with substrates forming the openings, and with items, if any, penetrating the fire stop under conditions of application and service, as demonstrated by the fire stop manufacturer based on testing and site experience.

.5 Pipe and Duct Insulation: Confirm that proposed fire stop system has been tested with the actual insulation penetrating the fire separation on site, as indicated in the approved system design listing. Maintain insulation around pipes and ducts penetrating the fire separation.

.6 Ensure no additional items have been installed through opening that does not appear on the approved system design listing.

.7 Ensure fire stopped areas are accessible for proper application and that conditions are suitable for installation of the fire stop system. Areas to remain accessible for inspection.

.8 Report in writing to the HRCE Representative any defective surfaces or conditions affecting the fire stop system installation immediately and before commencing any installations.

.9 Proceed only once defected surfaces or conditions have been corrected.

.10 Proceed with installation only after unacceptable conditions have been remedied.

3.2 PREPARATION

.1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials:

.1 Ensure that substrates and surfaces are clean, dry, and frost free.

.2 Ensure substrates and surfaces are free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.

.2 Prepare surfaces in contact with fire stop and smoke stop materials to manufacturer's instructions.

.3 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour barrier.

.4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

.5 Protect adjacent work areas and finish surfaces from damage during product installation.

.6 Prime surfaces as required.

.7 Ensure multi-penetration openings have been framed and boarded out around annular openings, as indicated in the system design listing before prepping the opening.

3.3 INSTALLATION

.1 Install fire stop and smoke seal materials and components in accordance with manufacturer's certified tested system listing.

.2 Coordinate with other sub-trades to ensure that all pipes, conduits, cables, and other items, which penetrate fire separations, have been permanently installed before installation of fire stop systems.

.3 Schedule work to ensure that fire separations and all other construction that conceals penetrations are not erected before installation of fire and smoke seal systems.

.4 Seal holes or voids made by through-penetrations, poke-through termination devices, and un-penetrated openings or joints to ensure that both continuity and integrity of fire separation are maintained.

.5 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing per manufacturer's instructions.

.6 Tool or trowel exposed surfaces to neat finish.

.7 Remove excess compound promptly as work progresses and upon completion.

.8 Protect gaps around recessed components (e.g. panels, electrical boxes, outlets) with sealing putty in accordance with manufacturer's instructions.

.9 Do not use damaged or expired material.

3.4 INSTALLATION - THROUGH PENETRATION JOINT SEALANTS

.1 Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position required to achieve fire ratings of designated through-penetration fire stop systems.

.2 Install fill materials for through-penetration fire stop systems by techniques recommended by the manufacturer to produce the following results:

.1 Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.

.2 Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

.3 For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

.3 Remove combustible forming materials and other accessories not indicated as permanent components of fire stop systems.

3.5 IDENTIFICATION

.1 General:

.1 Clean substrate before applying identification.

.2 Determine final location of identification on site.

.3 Identification is not required on both sides of the fire separation.

.4 Refer to Drawings for locations of fire separations and rating required.

.2 Fire Stopped Penetrations:

.1 Install identification label adjacent to each fire stopped wall/floor service penetration. Provide one identification label per single opening or per grouping cluster.

.2 Securely apply identification to substrate by providing adequate adhesive.

.3 Secure tags with metal fasteners or hang with metal chain or wire.

.4 Identification shall be completely filled out and installed before requesting substantial performance.

3.6 REPAIRS AND MODIFICATIONS

.1 Identify damaged or re-entered seals requiring repair or modification.

.2 Remove loose or damaged materials. If adding penetrating items, remove sufficient material to insert new elements and to avoid damaging the balance of the seal.

.3 Ensure sealed surfaces are clean and dry.

.4 Use only materials that are suitable for repair of original seal, as approved by manufacturer. Do not mix products from different manufacturers.

3.7 SITE QUALITY CONTROL

.1 Inspections: Notify the HRCE Representative when ready for inspection and before concealing or enclosing fire stop materials and service penetration assemblies.

3.8 INSPECTIONS

.1 The HRCE Representative is to conduct random inspections and direct exploratory review (i.e. destructive testing) during the course of construction and before closing off any concealed areas. Perform inspections and destructive testing in compliance with ASTM E2174 and ASTM E2393:

.1 Include a minimum of 2% of each 900 m^2 area for exploratory reviews for each approved system design listing and each trade involved. Perform cut tests at perimeter joints every 15 meters. Perform cut test at bottom and top of wall joints and wall-to-wall joints and building expansion joints every 15 meters.

.2 Perform exploratory review as directed by the HRCE Representative. Cut out fire stop and remove to ensure fire stop system installation meets or exceeds the system design listing as identified.

.2 Submit formal request for substantial performance review of work once all work is completed, quality control has been performed and all fire stop installations have been inspected and identified with the approved fire stop identification labels.

3.9 CLEANING

.1 Perform cleaning in accordance with Section 01 74 00 - Cleaning.

.2 Remove equipment, excess materials, and debris and clean adjacent surfaces immediately after application. Use methods and cleaning materials approved by manufacturer.

.3 Protect fire stops during and after curing period from contact with contaminating substances

.4 Remove temporary dams after initial set of fire stop and smoke seal materials.

3.10 SCHEDULE

.1 Provide fire stop and L-Rated smoke-resistant fire stop systems at locations shown on Drawings and as indicated on Drawing schedules and details.

.2 Design and provide through-penetration fire stopping and smoke seals as follows:

.1 Systems with no penetrating items, select one or more of the following fill materials:

.1 Latex sealant.

.2 Silicone sealant.

.3 Intumescent putty.

.4 Intumescent foam blocks or boards.

.5 Intumescent spray foam.

.2 Systems for metallic pipes, conduit, or tubing, select one or more of the following fill materials:

.1 Latex sealant.

.2 Silicone sealant.

.3 Intumescent putty.

.4 Intumescent foam blocks or boards.

.5 Intumescent spray foam.

.3 Systems for non-metallic pipe, conduit, or tubing, select one or more of the following fill materials:

.1 Latex sealant.

.2 Silicone sealant.

.3 Intumescent putty.

.4 Intumescent foam blocks or boards.

.5 Intumescent spray foam.

.4 Systems for electrical, and data and communications cables, select one or more of the following fill materials:

.1 Latex sealant.

.2 Silicone sealant.

.3 Intumescent putty.

.4 Silicone foam.

.5 Prefabricated fire stop sleeve cp 653 (hilti).

.6 Preformed intumescent blocks cfs-bl (hilti).

.7 Preformed intumescent blocks (roxtec).

.8 Prefabricated cable pathways (ez-path).

.9 Intumescent foam blocks or boards.

.10 Intumescent spray foam.

.5 Systems for insulated pipes, select one or more of the following fill materials:

.1 Latex sealant.

.2 Intumescent putty.

.3 Silicone foam.

.4 Intumescent wrap strips.

.5 Intumescent foam blocks or boards.

.6 Intumescent spray foam.

.6 Systems for miscellaneous electrical penetrations, select one or more of the following fill materials:

.1 Latex sealant.

.2 Intumescent putty.

.3 Intumescent foam blocks or boards.

.4 Intumescent spray foam.

.7 Systems for miscellaneous mechanical penetrations, select one or more of the following fill materials:

.1 Latex sealant.

.2 Intumescent foam blocks or boards.

.3 Intumescent spray foam.

.8 Systems for groupings of penetrations, select one or more of the following fill materials:

.1 Latex sealant.

.2 Intumescent wrap strips.

.3 Fire stopping and smoke seal device.

.4 Intumescent composite sheet.

.5 Intumescent foam blocks or boards.

.6 Intumescent spray foam.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 30 00 - Cast-in-Place Concrete: Sealants required in conjunction with cast-in-place concrete.

.2 Section 07 84 00 - Firestopping: Sealants required in conjunction with firestopping.

1.2 REFERENCE STANDARDS

.1 ASTM C834-17 Standard Specification for Latex Sealants.

.2 ASTM C920-18 Standard Specification for Elastomeric Joint Sealants.

.3 ASTM C1184-23 Standard Specification for Structural Silicone Sealants.

.4 ASTM C1193-16 Standard Guide for Use of Joint Sealants.

.5 ASTM C1311-22 Standard Specification for Solvent Release Sealants.

.6 ASTM C1330-23 Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants.

.7 ASTM C1401-23 Standard Guide for Structural Sealant Glazing.

.8 ASTM C1481-12 Standard Guide for Use of Joint Sealants with Exterior Insulation and Finish Systems (EIFS).

1.3 ACTION SUBMITTALS

.1 Section 01 33 00 - Submittal Procedures.

.2 Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and colour availability.

1.4 INFORMATIONAL SUBMITTALS

.1 Section 01 33 00 - Submittal Procedures.

.2 Installation Data: Manufacturer's special installation requirements.

1.5 SITE CONDITIONS

.1 Ambient Conditions:

.1 Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.6 WARRANTY

.1 Section 01 78 00 - Closeout Submittals.

.2 Warranty: Provide a five (5) year warranty for failure to meet specified requirements including coverage for installed sealants and accessories which fail to achieve water tight seal, exhibit loss of adhesion or cohesion, or do not cure.

.3 Manufacturer's Warranty: Provide manufacturer's twenty (20) year material warranty for installed silicone sealant.

Part 2 Products

2.1 PERFORMANCE/DESIGN CRITERIA

.1 Sealant Design: Design structural sealant to withstand specified loads without breakage, loss, failure of seals, product deterioration, and other defects.

.2 Design installed sealant to withstand:

.1 Loads: Design and size to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of panel:

.1 As calculated in accordance with applicable code.

.2 As measured in accordance with ASTM E330/E330M.

.2 Movement from ambient temperature range of 49 °C.

.3 Movement and deflection of structural support framing.

.4 Water and air penetration.

2.2 SEALANTS

.1 Bituminous Based (Type B): Single component, asphalt compound, elongation capability of 0% to 2% of joint width.

.2 Acrylic Emulsion Latex (Type C): ASTM C834, Type C; single component, non-staining, non-bleeding, non-sagging:

.1 Elongation Capability 2% to 5%.

.2 Service Temperature Range -17 to 71 °C.

.3 Shore A Hardness Range 15 to 40.

.3 Acrylic Sealant (Type D): ASTM C920; single component, solvent curing, non-staining, non-bleeding, non-sagging; colour: as selected:

.1 Elongation Capability 7.5% to 12%.

.2 Service Temperature Range -17 to 71 °C.

.3 Shore A Hardness Range 25 to 50.

.4 Silicone Sealant (Type M): ASTM C920; multi-component, neutral curing, non-sagging, non-staining, non-bleeding:

.1 Elongation Capability 25%.

.2 Service Temperature Range -54 to 82 °C.

.3 Shore A Hardness Range 15 to 35.

.5 Sanitary Silicone Sealant (Type N): ASTM C920, Grade NS, Class 25, Use NT; single component, acetoxy curing, non-sagging, non-staining, mildew resistant; colour as selected:

.1 Elongation Capability 25%.

.2 Service Temperature Range -54 to 82 °C.

.3 Shore A Hardness Range 15 to 35.

2.3 ACCESSORIES

.1 Primer: Non-staining type, as recommended by sealant manufacturer to suit application.

.2 Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

.3 Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

.4 Masking tape: Non-staining, non-absorbent type compatible with sealant and adjacent surfaces.

.5 Setting Blocks and Spacers: Compatible with silicone sealant and recommended by sealant manufacturer.

Part 3 Execution

3.1 PREPARATION

.1 Remove loose materials and foreign matter which might impair adhesion of sealant.

.2 Clean and prime joints to sealant manufacturer's written instructions.

.3 Perform preparation to sealant manufacturer's written instructions.

.4 Protect elements surrounding the work of this section from damage or disfiguration.

3.2 INSTALLATION

.1 Install sealant to sealant manufacturer's written instructions.

.2 Measure joint dimensions and size materials to achieve required width/depth ratios.

.3 Install bond breaker where joint backing is not used.

.4 Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

.5 Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

.6 Tool joints concave.

3.3 FIELD QUALITY CONTROL

.1 Inspection and Testing:

.1 Joint Sealants: Perform adhesion tests to manufacturer's written instructions and ASTM C1193, Method A - Field-Applied Sealant Joint Hand Pull Tab.

.2 Remove sealants failing adhesion test, clean substrates, reinstall sealants, and perform retesting.

.3 Maintain test log and submit report to the HRCE Representative indicating tests, locations, dates, results, and remedial actions.

.2 Manufacturer's Services:

.1 Monitor and report installation procedures and unacceptable conditions.

3.4 CLEANING

.1 Section 01 74 00 - Cleaning: Cleaning installed work.

.2 Clean adjacent soiled surfaces.

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Shop Drawings:

.1 Submit manufacturer's instructions, printed product literature, and data sheets for all Division 23 products and include product characteristics, performance criteria, physical size, finish, and limitations.

.2 Indicate on drawings:

.1 Mounting arrangements.

.2 Operating and maintenance clearances.

.3 Shop drawings and product data accompanied by:

.1 Detailed drawings of bases, supports, and anchor bolts.

.2 Acoustical sound power data, where applicable.

.3 Points of operation on performance curves.

.4 Manufacturer to certify current model production.

.5 Certification of compliance to applicable codes.

1.2 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for all Division 23 products for incorporation into manual.

.1 Operation and maintenance manual approved by, and final copies deposited with, the HRCE Representative before final inspection.

.2 Operation data to include:

.1 Control schematics for systems including environmental controls.

.2 Description of systems and their controls.

.3 Description of operation of systems at various loads together with reset schedules and seasonal variances.

.4 Operation instruction for systems and component.

.5 Description of actions to be taken in event of equipment failure.

.6 Valves schedule and flow diagram.

.7 Colour coding chart.

.3 Maintenance data to include:

.1 Servicing, maintenance, operation, and trouble-shooting instructions for each item of equipment.

.2 Data to include schedules of tasks, frequency, tools required, and task time.

.4 Performance data to include:

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

.2 Equipment performance verification test results.

.3 Special performance data as specified.

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

.5 Approvals:

.1 Submit 2 copies of draft Operation and Maintenance Manual to the HRCE Representative for approval. Submission of individual data will not be accepted unless directed by the HRCE Representative.

.2 Make changes as required and re-submit as directed by the HRCE Representative.

.6 Additional data:

.1 Prepare and insert into Operation and Maintenance Manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.7 Site records:

.1 Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems, and low voltage control wiring.

.2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection.

.8 As-built drawings:

.1 Prior to start of testing, adjusting, and balancing for HVAC, finalize production of as-built drawings.

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

.3 Submit to the HRCE Representative for approval and make corrections as directed.

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

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

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

1.3 MAINTENANCE MATERIAL SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Furnish spare parts as follows:

.1 One set of packing for each pump.

.2 One casing joint gasket for each size pump.

.3 One head gasket set for each heat exchanger.

.4 One glass for each gauge glass.

.5 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.

.3 Provide one set of special tools required to service equipment as recommended by manufacturers.

1.4 DELIVERY, STORAGE, AND HANDLING

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

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

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

.2 Store and protect materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse or recycling of pallets, crates, padding, and/or packaging materials in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for all Division 23 product installation in accordance with manufacturer's written instructions:

.1 Visually inspect substrate in presence of the HRCE Representative.

.2 Inform the HRCE Representative of unacceptable conditions immediately upon discovery.

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

3.2 PAINTING REPAIRS AND RESTORATION

.1 Prime and touch up marred finished paintwork to match original.

.2 Restore to new condition, finishes which have been damaged.

3.3 SYSTEM CLEANING

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

3.4 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:

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

3.5 DEMONSTRATION

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

.2 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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.

3.7 PROTECTION

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

END OF SECTION

Part 1 General

1.1 DEFINITIONS

.1 Demolish: Detach items from existing construction and legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.

.2 Remove: Planned deconstruction and disassembly of electrical items from existing construction including removal of conduit, junction boxes, cabling, and wiring from electrical component to panel taking care not to damage adjacent assemblies designated to remain; legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.

.3 Remove and Salvage: Detach items from existing construction and deliver them to the HRCE Representative ready for reuse.

.4 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

.5 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed and salvaged, or removed and reinstalled.

.6 Hazardous Substances: Dangerous substances, dangerous goods, hazardous commodities and hazardous products may include asbestos, mercury and lead, PCB's, poisons, corrosive agents, flammable substances, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly as defined by the Federal Hazardous Products Act (RSC 1985) including latest amendments.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Action Submittals: Provide the following in accordance with Section 01 33 00 - Submittal Procedures before starting work of this Section:

.1 Construction Waste Management Plan (CWM Plan): Submit plan addressing opportunities for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 19 - Waste Management and Disposal.

.2 Landfill Records: Indicate receipt and acceptance of selective demolition waste and hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Coordination: Coordinate work of this Section to avoid interference with work by other Sections.

1.4 QUALITY ASSURANCE

.1 Regulatory Requirements: Perform work of this Section in accordance with the following:

.1 Government of Canada, Labour Program: Workplace Safety.

.2 Provincial/Territorial Occupational Health and Safety Standards and Programs.

.3 Provincial/Territorial Worker's Compensation Boards/Commissions.

1.5 SITE CONDITIONS

.1 Existing Conditions: Condition of materials identified as being salvaged or demolished are based on their observed condition on date that tender is accepted.

1.6 SALVAGE AND DEBRIS MATERIALS

.1 Demolished items become Contractors property and will be removed from Project site; except for items indicated as being reused, salvaged, or otherwise indicated to remain HRCE's property.

.2 Carefully remove materials and items designated for salvage and store in a manner to prevent damage or devaluation of materials.

Part 2 Products

2.1 MATERIAL

.1 HVAC Repair Materials: Use only new materials required for completion or repair matching materials damaged during performance of work of this Section; new materials are required to meet assembly or system characteristics as existing systems indicated to remain and carry CSA approval labels required by the Authority Having Jurisdiction.

.2 Fire stopping Repair Materials: Use fire stopping materials compatible with existing fire stopping systems where removal or demolition work affects rated assemblies, restore to match existing fire rated performance.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Existing Conditions: Visit site, thoroughly examine, and become familiar with conditions that may affect the work of this Section before tendering the Bid; HRCE Representative will not consider claims for extras for work or materials necessary for proper execution and completion of the contract that could have been determined by a site visit.

3.2 PREPARATION

.1 Protection of Existing Systems to Remain: Protect systems and components indicated to remain in place during selective demolition operations and as follows:

.1 Prevent movement and install bracing to prevent settlement or damage of adjacent services and parts of existing buildings scheduled to remain.

.2 Notify HRCE Representative and cease operations where safety of buildings being demolished, adjacent structures or services appears to be endangered and await additional instructions before resuming demolition work specified in this Section.

.3 Prevent debris from blocking drainage inlets.

.4 Protect mechanical systems that must remain in operation.

.2 Protection of Building Occupants: Sequence demolition work so that interference with the use of the building by the HRCE Representative and users is minimized and as follows:

.1 Prevent debris from endangering the safe access to and egress from occupied buildings.

.2 Notify HRCE Representative and cease operations where safety of occupants appears to be endangered and await additional instructions before resuming demolition work specified in this Section.

3.3 EXECUTION

.1 Demolition: Coordinate requirements of this Section with information as follows:

.1 Disconnect and cap gas supply and electrical services in accordance with requirements of local Authority Having Jurisdiction.

.2 Do not disrupt active or energized utilities without approval of the HRCE Representative.

.3 Erect and maintain dust proof and weather tight partitions to prevent the spread of dust and fumes to occupied building areas; remove partitions when complete.

.4 Demolish parts of existing building to accommodate new construction and remedial work as indicated.

.5 At end of each day's work, leave worksite in safe condition.

.6 Perform demolition work in a neat and workmanlike manner:

.1 Remove any tools or equipment after completion of work, and leave site clean and ready for subsequent renovation work.

.2 Repair and restore damages caused as a result of work of this Section to match existing materials and finishes.

3.4 CLOSEOUT ACTIVITIES

.1 Demolition Waste Disposal: Arrange for legal disposal and remove demolished materials to accredited Provincial landfill site or alternative disposal site (recycle centre) except where explicitly noted otherwise for materials being salvaged for reuse in new construction.

.2 Hazardous Substances Disposal: Arrange for disposal of hazardous substances in accordance with requirements of HRCE Representative.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

.2 CSA Group (CSA):

.1 CAN/CSA B139-19, Installation Code for Oil Burning Equipment.

.3 National Research Council Canada (NRC):

.1 National Fire Code of Canada 2020 (NFC).

1.2 DELIVERY, STORAGE, AND HANDLING

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

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

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

.2 Store and protect materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse or recycling of pallets, crates, padding, and/or packaging materials in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 MATERIAL

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

.1 Primers, coatings, and paints: 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 flexible connections, hoses, or other approved fittings 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 applicable codes and standards.

.2 Provide space for disassembly, removal of equipment, and components as recommended by manufacturer and/or as indicated without interrupting operation of other system, equipment, and components.

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 gate or globe valves unless indicated otherwise, with hose end male thread, cap, and chain.

3.5 AIR VENTS

.1 Install air vents at high points in piping systems and as required by equipment manufacturer.

.2 Install isolating valve at each automatic air valve.

3.6 DIELECTRIC COUPLINGS

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

.2 Locations: where dissimilar metals are joined.

.3 NPS 2 and under: isolating unions or bronze valves.

.4 Over NPS 2: isolating flanges.

3.7 PIPEWORK INSTALLATION

.1 Install pipework to requirements of applicable codes and standards.

.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 similar items parallel or perpendicular to building lines.

.8 Install concealed pipework to minimize furring space, maximize headroom, and 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 as indicated.

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

.6 Use chain operators on valves NPS 2 1/2 and larger where installed more than 2,400 mm above floor in Mechanical Rooms.

3.8 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, and 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 Foundation walls and below grade floors: fire retardant, waterproof non-hardening mastic.

.2 Elsewhere:

.1 Provide space for fire stopping.

.2 Maintain the fire-resistance rating integrity of the fire separation.

.3 Sleeves installed for future use: fill with lime plaster or other easily removable filler.

.4 Ensure no contact between copper pipe or tube and sleeve.

3.9 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.

3.10 PREPARATION FOR FIRE STOPPING

.1 Coordinate the installation of fire stopping around pipes, insulation, and adjacent fire separation.

.2 Pipes subject to movement: conform to fire stop system design listing to ensure pipe movement without damaging fire stopping material or installation.

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

3.11 FLUSHING OUT OF PIPING SYSTEMS

.1 Flush system in accordance with Section 23 08 16 - Cleaning and Start-up of HVAC Piping Systems.

.2 Before start-up, clean interior of piping systems in accordance with requirements of Section 01 74 00 - Cleaning supplemented as specified in relevant mechanical sections.

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

3.12 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

.1 Advise 48 hours minimum prior to performance of pressure tests.

.2 Pipework: test as specified in relevant sections of heating, ventilating, and air conditioning work.

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

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

.5 Conduct tests in presence of HRCE Representative.

.6 Pay costs for repairs or replacement, retesting, and making good. HRCE Representative to determine whether repair or replacement is appropriate.

.7 Insulate or conceal work only after approval and certification of tests by HRCE Representative.

3.13 EXISTING SYSTEMS

.1 Connect into existing piping systems at times approved by HRCE Representative.

.2 Request written approval by HRCE Representative 5 days minimum, prior to commencement of work.

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

3.14 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 American Society of Mechanical Engineers (ASME):

.1 ASME B40.100-2022, Pressure Gauges and Gauge Attachments.

.2 ASME B40.200-2008 (R2013), Thermometers, Direct Reading, and Remote Reading.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Shop Drawings:

.1 Submit manufacturer's instructions, printed product literature, and data sheets for thermometers and pressure gauges and include product characteristics, performance criteria, physical size, finish, and limitations.

1.3 DELIVERY, STORAGE, AND HANDLING

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

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

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

.2 Store and protect materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse or recycling of pallets, crates, padding, and/or packaging materials in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 GENERAL

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

.2 Ranges: as indicated.

2.2 DIRECT READING THERMOMETERS

.1 Industrial, variable angle type, mercury-free, liquid filled, 125 mm scale length: to ASME B40.200:

.1 Resistance to shock and vibration.

2.3 REMOTE READING THERMOMETERS

.1 100 mm diameter activated dial type: to ASME B40.200, accuracy within one scale division, brass movement, stainless steel capillary, stainless steel spiral armour, stainless steel bulb, and polished stainless steel case for wall mounting.

2.4 THERMOMETER WELLS

.1 Copper pipe: copper or bronze.

.2 Steel pipe: stainless steel.

2.5 PRESSURE GAUGES

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

.2 Provide:

.1 Snubber for pulsating operation.

.2 Diaphragm assembly for corrosive service.

.3 Gasketted pressure relief back with solid front.

.4 Bronze stop cock.

.5 Oil filled for high vibration applications.

Part 3 Execution

3.1 GENERAL

.1 Install thermometers and gauges so they can be easily read from floor or platform:

.1 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. Include heat conductive material inside well.

.2 Install in locations as indicated and on inlet and outlet of:

.1 Heat exchangers.

.2 Water heating and cooling coils.

.3 Water boilers.

.4 DHW tanks.

.3 Use extensions where thermometers are installed through insulation.

3.3 PRESSURE GAUGES

.1 Install in locations as follows:

.1 Suction and discharge of pumps.

.2 Upstream and downstream of PRV's.

.3 Upstream and downstream of control valves.

.4 Inlet and outlet of coils.

.5 Inlet and outlet of liquid side of heat exchangers.

.6 Outlet of boilers.

.7 In other locations as indicated.

.2 Install gauge cocks for isolation purposes, elsewhere as indicated.

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

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME):

.1 ANSI/ASME B1.20.1-2013 (R2018), Pipe Threads, General Purpose (Inch).

.2 ASTM International (ASTM):

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

.2 ASTM B505/B505M-22, Standard Specification for Copper-Base Alloy Continuous Castings.

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

.1 MSS-SP-80-2019, Bronze Gate Globe, Angle and Check Valves.

.2 MSS-SP-110-2010, Ball Valves, Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Shop Drawings:

.1 Provide manufacturer's printed product literature and data sheets for valves specified in this Section and include product characteristics, performance criteria, physical size, finish, and limitations.

1.3 MAINTENANCE MATERIAL SUBMITTALS

.1 Extra Materials/Spare Parts:

.1 Furnish following spare parts:

.1 Valve seats: one for every 10 valves each size. Minimum 1.

.2 Discs: one for every 10 valves, each size. Minimum 1.

.3 Stem packing: one for every 10 valves, each size. Minimum 1.

.4 Valve handles: 2 of each size.

.5 Gaskets for flanges: one for every 10 flanged joints.

.2 Tools:

.1 Furnish special tools for maintenance of systems and equipment.

1.4 DELIVERY, STORAGE, AND HANDLING

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

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

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

.2 Store and protect materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse or recycling of pallets, crates, padding, and/or packaging materials in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

.1 Valves:

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

.2 Products to have CRN registration numbers.

.2 End Connections:

.1 Connection into adjacent piping/tubing:

.1 Screwed ends with hexagonal shoulders to ANSI/ASME B1.20.1.

.3 Gate Valves:

.1 Requirements common to gate valves, unless specified otherwise:

.1 Standard specification: MSS SP-80.

.2 Bonnet: union with hexagonal shoulders.

.3 Inspection and pressure testing: to MSS SP-80. Tests to be hydrostatic.

.4 Packing: non-asbestos.

.5 Handwheel: non-ferrous.

.6 Handwheel Nut: bronze to ASTM B62.

.2 NPS 2 and under, non-rising stem, solid wedge disc, Class 125:

.1 Body: with long disc guides, screwed bonnet with stem retaining nut.

.2 Operator: Handwheel.

.3 NPS 2 and under, rising stem, split wedge disc, Class 125:

.1 Body: with long disc guides, screwed bonnet.

.2 Disc: split wedge, bronze to ASTM B283, loosely secured to stem.

.3 Operator: handwheel.

.4 Globe Valves:

.1 Requirements common to globe valves, unless specified otherwise:

.1 Standard specification: MSS SP-80.

.2 Bonnet: union with hexagonal shoulders.

.3 Pressure testing: to MSS SP-80. Tests to be hydrostatic.

.4 Stuffing box: threaded to bonnet with gland follower, packing nut, high grade non-asbestos packing.

.5 Handwheel: non-ferrous.

.6 Handwheel Nut: bronze to ASTM B62.

.2 NPS 2 and under, plug disc, Class 150, screwed ends:

.1 Disc and seat ring: tapered plug type with disc stem ring of AISI S420 stainless steel to ASTM A276, loosely secured to stem.

.2 Operator: handwheel.

.5 Check Valves:

.1 Requirements common to check valves, unless specified otherwise:

.1 Standard specification: MSS SP-80.

.2 NPS 2 and under, swing type, bronze disc, Class 125:

.1 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.

.2 Disc and seat: renewable rotating disc, two-piece hinge disc construction; seat: regrindable.

.6 Ball Valves:

.1 Standard specification: MSS SP-110.

.2 NPS 2 and under:

.1 Body and cap: cast high tensile bronze to ASTM B62.

.2 Pressure rating: Class 125.

.3 Stem: tamperproof ball drive.

.4 Stem packing nut: external to body.

.5 Ball and seat: replaceable stainless steel solid ball and Teflon seats.

.6 Stem seal: TFE with external packing nut.

.7 Operator: removable lockable lever handle.

.7 Pressure Independent Balancing and Control Valves:

.1 NPS 1/2 to NPS 2:

.1 Body: Dezincification Resistant (DZR) copper brass alloy.

.2 Differential Pressure Insert: DZR and polyphenylsulphide (PPS).

.3 Disc: stainless steel or DZR/PTFE.

.4 Stem and Spring: stainless steel.

.5 Seals and Membrane: EPDM.

.6 Pressure Rating: 1,600 kPa (230 psi).

.7 Operating Temperature Range: -10 °C to +90 °C.

.2 Performance:

.1 Max Flowrate: factory pre-set to flowrate as indicated.

.2 Flow Factor (Kv): manufacturer specified to suit installation requirements.

.3 Flow Characteristic: equal percentage.

.4 Min-Max Differential Pressure: 30 - 400 kPa (4.4 - 58 psi).

.3 Control:

.1 Modulating or 2 Position: as indicated.

.2 Actuator: 24 V electric.

.3 Control I/O: as indicated.

.4 Failure position: as indicated.

.5 Torque: manufacturer specified to suit installation requirements.

.6 Indication: visual scale or dial to indicate valve position.

.7 Factory installed and calibrated by valve manufacturer.

.8 Coil Kits:

.1 Size: NPS 1/2 to NPS 2.

.2 Construction: as specified this section or DZR copper brass alloy with EPDM seals and o-rings.

.3 Coil Inlet (Supply) Assembly:

.1 Combination Ball Valve/Strainer: DZR copper brass alloy, stainless steel ball, EPDM seals, 0.84 mm (20 mesh) stainless steel screen, 6 mm manual air vent, 6 mm drain ball valve with 19 mm hose thread and cap, 6 mm probe port with cap, FNPT inlet, FNPT union outlet.

.2 Hose: braided stainless steel flex hose with swivel connection at coil.

.4 Coil Outlet (Return) Assembly:

.1 Hose: braided stainless steel flex hose with swivel connection at coil.

.2 Pressure Independent Balancing and Control Valve: as specified this section.

.3 Combination Ball Valve: DZR copper brass alloy, stainless steel ball, EPDM seals, 6 mm drain ball valve with 19 mm hose thread and cap, 6 mm probe port with cap, FNPT union inlet, FNPT outlet.

.5 Handle and probe extensions where installed in insulated piping.

.6 Factory assembled and tagged to match equipment identification.

Part 3 Execution

3.1 INSTALLATION

.1 Install valves with unions at each piece of equipment arranged to allow servicing, maintenance, and equipment removal.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 American Society of Mechanical Engineers (ASME):

.1 ASME B16.1-20, Cast Iron Pipe Flanges and Flanged Fittings.

.2 ASTM International (ASTM):

.1 ASTM A49-12 (2019), Standard Specification for Heat-Treated Carbon Steel Joint Bars.

.2 ASTM A126-04 (2019), Standard Specification for Grey Iron Castings for Valves, Flanges, and Pipe Fittings.

.3 ASTM A536-84 (2019)e1, Standard Specification for Ductile Iron Castings.

.4 ASTM B61-15 (2021), 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-18e01, Standard Specification for Aluminum-Alloy Die Castings.

.3 CSA Group (CSA):

.1 CSA B242-05 (2015), Groove and Shoulder Type Mechanical Pipe Couplings.

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

.1 MSS SP-61-2019, Pressure Testing of Steel Valves.

.2 MSS SP-70-2011, Grey Iron Gate Valves, Flanged and Threaded Ends.

.3 MSS SP-71-2018, Grey Iron Swing Check Valves, Flanged and Threaded Ends.

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

.5 MSS SP-85-2011, Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Shop Drawings:

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

1.3 MAINTENANCE MATERIAL SUBMITTALS

.1 Extra Materials/Spare Parts:

.1 Furnish following spare parts:

.1 Valve seats: one for every 10 valves each size. Minimum 1.

.2 Discs: one for every 10 valves, each size. Minimum 1.

.3 Stem packing: one for every 10 valves, each size. Minimum 1.

.4 Valve handles: 2 of each size.

.5 Gaskets for flanges: one for every 10 flanged joints.

.2 Tools:

.1 Furnish special tools for maintenance of systems and equipment.

1.4 DELIVERY, STORAGE, AND HANDLING

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

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

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

.2 Store and protect materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse or recycling of pallets, crates, padding, and/or packaging materials in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 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 B126 Class B or ductile iron to ASTM A536 Grade 65-45-12.

.2 Connections: flanged ends with 2 mm raised face with serrated finish to ANSI B16.1 or grooved ends to CSA B242.

.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, bronze 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 125.

.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.

.2 NPS 2 1/2-8, outside screw and yoke (OS&Y), bronze 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, yoke, yoke hub, yoke sleeve and nut. Class 125.

.2 Disc: solid offset taper wedge, bronze to ASTM B62 up to NPS 3, cast iron with bronze disc rings on other sizes, secured to stem through integral forged T-head disc-stem connection.

.3 Seat rings: renewable bronze screwed into body.

.4 Stem: manganese-bronze.

.5 Disc: solid offset taper all-cast iron, secured to stem through integral forged T-head disc-stem connection.

.6 Seat rings: integral with body.

.7 Stem: nickel-plated steel.

.8 Pressure-lubricated operating mechanism.

.9 Operator: handwheel.

2.3 GLOBE VALVES

.1 NPS 2 1/2 - 10, OSY:

.1 Body: with multiple-bolted bonnet.

.2 WP: 860 kPa steam, 1.4 MPa CWP.

.3 Bonnet-yoke gasket: non-asbestos.

.4 Disc: bronze to ASTM B62, fully guided from bottom, securely yet freely connected to stem for swivel action and accurate engagement with disc.

.5 Seat ring: renewable, regrindable, screwed into body.

.6 Stem: bronze to ASTM B62.

.7 Operator: handwheel.

2.4 BYPASSES FOR GATE AND GLOBE VALVES

.1 Locations: on valves as indicated.

.2 Size of bypass valve:

.1 Main valve up to NPS 8: NPS 3/4.

.2 Main valve NPS 10 and over: NPS 1.

.3 Type of bypass valves:

.1 On gate valve: globe, with stainless steel disc, bronze trim, to Section 23 05 23.01 - Valves - Bronze. Pressure rating to match main valve.

.2 On globe valve: globe, with stainless steel disc, bronze trim, to Section 23 05 23.01 - Valves - Bronze. Pressure rating to match main valve.

2.5 VALVE OPERATORS

.1 Install valve operators as follows:

.1 Handwheel: on valves except as specified.

.2 Handwheel with chain operators: on valves installed more than 2,400 mm above floor in mechanical equipment rooms.

2.6 CHECK VALVES

.1 Swing check valves, Class 125:

.1 Body and bolted cover: with tapped and plugged opening on each side for hinge pin. Grooved or flanged ends: plain faced with smooth finish:

.1 Up to NPS 16: cast iron to ASTM A126 Class B or ductile iron ASTM A536 Grade 65-45-12.

.2 Ratings:

.1 NPS 2 1/2 - 12: 860 kPa steam; 1.4 MPa CWP.

.3 Disc: rotating for extended life:

.1 Up to NPS 6: bronze to ASTM B62.

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

.5 Hinge pin, bushings: renewable bronze to ASTM B62.

.6 Disc: A126 Class B, secured to stem, rotating for extended life.

.7 Seat: cast iron, integral with body.

.8 Hinge pin: exelloy; bushings: malleable iron.

.9 Identification tag: fastened to cover.

.10 Hinge: galvanized malleable iron.

Part 3 Execution

3.1 INSTALLATION

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

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME):

.1 ASME B16.1-20, Grey Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.

.2 ANSI/ASME B16.5-20, Pipe Flanges and Flanged Fittings: NPS ½ through 24.

.2 ASTM International (ASTM):

.1 ASTM A536-84 (2019) e1, Standard Specification for Ductile Iron Castings.

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

.1 MSS SP-67-22, Butterfly Valves.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Shop Drawings:

.1 Provide manufacturer's printed product literature and data sheets for valves specified in this Section and include product characteristics, performance criteria, physical size, finish, and limitations.

1.3 DELIVERY, STORAGE, AND HANDLING

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

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

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

.2 Store and protect materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse or recycling of pallets, crates, padding, and/or packaging materials in accordance with Section 01 74 19 - Waste Management and Disposal.

1.4 MAINTENANCE MATERIAL SUBMITTALS

.1 Furnish following spare parts:

.1 Valve seats: one for every 10 valves each size. Minimum 1.

.2 Discs: one for every 10 valves, each size, minimum 1.

.3 Stem packing: one for every 10 valves, each size, minimum 1.

.4 Valve handles: 2 of each size.

.5 Gaskets for flanges: one for every 10 flanged joints.

.2 Tools:

.1 Furnish special tools for maintenance of systems and equipment.

Part 2 Products

2.1 BUTTERFLY VALVES - COMMON REQUIREMENTS

.1 Bubble tight shutoff with downstream flanges removed, suitable for dead-end service.

.2 CRN required for products.

.3 Designed to comply with MSS SP-67.

.4 Application: on-off operation.

2.2 BUTTERFLY VALVES - GROOVED CONNECTION

.1 Manufacturer: Victaulic.

.2 Sizes:

.1 Grooved end type: NPS 2-1/2 to 12.

.3 Pressure rating: 300 psig at 110 °C.

.4 Operators:

.1 NPS 2-1/2 - 6: handles capable of locking in any of ten (10) positions - 0 degrees to 90 degrees. Handle and release trigger - ductile iron. Return spring and hinge pin: carbon steel. Latch plate and mounting hardware: cadmium plated carbon steel.

.5 Construction:

.1 Body: ductile iron.

.2 Disc: plated ductile iron.

.3 Seat: EPDM.

.4 Shaft: 416 stainless steel.

.5 Disc shall not be pinned to shaft.

.6 Refer to manufacturer's literature for additional materials.

2.3 MOUNTING FLANGES

.1 Class 125 cast iron to ANSI B16.1 or Class 150 steel to B16.5 pipe flanges.

2.4 ELECTRIC ACTUATORS

.1 Operation: designed to provide precise quarter turn electric operation:

.1 Torque range: up to 1.130 N-m and speed ranges from 10 seconds to 30 seconds to move from fully open to fully closed.

.2 Gear train within actuator to provide smooth continuous rotary power stroke for accurate automatic valve positioning. Factory-set, field adjustable cam-actuated travel limit switches to provide precise control of shaft rotation.

.2 Construction:

.1 Castings: heavy duty industrial grade for rugged use.

.2 Actuators: continuous duty with high efficiency single phase reversing capacitor motor with thermal overload protection.

.3 Gears and pinions constructed from hardened steel.

.4 Gear train to be permanently lubricated.

.5 Mechanical brake to ensure that gear is locked in precise position.

.3 Electrical:

.1 Standard voltage: 120 VAC. 60 Hz.

.2 Control options: 2 position.

.3 CSA approved.

.4 Electrical rating: NEMA IV.

Part 3 Execution

3.1 PREPARATION

.1 Valve and mating flange preparation:

.1 Inspect adjacent pipeline, remove rust, scale, welding slag, and other foreign material.

.2 Ensure that valve seats and pipe flange faces are free of dirt or surface irregularities which may disrupt flange seating and cause external leakage.

.3 Install butterfly valves with disc in almost closed position.

.4 Inspect valve disc seating surfaces and waterway and eliminate dirt or foreign material.

3.2 INSTALLATION OF VALVES

.1 Install in accordance with manufacturer's instructions.

.2 Do not use gaskets between pipe flanges and valves unless instructed otherwise by valve manufacturer.

.3 Verify suitability of valve for application by inspection of identification tag.

.4 Mount actuator on to valve prior to installation.

.5 Handle valve with care so as to prevent damage to disc and seat faces.

.6 Valves in horizontal pipe lines should be installed with stem in horizontal position to minimize liner and seal wear.

.7 Ensure that valves are centered between bolts before bolts are tightened and then opened and closed to ensure unobstructed disc movement. If interference occurs due, for example to pipe wall thickness, taper bore adjacent piping to remove interference.

3.3 ACTUATOR INSTALLATION

.1 Cycle valve operation from fully closed to fully open then back to fully closed.

.2 At same time, check travel stop settings for proper disc alignment.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 American Society of Mechanical Engineers (ASME):

.1 ASME B31.1-22, Power Piping.

.2 ASTM International (ASTM):

.1 ASTM A307-21, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.2 ASTM A563/A563M-21ae1, Standard Specification for Carbon and Alloy Steel Nuts (Inch and Metric).

.3 American National Standards Institute (ANSI)/Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS):

.1 MSS SP58-2018, Pipe Hangers And Supports - Materials, Design, Manufacture, Selection, Application, and Installation.

.4 National Research Council Canada (NRC):

.1 National Plumbing Code of Canada 2020 (NPC).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 DELIVERY, STORAGE, AND HANDLING

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

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

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

.2 Store and protect materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse or recycling of pallets, crates, padding, and/or packaging materials in accordance with Section 01 74 19 - Waste Management and Disposal.

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, and 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 MSS SP58 and ANSI B31.1.

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

2.3 PIPE HANGERS

.1 Finishes:

.1 Pipe hangers and supports: galvanized after manufacture.

.2 Use electro-plating galvanizing process.

.3 Ensure steel hangers in contact with copper piping are copper plated or epoxy coated.

.2 Upper attachment structural: suspension from lower flange of I-Beam:

.1 Cold piping NPS 2 maximum: malleable iron C-clamp with hardened steel cup point setscrew, locknut, and carbon steel retaining clip.

.2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts, and washers.

.3 Upper attachment structural: suspension from upper flange of I-Beam:

.1 Cold piping NPS 2 maximum: ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut, and carbon steel retaining clip.

.2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer, and nut.

.4 Upper attachment to concrete:

.1 Ceiling: carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye 6 mm minimum greater than rod diameter.

.2 Concrete inserts: wedge shaped body with knockout protector plate to MSS SP58.

.5 Shop and field-fabricated assemblies:

.1 Trapeze hanger assemblies: as indicated.

.2 Steel brackets: as indicated.

.6 Hanger rods: threaded rod material to MSS SP58:

.1 Ensure that hanger rods are subject to tensile loading only.

.2 Provide linkages where lateral or axial movement of pipework is anticipated.

.3 Do not use 22 mm or 28 mm rod.

.7 Pipe attachments: material to MSS SP58:

.1 Attachments for steel piping: carbon steel galvanized.

.2 Attachments for copper piping: copper plated black steel.

.3 Use insulation shields for hot pipework.

.4 Oversize pipe hangers and supports.

.8 Adjustable clevis: material to MSS SP58, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis:

.1 Ensure "U" has hole in bottom for rivetting to insulation shields.

.9 Yoke style pipe roll: carbon steel yoke, rod, and nuts with cast iron roll, to MSS SP58.

.10 U-bolts: carbon steel to MSS SP58 with 2 nuts at each end to ASTM A563:

.1 Finishes for steel pipework: galvanized.

.2 Finishes for copper, glass, brass, or aluminum pipework: epoxy coated.

.11 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP58.

2.4 INSULATION PROTECTION SHIELDS

.1 Insulated hot piping:

.1 Curved plate 300 mm long, with edges turned up, welded-in centre plate for pipe sizes NPS 12 and over, carbon steel to comply with MSS SP58.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install in accordance with:

.1 Manufacturer's instructions and recommendations.

.2 Clevis plates:

.1 Attach to concrete with 4 minimum concrete inserts, one at each corner.

.3 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.

3.3 HANGER SPACING

.1 Gas and fuel oil piping: up to NPS 1: every 1.8 m.

.2 Copper piping: up to NPS 1: every 1.5 m.

.3 Flexible joint roll groove pipe: in accordance with table below for steel, but not less than one hanger at joints. Table listings for straight runs without concentrated loads and where full linear movement is not required.

.4 Within 300 mm of each elbow.

.5 Support Spacing: Conform to following table:

Maximum Pipe Size: NPS	Maximum Spacing Steel	Maximum Spacing Copper
Up to 1-1/4	2.4 m	1.8 m
1-1/2	3.0 m	2.4 m
2	3.0 m	2.4 m
2-1/2	3.7 m	3.0 m
3	3.7 m	3.0 m
3-1/2	3.7 m	3.3 m
4	3.7 m	3.6 m
5	4.3 m	
6	4.3 m	
8	4.3 m	
10	4.9 m	
12	4.9 m	

3.4 HANGER INSTALLATION

.1 Install hanger so that rod is vertical under operating conditions.

.2 Adjust hangers to equalize load.

.3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

3.5 HORIZONTAL MOVEMENT

.1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.

.2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.6 FINAL ADJUSTMENT

.1 Adjust hangers and supports:

.1 Ensure that rod is vertical under operating conditions.

.2 Equalize loads.

.2 Adjustable clevis:

.1 Tighten hanger load nut securely to ensure proper hanger performance.

.2 Tighten upper nut after adjustment.

.3 C-clamps:

.1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.

.4 Beam clamps:

.1 Hammer jaw firmly against underside of beam.

3.7 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section includes:

.1 Materials and requirements for the identification of piping systems, duct work, valves, and controllers, including the installation and location of identification systems.

1.2 REFERENCE STANDARDS

.1 CSA Group (CSA):

.1 CSA B149.1-20, Natural Gas and Propane Installation Code.

.2 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-24.3-92, Identification of Piping Systems.

.3 National Fire Protection Association (NFPA):

.1 NFPA 13-2022, Standard for the Installation of Sprinkler Systems.

.2 NFPA 14-2019, Standard for the Installation of Standpipe and Hose Systems.

1.3 DELIVERY, STORAGE, AND HANDLING

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

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

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

.2 Store and protect materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse or recycling of pallets, crates, padding, and/or packaging materials in accordance with Section 01 74 19 - Waste Management and Disposal.

.5 Paint and Coating Disposal:

.1 Dispose of unused paint and coating material at official hazardous material collections site.

.2 Do not dispose of unused paint and coating material into sewer system, into streams, lakes, onto ground, or in locations where it will pose health or environmental hazard.

Part 2 Products

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

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

.2 Lettering and numbers raised or recessed.

.3 Information to include, as appropriate:

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

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

2.2 SYSTEM NAMEPLATES

.1 Colours:

.1 Hazardous: red letters, white background.

.2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).

.2 Construction:

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

.3 Sizes:

.1 Conform to following table:

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

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

.4 Locations:

.1 Terminal cabinets, control panels: use size #5.

.2 Equipment in Mechanical Rooms: use size #9.

.5 Identification for PSPC Preventive Maintenance Support System (PMSS):

.1 Use arrangement of Main identifier, Source identifier, Destination identifier.

.2 Equipment in Mechanical Room:

.1 Main identifier: size #9.

.2 Source and Destination identifiers: size #6.

.3 Terminal cabinets, control panels: size #5.

.3 Equipment elsewhere: sizes as appropriate.

2.3 PIPING SYSTEMS GOVERNED BY CODES

.1 Identification:

.1 Propane gas: to CSA/CGA B149.1.

2.4 IDENTIFICATION OF PIPING SYSTEMS

.1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.

.2 Pictograms:

.1 Where required: Workplace Hazardous Materials Information System (WHMIS) regulations.

.3 Legend:

.1 Block capitals to sizes and colours listed in CAN/CGSB 24.3.

.4 Arrows showing direction of flow:

.1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.

.2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.

.3 Use double-headed arrows where flow is reversible.

.5 Extent of background colour marking:

.1 To full circumference of pipe or insulation.

.2 Length to accommodate pictogram, full length of legend, and arrows.

.6 Materials for background colour marking, legend, arrows:

.1 Pipes and tubing 20 mm and smaller: waterproof and heat-resistant pressure sensitive plastic marker tags.

.2 Other pipes: pressure sensitive vinyl with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH, and continuous operating temperature of 150 °C and intermittent temperature of 200 °C.

.7 Colours and Legends:

.1 Where not listed, obtain direction from HRCE Representative.

.2 Colours for legends, arrows: to following table:

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

.3 Background colour marking and legends for piping systems:

Contents	Background Colour Marking	Legend
Hot water heating supply	Yellow	HEATING SUPPLY
Hot water heating return	Yellow	HEATING RETURN
Domestic hot water supply	Green	DOM. HW SUPPLY
Dom. HWS recirculation	Green	DOM. HW CIRC
Domestic cold water supply	Green	DOM. CWS
Refrigeration suction	Yellow	REF. SUCTION
Refrigeration liquid	Yellow	REF. LIQUID
Propane	to Codes	

2.5 IDENTIFICATION DUCTWORK SYSTEMS

.1 50 mm high stenciled letters and directional arrows 150 mm long x 50 mm high.

.2 Colours: black or coordinated with base colour to ensure strong contrast.

2.6 VALVES, CONTROLLERS

.1 Brass tags with 12 mm stamped identification data filled with black paint.

.2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, and location of tagged item.

2.7 CONTROLS COMPONENTS IDENTIFICATION

.1 Identify all systems, equipment, components, controls, and sensors with system nameplates specified in this section.

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

2.8 LANGUAGE

.1 Identification in English.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 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.

3.3 NAMEPLATES

.1 Locations:

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

.2 Standoffs:

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

.3 Protection:

.1 Do not paint, insulate, or cover.

3.4 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

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

.2 Adjacent to each change in direction.

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

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

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

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

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

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

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

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

3.5 VALVES, CONTROLLERS

.1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.

.2 Number valves in each system consecutively.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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.

END OF SECTION

Part 1 General

1.1 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.

1.2 QUALIFICATIONS OF TAB PERSONNEL

.1 Submit names of personnel to perform TAB to HRCE Representative 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 Associated Air Balance Council, (AABC) National Standards for Total System Balance, 7th Edition.

.2 National Environmental Balancing Bureau (NEBB), Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems, 9th Edition - 2019.

.3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing, 3rd Edition - 2002.

.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 SMACNA), requirements and recommendations contained in these procedures and requirements are mandatory.

1.3 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.

1.4 EXCEPTIONS

.1 TAB of systems and equipment regulated by codes, standards to satisfaction of Authority Having Jurisdiction.

1.5 CO-ORDINATION

.1 Schedule time required for TAB (including repairs and 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.

1.6 PRE-TAB REVIEW

.1 Review Contract Documents before project construction is started confirm in writing to HRCE Representative adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.

.2 Review specified standards and report to HRCE Representative 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.

1.7 START-UP

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

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

1.8 OPERATION OF SYSTEMS DURING TAB

.1 Operate systems for length of time required for TAB and as required by HRCE Representative for verification of TAB reports.

1.9 START OF TAB

.1 Notify HRCE Representative days prior to start of TAB.

.2 Start TAB when building is essentially completed, including:

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

.2 Application of weatherstripping, sealing, and caulking.

.3 Pressure, leakage, other tests specified elsewhere Division 23.

.4 Provisions for TAB installed and operational.

.3 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 Proper thermal overload protection in place for electrical equipment.

.2 Air systems:

.1 Filters in place, clean.

.2 Duct systems clean.

.3 Ducts, air shafts, and ceiling plenums are airtight to within specified tolerances.

.4 Correct fan rotation.

.5 Fire, smoke, and volume control dampers installed and open.

.6 Coil fins combed and clean.

.7 Access doors, installed, and closed.

.8 Outlets installed and volume control dampers open.

.3 Liquid systems:

.1 Flushed, filled, and vented.

.2 Correct pump rotation.

.3 Strainers in place and baskets clean.

.4 Isolating and balancing valves installed and open.

.5 Calibrated balancing valves installed and at factory settings.

.6 Chemical treatment systems complete, and operational.

1.10 APPLICATION TOLERANCES

.1 Do TAB to following tolerances of design values:

.1 HVAC systems: plus or minus 10%.

1.11 ACCURACY TOLERANCES

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

1.12 INSTRUMENTS

.1 Prior to TAB, submit to HRCE Representative list of instruments used together with serial numbers.

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

.3 Calibrate within 3 months of TAB. Provide certificate of calibration to HRCE Representative.

1.13 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit, prior to commencement of TAB:

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

1.14 TAB REPORT

.1 Format in accordance with referenced standard.

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

.1 Project record drawings.

.2 System schematics.

.3 Submit TAB Report for verification and approval, in PDF format.

1.15 VERIFICATION

.1 Reported results subject to verification by HRCE Representative.

.2 Provide personnel and instrumentation to verify up to 30% of reported results.

.3 Number and location of verified results as directed by HRCE Representative.

.4 Pay costs to repeat TAB as required to satisfaction of HRCE Representative.

1.16 SETTINGS

.1 After TAB is completed to satisfaction of HRCE Representative, replace drive guards, close access doors, lock devices in set positions, and 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.

1.17 COMPLETION OF TAB

.1 TAB considered complete when final TAB Report received and approved by HRCE Representative.

1.18 HVAC SYSTEMS

.1 Standard: TAB to most stringent of TAB standards of AABC, NEBB, or SMACNA.

.2 Do TAB of systems, equipment, components, and controls specified in Division 22, 23, and 25

.3 Qualifications: personnel performing TAB qualified to standards of AABC or NEBB.

.4 Quality assurance: perform TAB under direction of supervisor qualified to standards of AABC or NEBB.

.5 Measurements: to include as appropriate for systems, equipment, components, and controls:

.1 Air Systems: Air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, or dewpoint), duct cross-sectional area, and noise.

.2 Liquid Systems: flow rate, pressure, pressure drop, and temperature.

.3 Motors: RPM, electrical power, voltage, noise, and vibration.

.6 Locations of equipment measurements: to include as appropriate:

.1 Air Systems: Inlet and outlet of dampers, filter, coil, humidifier, fan, and other equipment causing changes in conditions.

.2 Liquid Systems: Inlet and outlet of pumps, heat exchangers, boilers, chillers, separators, terminal devices, coils, and other equipment causing changes in conditions.

.3 At controllers and controlled device.

.7 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register, or diffuser).

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 DEFINITIONS

.1 For the purposes of this Section:

.1 Concealed means insulated mechanical services in suspended ceilings, or in non-accessible chases, or in furred-in spaces.

.2 Exposed means not concealed.

.3 Jacketing is synonymous with insulation cladding and lagging.

.4 Mineral fibre is synonymous with glass fibre, rock wool, or slag wool.

1.2 REFERENCE STANDARDS

.1 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):

.1 ANSI/ASHRAE/IES 90.1-2022, Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 ASTM International (ASTM):

.1 ASTM C335/C335M-23, Standard Test Method for Steady-State Heat Transfer Properties of Pipe Insulation.

.2 ASTM C449/C449M-07 (2024), Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.

.3 ASTM C921-10 (2015), Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.4 ASTM C1729-21, Standard Specification for Aluminum Jacketing for Insulation.

.3 Midwest Insulation Contractors Association (MICA):

.1 North American Commercial and Industrial Insulation Standards (NACIIS) Manual, 9th Edition.

.4 ULC Standards (ULC):

.1 CAN/ULC-S102-19 (R2024), Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC-S702.1-21, Standard for Mineral Fibre Thermal Insulation for Buildings, Part 1: Material Specification.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Shop Drawings:

.1 Submit a schedule with a list of insulation for each service location, insulation type, thickness, and jacketing type.

.2 Submit manufacturer's product literature, specifications, and datasheets. Include product characteristics, performance criteria, and limitations.

1.4 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer: Specialist in performing work of this Section with at least three years successful experience in this type and size of project, member of Thermal Insulation Association of Canada (TIAC).

1.5 DELIVERY, STORAGE, AND HANDLING

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

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address, and ULC markings.

.3 Storage and Handling Requirements:

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

.2 Store and protect materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse or recycling of pallets, crates, padding, and/or packaging materials in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 DESCRIPTION

.1 Regulatory Requirements:

.1 Combustible piping materials, including adhesives in accordance with CAN/ULC-S102:

.1 Flame-spread rating: Maximum 25.

.2 Smoke developed classification: Maximum 50.

2.2 INSULATION

.1 Thermal conductivity ("k" factor) not to exceed specified values at 24 °C mean temperature when tested in accordance with ASTM C335/C335M.

.2 Type A-1: Rigid moulded mineral fibre without factory-applied vapour retarder jacketing:

.1 Mineral fibre: To CAN/ULC-S702.1.

.2 Maximum "k" factor: To CAN/ULC-S702.1.

.3 Type A-3: Rigid moulded mineral fibre with factory-applied vapour retarder jacketing:

.1 Mineral fibre: To CAN/ULC-S702.1.

.2 Jacketing: To ASTM C921.

.3 Maximum "k" factor: To CAN/ULC-S702.1.

.4 Type A-6: Flexible unicellular tubular elastomer:

.1 Insulation: With vapour retarder jacket.

.2 Jacketing: To ASTM C921.

.3 Maximum "k" factor: 0.04 W/m·K.

.4 Certified by manufacturer as free of potential stress corrosion cracking corrosive substances.

2.3 JACKETING

.1 Polyvinyl Chloride (PVC) Jacketing:

.1 One-piece moulded type and sheet, in accordance with ASTM C921, with pre-formed shapes as required.

.2 Colours: As selected by HRCE Representative from manufacturer's standard colour range.

.3 Minimum service temperature: -20 °C.

.4 Maximum service temperature: 65 °C.

.5 Moisture vapour transmission: Maximum 0.02 perm.

.6 Thickness: 0.51 mm (20 mils).

.7 Fastenings:

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

.2 Tacks.

.3 Pressure sensitive vinyl tape in matching colour.

.8 Covering adhesive: Compatible with insulation.

2.4 ACCESSORIES

.1 Weatherproof Sealant for Jackets Installed Outdoors: In accordance with Section 07 92 00 - Joint Sealants.

.2 Tape: Self-adhesive, aluminum, reinforced, and minimum 50 mm wide.

.3 Contact Adhesive: Quick setting type.

.4 Canvas Adhesive: Washable.

.5 Tie Wire: Stainless steel, minimum 1.5 mm diameter.

.6 Bands: Stainless steel, 19 mm wide, minimum 0.5 mm thick.

.7 Thermal Insulating and Finishing Cement: To ASTM C449, hydraulic setting type on mineral wool.

.8 Vapour Retarder Lap Adhesive: Water-based and fire retardant type, compatible with insulation.

.9 Indoor Vapour Retarder Finish: Vinyl emulsion type acrylic, compatible with insulation.

.10 Outdoor Vapour Retarder Finish:

.1 Vinyl emulsion type acrylic, compatible with insulation.

.2 Reinforcing fabric: Fibrous glass, untreated 305 g/m^2.

Part 3 Execution

3.1 PREPARATION

.1 Verify that pressure testing of piping systems and adjacent equipment is complete, witnessed, and certified.

.2 Verify that surfaces are clean, dry, and free from foreign material.

3.2 INSTALLATION

.1 Install to manufacturer's instructions and in accordance with MICA, North American Commercial and Industrial Insulation Standards (NACIIS) Manual.

.2 Provide two layers of insulation with staggered joints when required nominal wall thickness exceeds 75 mm.

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

.4 Install piping insulation continuous through wall and ceiling openings and sleeves, except where firestopping is required.

.5 Supports and Hangers:

.1 Hangers and supports in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

.2 Install hangars and supports outside vapour retarder jacket.

.3 Apply high compressive strength insulation that is suitable for HVAC piping service at oversized saddles and shoes where insulation saddles have not been provided.

3.3 INSTALLATION - ELASTOMERIC INSULATION

.1 Insulation to remain dry.

.2 Provide vapour retarder as recommended by manufacturer.

3.4 PIPING INSULATION SCHEDULES

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

.2 Type: A-1:

.1 Securements: Stainless steel wire at 300 mm on centre.

.2 Seals: Lap seal adhesive, lagging adhesive.

.3 Type: A-3:

.1 Securements: Stainless steel wire at 300 mm on centre.

.2 Seals: Vapour retarder lap seal adhesive, vapour retarder lagging adhesive.

.4 Type: A-6:

.1 Securements: to manufacturer's requirements.

.2 Seals: Lap seal adhesive, lagging adhesive.

.5 Provide insulation thickness as listed in the following table:

.1 Run-out: Branch piping to individual units and equipment not exceeding 4,000 mm long:

Application	Temperature	Piping Insulation Type	Run-out	Pipe sizes (NPS) to 1	Pipe sizes (NPS) 1 1/4 to 2	Pipe sizes (NPS) 2 1/2 to 4	Pipe sizes (NPS) 5 to 6	Pipe sizes (NPS) 8 & over
Hot Water Heating	60 - 94 °C	A-1	25 mm	38 mm	38 mm	38 mm	38 mm	38 mm
Hot Water Heating	Up to 59 °C	A-1	25 mm	25 mm	25 mm	25 mm	38 mm	38 mm
Glycol Heating	60 - 94 °C	A-1	25 mm	38 mm	38 mm	38 mm	38 mm	38 mm
Glycol Heating	Up to 59 °C	A-1	25 mm	25 mm	25 mm	25 mm	38 mm	38 mm
Refrigerant	4 - 13 °C	A-6	25 mm	25 mm	25 mm	25 mm	25 mm	25 mm
Refrigerant	Below 4 °C	A-6	25 mm	25 mm	38 mm	38 mm	38 mm	38 mm
Cooling Coil Condensate Drain		A-3	25 mm	25 mm	25 mm	25 mm	25 mm	25 mm

.6 Finishes:

.1 Exposed indoors: PVC jacketing.

.2 Exposed in mechanical rooms: PVC jacketing.

.3 Concealed, indoors: No additional finish.

.4 Outdoors: Waterproof aluminum jacketing.

.5 Outdoors: pipe insulation be completed with zero permeability insulation jacketing system.

.6 Finish attachments: Stainless steel bands, at 300 mm on centre.

.7 Seals: Wing.

3.5 SITE QUALITY CONTROL

.1 Non-Conforming Work: Replace insulation where there is damage to the vapour barrier and insulation is saturated with moisture.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 ASTM International (ASTM):

.1 ASTM E202-18, Standard Test Methods for Analysis of Ethylene Glycols and Propylene Glycols.

1.2 HYDRONIC SYSTEMS - PERFORMANCE VERIFICATION (PV)

.1 Perform hydronic systems performance verification after cleaning is completed and system is in full operation.

.2 When systems are operational, perform following tests:

.1 Conduct full scale tests at maximum design flow rates, temperatures, and pressures for continuous consecutive period of 48 hours to demonstrate compliance with design criteria.

.2 Verify performance of hydronic system circulating pumps as specified, recording system pressures, temperatures, fluctuations by simulating maximum design conditions and varying:

.1 Pump operation.

.2 Boiler and/or chiller operation.

.3 Pressure bypass open/closed.

.4 Control pressure failure.

.5 Maximum heating demand.

.6 Maximum cooling demand.

.7 Boiler and/or chiller failure.

.8 Outdoor reset. Re-check heat exchanger output supply temperature at 100% and 50% reset, maximum water temperature.

1.3 HYDRONIC SYSTEM CAPACITY TEST

.1 Perform hydronic system capacity tests after:

.1 TAB has been completed.

.2 Verification of operating, limit, and safety controls.

.3 Verification of primary and secondary pump flow rates.

.4 Verification of accuracy of temperature and pressure sensors and gauges.

.2 Calculate system capacity at test conditions.

.3 Using manufacturer's published data and calculated capacity at test conditions, extrapolate system capacity at design conditions.

.4 When capacity test is completed, return controls and equipment status to normal operating conditions.

.5 Submit sample of system water to approved testing agency to determine if chemical treatment is correct. Include cost.

.6 Heating system capacity test:

.1 Perform capacity test when ambient temperature is within 10% of design conditions. Simulate design conditions by:

.1 Increasing OA flow rates through heating coils (in this case, monitor heating coil discharge temperatures to ensure that coils are not subjected to freezing conditions); or

.2 Reducing space temperature by turning of heating system for sufficient period of time before starting testing.

.2 Test procedures:

.1 Open fully heat exchanger, heating coil, and radiation control valves.

.2 With boilers on full firing and hot water heating supply temperature stabilized, record flow rates and supply and return temperatures simultaneously.

.3 Conduct flue gas analysis test on boilers at full load and at low fire conditions.

1.4 GLYCOL SYSTEMS

.1 Test to prove concentration will prevent freezing to -30 °C Test inhibitor strength and include in procedural report. Refer to ASTM E202.

1.5 GASEOUS FUEL SYSTEMS

.1 Operation tests:

.1 Measure gas pressure at gas meter outlet and at burner manifold.

.2 Verify details of temperature and pressure compensation at meter.

.3 Verify settings, operation, venting of high and low pressure cut-outs, and alarms.

.4 Check terminals of vents for gas pressure regulators.

1.6 POTABLE WATER SYSTEMS

.1 When cleaning is completed and system filled:

.1 Verify performance of equipment and systems as specified elsewhere in Division 23.

.2 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut of water immediately. If water hammer occurs, replace water hammer arrestor or recharge air chambers. Repeat for each outlet and flush valve.

.3 Confirm water quality consistent with supply standards, verifying that no residuals remain resulting from flushing and/or cleaning.

1.7 REPORTS

.1 In accordance with Section 01 91 13 - General Commissioning Requirements: Reports, supplemented as specified herein.

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 REFERENCE STANDARDS

.1 ASTM International (ASTM):

.1 ASTM E202-18, 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).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Shop Drawings:

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

.2 Submit 2 copies of WHMIS SDS.

1.3 DELIVERY, STORAGE, AND HANDLING

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

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

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

.4 Packaging Waste Management: remove for reuse or recycling of pallets, crates, padding, and/or packaging materials in accordance with Section 01 74 19 - 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, and 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, and 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 system with water, ensure air is vented from system.

.2 Fill expansion tanks 1/3 to 1/2 full, charge system with compressed air to at least 35 kPa (does not apply to diaphragm type expansion tanks).

.3 Use water metre to record volume of water in system to +/- 0.5%.

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

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

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

.7 Add chemical solution to system.

.8 Establish circulation, raise temperature slowly to maximum design. Circulate for 12 hours, ensuring flow in all circuits. Remove heat, continue to circulate until temperature is below 38 °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).

.8 Glycol Systems:

.1 In addition to procedures specified above perform specified procedures.

.2 Test to prove concentration will prevent freezing to minus -25 °C. Test inhibitor strength and include in procedural report. Refer to ASTM E202.

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, and 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 system is clean.

.6 Commission water treatment systems as specified in Section 23 25 00 - HVAC Water Treatment.

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

.8 Repeat with water at design temperature.

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

.10 Bring system up to design temperature and pressure slowly.

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

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

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

.14 If expansion joints flex incorrectly or bind, shut down system, re-align, and repeat start-up procedures.

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

.16 Check operation of drain valves.

.17 Adjust valve stem packings as systems settle down.

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

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

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

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 American Society of Mechanical Engineers (ASME):

.1 ASME B1.20.1-13 (2008), Pipe Threads, General Purpose, Inch.

.2 ASME B16.3-21, Malleable Iron Threaded Fittings: Classes 150 and 300.

.3 ASME B16.5-20, Pipe Flanges and Flanged Fittings: NPS ½ through NPS 24 Metric/Inch Standard.

.4 ASME B16.9-18, Factory-Made Wrought Buttwelding Fittings.

.5 ASME B18.2.1-12 (2021), Square Hex, Heavy Hex and Askew Head Bolts and Hex, Heavy Hex, Hex Flange. Loaded Head and Lag Screws (Inch Series).

.6 ASME B18.2.2-22, Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series).

.2 ASTM International (ASTM):

.1 ASTM A53/A53M-22, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.

.2 ASTM A105/A105M-21, Standard Specification for Carbon Steel Forgings for Piping Applications.

.3 ASTM A197/A197M-00 (2019), Standard Specification for Cupola Malleable Iron.

.4 ASTM A234/A234M-23A, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.

.5 ASTM A536-84 (2019e1), Standard Specification for Ductile Iron Castings.

.6 ASTM E202-18, Standard Test Method for Analysis of Ethylene Glycols and Propylene Glycols.

.3 CSA Group (CSA):

.1 CSA B242-05 (R2021), Groove and Shoulder Type Mechanical Pipe Couplings.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Shop Drawings:

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

.2 Include submittals for:

.1 Piping.

.2 Fittings.

.3 Flanges.

.4 Valves.

.3 Indicate on drawings:

.1 Selected options, components, and accessories.

1.3 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.

1.4 DELIVERY, STORAGE, AND HANDLING

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

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

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

.2 Store and protect materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse or recycling of pallets, crates, padding, and/or packaging materials in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 PIPE

.1 Steel pipe: to ASTM A53/A53M, Grade B, as follows:

.1 To NPS 10: Schedule 40.

2.2 PIPE JOINTS

.1 NPS 2 and under: screwed fittings to ASME B16.3 with lead-free pipe dope:

.1 Pipe thread: to ASME B1.20.1

.2 NPS 2-1/2 and over: as indicated:

.1 Victaulic Roll grooved: standard or rigid couplings as indicated on drawings or as recommended by manufacturer. Couplings to CSA B242:

.1 Coupling gaskets: EPDM or as recommended by manufacturer to suit operating temperatures, pressures, and fluids.

.3 Bolts and nuts: to ASME B18.2.1 and ASME B18.2.2.

2.3 FITTINGS

.1 Screwed fittings: malleable iron, to ASTM A197, Class 150.

.2 Fittings for Victaulic rool grooved piping: ductile iron to ASTM A536.

2.4 VALVES

.1 Connections: as indicated above. See Pipe Joints.

.2 Gate valves:

.1 NPS 2 and under:

.1 Mechanical Rooms: Class 125, rising stem, split wedge disc, as specified Section 23 05 23.01 - Valves - Bronze.

.2 Elsewhere: Class 125, non- rising stem, solid wedge disc, as specified Section 23 05 23.01 - Valves - Bronze.

.2 NPS 2-1/2 and over:

.1 Mechanical Rooms: rising stem, split wedge disc, bronze trim, as specified Section 23 05 23.02 - Valves - Cast Iron.

.2 Elsewhere: non- rising stem, solid wedge disc, bronze trim, as specified Section 23 05 23.02 - Valves - Cast Iron.

.3 Butterfly valves:

.1 NPS 2-1/2 and over: as specified Section 23 05 23.05 - Butterfly Valves.

.4 Globe valves:

.1 NPS 2 and under: as specified in Section 23 05 23.01 - Valves - Bronze.

.2 NPS 2-1/2 and over: as specified in Section 23 05 23.02 - Valves - Cast Iron.

.5 Balancing valves, for TAB: As specified in Section 23 05 23.01 - Valves - Bronze.

.6 Drain valves: Gate, Class 125, non-rising stem, solid wedge disc, as specified Section 23 05 23.01 - Valves - Bronze.

.7 Swing check valves:

.1 NPS 2 and under: as specified in Section 23 05 23.01 - Valves - Bronze.

.2 NPS 2-1/2 and over: as specified in Section 23 05 23.02 - Valves - Cast Iron.

.8 Ball valves:

.1 NPS 2 and under: as specified Section 23 05 23.01 - Valves - Bronze.

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 Visually inspect substrate in presence of HRCE Representative.

.2 Inform HRCE Representative of unacceptable conditions immediately upon discovery.

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

3.2 PIPING INSTALLATION

.1 Install pipework in accordance with Section 23 05 15 - Common Installation Requirements for HVAC Pipework.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by hydronic systems installation.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 ASME:

.1 ASME Boiler and Pressure Vessel Code (BPVC), Section VII-2023.

.2 ASTM International (ASTM):

.1 ASTM A126-04 (2019), Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.

.2 ASTM A536-84 (2019) e1, Standard Specification for Ductile Iron Castings.

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

.3 CSA Group (CSA):

.1 CSA B51-19, Boiler, Pressure Vessel, and Pressure Piping Code.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Shop Drawings:

.1 Submit manufacturer's instructions, printed product literature, and data sheets for hydronic piping specialties and include product characteristics, performance criteria, physical size, finish, and limitations.

.2 Include submittals for:

.1 Expansion tanks.

.2 Air vents.

.3 Air-Dirt-Magnetic Separators.

.4 Hydraulic Separators.

.5 Strainers.

.3 Indicate on drawings:

.1 Selected options, components, and accessories.

1.3 DELIVERY, STORAGE, AND HANDLING

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

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

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

.2 Store and protect materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse or recycling of pallets, crates, padding, and/or packaging materials in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 BLADDER TYPE EXPANSION TANK

.1 Vertical steel pressurized bladder type expansion tank with 100% acceptance factor.

.2 Size and capacity: as indicated.

.3 Replaceable heavy duty butyl rubber bladder suitable for 115 °C operating temperature.

.4 Working pressure: 860 kPa with ASME stamp and certification.

.5 Air precharged to 84 kPa (initial fill pressure of system).

.6 Conform to: ASME BPVC, Section VII and CSA B51, and Provincial regulations.

2.2 AUTOMATIC AIR VENT

.1 Standard float vent: brass body and NPS 1/8 connection and rated at 690 kPa working pressure.

.2 Float: solid material suitable for 115 °C working temperature.

2.3 COMBINATION HYDRAULIC-AIR-DIRT-MAGNETIC SEPARATOR

.1 General:

.1 Fluid: Water or glycol solution to 50% concentration.

.2 Air: 100% removal down to micro-bubble level.

.3 Dirt: to 5 micron.

.4 Ferrous impurities: 100% removal, including magnetite, with removable neodymium rare-earth magnets.

.5 Pressure: 1,034 kPa, ASME rated.

.6 Temperature: 0 to 100 °C.

.7 Body: epoxy painted carbon steel.

.8 Air vent: automatic air vent, NPS 3/4 outlet connection, brass body, viton air seal, stainless steel air vent float, and with NPS 3/4 shut off ball valve for vent isolation/maintenance.

.9 Seals: EPDM.

.2 Size NPS 2½ to 4:

.1 ASME rated with CRN.

.2 Inlet/outlet connection: Class 150 raised face flange.

.3 Internal element: 300 series stainless steel screen and coalescing medium.

.4 Drain: NPS 1.

.5 Rigid closed cell expanded polyurethane foam shell insulation with external embossed aluminum cover.

2.4 COMBINATION AIR-DIRT-MAGNETIC SEPARATOR

.1 General:

- .1 Air: 100% removal down to micro-bubble level.
- .2 Dirt: to 5 micron.
- .3 Ferrous impurities: 100% removal, including magnetite, with removable neodymium rare-earth magnets.
- .4 Pressure: 1,034 kPa, ASME rated.
- .5 Temperature: 0 to 110 °C.
- .6 Body: epoxy painted carbon steel.
- .7 Internal element: stainless steel screen and coalescing medium.
- .8 Drain valve: brass with NPS 3/4 hose thread.
- .9 Air vent: brass.
- .10 Seals: EPDM.

.2 Size NPS 1-1/2 to 2:

- .1 Inlet/outlet connections: Screwed female union.
- .2 Drain: NPS 3/4 hose thread.

.3 Size NPS 2-1/2 to 6:

- .1 Inlet/outlet connection: Class 150 raised face flange.
- .2 Drain: NPS 1.

2.5 PIPE LINE STRAINER

.1 NPS 1/2 to 2: bronze body to ASTM B62, screwed connections, Y pattern.

.2 NPS 2 1/2 to 12: Y pattern, cast iron body to ASTM A126, Class 125 flanged connections.

.3 NPS 2 to 12: T type with ductile iron body to ASTM A536, grooved ends.

.4 Blowdown connection: NPS 1.

.5 Screen: stainless steel with 1.19 mm perforations.

.6 Working pressure: 860 kPa.

2.6 GLYCOL FEEDER

.1 Packaged, automatic glycol solution make up unit. The package shall consist of a base, propylene glycol 208 litre reservoir with removable lid compatible of up to 50% solutions, visible solution level scale in gallons and liters, y-strainer, isolation valve, pump, open drip-proof motor, pump isolation, check and balance valve, discharge pressure gauge, motor contactor and control circuit in a NEMA 4 panel, and necessary interconnecting piping.

.2 Green light shall indicate power supplied to unit. Pump shall start based on falling pressure. System shall require a 120/1/60 single power connection and a 19 mm NPT system piping connection. Glycol feeder shall provide 19 LPM and maintain a fill pressure of 207 kPa.

.3 Unit includes low level cut-out, with red indicator light and 110 V contact for alarm indication, to stop the pump during low level condition, remote monitoring dry contacts. Contractor shall furnish application specific pressure reducing valve between glycol feeder and connection to the system piping.

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 Run drain lines and blow off connections to terminate above nearest drain.

.2 Maintain adequate clearance to permit service and maintenance.

.3 Should deviations beyond allowable clearances arise, request, and follow HRCE Representative directive.

.4 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.

.4 Install ahead of each automatic control valve and as indicated.

3.4 AIR VENTS

.1 Install at high points of systems.

3.5 EXPANSION TANKS

.1 Adjust expansion tank pressure to suit design criteria.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

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

.1 ANSI/ASHRAE/IES Standard 90.1-2022, Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 American Society of Mechanical Engineers (ASME):

.1 ASME B16.1-2020, Gray Iron Pipe Flanges And Flanged Fittings: Classes 25, 125, And 250.

.3 ASTM International (ASTM):

.1 ASTM A536-84 (2019e1), Standard Specification for Ductile Iron Castings.

.2 ASTM A582/582M-22, Standard Specification for Free-Machining Stainless Steel Bars.

.3 ASTM B584-22, Standard Specification for Copper Alloy Sand Castings for General Applications.

.4 CSA Group (CSA):

.1 CSA C22.2 No. 108-14 (2019), Liquid Pumps.

.5 International Organization for Standardization (ISO):

.1 ISO 21940-11-2016 (2021), Mechanical Vibration - Rotor Balancing - Part 11: Procedures and Tolerances for Rotors with Rigid Behaviour.

.6 Institute of Electrical and Electronics Engineers (IEEE):

.1 IEEE 519-2022, IEEE Standard for Harmonic Control in Electric Power Systems.

.7 National Electrical Manufacturers' Association (NEMA):

.1 ANSI/NEMA 250-2020, Enclosures For Electrical Equipment (1,000 Volts Maximum).

.8 Underwriters Laboratories (UL):

.1 UL 778-Edition 6, UL Standard for Motor-Operated Water Pumps.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Shop Drawings:

.1 Submit manufacturer's instructions, printed product literature, and data sheets for pump, circulator, and equipment, and include product characteristics, performance criteria, physical size, finish, and limitations indicate point of operation, and final location in field assembly.

.2 Submit manufacturer's detailed composite wiring diagrams for control systems showing factory installed wiring and equipment on packaged equipment or required for controlling devices or ancillaries, accessories, and controllers.

1.3 DELIVERY, STORAGE, AND HANDLING

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

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

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

.2 Store and protect materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse or recycling of pallets, crates, padding, and/or packaging materials in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 VARIABLE SPEED VERTICAL IN-LINE CIRCULATORS

.1 General:

.1 Design pump for variable flow applications and selected for hydraulic design conditions and minimum system pressure with sensorless load Demand Based and EMCS control.

.2 Select hydraulic design conditions and minimum pressure with sensorless load control.

.3 Meet or exceed energy saving requirements of ASHRAE 90.1

.4 Design pumping units to UL STD 778 & CSA STD C22.2 No. 108.

.2 Casing: Ductile iron ASTM A536, Epoxy coated:

.1 Test casing to 150% maximum working pressure.

.2 Ensure casing is radially split to allow for removal of rotating element without disturbing pipe connections.

.3 Casing wetted surfaces shall be epoxy-coated to prevent seizing of impeller to casing after periods of inactivity.

.4 Drill and tap casing for gauge ports on both suction and discharge connections.

.5 Drill and tap casing at lowest point for drain port.

.3 Impeller: To ASTM B584, bronze, fully enclosed and dynamically balanced to ISO 21940-11 G6.3 and fitted to shaft with key. Use two-plane balancing when installed impeller diameter is less than 6 times impeller width.

.4 Pump Shafts: Split-coupled, stainless steel to ASTM A582/A582M, Grade 416.

.5 Flanges: Class 125, to ANSI/ASME B16.1.

.6 Flush Line: 3/8 inch braided stainless steel complete with vent, factory installed. Ensure flush/vent line runs from seal chamber to pump suction.

.7 Casing Gasket: Synthetic fiber.

.8 Mechanical Seal: Fluid as indicated, Type 2A inside single spring seal design and rated to 121 °C:

.1 Rotating face: Silicon Carbide or Resin Bonded Carbon to suit fluid.

.2 Stationary face: Sintered Silicon Carbide.

.3 Seal rotating hardware: Stainless Steel.

.4 Secondary/shaft seal elastomer: EPDM.

.5 Maximum Total Dissolved Solids (TDS): 2000 PPM.

.9 Motor:

.1 Permanent Magnet Motor, Variable Speed, TEFC enclosure, and as indicated on drawings and in Section 23 05 13 - Common Motor Requirements for HVAC Equipment.

.10 Controls:

.1 Integrated with motor. Type 12 minimum enclosure rating to NEMA 250, sensorless controls complete with fused disconnect switch and menu-driven graphical
keypad interface:

.1 Orientation: To suit site conditions.

.2 Cooling: Fan cooled through back panel.

.3 Ambient working conditions: 45 °C, up to 1,000 m above sea level.

.4 Sensorless override for EMCS control signal.

.5 Manual pump control/Closed loop PID control.

.6 Communication protocol: BACnet.

.7 Communications ports: 1- RS485.

.8 Auto alarm reset.

.2 Provide near unity displacement power factor (cos Ø) without need for external power factor correction capacitors at all loads and speeds using VVC-PWM type integrated controls:

.1 Incorporate DC link reactors for reduction of mains borne harmonic currents and DC link ripple current to increase DC link capacitor lifetime.

.2 Fit RFI filters as standard to ensure integrated controls meets low emission and immunity requirements.

.3 Ensure additional 3% AC line reactor is available for controls with saturating (nonlinear) DC link reactors.

.4 Harmonic suppression: Dual DC-link reactors (Equivalent: 5% impedance AC line reactor) to mitigate harmonics to support IEEE 519 system requirements.

.3 Input/Output:

.1 Analog I/O: 2 inputs minimum, 1 output minimum. Output can be configured for voltage or current.

.2 Digital I/O: 2 inputs minimum, 2 outputs minimum. Outputs can be configured as inputs.

.3 Pulse inputs: 2 programmable minimum.

.4 Relay outputs: 2 programmable minimum.

.5 One volt free contact.

.4 Minimum system pressure to be maintained: 40% of design head.

.5 Software: Ensure software for sensorless control includes automatic speed control in variable volume systems without need for pump mounted (internal/external) or remotely mounted differential pressure sensor:

.1 Operating mode under sensorless control: Quadratic Pressure Control (QPC).

.2 Ensure head reduction with reducing flow conforms to quadratic control curve.

.3 Head at zero flow: 40% minimum of design duty head.

.4 Linear or Proportional Pressure Control without sensor is unacceptable.

.5 Ensure control mode setting and minimum/maximum head set points are user adjustable using built-in programming interface.

.6 Performance for non-overloading power at every point of operation.

.7 Ensure integrated control software is capable of flow rate display and data output of ± 5% accuracy to EMCS.

.8 Ensure the controls can displayed and digitally transmit real-time flow & values.

.6 For multiple pump configuration ensure duty/standby is applied.

.11 Pump motor and controls protection:

.1 Motor phase to phase fault.

.2 Motor phase to ground fault.

.3 Loss of supply phase.

.4 Over voltage.

.5 Under voltage.

.6 Motor over temperature.

.7 Inverter overload.

.8 Over current.

.9 Ensure controls run Automatic Motor Adaptation (AMA) for superior motor protection and control.

.12 Accessories:

.1 Hangers and Supports: in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

.2 Suction Diffuser: grooved pipe or flanged Class 125, to ANSI/ASME B16.1 flange as indicated.

.3 Pressure Gauges: 114 mm diameter sized to meet system pressure requirements.

2.2 IN-LINE CIRCULATORS

.1 Volute: cast iron radially split, with screwed or flanged design suction and discharge connections.

.2 Impeller: copper alloy.

.3 Shaft: alloy steel with bronze sleeve bearing, integral thrust collar.

.4 Seal assembly: mechanical for service to 121 °C.

.5 Coupling: rigid self-aligning.

.6 Motor: as indicated in Section 23 05 13 - Common Motor Requirements for HVAC Equipment.

.7 Capacity: as indicated.

2.3 SUCTION DIFFUSER

.1 Body: cast iron with screwed or flanged connections.

.2 Strainer: with built-in, disposable 1.19 mm mesh, low pressure drop screen and NPS 1 blowdown connection.

.3 Full length straightening vanes.

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 INSTALLATION

.1 In line circulators: install as indicated by flow arrows:

.1 Support at inlet and outlet flanges or unions.

.2 Install with bearing lubrication points accessible.

.2 Ensure that pump body does not support piping or equipment:

.1 Provide stanchions or hangers for this purpose.

.2 Where pumps are supported entirely by piping system ensure hangers are sized for extra load of pump weight.

.3 Refer to manufacturer's installation instructions for details.

.3 Pipe drain tapping to floor drain.

.4 Install volute venting pet cock in accessible location.

.5 Check rotation prior to start-up. Do not dry run pump to check rotation.

.6 Install pressure gauges with test cocks on suction and discharge pump connections.

.7 Install suction diffuser on pump suction connection.

3.3 START-UP

.1 General:

.1 In accordance with manufacturer's recommendations.

.2 Procedures:

.1 Before starting pump, check that cooling water system over-temperature and other protective devices are installed and operative.

.2 After starting pump, check for proper, safe operation.

.3 Check installation, operation of mechanical seals, packing gland type seals. Adjust as necessary.

.4 Check base for free-floating, no obstructions under base.

.5 Run-in pumps for 12 continuous hours minimum.

.6 Verify operation of over-temperature and other protective devices under low- and no-flow condition.

.7 Eliminate air from scroll casing.

.8 Adjust water flow rate through water-cooled bearings.

.9 Adjust flow rate from pump shaft stuffing boxes to manufacturer's recommendation.

.10 Adjust alignment of piping and conduit to ensure true flexibility.

.11 Eliminate cavitation, flashing, and air entrainment.

.12 Adjust pump shaft seals, stuffing boxes, and glands.

.13 Measure pressure drop across strainer when clean and with flow rates as finally set.

.14 Replace seals if pump used to degrease system or if pump used for temporary heat.

3.4 PERFORMANCE VERIFICATION (PV)

.1 General:

.1 Verify performance in accordance with Section 01 91 13 - General Commissioning Requirements: General Requirements, supplemented as specified herein.

.2 Verify that manufacturer's performance curves are accurate.

.3 Ensure valves on pump suction and discharge provide tight shut-off.

.4 Net Positive Suction Head (NPSH):

.1 Application: measure NPSH for pumps which operate on open systems and with water at elevated temperatures.

.2 Measure using procedures prescribed in Section 01 91 13 - General Commissioning Requirements.

.3 Where procedures do not exist, discontinue PV, report to HRCE Representative and await instructions.

.5 Multiple Pump Installations - Series and Parallel:

.1 Repeat PV procedures specified above for pump performance and pump BHP for combinations of pump operations.

.6 Mark points of design and actual performance at design conditions as finally set upon completion of TAB.

.7 Commissioning Reports: in accordance with Section 01 91 13 - General Commissioning Requirements reports supplemented as specified herein. Reports to include:

.1 Record of points of actual performance at maximum and minimum conditions and for single and parallel operation as finally set at completion of commissioning on pump curves.

.2 Use Report Forms specified in Section 01 91 13 - General Commissioning Requirements: Report Forms and Schematics.

.3 Pump performance curves (family of curves).

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI) / American Society of Mechanical Engineers (ASME):

.1 ASME B16.1-05, Cast Iron Pipe Flanges and Flanged Fittings: Class 25, 125, 250 and 800.

.2 ASME B16.25-07, Buttwelding Ends.

.3 ASME B16.3-06, Malleable Iron Threaded Fittings: Classes 150 and 300.

.4 ANSI/ASME B16.5-03, Pipe Flanges and Flanged Fittings: NPS ½ through 24.

.5 ANSI/ASME B16.9-07, Factory-Made Wrought Steel Buttwelding Fittings.

.6 ANSI B18.2.1-96 (R2005), Square and Hex Bolts and Screws (Inch Series).

.7 ANSI/ASME B18.2.2-87 (R2005), Square and Hex Nuts (Inch Series).

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

.1 ANSI/AWWA C111/A21.11-07, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

.3 ASTM International (ASTM):

.1 ASTM A47/A47M-99 (2004), Standard Specification for Ferritic Malleable Iron Castings.

.2 ASTM A53/A53M-07, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.

.3 ASTM A126-04, Standard Specification for Grey Iron Castings for Valves, Flanges, and Pipe Fittings.

.4 CSA Group (CSA):

.1 CSA W48-06, Filler Metals and Allied Materials for Metal Arc Welding.

.5 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc:

.1 MSS-SP-70-2006, Cast Iron Gate Valves, Flanged and Threaded Ends.

.2 MSS-SP-71-2005, Grey Iron Swing Check Valves, Flanged and Threaded Ends.

.3 MSS-SP-80-2003, Bronze Gate, Globe, Angle and Check Valves.

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

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

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

1.3 CLOSEOUT SUBMITTALS

.1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals and include following:

.1 Special servicing requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store, and handle in accordance with Section 01 61 00 - Material & Equipment.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

Part 2 Products

2.1 PIPE

.1 Steel pipe: to ASTM A53/A53M, Grade B, as follows:

.1 Steam;

.1 To NPS 6: Sch 40.

.2 Condensate: Sch 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 Flanges: plain or raised face. Flange gaskets to ANSI/AWWA C111/A21.11.

.4 Pipe thread: taper.

.5 Bolts and nuts: carbon steel, to ANSI/ASME B18.2.1 and ANSI/ASME B18.2.2.

.6 Buttwelding ends: to ANSI/ASME B16.25.

2.3 FITTINGS

.1 Pipe flanges: cast-iron to ASME B16.1, Class 125.

.2 Screwed fittings: malleable iron to ASME B16.3, Class 150.

.3 Steel pipe gaskets, flanges, and flanged fittings: to ANSI/ASME B16.5

.4 Buttwelding fittings: steel to ANSI/ASME B16.9

.5 Unions: malleable iron, to ASTM A47/A47M and ASME B16.3.

2.4 VALVES

.1 Connections:

.1 NPS 2 and smaller: screwed ends.

.2 NPS 2 1/2 and larger:

.1 Equipment: Flanged ends.

.2 Elsewhere: welded ends.

.2 Gate valves: Application: Steam service, for isolating equipment, control valves, and pipelines:

.1 NPS 2 and under:

.1 Mechanical Rooms: Class 125, rising stem, split wedge disc, as specified Section 23 05 23.01 - Valves-Bronze.

.2 Elsewhere: Class 125, non- rising stem, solid wedge disc, as specified Section 23 05 23.01 - Valves-Bronze.

.2 NPS 2 1/2-8:

.1 Mechanical Rooms: Class 150, rising stem, split wedge disc, cast iron, bronze trim, as specified Section 23 05 23.02 - Valves-Cast Iron.

.2 Elsewhere: Class 150, Non- rising stem, solid wedge disc, cast iron with bronze trim, as specified Section 23 05 23.02 - Valves-Cast Iron.

.3 Globe valves: Application: Steam service, throttling, flow control, and emergency bypass:

.1 NPS 2 and under:

.1 Mechanical Rooms: with PFTE disc as specified Section 23 05 23.01 - Valves-Bronze.

.2 Elsewhere: with composition disc as specified Section 23 05 23.01 - Valves-Bronze.

.2 NPS 2 1/2 and over:

.1 With bronze disc, cast iron with bronze trim, to Section 23 05 23.02 - Valves-Cast Iron.

.4 Gate valves: Application: gravity condensate return service, and steam drip point assemblies:

.1 NPS 2 and under:

.1 Mechanical Rooms: Class 125, rising stem, split wedge disc, as specified Section 23 05 23.01 - Valves-Bronze.

.2 Elsewhere: Class 125, non- rising stem, solid wedge disc, as specified Section 23 05 23.01 - Valves-Bronze.

.5 Drain valves: Gate, Class 125, non-rising stem, solid wedge disc, as specified Section 23 05 23.01 - Valves-Bronze.

2.5 VALVE OPERATORS

.1 Handwheel with chain operators: on valves installed more than 2,400 mm above floor in Mechanical Equipment rooms.

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 PIPING

.1 Install pipework in accordance with Section 23 05 05 - Selective Demolition for Heating, Ventilating, and Air Conditioning (HVAC), supplemented as specified below.

.2 Connect branch lines into top of mains.

.3 Install piping in direction of flow with slopes as follows, unless indicated:

.1 Steam: 1:240.

.2 Condensate return: 1:70.

.4 Make provision for thermal expansion as indicated.

.5 Drip pocket: line size.

3.3 VALVES

.1 Install globe valves around, NPS 8 and over, gate valves.

3.4 TESTING

.1 Test system in accordance with Section 23 05 00 - Common Work Results for HVAC.

.2 Test pressure: 1-1/2 times maximum system operating pressure or 860 kPa whichever is greater.

3.5 SYSTEM START-UP

.1 In accordance with Section 23 08 16 - Cleaning and Start-up of HVAC Piping Systems.

3.6 PERFORMANCE VERIFICATION (PV)

.1 General:

.1 Verify performance in accordance with Section 23 08 13 - Performance Verification HVAC Systems supplemented as specified herein.

.2 Timing, only after:

.1 Pressure tests successfully completed.

.2 Flushing as specified has been completed.

.3 Water treatment system has been commissioned.

.3 PV Procedures:

.1 Verify complete drainage of condensate from steam coils.

.2 Verify proper operation of system components, including, but not limited to:

.1 Steam traps-verify no blow-by.

.2 Flash tanks.

.3 Thermostatic vents.

3.7 CLEANING

.1 Clean in accordance with Section 01 74 00 - Cleaning:

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

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 American Society for Mechanical Engineers (ASME).

.2 ASTM International (ASTM):

.1 ASTM A126-04, Standard Specification for Grey Iron Castings for Valves, Flanges and Pipe Fittings.

.2 ASTM A167-99 (2004), Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

.3 ASTM A216/A216M-07, Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding for High-Temperature Service.

.4 ASTM A240/A240M-07e1, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

.5 ASTM A276-06, Standard Specification for Stainless Steel Bars and Shapes.

.6 ASTM A278/A278M-01(2006), Standard Specification for Grey Iron Castings for Pressure-Containing Parts for Temperatures up to 650 °F (350 °C).

.7 ASTM A351/A351M-06, Standard Specification for Castings, Austenitic, for Pressure-Containing Parts.

.8 ASTM A564/A564M-04, Standard Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes.

.9 ASTM B62-02, Standard Specification for Composition Bronze or Ounce Metal Castings.

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

.1 Safety Data Sheets (SDS).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Provide manufacturer's printed product literature Canadian Registration Number (CRN), and datasheets for steam traps, vacuum breakers, pressure reducing valves, air vents, safety relief valves, and include product characteristics, performance criteria, physical size, finish, and limitations.

.3 Closeout Submittals:

.1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals and include following:

.1 Special servicing requirements.

1.3 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store, and handle in accordance with Section 01 61 00 - Material & Equipment.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

Part 2 Products

2.1 MATERIALS

.1 Cast steel: to ASTM A216/A216M.

.2 Cast iron: to ASTM A278, Class 300.

.3 Bronze: to ASTM B62.

.4 Stainless steel: to ASTM A351/A351M.

2.2 FLOAT AND THERMOSTATIC STEAM TRAPS 0-110 KPA

.1 Application: for modulating steam service on as indicated.

.2 Materials: body-cast iron; valve-stainless steel with stainless steel seat; float and mechanisms-stainless steel; air vent-stainless steel thermostatic type.

.3 Capacity: as indicated.

2.3 VACUUM BREAKERS 0.85-68 KPA

.1 Application: on inlets to steam coils, heat exchangers as indicated.

.2 Materials: body and cap-brass; spring-stainless steel; stem and seat-brass.

.3 Capacity: as indicated.

2.4 PIPE LINE STRAINERS UP TO NPS 2

.1 Application: ahead of condensate pumps, steam traps, control valves and elsewhere as indicated.

.2 Working pressure: 860 kPa.

.3 Body: bronze.

.4 Connections: screwed.

.5 Screen: stainless steel with 0.8 mm perforations.

2.5 PIPE LINE STRAINERS NPS 2-1/2 AND OVER

.1 Application: ahead of condensate pumps, steam traps, control valves as indicated.

.2 Working pressure: 860 kPa.

.3 Body: cast iron.

.4 Connections: flanged.

.5 Blowdown connection: NPS 1-1/4 complete with gate valve and cap.

.6 Screen: stainless steel with 3.2 mm perforations.

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.

.2 Maintain proper clearance around equipment to permit maintenance.

3.2 STRAINERS

.1 Install as indicated.

.2 Ensure clearance for removal of basket.

.3 Install valved blow-down as indicated.

3.3 SAFETY RELIEF VALVE

.1 Pipe to atmosphere independent of other vents and in accordance with applicable code.

.2 Support discharge pipe against reaction forces and to take up thermal movement.

.3 Drain pipe from drip pan elbow to terminate over floor drain.

3.4 STEAM TRAPS

.1 Install unions on inlet and outlet.

3.5 PRESSURE REDUCING VALVES

.1 Install on 3-valve bypass with strainer on inlet.

.2 Pipe as indicated. Follow manufacturer's installation instructions.

3.6 FLASH TANKS

.1 Pipe arrangement as indicated.

3.7 PERFORMANCE VERIFICATION

.1 In accordance with Section 23 08 13 - Performance Verification HVAC Systems.

3.8 CLEANING

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

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

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 ASME:

.1 ASME Boiler and Pressure Vessel Code (BPVC), Section VII-2023.

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

.1 Safety Data Sheets (SDS).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Shop Drawings:

.1 Submit manufacturer's instructions, printed product literature, and data sheets for HVAC water treatment systems and include product characteristics, performance criteria, physical size, finish, and limitations.

.2 Submit 2 copies of WHMIS SDS.

1.3 DELIVERY, STORAGE, AND HANDLING

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

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

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

.2 Store and protect materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse or recycling of pallets, crates, padding, and/or packaging materials in accordance with Section 01 74 19 - Waste Management and Disposal.

Part 2 Products

2.1 MANUFACTURER

.1 Equipment, chemicals, and service provided by one supplier.

2.2 POT FEEDER

.1 Welded steel, pressure rating 860 kPa. Temperature rating: 90 °C.

2.3 WATER TREATMENT FOR HYDRONIC SYSTEMS

.1 Hot water heating system: pot feeder, 19 L, operating pressure 860 kPa.

.2 Glycol system: pot feeder, 19 L, operating pressure 860 kPa.

.3 Micron filter for each pot feeder:

.1 Capacity 2% of pump recirculating rate at operating pressure.

.2 Six (6) sets of filter cartridges for each type, size of micron filter.

2.4 CHEMICALS

.1 Provide 1 years supply.

2.5 TEST EQUIPMENT

.1 Provide one set of test equipment for each system to verify performance.

.2 Complete with carrying case, reagents for chemicals, specialized, or supplementary equipment.

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 HVAC water treatment systems in accordance with ASME Boiler and Pressure Code Section VII, and requirements and standards of Authorities Having Jurisdiction, except where specified otherwise.

.2 Ensure adequate clearances to permit performance of servicing and maintenance of equipment.

3.3 CLEANING OF MECHANICAL SYSTEM

.1 Provide copy of recommended cleaning procedures and chemicals for approval by HRCE Representative.

.2 Flush mechanical systems and equipment with approved cleaning chemicals designed to remove deposition from construction such as pipe dope, oils, loose mill scale, and other extraneous materials. Use chemicals to inhibit corrosion of various system materials that are safe to handle and use.

.3 Examine and clean filters and screens, periodically during circulation of cleaning solution, and monitor changes in pressure drop across equipment.

.4 Drain and flush systems until alkalinity of rinse water is equal to make-up water. Refill with clean water treated to prevent scale and corrosion during system operation.

.5 Disposal of cleaning solutions approved by Authority Having Jurisdiction.

3.4 WATER TREATMENT SERVICES

.1 Provide water treatment monitoring and consulting services for period of 1 year after system start-up. Service to include:

.1 Initial water analysis and treatment recommendations.

.2 System start-up assistance.

.3 Operating staff training.

.4 Visit plant every 7 days during period of operation and as required until system stabilizes, and advise on treatment system performance.

.5 Provide necessary recording charts and log sheets for 1 year operation.

.6 Provide necessary laboratory and technical assistance.

.7 Provide clear, concise, written instructions, and advice to operating staff.

3.5 FIELD QUALITY CONTROL

.1 Start-up:

.1 Start up water treatment systems in accordance with manufacturer's instructions.

.2 Verify:

.1 Presence of test equipment, reagents, chemicals, details of specific tests performed, and operating instructions.

.2 Suitability of log book.

.3 Currency and accuracy of initial water analysis.

.4 Required quality of treated water.

.3 Procedures - Water Treatment Systems:

.1 Establish, adjust as necessary, and record automatic controls and chemical feed rates.

.2 Monitor performance continuously during commissioning of connected systems and until acceptance of project.

.3 Establish test intervals and regeneration intervals.

.4 Record on approved report forms commissioning procedures, test procedures, dates, times, quantities of chemicals added, raw water analysis, treated water analysis, test results, instrument readings, adjustments made, and results obtained.

.5 Establish, monitor, and adjust automatic controls and chemical feed rates as necessary.

.6 Visit project at specified intervals after commissioning is satisfactorily completed to verify that performance remains as set during commissioning (more often as required until system stabilizes at required level of performance).

.4 Procedures - Closed Circuit Hydronic Systems:

.1 Analyze water in system.

.2 Based upon an assumed rate of loss establish rate of chemical feed.

.3 Record types, quantities of chemicals applied.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 American Society of Mechanical Engineers (ASME):

.1 ASME BPVC-2021, ASME Boiler and Pressure Vessel Code.

.2 CSA Group (CSA):

.1 CSA B51:19, Boiler, Pressure Vessel, and Pressure Piping Code.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Product Data:

.1 Submit product literature and data sheets for heat exchangers and indicate product characteristics, performance criteria, physical size, finishes, and limitations.

.3 Shop Drawings:

.1 Submit drawings.

.2 Shop drawings to indicate project layout, including layout and dimensions of heat exchangers and system:

.1 Indicate manufacturer's recommended clearances for tube withdrawal and manipulation of tube cleaning tools.

.4 Test Reports: When requested, submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

.5 Certificates: When requested, submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.6 Manufacturer's Instructions: Submit manufacturer's installation instructions.

.7 Manufacturer Reports: Submit manufacturer's written reports within three days of review, verifying compliance of work, as described in Site Quality Control in Part 3 of this Section.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: Submit operation and maintenance data and incorporate into manual.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Perform in accordance with Section 01 61 00 - Material & Equipment.

.2 Storage and Handling Requirements:

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

.2 Store and protect heat exchangers from nicks, scratches, and blemishes.

Part 2 Products

2.1 FLOODED STEAM HEAT EXCHANGER

.1 Pre-assembled flooded steam heat exchanger package unit shall be CompackHeat™ model: CH-18-160/180-10-205-W-SC-EL, designed and manufactured by Preston Phipps Inc. The unit controls the hot liquid outlet temperature by modulating the condensate level into the heat exchanger according to the process demand. The design utilizes the sensible and latent heat of saturated steam by subcooling the condensate. Supply steam pressure to the unit shall be constant. Conventional design with modulating steam pressure supply is not accepted.

.2 System shall be designed for heating 18 usgpm of water from 160 ºF to 180 ºF, using 190 lbs/h of saturated steam at 10 psig. Subcooling at 205 ºF. Capacity of 180 MBH.

.3 Package shall be complete with heat exchanger, condensate control valve, steam trap, check valve, strainer, necessary interconnecting piping, fittings, valves, and instrumentations, mounted on a steel frame and support base.

.4 Skid to fit on existing 4’ x 3.5’ housekeeping pad.

.5 Heat exchanger shall be a Shell & Coil type, complete 316 L stainless steel welded construction, helically coiled corrugated tube bundle, angular connections and designed for a compact vertical installation. Design pressure/temperature shall be 300 psi/422 ºF. The heat exchanger shall be designed, tested and manufactured in accordance with ASME Section VIII Div. 1, comes from an ISO 9001 manufacturing shop and be CRN registered.

.6 Control valve shall be Python 1500 series and manufactured by Armstrong International. Control valve shall be electric with Multi-Function Technology (MFT), NEMA 2 actuator enclosure rating, 24 Vac or 24 Vdc power supply, spring return fail closed. Input signal shall be 2-10 Vdc or 4-20 mA. Control valve body construction shall be carbon steel with flanged connections with seat and stem in stainless steel. Valve shall have a shutoff class IV metal seat and offer a rangeability of 50:1. Gland packing shall be V-Teflon up to 366 °F.

.7 Main steam trap shall be a Float & Thermostatic (F&T) type and manufactured by Armstrong International. Selection shall be made with 2:1 safety factor applied on the application condensate load. The main trap must be installed downstream of the control valve. The main trap shall be CRN registered.

.8 Overflow steam trap (shipped loose) shall be a Thermodynamic Disc (CD) type in stainless steel construction and manufactured by Armstrong International. The overflow trap must be installed at the steam supply inlet of skid. The overflow trap shall be CRN registered.

.9 Strainer shall have a mesh size of 100 x 100 and installed upstream of the control valve. The strainer shall be CRN registered.

.10 Check valve shall be spring-assisted non-slam type in 316 stainless steel construction and installed downstream of the main steam trap. Check valve seat and disc shall be in 316 stainless steel. The check valve shall be CRN registered.

.11 RTD shall be 3-wire platinum type with 316 stainless steel probe complete with NEMA 4 aluminum head and must be installed at the hot liquid outlet with a 316 stainless steel thermowell.

.12 Automated electric high performance butterfly valve manufactured by Bray Controles Canada shall be used as a high temperature shutoff protection and installed at the steam supply inlet. Valve shaft must be blow-out resistant and disc taper pins must be tangentially positioned half in disc and half in stem. Valve must be designed with two-piece stem and double-offset disc/stem. Valve body construction shall be steel, disc in stainless steel with a polymer RTFE seat good up to 500 ºF. The valve shall be CRN registered.

.13 All isolation gate valves installed shall be in forged steel designed ASME Class 800 1975 psi @ 100 ºF for threaded connection and cast carbon steel designed ASME 150# or 300# for flanged connection with trim suitable for applications up to 850 ºF. All isolation gate valves shall be bolted bonnet type and be CRN registered.

.14 Manuel lugged style resilient seated bi-directional butterfly valve manufactured by Bray Controles Canada shall be installed at both liquid inlet and outlet. Valve stem construction shall be 416 stainless steel and disc shall be 304 stainless steel. Molded-in resilient seat must provide bubble-tight shutoff up to 250 psi.

.15 Premium stainless steel pressure gauge with StabiliZR must be installed at both liquid inlet and outlet. Gauge must have a 4" dial face, stainless steel case and stainless steel internal and provide ±1% accuracy. Pressure gauge installed on steam shall be protected by a 180 degree coil siphon made of 304 stainless steel seamless schedule 40 good for a working pressure of 500 psi @ 680 ºF. Both pressure gauge and siphon shall be CRN registered.

.16 Thermostatic stainless steel air vent installed on the steam supply inlet and manufactured by Armstrong International. The thermostatic vent shall be suitable for pressure from 0 to 300 psig and have a discharge orifice of 3/16". Design pressure/temperature shall be 300 psi/450 ºF. Thermostatic air vent shall be CRN registered.

.17 Vacuum breaker (anti-siphoning check valve) shall be installed the steam supply to protect against collapse or back flowing. Vacuum breaker shall be made of 304 stainless steel and have a Viton o-ring seat. Design pressure/temperature shall be 300 psi/365 ºF. The vacuum breaker shall be CRN registered.

.18 Bi-metal thermometer shall be installed at both liquid inlet and liquid outlet. Thermometer must have 3" dial stainless steel case and stem, fixed centre back connection, dual scale (ºF & ºC) and provide ±1% accuracy. Thermometer shall be connected in either a brass or stainless steel thermowell.

.19 Control panel shall be pre-assembled and pre-programmed at factory with set points and alarms. The cabinet shall be NEMA 4-12 and complete with PLC, front digital panel display, pilot lights for high temperature and power on, dry contacts, bacnet BAS connectivity. Supply voltage shall be 120 V/1/60. Set points shall be remotely adjustable. The PLC shall have 2 universal inputs, 2 analog outputs, 2 digital I/O and 4 relays. Control panel shall be CSA and UL listed.

.20 Piping and frame shall have a high heat resistance black paint that offer excellent resistance against solvents. The paint shall have the capacity to handle temperature up to 800 ºF.

.21 Piping shall be hydrostatically tested at the factory prior to shipping.

.22 System shall be assembled in an approved CSA B51 & ASME shop.

.23 Standard material specifications:

.1 Carbon steel seamless piping ASME SA-106 B sch.80 (≤2"Ø), sch.40 (≥2-1/2"Ø).

.2 Carbon steel flanges ASME B16.5 SA-105.

.3 Carbon steel threaded fittings ASME B16.11 SA-105 3000#.

.4 Carbon steel butt weld fittings ASME B16.9 SA-234 WPB.

.5 Carbon steel union MSS-SP-83 SA-105 3000#.

.6 Carbon steel threadolet MSS-SP-97 SA-105 3000#.

.7 Metallic gaskets ASME B16.20 316L (steam/condensate).

.8 Non-metallic gaskets EPDM (water).

.9 Studs black ASME SA-193 B7/Hex nuts black ASME SA-194 2H.

.24 Shop drawing shall be presented in 3D, including a detailed bill of materials, connections sizes table, operating conditions table, and a complete specifications package of every component.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: Verify conditions of substrates previously installed are acceptable for heat exchanger installation in accordance with manufacturer's instructions:

.1 Inform HRCE Representative of unacceptable conditions immediately upon discovery.

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

3.2 INSTALLATION

.1 Install in accordance with manufacturer’s instructions.

.2 Install level and firmly anchored to supports.

.3 Tube in shell heat exchangers: Arrange piping so that tube bundle can be removed after disconnecting two unions or flanges adjacent to head and without disturbing other equipment and systems.

3.3 SITE QUALITY CONTROL

.1 Site Tests and Inspections:

.1 Perform one or more tests as required to verify heat exchangers are functioning as specified.

.2 Obtain reports promptly after review and submit immediately to HRCE Representative.

.2 Manufacturer’s Report: Submit written report from manufacturer verifying compliance of work.

.3 Manufacturer's Site Services:

.1 Submit manufacturer's site services consisting of periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.2 Ensure manufacturer's representative is present before and during critical periods of installation.

.3 Schedule site visits:

.1 After delivery and storage of products, and when preparatory Work, or other work on which the work of this Section depends, is complete but before installation begins.

3.4 CLEANING

.1 Progress and Final Cleaning: Clean in accordance with Section 01 74 00 - Cleaning.

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by heat exchanger installation.

END OF SECTION

Part 1 General

1.1 DEFINITIONS

.1 CDL - Control Description Logic.

.2 For additional acronyms and definitions refer to Section 25 05 01 - EMCS: General Requirements.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures, supplemented and modified by requirements of this Section.

.2 Submit training proposal complete with hour-by-hour schedule including brief overview of content of each segment to HRCE Representative 30 days prior to anticipated date of beginning of training:

.1 List name of trainer and type of visual and audio aids to be used.

.2 Show coordinated interface with other EMCS mechanical and electrical training programs.

.3 Submit reports within one week after completion of training program that training has been satisfactorily completed.

1.3 QUALITY ASSURANCE

.1 Provide competent instructors thoroughly familiar with aspects of EMCS installed in facility.

1.4 INSTRUCTIONS

.1 Provide instruction to designated personnel in adjustment, operation, maintenance, and pertinent safety requirements of EMCS installed.

.2 Training to be project specific.

1.5 TIME FOR TRAINING

.1 Number of days of instruction to be as specified in this section (1 day = 8 hours including two 15-minute breaks and excluding lunch time).

1.6 TRAINING MATERIALS

.1 Provide equipment, visual, and audio aids, and materials for classroom training.

.2 Supply manual for each trainee, describing in detail data included in each training program:

.1 Review contents of manual in detail to explain aspects of Operation and Maintenance (O&M).

1.7 TRAINING PROGRAM

.1 To be in 2 phases over 6-month period.

.2 Phase 1: 2-day program to begin before 30 day test period at time mutually agreeable to Contractor, HRCE Representative, and Commissioning Manager:

.1 Train O&M personnel in functional operations and procedures to be employed for system operation.

.2 Supplement with on-the-job training during 30 day test period.

.3 Include overview of system architecture, communications, operation of computer and peripherals, and report generation.

.4 Include detailed training on operator interface functions for control of mechanical systems, CDL's for each system, and elementary preventive maintenance.

.3 Phase 2: 5 day program to begin 8 weeks after acceptance for operators, equipment maintenance personnel, and programmers:

.1 Provide multiple instructors on pre-arranged schedule. Include at least following:

.1 Operator training: provide operating personnel, maintenance personnel, and programmers with condensed version of Phase 1 training.

.2 Equipment maintenance training: provide personnel with 2 days training within 5 day period in maintenance of EMCS equipment, including general equipment layout, trouble shooting, and preventive maintenance of EMCS components, maintenance, and calibration of sensors and controls.

.3 Programmers: provide personnel with 2 days training within 5 day period in following subjects in approximate percentages of total course shown.

1.8 ADDITIONAL TRAINING

.1 List courses offered by name, duration, and approximate cost per person per week. Note courses recommended for training supervisory personnel.

1.9 MONITORING OF TRAINING

.1 HRCE Representative to monitor training program and may modify schedule and content.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Project intent is to upgrade and expand the existing BACnet compatible Energy Monitoring and Control System, fully integrating all existing and new building HVAC control systems, specifically:

- .1 Removal of existing control devices from the hydronic heating system.
- .2 Installation of new control devices as required to support the new hydronic boiler system.
- .3 Installation of electronic zone controls throughout the building, including zone temperature sensors and zone solenoid valves, and generally providing EMCS control for all new in-scope mechanical equipment indicated on the drawings.
- .4 Decommissioning and removal of all pneumatic control devices in the building, replacement of all pneumatic field devices, such that the existing control air compressor can be decommissioned and removed with no loss to functionality.
- .5 Update of EMCS software to latest version, update of all graphics and related software functions.
- .6 Upgrade, expand, or replace any out-of-date field control units including I/O modules BCU, and LCU's.
- .7 Standard of Acceptance: Alerton Compass 2 and compatible hardware, as provided by Advanced Energy Management Ltd. (AEM).

.2 New field devices and low voltage/communication wiring shall be provided and installed by controls Contractor. Coordinate with Division 26 for conduit installation requirements and 120 V wiring and connection locations.

1.2 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI)/The Instrumentation, Systems and Automation Society (ISA):

- .1 ANSI/ISA 5.5-1985, Graphic Symbols for Process Displays.

.2 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE):

- .1 ANSI/IEEE 260.1-1993, American National Standard Letter Symbols Units of Measurement (SI Units, Customary Inch-Pound Units, and Certain Other Units).

.3 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE):

- .1 ASHRAE STD 135-R2001, BACNET - Data Communication Protocol for Building Automation and Control Network.

.4 CSA Group (CSA):

- .1 CAN/CSA-Z234.1-89 (R1995), Canadian Metric Practice Guide.

.5 Consumer Electronics Association (CEA):

- .1 CEA-709.1-B-2002, Control Network Protocol Specification.

.6 Department of Justice Canada (Jus):

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

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

.7 Electrical and Electronic Manufacturers Association (EEMAC):

.1 EEMAC 2Y-1-1958, Light Grey Colour for Indoor Switch Gear.

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

.1 Safety Data Sheets (SDS).

.9 Transport Canada (TC):

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

1.3 ABBREVIATIONS AND ACRONYMS

.1 Acronyms used in EMCS:

.1 AEL - Average Effectiveness Level.

.2 AI - Analog Input.

.3 AIT - Agreement on International Trade.

.4 AO - Analog Output.

.5 BACnet - Building Automation and Control Network.

.6 BC(s) - Building Controller(s).

.7 BECC - Building Environmental Control Centre.

.8 CAD - Computer Aided Design.

.9 CDL - Control Description Logic.

.10 CDS - Control Design Schematic.

.11 COSV - Change of State or Value.

.12 CPU - Central Processing Unit.

.13 DI - Digital Input.

.14 DO - Digital Output.

.15 DP - Differential Pressure.

.16 ECU - Equipment Control Unit.

.17 EMCS - Energy Monitoring and Control System.

.18 HVAC - Heating, Ventilation, Air Conditioning.

.19 IDE - Interface Device Equipment.

.20 I/O - Input/Output.

.21 ISA - Industry Standard Architecture.

.22 LAN - Local Area Network.

.23 LCU - Local Control Unit.

.24 MCU - Master Control Unit.

.25 NAFTA - North American Free Trade Agreement.

.26 NC - Normally Closed.

.27 NO - Normally Open.

.28 OS - Operating System.

.29 O&M - Operation and Maintenance.

.30 OWS - Operator Work Station.

.31 PC - Personal Computer.

.32 PCI - Peripheral Control Interface.

.33 PCMCIA - Personal Computer Micro-Card Interface Adapter.

.34 PID - Proportional, Integral and Derivative.

.35 RAM - Random Access Memory.

.36 SP - Static Pressure.

.37 ROM - Read Only Memory.

.38 TCU - Terminal Control Unit.

.39 USB - Universal Serial Bus.

.40 UPS - Uninterruptible Power Supply.

.41 VAV - Variable Air Volume.

1.4 DEFINITIONS

.1 Point: may be logical or physical.

.1 Logical points: values calculated by system such as setpoints, totals, counts, derived corrections, and may include but not limited to result of and statements in CDLs.

.2 Physical points: inputs or outputs which have hardware wired to controllers which are measuring physical properties, or providing status conditions of contacts or relays which provide interaction with related equipment (stop, start) and valve or damper actuators.

.2 Point Name: composed of two parts, point identifier, and point expansion:

.1 Point identifier: comprised of three descriptors, "area" descriptor, "system" descriptor, and "point" descriptor, for which database to provide 25 character field for each point identifier. "System" is system that point is located on:

.1 Area descriptor: building or part of building where point is located.

.2 System descriptor: system that point is located on.

.3 Point descriptor: physical or logical point description. For point identifier "area", "system", and "point" will be shortforms or acronyms. Database must provide 25 character field for each point identifier.

.2 Point expansion: comprised of three fields, one for each descriptor. Expanded form of shortform or acronym used in "area", "system", and "point" descriptors is placed into appropriate point expansion field. Database must provide 32 character field for each point expansion.

.3 Bilingual systems to include additional point identifier expansion fields of equal capacity for each point name for second language:

.1 System to support use of numbers and readable characters including blanks, periods, or underscores to enhance user readability for each of the above strings.

.3 Point Object Type: points fall into following object types:

.1 AI (analog input).

.2 AO (analog output).

.3 DI (digital input).

.4 DO (digital output).

.5 Pulse inputs.

.4 Symbols and engineering unit abbreviations utilized in displays: to ANSI/ISA S5.5:

.1 Printouts: to ANSI/IEEE 260.1.

.2 Refer also to Section 25 05 54 - EMCS: Identification.

1.5 SYSTEM DESCRIPTION

.1 Refer to control schematics for system architecture.

.2 Work covered by sections referred to above consists of fully operational EMCS, including, but not limited to, following:

.1 Building Controllers.

.2 Control devices as listed in I/O point summary tables.

.3 OWS(s).

.4 Data communications equipment necessary to effect EMCS data transmission system.

.5 Field control devices.

.6 Software/Hardware complete with full documentation.

.7 Complete operating and maintenance manuals.

.8 Training of personnel.

.9 Acceptance tests, technical support during commissioning, and full documentation.

.10 Wiring interface co-ordination of equipment supplied by others.

.11 Miscellaneous work as specified in these sections and as indicated.

.3 Design Requirements:

.1 Design and provide conduit and wiring linking elements of system.

.2 Supply sufficient programmable controllers of types to meet project requirements. Quantity and points contents as reviewed by HRCE Representative prior to installation.

.3 Location of controllers as reviewed by HRCE Representative prior to installation.

.4 Provide utility power to EMCS and emergency power to EMCS as indicated.

.5 Metric references: in accordance with CAN/CSA Z234.1.

.4 Language Operating Requirements:

.1 Provide English operator selectable access codes.

.2 Use non-linguistic symbols for displays on graphic terminals wherever possible. Other information to be in English.

.3 Operating system executive: provide primary hardware-to-software interface specified as part of hardware purchase with associated documentation to be in English.

.4 System manager software: include in English system definition point database, additions, deletions or modifications, control loop statements, use of high level programming languages, report generator utility and other OS utilities used for maintaining optimal operating efficiency.

.5 Include, in English:

.1 Input and output commands and messages from operator-initiated functions, field related changes, alarms as defined in CDL's or assigned limits (i.e. commands relating to day-to-day operating functions and not related to system modifications, additions, or logic re-definements).

.2 Graphic "display" functions, point commands to turn systems on or off, manually override automatic control of specified hardware points. To be in English at specified OWS.

.3 Reporting function such as trend log, trend graphics, alarm report logs, energy report logs, and maintenance generated logs.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures and Section 25 05 02 - EMCS: Submittals and Review Process.

.2 Quality Control:

.1 Provide equipment and material from manufacturer's regular production, CSA certified, and manufactured to standard quoted plus additional specified requirements.

.2 Where CSA certified equipment is not available submit such equipment to inspection authorities for special inspection and approval before delivery to site.

.3 Submit proof of compliance to specified standards with shop drawings and product data in accordance with Section 25 05 02 - EMCS: Submittals and Review Process. Label or listing of specified organization is acceptable evidence.

.4 In lieu of such evidence, submit certificate from testing organization, approved by HRCE Representative, certifying that item was tested in accordance with their test methods and that item conforms to their standard/code.

.5 For materials whose compliance with organizational standards/codes/specifications is not regulated by organization using its own listing or label as proof of compliance, furnish certificate stating that material complies with applicable referenced standard or specification.

.6 Permits and fees: in accordance with general conditions of contract.

.7 Submit certificate of acceptance from Authority Having Jurisdiction to HRCE Representative.

.8 Existing devices intended for re-use: submit test report.

1.7 QUALITY ASSURANCE

.1 Have local office within 50 km of project staffed by trained personnel capable of providing instruction, routine maintenance, and emergency service on systems.

.2 Provide record of successful previous installations submitting tender showing experience with similar installations utilizing computer-based systems.

.3 Have access to local supplies of essential parts and provide 7 year guarantee of availability of spare parts after obsolescence.

.4 Ensure qualified supervisory personnel continuously direct and monitor Work and attend site meetings.

.5 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29 - Occupational Health & Safety Requirements.

1.8 DELIVERY, STORAGE, AND HANDLING

.1 Material Delivery Schedule: provide HRCE Representative with schedule within 2 weeks after award of Contract.

.2 Waste Management and Disposal:

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

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

.3 Separate for reuse or recycling and place in designated containers Steel, Metal, and Plastic waste in accordance with Waste Management Plan.

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

.5 Handle and dispose of hazardous materials in accordance with Regional and Municipal, CEPA, and TDGA regulations.

.6 Label location of salvaged material's storage areas and provide barriers and security devices.

.7 Ensure emptied containers are sealed and stored safely.

.8 Divert unused metal materials from landfill to metal recycling facility as approved by HRCE Representative.

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

Part 2 Products

2.1 EQUIPMENT

.1 Control Network Protocol and Data Communication Protocol: to CEA 709.1 ASHRAE STD 135.

.2 Complete list of equipment and materials to be used on project and forming part of tender documents by adding manufacturer's name, model number and details of materials, and submit for approval.

Part 3 Execution

3.1 MANUFACTURER'S RECOMMENDATIONS

.1 Installation: to manufacturer's recommendations.

END OF SECTION

Part 1 General

1.1 DEFINITIONS

.1 Acronyms and definitions: refer to Section 25 05 01 - EMCS: General Requirements.

1.2 DESIGN REQUIREMENTS

.1 Preliminary Design Review: to contain following Contractor and systems information:

.1 Location of local office.

.2 Description and location of installing and servicing technical staff.

.3 Location and qualifications of programming design and programming support staff.

.4 List of spare parts.

.5 Location of spare parts stock.

.6 Names of Subcontractors and site-specific key personnel.

.7 Sketch of site-specific system architecture.

.8 Specification sheets for each item including memory provided, programming language, speed, and type of data transmission.

.9 Descriptive brochures.

.10 Sample CDL and graphics (systems schematics).

.11 Response time for each type of command and report.

.12 Item-by-item statement of compliance.

.13 Proof of demonstrated ability of system to communicate utilizing BACnet.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures and coordinate with requirements in this Section.

.2 Submit preliminary design document within 5 working days after tender closing and before contract award, for review by HRCE Representative.

.3 Shop Drawings to consist of 3 hard copies and 1 soft copy of design documents, shop drawings, product data, and software.

.4 Hard copy to be completely indexed and coordinated package to assure compliance with contract requirements and arranged in same sequence as specification and cross-referenced to specification section and paragraph number.

.5 Soft copy to be in AutoCAD - Latest Version and Microsoft Word - Latest Version format, structured using menu format for easy loading and retrieval on OWS.

1.4 PRELIMINARY SHOP DRAWING REVIEW

.1 Submit preliminary shop drawings within 30 working days of award of contract and include following:

.1 Specification sheets for each item. To include manufacturer's descriptive literature, manufacturer's installation recommendations, specifications, drawings, diagrams, performance and characteristic curves, catalogue cuts, manufacturer's

name, trade name, catalogue or model number, nameplate data, size, layout, dimensions, capacity, and other data to establish compliance.

.2 Detailed system architecture showing all points associated with each controller.

.3 Spare point capacity of each controller by number and type.

.4 Controller locations.

.5 Auxiliary control cabinet locations.

.6 Single line diagrams showing cable routings, conduit sizes, spare conduit capacity between control centre, field controllers and systems being controlled.

.7 Valves: complete schedule listing including following information: designation, service, manufacturer, model, point ID, design flow rate, design pressure drop, required Cv, Valve size, actual Cv, spring range, pilot range, required torque, actual torque, and close off pressure (required and actual).

.8 Dampers: sketches showing module assembly, interconnecting hardware, operator locations, operator spring range, pilot range, required torque, and actual torque.

.9 Flow measuring stations: complete schedule listing designation, service, point ID, manufacturer, model, size, velocity at design flow rate, manufacturer, model, and range of velocity transmitter.

1.5 DETAILED SHOP DRAWING REVIEW

.1 Submit detailed shop drawings within 60 working days after award of contract and before start of installation and include following:

.1 Corrected and updated versions (hard copy only) of submissions made during preliminary review.

.2 Wiring diagrams.

.3 Piping diagrams and hook-ups.

.4 Interface wiring diagrams showing termination connections and signal levels for equipment to be supplied by others.

.5 Shop drawings for each input/output point, sensors, transmitters, showing information associated with each particular point including:

.1 Sensing element type and location.

.2 Transmitter type and range.

.3 Associated field wiring schematics, schedules, and terminations.

.4 Complete Point Name Lists.

.5 Setpoints, curves, or graphs and alarm limits (high and low, 3 types critical, cautionary and maintenance), signal range.

.6 Software and programming details associated with each point.

.7 Manufacturer's recommended installation instructions and procedures.

.8 Input and output signal levels or pressures where new system ties into existing control equipment.

.6 Control schematics, narrative description, CDLs fully showing and describing automatic and manual procedure required to achieve proper operation of project, including under complete failure of EMCS.

.7 Graphic system schematic displays of water, air, and VRF systems with point identifiers and textual description of system, and typical floor plans as specified.

.8 Complete system CDLs including companion English language explanations on same sheet but with different font and italics. CDLs to contain specified energy optimization programs.

.9 Listing and example of specified reports.

.10 Listing of time of day schedules.

.11 Mark up to-scale construction drawing to detail control room showing location of equipment and operator work space.

.12 Type and size of memory with statement of spare memory capacity.

.13 Full description of software programs provided.

.14 Sample of "Operating Instructions Manual" to be used for training purposes.

.15 Outline of proposed start-up and verification procedures.

1.6 QUALITY ASSURANCE

.1 Preliminary Design Review Meeting: Convene meeting within 45 working days of award of contract to:

.1 Undertake functional review of preliminary design documents, resolve inconsistencies.

.2 Resolve conflicts between Contract Document requirements and actual items (e.g. points list inconsistencies).

.3 Review interface requirements of materials supplied by others.

.4 Review "Sequence of Operations".

.2 Contractor's programmer to attend meeting.

.3 HRCE Representative retains right to revise sequence or subsequent CDL prior to software finalization without cost to HRCE Representative

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group (CSA):

.1 CSA C22.1-24, The Canadian Electrical Code, Part I (26th Edition), Safety Standard for Electrical Installations.

1.2 DEFINITIONS

.1 For acronyms and definitions refer to Section 25 05 01 - EMCS: General Requirements.

1.3 SYSTEM DESCRIPTION

.1 Language Operating Requirements: provide identification for control items in English.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures supplemented and modified by requirements of this Section.

.2 Submit to HRCE Representative for approval samples of nameplates, identification tags, and list of proposed wording.

Part 2 Products

2.1 NAMEPLATES FOR PANELS

.1 Identify by plastic laminate, matt white finish, black core, square corners, lettering accurately aligned, and engraved into core.

.2 Sizes: 25 x 67 mm minimum.

.3 Lettering: minimum 7 mm high, black.

.4 Inscriptions: machine engraved to identify function.

2.2 NAMEPLATES FOR FIELD DEVICES

.1 Identify by plastic encased cards attached by chain.

.2 Sizes: 50 x 100 mm minimum.

.3 Lettering: minimum 5 mm high produced from laser printer in black.

.4 Data to include: point name and point address.

.5 Companion cabinet: identify interior components using plastic enclosed cards with point name and point address.

2.3 NAMEPLATES FOR ROOM SENSORS

.1 Identify by stick-on labels using point identifier.

.2 Location: as directed by HRCE Representative.

.3 Letter size: to suit, clearly legible.

2.4 WARNING SIGNS

.1 Equipment including motors, starters under remote automatic control: supply and install orange coloured signs warning of automatic starting under control of EMCS.

.2 Sign to read: "Caution: This equipment is under automatic remote control of EMCS" as reviewed by HRCE Representative.

2.5 WIRING

.1 Supply and install numbered tape markings on wiring at panels, junction boxes, splitters, cabinets, and outlet boxes.

.2 Colour coding: to CSA C22.1. Use colour coded wiring in communications cables, matched throughout system.

.3 Power wiring: identify circuit breaker panel/circuit breaker number inside each EMCS panel.

2.6 CONDUIT

.1 Colour code EMCS conduit.

.2 Pre-paint box covers and conduit fittings.

.3 Coding: use fluorescent orange paint and confirm colour with HRCE Representative during "Preliminary Design Review".

Part 3 Execution

3.1 NAMEPLATES AND LABELS

.1 Ensure that manufacturer's nameplates, CSA labels, and identification nameplates are visible and legible at all times.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI):

.1 ANSI/ASME B16.22-2013, Wrought Copper and Copper Alloy Solder Joint Pressures Fittings.

.2 ANSI C2-1990, National Electrical Safety Code.

.3 ANSI/NFPA 70-1990, National Electrical Code.

.2 CSA Group (CSA):

.1 CSA C22.1-24.

.2 CAN/CSA-C22.3 No. 7-20, Underground Systems.

.3 CAN/CSA C22.2 No. 45.1-07 (R2012), Electrical Rigid Metal Conduit.

.4 CAN/CSA C22.2 No. 56-13, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.

.5 CAN/CSA C22.2 No. 83-M1985 (R2013), Electrical Metallic Tubing.

1.2 SYSTEM DESCRIPTION

.1 Electrical:

.1 Provide power wiring from existing emergency power panels to EMCS field panels. Circuits to be for exclusive use of EMCS equipment. Panel breakers to be identified on panel legends tagged and locks applied to breaker switches.

.2 Hard wiring between field control devices and EMCS field panels.

.3 Communication wiring between EMCS field panels, MCUs, LCUs, ECUs, and TCUs.

.4 VRF system control wiring between WSVRF units, Branch Box Controllers, Indoor Units, and BACnet integration controller.

.5 Starters to provide for EMCS as indicated in I/O Summaries and as indicated.

.6 Refer to wiring diagrams and flow diagrams in drawing package.

.2 Mechanical:

.1 Pipe Taps Required for EMCS equipment will be supplied by EMCS Contractor and installed by Division 23.

.2 Wells, control valves, and flowmeters shall be supplied by EMCS Contractor and installed by Division 23.

.3 Installation of air flow stations, dampers, and other devices requiring sheet metal trades to be mounted by Division 23. Costs to be carried by designated trade.

.4 Air flow DP sensor, actuator, and associated vav controls to be supplied and installed by EMCS Contractor. Tubing from air probe to DP sensor as well as installation and adjustment of air flow sensors and actuators to be the responsibility of EMCS Contractor. Coordinate air flow adjustments with balancing trade.

.5 All other devices/controllers identified on drawings and elsewhere in specifications shall be supplied and installed by EMCS Contractor.

1.3 PERSONNEL QUALIFICATIONS

.1 Qualified supervisory personnel to:

.1 Continuously direct and monitor all work.

.2 Attend site meetings.

1.4 EXISTING CONDITIONS

.1 Repair all surfaces damaged during execution of work.

.2 Turn over to HRCE Representative existing materials removed from work not identified for re-use.

Part 2 Products

2.1 WIRING

.1 As per requirements of Division 26.

.2 For 70 V and above copper conductor with chemically cross-linked thermosetting polyethylene insulation rated RW90 and 600 V. Colour code to CSA 22.1.

.3 For wiring under 70 volts use FT6 rated wiring where wiring is not run in conduit. All other cases use FT4 wiring.

.4 Sizes:

.1 120 V Power supply: to match or exceed breaker, size #12 minimum.

.2 Wiring for safeties/interlocks for starters, motor control centres, to be stranded, #14 minimum.

.3 Field wiring to digital device: 20 AWG stranded twisted pair.

.4 Analog input and output: shielded #20 minimum stranded twisted pair. Wiring must be continuous without joints.

.5 More than 4 conductors: #22 minimum solid copper.

.5 Terminations:

.1 Terminate wires with screw terminal type connectors suitable for wire size, and number of terminations.

2.2 CONDUIT

.1 As per requirements of Division 26.

.2 Electrical metallic tubing to CAN/CSA C22.2 No. 83. Flexible and liquid tight flexible metal conduit to CAN/CSA C22.2 No. 56. Rigid steel threaded conduit to CAN/CSA C22.2 No. 45.1.

.3 Junction and pull boxes: welded steel:

.1 Surface mounting cast FS: screw-on flat covers.

.2 Flush mounting: covers with 25 mm minimum extension all round.

.4 Cabinets: sheet steel, for surface mounting, with hinged door, latch lock, 2 keys, complete with perforated metal mounting backboard. Panels to be keyed alike for similar functions and or entire contract as approved.

.5 Outlet boxes: 100 mm minimum, square.

.6 Conduit boxes and fittings:

.1 Bushings and connectors: with nylon insulated throats.

.2 With push pennies to prevent entry of foreign materials.

.7 Fittings for rigid conduit:

.1 Couplings and fittings: threaded type steel.

.2 Double locknuts and insulated bushings: use on sheet metal boxes.

.3 Use factory "ells" where 90 degree bends required for 25 mm and larger conduits.

.8 Fittings for thin wall conduit:

.1 Connectors and couplings: steel, set screw type.

2.3 SUPPORTS FOR CONDUIT, FASTENINGS, AND EQUIPMENT

.1 Solid masonry, tile, and plastic surfaces: lead anchors or nylon shields:

.1 Hollow masonry walls, suspended drywall ceilings: toggle bolts.

.2 Exposed conduits or cables:

.1 50 mm diameter and smaller: one-hole steel straps.

.2 Larger than 50 mm diameter: two-hole steel straps.

.3 Suspended support systems:

.1 Individual cable or conduit runs: support with 6 mm diameter threaded rods and support clips.

.2 Two or more suspended cables or conduits: support channels supported by 6 mm diameter threaded rod hangers.

Part 3 Execution

3.1 INSTALLATION

.1 Install equipment, components so that manufacturer's and CSA labels are visible and legible after commissioning is complete.

3.2 SUPPORTS

.1 Install special supports as required and as indicated.

3.3 ELECTRICAL GENERAL

.1 Do complete installation in accordance with requirements of:

.1 Division 26, this specification.

.2 CSA 22.1 Canadian Electrical Code.

.3 ANSI/NFPA 70.

.4 ANSI C2.

.2 Fully enclose or properly guard electrical wiring, terminal blocks, high voltage above 70 V contacts, and mark to prevent accidental injury.

.3 Do underground installation to CAN/CSA-C22.3 No. 7, except where otherwise specified.

.4 Conform to manufacturer's recommendations for storage, handling, and installation.

.5 Check factory connections and joints. Tighten where necessary to ensure continuity.

.6 Install electrical equipment between 1,000 and 2,000 mm above finished floor wherever possible and adjacent to related equipment.

.7 Protect exposed live equipment such as panel, mains, and outlet wiring during construction for personnel safety.

.8 Shield and mark live parts "LIVE 120 VOLTS" or other appropriate voltage.

.9 Install conduits and sleeves prior to pouring of concrete.

.10 Holes through exterior wall and roofs: flash and make weatherproof.

.11 Make necessary arrangements for cutting of chases, drilling holes, and other structural work required to install electrical conduit, cable, pull boxes, and outlet boxes.

.12 Install cables, conduits, and fittings which are to be embedded or plastered over, neatly, and closely to building structure to minimize furring.

3.4 CONDUIT SYSTEM

.1 Communication wiring shall be installed in conduit. Provide complete conduit system to link Building Controllers to BECC. Conduit sizes to suit wiring requirements and to allow for future expansion capabilities specified for systems. Maximum conduit fill not to exceed 40%. Design drawings do not show conduit layout.

.2 Install conduits parallel or perpendicular to building lines, to conserve headroom and to minimize interference.

.3 Do not run exposed conduits in normally occupied spaces unless otherwise indicated or unless impossible to do otherwise. Obtain approval from HRCE Representative before starting such work. Provide complete conduit system to link field panels and devices with main control centre. Conduit size to match conductors plus future expansion capabilities as specified.

.4 Locate conduits at least 150 mm from parallel hot water pipes and at least 50 mm at crossovers.

.5 Bend conduit so that diameter is reduced by less than $1/10^{th}$ original diameter.

.6 Field thread on rigid conduit to be of sufficient length to draw conduits up tight.

.7 Limit conduit length between pull boxes to less than 30 m.

.8 Use conduit outlet boxes for conduit up to 32 mm diameter and pull boxes for larger sizes.

.9 Fastenings and supports for conduits, cables, and equipment:

.1 Provide metal brackets, frames, hangers, clamps, and related types of support structures as indicated and as required to support cable and conduit runs.

.2 Provide adequate support for raceways and cables, sloped vertically to equipment.

.3 Use supports or equipment installed by other trades for conduit, cable, and raceway supports only after written approval from HRCE Representative.

.10 Install polypropylene fish cord in empty conduits for future use.

.11 Where conduits become blocked, remove and replace blocked sections.

.12 Pass conduits through structural members only after receipt of HRCE Representative's written approval.

.13 Conduits may be run in flanged portion of structural steel.

.14 Group conduits wherever possible on suspended or surface channels.

.15 Pull boxes:

.1 Install in inconspicuous but accessible locations.

.2 Support boxes independently of connecting conduits.

.3 Fill boxes with paper or foam to prevent entry of construction material.

.4 Provide correct size of openings. Reducing washers not permitted.

.5 Mark location of pull boxes on record drawings.

.6 Identify AC power junction boxes, by panel and circuit breaker.

.16 Install bonding conductor for 120 volt and above in conduit.

3.5 WIRING

.1 Install multiple wiring in ducts simultaneously.

.2 Do not pull spliced wiring inside conduits or ducts.

.3 Use CSA certified lubricants of type compatible with insulation to reduce pulling tension.

.4 Tests: use only qualified personnel. Demonstrate that:

.1 Circuits are continuous, free from shorts, unspecified grounds.

.2 Resistance to ground of all circuits is greater than 50 Megohms.

.5 Provide HRCE Representative with test results showing locations, circuits, results of tests.

.6 Remove insulation carefully from ends of conductors and install to manufacturer's recommendations. Accommodate all strands in lugs. Where insulation is stripped in excess, neatly tape so that only lug remains exposed.

.7 Wiring in main junction boxes and pull boxes to terminate on terminal blocks only, clearly, and permanently identified. Junctions or splices not permitted for sensing or control signal covering wiring.

.8 Do not allow wiring to come into direct physical contact with compression screw.

.9 Install ALL strands of conductor in lugs of components. Strip insulation only to extent necessary for installation.

3.6 GROUNDING

.1 Install complete, permanent, and continuous grounding system for equipment, including conductors, connectors, and accessories.

.2 Install separate grounding conductors in conduit within building.

.3 Install ground wire in all PVC ducts and in tunnel conduit systems.

.4 Tests: perform ground continuity and resistance tests, using approved method appropriate to site conditions.

3.7 TESTS

.1 General:

.1 Give 14 days written notice of intention to test.

.2 Conduct in presence of HRCE Representative and Authority Having Jurisdiction.

.3 Conceal work only after tests satisfactorily completed.

.4 Report results of tests to HRCE Representative in writing.

.5 Preliminary tests:

.1 Conduct as directed to verify compliance with specified requirements.

.2 Make needed changes, adjustments, and replacements.

.3 Insulation resistance tests:

.1 Megger all circuits, feeders, and equipment for 120 - 600 V with 1,000 V instrument. Resistance to ground to be more than required by Code before energizing.

.2 Test insulation between conductors and ground, efficiency of grounding system to satisfaction of HRCE Representative and Authority Having Jurisdiction.

3.8 IDENTIFICATION

.1 Refer to Section 25 05 54 - EMCS: Identification.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 Section Includes:

.1 Requirements and procedures for warranty and activities during warranty period and service contracts, for building Energy Monitoring and Control System (EMCS).

1.2 DEFINITIONS

.1 BC(s) - Building Controller(s).

.2 OWS - Operator Work Station.

.3 For additional acronyms and definitions refer to Section 25 05 01 - EMCS: General Requirements.

1.3 REFERENCE STANDARDS

.1 CSA Group (CSA):

.1 CSA Z204-94, Guidelines for Managing Indoor Air Quality in Office Buildings.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit detailed preventative maintenance schedule for system components to HRCE Representative.

.3 Submit detailed inspection reports to HRCE Representative.

.4 Submit dated, maintenance task lists to HRCE Representative and include the following sensor and output point detail, as proof of system verification:

.1 Point name and location.

.2 Device type and range.

.3 Measured value.

.4 System displayed value.

.5 Calibration detail.

.6 Indication if adjustment required.

.7 Other action taken or recommended.

.5 Submit network analysis report showing results with detailed recommendations to correct problems found.

.6 Records and logs: in accordance with Section 01 78 00 - Closeout Submittals:

.1 Maintain records and logs of each maintenance task on site.

.2 Organize cumulative records for each major component and for entire EMCS chronologically.

.3 Submit records to HRCE Representative, after inspection indicating that planned and systematic maintenance have been accomplished.

.7 Revise and submit to HRCE Representative in accordance with Section 01 78 00 - Closeout Submittals “As-built drawings" documentation and commissioning reports to reflect changes, adjustments, and modifications to EMCS made during warranty period.

1.5 MAINTENANCE SERVICE DURING WARRANTY PERIOD

.1 Provide services, materials, and equipment to maintain EMCS for specified warranty period. Provide detailed preventative maintenance schedule for system components as described in Submittal article.

.2 Emergency Service Calls:

.1 Initiate service calls when EMCS is not functioning correctly.

.2 Qualified control personnel to be available during warranty period to provide service to "CRITICAL" components whenever required at no extra cost.

.3 Furnish HRCE Representative with telephone number where service personnel may be reached at any time.

.4 Service personnel to be on site ready to service EMCS within 2 hours after receiving request for service.

.5 Perform Work continuously until EMCS restored to reliable operating condition.

.3 Operation: foregoing and other servicing to provide proper sequencing of equipment and satisfactory operation of EMCS based on original design conditions and as recommended by manufacturer.

.4 Work requests: record each service call request, when received separately on approved form and include:

.1 Serial number identifying component involved.

.2 Location, date, and time call received.

.3 Nature of trouble.

.4 Names of personnel assigned.

.5 Instructions of work to be done.

.6 Amount and nature of materials used.

.7 Time and date work started.

.8 Time and date of completion.

.5 Provide system modifications in writing:

.1 No system modification, including operating parameters and control settings, to be made without prior written approval of HRCE Representative.

1.6 SERVICE CONTRACTS

.1 Provide in-depth technical expertise and assistance to HRCE Representative and Commissioning Manager in preparation and implementation of service contracts and in-house preventive maintenance procedures.

.2 Service Contracts to include:

.1 Annual verification of site points for operation and calibration.

.2 2 visits per year.

.3 10 responses to emergency calls during day, per year.

.4 10 responses to emergency calls during silent hours per year.

.5 Complete inventory of installed system.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 SITE QUALITY CONTROL

.1 Perform as minimum (3) three minor inspections and one major inspection (more often if required by manufacturer) per year. Provide detailed written report to HRCE Representative as described in Submittal article.

.2 Perform inspections during regular working hours, 0800 to 1630 h, Monday through Friday, excluding statutory holidays.

.3 Following inspections are minimum requirements and should not be interpreted to mean satisfactory performance:

.1 Perform calibrations using test equipment having traceable, certifiable accuracy at minimum 50% greater than accuracy of system displaying or logging value.

.2 Check and Calibrate each site input/output device in accordance with CSA Z204.

.3 Provide dated, maintenance task lists, as described in Submittal article, as proof of execution of complete system verification.

.4 Minor inspections to include, but not limited to:

.1 Perform visual, operational checks to BC's, peripheral equipment, interface equipment, and other panels.

.2 Check equipment cooling fans as required.

.3 Visually check for mechanical faults, air leaks, and proper pressure settings on pneumatic components.

.4 Review system performance with HRCE Representative to discuss suggested or required changes.

.5 Major inspections to include, but not limited to:

.1 Minor inspection.

.2 Clean OWS(s) peripheral equipment, BC(s), interface and other panels, micro-processor interior, and exterior surfaces.

.3 Check signal, voltage and system isolation of BC(s), peripherals, interface, and other panels.

.4 Verify calibration/accuracy of each input and output device and recalibrate or replace as required.

.5 Provide mechanical adjustments and necessary maintenance on printers.

.6 Run system software diagnostics as required.

.7 Install software and firmware enhancements to ensure components are operating at most current revision for maximum capability and reliability:

.1 Perform network analysis and provide report as described in Submittal article.

.6 Rectify deficiencies revealed by maintenance inspections and environmental checks.

.7 Continue system debugging and optimization.

.8 Testing/verification of occupancy and seasonal-sensitive systems to take place during four (4) consecutive seasons, after facility has been accepted, taken over and fully occupied:

.1 Test weather-sensitive systems twice: first at near winter design conditions and secondly under near summer design conditions.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

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

.1 ASHRAE 2003, Applications Handbook, SI Edition.

.2 CSA Group (CSA):

.1 C22.2 No. 205-M1983 (R1999), Signal Equipment.

.3 Institute of Electrical and Electronics Engineers (IEEE):

.1 IEEE C37.90.1-02, Surge Withstand Capabilities (SWC) Tests for Relays and Relay Systems Associated with Electric Power Apparatus.

1.2 DEFINITIONS

.1 Acronyms and definitions: refer to Section 25 05 01 - EMCS: General Requirements.

1.3 DESCRIPTION

.1 General: Network of controllers comprising of MCU('s), LCU('s), ECU('s), or TCU('s) to be provided as indicated in System Architecture Diagram to support building systems and associated sequence(s) of operations as detailed in these specifications:

.1 Provide sufficient controllers to meet intents and requirements of this Section.

.2 Controller quantity and point contents to be approved by HRCE Representative at time of preliminary design review.

.2 Controllers: stand-alone intelligent Control Units:

.1 Incorporate programmable microprocessor, non-volatile program memory, RAM, power supplies, as required to perform specified functions.

.2 Incorporate communication interface ports for communication to LANs to exchange information with other Controllers.

.3 Capable of interfacing with operator interface device.

.4 Execute its logic and control using primary inputs and outputs connected directly to its onboard input/output field terminations or slave devices, and without need to interact with other controller. Secondary input used for reset such as outdoor air temperature may be located in other Controller(s):

.1 Secondary input used for reset such as outdoor air temperature may be located in other Controller(s).

.3 Interface to include provisions for ethernet high speed internet connection with EMCS for remote monitoring and control:

.1 Controller to include integral built-in web-server software with encryption to facilitate secure remote login without requiring standalone OWS. Use of OWS remote desktop software is not an accepted solution for remote login.

1.4 DESIGN REQUIREMENTS

.1 To include:

.1 Scanning of AI and DI connected inputs for detection of change of value and processing detection of alarm conditions.

.2 Perform On-Off digital control of connected points, including resulting required states generated through programmable logic output.

.3 Perform Analog control using programmable logic (including PID) with adjustable dead bands and deviation alarms.

.4 Control of systems as described in sequence of operations.

.5 Execution of optimization routines as listed in this section.

.2 Total spare capacity for MCUs and LCUs: at least 25% of each point type distributed throughout the MCUs and LCUs.

.3 Field Termination and Interface Devices:

.1 To: CSA C22.2 No. 205.

.2 Electronically interface sensors and control devices to processor unit.

.3 Include, but not be limited to, following:

.1 Programmed firmware or logic circuits to meet functional and technical requirements.

.2 Power supplies for operation of logics devices and associated field equipment.

.3 Lockable wall cabinet.

.4 Required communications equipment and wiring (if remote units).

.5 Leave controlled system in "fail-safe" mode in event of loss of communication with, or failure of, processor unit.

.6 Input Output interface to accept as minimum AI, AO, DI, DO functions as specified.

.7 Wiring terminations: use conveniently located screw type or spade lug terminals.

.4 AI interface equipment to:

.1 Convert analog signals to digital format with 10 bit analog-to-digital resolution.

.2 Provide for following input signal types and ranges:

.1 4 - 20 mA;

.2 0 - 10 V DC;

.3 100/1,000 ohm RTD input;

.3 Meet IEEE C37.90.1 surge withstand capability.

.4 Have common mode signal rejection greater than 60 dB to 60 Hz.

.5 Where required, dropping resistors to be certified precision devices which complement accuracy of sensor and transmitter range specified.

.5 AO interface equipment:

.1 Convert digital data from controller processor to acceptable analog output signals using 8 bit digital-to-analog resolution.

.2 Provide for following output signal types and ranges:

.1 4 - 20 mA.

.2 0 - 10 V DC.

.3 Meet IEEE C37.90.1 surge withstand capability.

.6 DI interface equipment:

.1 Able to reliably detect contact change of sensed field contact and transmit condition to controller.

.2 Meet IEEE C37.90.1 surge withstand capability.

.3 Accept pulsed inputs up to 2 kHz.

.7 DO interface equipment:

.1 Respond to controller processor output, switch respective outputs. Each DO hardware to be capable of switching up to 0.5 amps at 24 V AC.

.2 Switch up to 5 amps at 220 V AC using optional interface relay.

.4 Controllers and associated hardware and software: operate in conditions of 0 °C to 44 °C and 20% to 90% non-condensing RH.

.5 Controllers (MCU, LCU): mount in wall mounted cabinet with hinged, keyed-alike locked door:

.1 Provide for conduit entrance from top, bottom, or sides of panel.

.2 ECUs and TCUs to be mounted in equipment enclosures or separate enclosures.

.3 Mounting details as approved by HRCE Representative for ceiling mounting.

.6 Cabinets to provide protection from water dripping from above, while allowing sufficient airflow to prevent internal overheating.

.7 Provide surge and low voltage protection for interconnecting wiring connections.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures:

.1 Submit product data sheets for each product item proposed for this project.

Part 2 Products

2.1 MASTER CONTROL UNIT (MCU)

.1 General: primary function of MCU is to provide co-ordination and supervision of subordinate devices in execution of optimization routines such as demand limiting or enthalpy control.

.2 Include high speed communication LAN Port for Peer to Peer communications with OT(s) and other MCU level devices:

.1 MCU must support BACnet.

.3 MCU local I/O capacity as follows:

.1 MCU I/O points as allocated in I/O Summary Table referenced in MD13800.

.2 LCUs may be added to support system functions.

.4 Central Processing Unit (CPU):

.1 Processor to consist of minimum 16 bit microprocessor capable of supporting software to meet specified requirements.

.2 CPU idle time to be more than 30% when system configured to maximum input and output with worst case program use.

.3 Minimum addressable memory to be at manufacturer's discretion but to support at least performance and technical specifications to include but not limited to:

.1 Non-volatile EEPROM to contain operating system, executive, application, sub-routine, and other configurations definition software. Tape media not acceptable.

.2 Battery backed (72 hour minimum capacity) RAM (to reduce the need to reload operating data in event of power failure) to contain CDLs, application parameters, operating data or software that is required to be modifiable from operational standpoint such as schedules, setpoints, alarm limits, PID constants, and CDL and hence modifiable on-line through operator panel or remote operator's interface.

.4 Include uninterruptible clock accurate to plus or minus 5 secs/month, capable of deriving year/month/day/hour/minute/second, with rechargeable batteries for minimum 72 hour operation in event of power failure.

.5 Local Operator Terminal (OT): Provide OT for each MCU unless otherwise indicated:

.1 Mount access/display panel in MCU or in suitable enclosure beside MCU as approved by HRCE Representative.

.2 Support operator's terminal for local command entry, instantaneous and historical data display, programs, additions, and modifications.

.3 Display simultaneously minimum of 16 point identifiers to allow operator to view single screen dynamic displays depicting entire mechanical systems. Point identifiers to be in English.

.4 Functions to include, but not be limited to, following:

.1 Start and stop points.

.2 Modify setpoints.

.3 Modify PID loop parameters.

.4 Override PID control.

.5 Change time/date.

.6 Add/modify/start/stop weekly scheduling.

.7 Add/modify setpoint weekly scheduling.

.8 Enter temporary override schedules.

.9 Define holiday schedules.

.10 View analog limits.

.11 Enter/modify analog warning limits.

.12 Enter/modify analog alarm limits.

.13 Enter/modify analog differentials.

.5 Provide access to real and calculated points in controller to which it is connected or to other controller in network. This capability not to be restricted to subset of predefined "global points" but to provide totally open exchange of data between OT and other controller in network.

.6 Operator access to OTs: via username and password. Password changes to automatically be downloaded to controllers on network.

.7 Provide prompting to eliminate need for user to remember command format or point names. Prompting to be consistent with user's password clearance and types of points displayed to eliminate possibility of operator error.

.8 Identity of real or calculated points to be consistent with network devices.

2.2 LOCAL CONTROL UNIT (LCU)

.1 Provide multiple control functions for typical built-up and package HVAC systems, hydronic systems, and electrical systems.

.2 Minimum of 16 I/O points of which minimum be 4 AOs, 4 AIs, 4 DIs, 4 DOs.

.3 Points integral to one Building System to be resident on only one controller.

.4 Microprocessor capable of supporting necessary software and hardware to meet specified requirements as listed in previous MCU article with following additions:

.1 Include minimum 2 interface ports for connection of local computer terminal.

.2 Design so that shorts, opens or grounds on input or output will not interfere with other input or output signals.

.3 Physically separate line voltage (70 V and over) circuits from DC logic circuits to permit maintenance on either circuit with minimum hazards to technician and equipment.

.4 Include power supplies for operation of LCU and associated field equipment.

.5 In event of loss of communications with, or failure of, MCU, LCU to continue to perform control. Controllers that use defaults or fail to open or close positions not acceptable.

.6 Provide conveniently located screw type or spade lug terminals for field wiring.

2.3 TERMINAL/EQUIPMENT CONTROL UNIT (TCU/ECU)

.1 Microprocessor capable of supporting necessary software and hardware to meet TCU/ECU functional specifications:

.1 TCU/ECU definition to be consistent with those defined in ASHRAE HVAC Applications Handbook Section 45.

.2 Controller to communicate directly with EMCS through EMCS LAN and provide access from EMCS OT for setting occupied and unoccupied space temperature setpoints, flow setpoints, and associated alarm values, permit reading of sensor values, field control values (% open) and transmit alarm conditions to EMCS OT.

.3 VAV Terminal Controller:

.1 Microprocessor based controller with integral flow transducer, including software routines to execute PID algorithms, calculate airflow for integral flow transducer and measure temperatures as per I/O Summary required inputs. Sequence of operation to ASHRAE HVAC Applications Handbook.

.2 Controller to support point definition; in accordance with Section 25 05 01 - EMCS: General Requirements.

.3 Controller to operate independent of network in case of communication failure.

.4 Controller to include damper actuator and terminations for input and output sensors and devices.

2.4 SOFTWARE

.1 General:

.1 Include as minimum: operating system executive, communications, application programs, operator interface, and systems sequence of operation - CDL's.

.2 Include "firmware" or instructions which are programmed into ROM, EPROM, EEPROM or other non-volatile memory.

.3 Include initial programming of Controllers, for entire system.

.2 Program and data storage:

.1 Store executive programs and site configuration data in ROM, EEPROM, or other non-volatile memory.

.2 Maintain CDL and operating data including setpoints, operating constants, alarm limits in battery-backed RAM, or EEPROM for display and modification by operator.

.3 Programming languages:

.1 Program Control Description Logic software (CDL) using English like or graphical, high level, general control language.

.2 Structure software in modular fashion to permit simple restructuring of program modules if future software additions or modifications are required. Go to constructs not allowed unless approved by HRCE Representative.

.4 Operator Terminal interface:

.1 Operating and control functions include:

.1 Multi-level password access protection to allow user/manager to limit workstation control.

.2 Alarm management: processing and messages.

.3 Operator commands.

.4 Reports.

.5 Displays.

.6 Point identification.

.5 Pseudo or calculated points:

.1 Software to provide access to value or status in controller or other networked controller in order to define and calculate pseudo point. When current pseudo point value is derived, normal alarm checks must be performed or value used to totalize.

.2 Inputs and outputs for process: include data from controllers to permit development of network-wide control strategies. Processes also to permit

operator to use results of one process as input to number of other processes (e.g. cascading).

.6 Control Description Logic (CDL):

.1 Capable of generating on-line project-specific CDLs which are software based, programmed into RAM or EEPROM and backed up to central control station. Owner must have access to these algorithms for modification or to be able to create new ones and to integrate these into CDLs on BC(s) remotely from central control station.

.2 Write CDL in high level language that allows algorithms and interlocking programs to be written simply and clearly. Use parameters entered into system (e.g. setpoints) to determine operation of algorithm. Operator to be able to alter operating parameters on-line from central control station and BC(s) to tune control loops.

.3 Perform changes to CDL on-line.

.4 Control logic to have access to values or status of points available to controller including global or common values, allowing cascading or inter-locking control.

.5 Energy optimization routines including enthalpy control, supply temperature reset, to be LCU or MCU resident functions and form part of CDL.

.6 MCU to be able to perform following pre-tested control algorithms:

.1 Two position control.

.2 Proportional Integral and Derivative (PID) control.

.7 Control software to provide ability to define time between successive starts for each piece of equipment to reduce cycling of motors.

.8 Provide protection against excessive electrical-demand situations during start-up periods by automatically introducing time delays between successive start commands to heavy electrical loads.

.9 Power Fail Restart: upon detection of power failure system to verify availability of Emergency Power as determined by emergency power transfer switches and analyse controlled equipment to determine its appropriate status under Emergency power conditions and start or stop equipment as defined by I/O Summary. Upon resumption of normal power as determined by emergency power transfer switches, MCU to analyse status of controlled equipment, compare with normal occupancy scheduling, turn equipment on or off as necessary to resume normal operation.

.7 Event and Alarm management: use management by exception concept for Alarm Reporting. This is system wide requirement. This approach will ensure that only principal alarms are reported to OT and central control station. Events which occur as direct result of primary event to be suppressed by system and only events which fail to occur to be reported. Such event sequence to be identified in I/O Summary and sequence of operation. Examples of above are, operational temperature alarms limits which are exceeded when main air handler is stopped, or General Fire condition shuts air handlers down, only Fire alarm status shall be reported. Exception is, when air handler which is supposed to stop or start fails to do so under event condition.

.8 Energy management programs: include specific summarizing reports, with date stamp indicating sensor details which activated and or terminated feature:

.1 MCU in coordination with subordinate LCU, TCU, ECU to provide for the following energy management routines:

.1 Time of day scheduling.

.2 Calendar based scheduling.

.3 Holiday scheduling.

.4 Temporary schedule overrides.

.5 Optimal start stop.

.6 Night setback control.

.7 Enthalpy (economizer) switchover.

.8 Peak demand limiting.

.9 Temperature compensated load rolling.

.10 Fan speed/flow rate control.

.11 Hot water reset.

.12 Geothermal water reset.

.13 Boiler sequencing.

.14 Heat Pump Sequencing

.15 Night purge.

.2 Programs to be executed automatically without need for operator intervention and be flexible enough to allow customization.

.3 Apply programs to equipment and systems as specified or requested by the HRCE Representative.

.9 Function/Event Totalization: features to provide predefined reports which show daily, weekly, and monthly accumulating totals and which include high rate (time stamped) and low rate (time stamped) and accumulation to date for month:

.1 MCUs to accumulate and store automatically run-time for binary input and output points.

.2 MCU to automatically sample, calculate and store consumption totals on daily, weekly, or monthly basis for user-selected analog or binary pulse input-type points.

.3 MCU to automatically count events (number of times pump is cycled off and on) daily, weekly, or monthly basis.

.4 Totalization routine to have sampling resolution of 1 min or less for analog inputs.

.5 Totalization to provide calculations and storage of accumulations up to 99,999.9 units (e.g. kWH, litres, tonnes, etc.).

.6 Store event totalization records with minimum of 9,999,999 events before reset.

.7 User to be able to define warning limit and generate user-specified messages when limit reached.

2.5 LEVELS OF ADDRESS

.1 Upon operator's request, EMCS to present status of any single 'point', 'system' or point group, entire 'area', or entire network on printer or remotely at central control station as selected by operator:

.1 Display analog values digitally to 1 place of decimals with negative sign as required.

.2 Update displayed analog values and status when new values received.

.3 Flag points in alarm by blinking, reverse video, different colour, bracketed, or other means to differentiate from points not in alarm.

.4 Updates to be Change-Of-Value (COV)-driven or if polled not exceeding 2 second intervals.

2.6 POINT NAME SUPPORT

.1 Controllers (MCU, LCU) to support HRCE point naming convention as defined in Section 25 05 01 - EMCS: General Requirements.

Part 3 Execution

3.1 LOCATION

.1 Location of Controllers to be approved by HRCE Representative.

3.2 INSTALLATION

.1 Install Controllers in secure locking enclosures as directed by HRCE Representative.

.2 Provide necessary power from local 120 V branch circuit panel for equipment.

.3 Install tamper locks on breakers of circuit breaker panel.

.4 Use Uninterruptible Power Supply (UPS) and emergency power when equipment must operate in emergency and coordinating mode.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI):

.1 ANSI C12.7-1993 (R1999), Requirements for Watthour Meter Sockets.

.2 ANSI/IEEE C57.13-1993, Standard Requirements for Instrument Transformers.

.2 ASTM International (ASTM):

.1 ASTM B148-97 (03), Standard Specification for Aluminum-Bronze Sand Castings.

.3 National Electrical Manufacturer's Association (NEMA):

.1 NEMA 250-03, Enclosures for Electrical Equipment (1,000 Volts Maximum).

.4 Air Movement and Control Association, Inc. (AMCA):

.1 AMCA Standard 500-D-98, Laboratory Method of Testing Dampers For Rating.

.5 CSA Group (CSA):

.1 CSA-C22.1-24, Canadian Electrical Code, Part 1 (26th Edition), Safety Standard for Electrical Installations.

.6 Green Building Initiative (GBI):

.1 Green Globes Design for New Construction and Major Renovations, Version 2. Green Globes for New Construction Technical Manual 2015.

1.2 DEFINITIONS

.1 Acronyms and Definitions: refer to Section 25 05 01 - EMCS: General Requirements.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit shop drawings and manufacturer's installation instructions in accordance with Section 01 33 00 - Submittal Procedures.

.2 Pre-Installation Tests:

.1 Submit samples at random from equipment shipped, as requested by HRCE Representative, for testing before installation. Replace devices not meeting specified performance and accuracy.

.3 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions for specified equipment and devices.

1.4 EXISTING CONDITIONS

.1 Repair surfaces damaged during execution of Work.

Part 2 Products

2.1 GENERAL

.1 Control devices of each category to be of same type and manufacturer.

.2 External trim materials to be corrosion resistant. Internal parts to be assembled in watertight, shockproof, vibration-proof, heat resistant, and assembly.

.3 Operating conditions: 0 - 32 °C with 10 - 90% RH (non-condensing) unless otherwise specified.

.4 Terminations: use standard conduit box with slot screwdriver compression connector block unless otherwise specified.

.5 Transmitters and sensors to be unaffected by external transmitters including walkie talkies.

.6 Account for hysteresis, relaxation time, maximum, and minimum limits in applications of sensors and controls.

.7 Outdoor installations: use weatherproof construction in NEMA 4 enclosures.

.8 Devices installed in user occupied space not exceed Noise Criteria (NC) of 25. Noise generated by any device must not be detectable above space ambient conditions.

.9 Range: including temperature, humidity, and pressure as indicated

2.2 TEMPERATURE SENSORS

.1 General: except for room sensors to be resistance or thermocouple type to following requirements:

.1 Thermocouples: limit to temperature range of 200 °C and over.

.2 RTD's: 100 or 1,000 ohm at 0 °C (plus or minus 0.2 ohms) platinum element with strain minimizing construction, 3 integral anchored leadwires. Coefficient of resistivity: 0.00385 ohms/ohm °C.

.3 Sensing element: hermetically sealed.

.4 Stem and tip construction: copper or type 304 stainless steel.

.5 Time constant response: less than 3 seconds to temperature change of 10 °C.

.6 Immersion wells: NPS 3/4, stainless steel spring loaded construction, with heat transfer compound compatible with sensor. Insertion length 100 - 150 mm as indicated.

.2 Duct temperature sensors:

.1 General purpose duct type: suitable for insertion into ducts at various orientations, insertion length 460 mm as indicated.

.2 Averaging duct type: incorporates numerous sensors inside assembly which are averaged to provide one reading. Minimum insertion length 6,096 mm. Bend probe at field installation time to 100 mm radius at point along probe without degradation of performance.

.3 Outdoor air temperature sensors:

.1 Outside air type: complete with probe length 100 - 150 mm long, non-corroding shield to minimize solar and wind effects, threaded fitting for mating to 13 mm conduit, weatherproof construction in NEMA 4 enclosure.

2.3 TEMPERATURE TRANSMITTERS

.1 Requirements:

.1 Input circuit: to accept 3-lead, 100 or 1,000 ohm at 0 °C, platinum resistance detector type sensors.

.2 Power supply: 24 V DC into load of 575 ohms. Power supply effect less than 0.01 °C per volt change.

.3 Output signal: 4 - 20 mA into 500 ohm maximum load.

.4 Input and output short circuit and open circuit protection.

.5 Output variation: less than 0.2% of full scale for supply voltage variation of plus or minus 10%.

.6 Combined non-linearity, repeatability, and hysteresis effects: not to exceed plus or minus 0.5% of full scale output.

.7 Maximum current to 100 or 1,000 ohm RTD sensor: not to exceed 25 mA.

.8 Integral zero and span adjustments.

.9 Temperature effects: not to exceed plus or minus 1.0% of full scale/50 °C.

.10 Long term output drift: not to exceed 0.25% of full scale/6 months.

.11 Transmitter ranges: select narrowest range to suit application from following:

.1 Minus 50 °C to plus 50 °C, plus or minus 0.5 °C.

.2 0 to 100 °C, plus or minus 0.5 °C.

.3 0 to 50 °C, plus or minus 0.25 °C.

.4 0 to 25 °C, plus or minus 0.1 °C.

.5 10 to 35 °C, plus or minus 0.25 °C.

2.4 SOLID STATE RELAYS

.1 General:

.1 Relays to be socket or rail mounted.

.2 Relays to have LED Indicator.

.3 Input and output Barrier Strips to accept 14 to 28 AWG wire.

.4 Operating temperature range to be -20 °C to 70 °C.

.5 Relays to be CSA Certified.

.6 Input/output Isolation Voltage to be 4,000 VAC at 25 °C for 1 second maximum duration.

.7 Operational frequency range, 45 to 65 HZ.

.2 Input:

.1 Control voltage, 3 to 32 VDC.

.2 Drop out voltage, 1.2 VDC.

.3 Maximum input current to match AO (Analog Output) board.

.3 Output:

.1 AC or DC Output Model to suit application.

2.5 CURRENT SENSING RELAYS

.1 Requirements:

.1 Suitable to detect belt loss or motor failure.

.2 Trip point adjustment, output status LED.

.3 Split core for easy mounting.

.4 Induced sensor power.

.5 Relay contacts: capable of handling 0.5 amps at 30 VAC/DC. Output to be NO solid state.

.6 Suitable for single or 3 phase monitoring. For 3-Phase applications: provide for discrimination between phases.

.7 Adjustable latch level.

2.6 CONTROL DAMPERS

.1 Construction: blades, 152 mm wide, 1,219 mm long, maximum. Modular maximum size, 1,219 mm wide x 1,219 mm high. Three or more sections to be operated by jack shafts.

.2 Materials:

.1 Frame: 2.03 mm minimum thickness extruded aluminum. For outdoor air and exhaust air applications, frames to be insulated.

.2 Blades: extruded aluminum. For outdoor air/exhaust air applications, blades to be internally insulated.

.3 Bearings: maintenance free, synthetic type of material.

.4 Linkage and shafts: aluminum, zinc, and nickel plated steel.

.5 Seals: synthetic type, mechanically locked into blade edges:

.1 Frame seals: synthetic type, mechanically locked into frame sides.

.3 Performance: minimum damper leakage meet or exceed AMCA Standard 500-D ratings:

.1 Size/Capacity: refer to damper schedule.

.2 25 L/s/m^2 maximum allowable leakage against 1,000 Pa static pressure for outdoor air and exhaust air applications.

.3 Temperature range: minus 40 °C to plus 100 °C.

.4 Arrangements: dampers mixing warm and cold air to be parallel blade, mounted at right angles to each other, with blades opening to mix air stream.

.5 Jack shafts:

.1 25 mm diameter solid shaft, constructed of corrosion resistant metal complete with required number of pillow block bearings to support jack shaft and operate dampers throughout their range.

.2 Include corrosion resistant connecting hardware to accommodate connection to damper actuating device.

.3 Install using manufacturer's installation guidelines.

.4 Use same manufacturer as damper sections.

2.7 ELECTRONIC CONTROL DAMPER ACTUATORS

.1 Requirements:

.1 Direct mount proportional type as indicated.

.2 Spring return for "fail-safe" in Normally Open or Normally Closed position as indicated.

.3 Operator: size to control dampers against maximum pressure and dynamic closing/opening pressure, whichever is greater.

.4 Power requirements: 5 VA maximum at 24 V AC.

.5 Operating range: 0 - 10 V DC or 4 - 20 mA DC.

.6 For VAV box applications floating control type actuators may be used.

.7 Damper actuator to drive damper from full open to full closed in less than 120 seconds.

2.8 CONTROL VALVES

.1 Body: globe style, characterized ball:

.1 Flow characteristic as indicated on control valve schedule: equal percentage, linear, and quick opening.

.2 Flow factor (KV) as indicated on control valve schedule: CV in imperial units.

.3 Normally open Normally closed, as indicated.

.4 Three Two port, as indicated.

.5 Leakage rate ANSI class IV, 0.01% of full open valve capacity.

.6 Packing easily replaceable.

.7 Stem, stainless steel.

.8 Plug and seat, stainless steel, brass, and bronze.

.9 Disc, replaceable, material to suit application.

.10 NPS 2 and under:

.1 Screwed National Pipe Thread (NPT) tapered female connections.

.2 Valves to ANSI Class 250, valves to bear ANSI mark.

.3 Rangeability 50:1 minimum.

.11 NPS 2½ and larger:

.1 Flanged connections.

.2 Valves to ANSI Class 150 or 250 as indicated, valves to bear ANSI mark.

.3 Rangeability 100:1 minimum.

.2 Butterfly Valves NPS 2 and larger:

.1 Body: for chilled water ANSI Class 150 cast iron lugged body wafer body installed in locations as indicated. For steam and heating water ANSI Class 150 carbon steel wafer body lugged body.

.2 End connections to suit flanges that are ANSI Class 150.

.3 Extended stem neck to provide adequate clearance for flanges and insulation.

.4 Pressure limit: bubble tight sealing to 170 kilopascals.

.5 Disc/vane: 316 stainless steel, aluminum bronze to ASTM B148.

.6 Seat: for service on chilled water PTFE (Polytetrafluoroethylene), EPDM (Ethylene Propylene Diene Monomer). For service on steam and heating water PTFE, RTFE (reinforced PTFE).

.7 Stem: 316 stainless steel.

.8 Flow factor (KV) as indicated on control valve schedule: CV in imperial units.

.9 Flow characteristic linear.

.10 Maximum flow requirement as indicated on control valve schedule.

.11 Maximum pressure drop as indicated on control valve schedule: pressure drop not to exceed one half of inlet pressure.

.12 Normally closed Normally open, as indicated.

.13 Valves are to be provided complete with mounting plate for installation of actuators.

2.9 ELECTRONIC/ELECTRIC VALVE ACTUATORS

.1 Requirements:

.1 Construction: steel, cast iron, and aluminum.

.2 Control signal: 4-20 mA DC or 0-10 V DC.

.3 Positioning time: to suit application. 90 sec maximum.

.4 Fail to normal position as indicated.

.5 Scale or dial indication of actual control valve position.

.6 Size actuator to meet requirements and performance of control valve specifications.

.7 For interior and perimeter terminal heating and cooling applications floating control actuators are acceptable.

.8 Minimum shut-off pressure: refer to control valve schedule.

2.10 PANELS

.1 Wall mounted enamelled steel cabinets with hinged and key-locked front door.

.2 Multiple panels as indicated required to handle requirements with additional space to accommodate 25% additional capacity as required HRCE Representative without adding additional cabinets.

.3 Panels to be lockable with same key.

Part 3 Execution

3.1 INSTALLATION

.1 Install equipment, components so that manufacturer's and CSA labels are visible and legible after commissioning is complete.

.2 Install field control devices in accordance with manufacturers recommended methods, procedures, and instructions.

.3 Temperature transmitters, humidity transmitters, current-to-pneumatic transducers, solenoid air valves, controllers, and relays: install in NEMA I enclosure or as required for specific applications. Provide for electrolytic isolation in cases when dissimilar metals make contact.

.4 Support field-mounted panels, transmitters, and sensors on pipe stands or channel brackets.

.5 Fire stopping: provide space for fire stopping. Maintain the fire-resistance rating integrity of the fire separation.

.6 Electrical:

.1 Complete installation in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Modify existing starters to provide for EMCS as indicated in I/O Summaries and as indicated.

.3 Refer to electrical control schematics included as part of control design schematics on drawings.

.4 Terminate wires with screw terminal type connectors suitable for wire size, and number of terminations.

.5 Install communication wiring in conduit:

.1 Provide complete conduit system to link Building Controllers, field panels, and OWS(s).

.2 Conduit sizes to suit wiring requirements and to allow for future expansion capabilities specified for systems.

.3 Maximum conduit fill not to exceed 40%.

.4 Design drawings do not show conduit layout.

.6 Do not run exposed conduits in normally occupied spaces unless otherwise indicated or unless impossible to do otherwise. HRCE Representative to review before starting Work. Wiring in mechanical rooms, wiring in service rooms, and exposed wiring must be in conduit.

.7 Mechanical: supply and install:

.1 Pipe Taps.

.2 Wells and Control Valves.

.3 Air flow stations, dampers, and other devices.

3.2 TEMPERATURE AND HUMIDITY SENSORS

.1 Stabilize to ensure minimum field adjustments or calibrations.

.2 Readily accessible and adaptable to each type of application to allow for quick easy replacement and servicing without special tools or skills.

.3 Outdoor installation:

.1 Protect from solar radiation and wind effects by non-corroding shields.

.2 Install in NEMA 4 enclosures.

.4 Duct installations:

.1 Do not mount in dead air space.

.2 Locate within sensor vibration and velocity limits.

.3 Securely mount extended surface sensor used to sense average temperature.

.4 Thermally isolate elements from brackets and supports to respond to air temperature only.

.5 Support sensor element separately from coils, and filter racks.

.5 Averaging duct type temperature sensors:

.1 Install averaging element horizontally across the ductwork starting 305 mm from top of ductwork. Each additional horizontal run to be no more than 305 mm from one above it. Continue until complete cross sectional area of ductwork is covered. Use multiple sensors where single sensor does not meet required coverage.

.2 Wire multiple sensors in series for low temperature protection applications.

.3 Wire multiple sensors separately for temperature measurement.

.4 Use software averaging algorithm to derive overall average for control purposes.

.6 Thermowells: install for piping installations:

.1 Locate well in elbow where pipe diameter is less than well insertion length.

.2 Thermowell to restrict flow by less than 30%.

.3 Use thermal conducting paste inside wells.

3.3 PANELS

.1 Arrange for conduit and tubing entry from top, bottom or either side.

.2 Wiring and tubing within panels: locate in trays or individually clipped to back of panel.

.3 Identify wiring and conduit clearly.

3.4 PRESSURE AND DIFFERENTIAL PRESSURE SWITCHES AND SENSORS

.1 Install isolation valve and snubber on sensors between sensor and pressure source where code allows:

.1 Protect sensing elements on steam and high temperature hot water service with pigtail syphon between valve and sensor.

3.5 IDENTIFICATION

.1 Identify field devices in accordance with Section 25 05 54 - EMCS: Identification.

3.6 TESTING AND COMMISSIONING

.1 Calibrate and test field devices for accuracy and performance.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group:

.1 CSA C22.1-24, Canadian Electrical Code, Part 1 (26th Edition), Safety Standard for Electrical Installations.

.2 CSA C235-19, Preferred Voltage Levels for AC Systems up to 50,000 V.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit necessary number of drawings and specifications for review and approval to Authority Having Jurisdiction prior to commencement of work. Pay all associated fees.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature, and data sheets for review and include product characteristics, performance criteria, physical size, finish, and limitations.

.3 Shop drawings:

.1 Submit manufacturer shop drawings of all products and equipment in PDF format, legible, and clear:

.1 A cover sheet is to be incorporated into each PDF submission and indicate the project name and number, specification section number and name, the Contractor’s name, supplier’s name, date submitted, Contractor’s stamp, and signature identifying that the Contractor has reviewed the information prior to submission for correctness and completeness. Sufficient white space (minimum of ¼ page) is to be left for the Engineer-Architect’s stamp and comments.

.2 Part numbers for products and equipment to be clearly identifies with all required accessories and components indicated.

.3 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Nova Scotia, Canada.

.4 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure coordinated installation.

.5 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.

.6 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.

.7 If changes are required, resubmit corrected shop drawings as many times as necessary at no additional cost.

.8 If changes are required, notify HRCE Representative of these changes before they are made.

.4 Certificates:

.1 Provide CSA certified equipment and material.

.2 Where CSA certified equipment and material is not available, submit such equipment and material to Authority Having Jurisdiction for special approval before delivery to site.

.3 Submit test results of installed electrical systems and instrumentation.

.4 Permits and fees: in accordance with General Conditions of contract.

.5 Submit upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.

.6 Submit upon completion of Work, load balance report as described in PART 3 - FIELD QUALITY CONTROL.

.7 Submit certificate of acceptance from Authority Having Jurisdiction upon completion of Work to HRCE Representative .

.5 Manufacturer's Field Reports: submit to HRCE Representative manufacturer's written report within 3 days of review verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

.6 Submit documentation and data for commissioning in accordance with Section 01 91 13 - General Commissioning Requirements.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual:

.1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

.2 Operating instructions to include following:

.1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.

.2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.

.3 Safety precautions.

.4 Procedures to be followed in event of equipment failure.

.5 Other items of instruction as recommended by manufacturer of each system or item of equipment.

1.4 DELIVERY, STORAGE, AND HANDLING

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

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

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

.2 Store and protect materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

.2 Motors, electric heating, control, and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard:

.1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.3 Language operating requirements: provide identification nameplates and labels for control items in English.

2.2 MATERIALS AND EQUIPMENT

.1 Material and equipment to be CSA certified. Where CSA certified material and equipment is not available, obtain special approval from Authority Having Jurisdiction before delivery to site and submit such approval as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.2 Factory assemble control panels and component assemblies.

2.3 ELECTRIC MOTORS, EQUIPMENT, AND CONTROLS

.1 Verify installation and co-ordination responsibilities related to motors, equipment, and controls as indicated.

2.4 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of Authority Having Jurisdiction.

.2 Decal signs, minimum size 175 x 250 mm.

2.5 WIRING TERMINATIONS

.1 Ensure lugs, terminals, and screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.6 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates and labels as follows:

.1 Nameplates: Lamicoid 3 mm thick plastic engraving sheet, white face, black core, lettering accurately aligned and engraved into core.

.2 Sizes as follows:

NAMEPLATE SIZES			
Size 1	9.5 x 50 mm	1 line	4.8 mm high letters
Size 2	12.7 x 76 mm	1 line	6 mm high letters
Size 3	16 x 75 mm	2 lines	5 mm high letters
Size 4	19 x 89 mm	1 line	9.5 mm high letters
Size 5	38 x 89 mm	2 lines	12.7 mm high letters
Size 6	25 x 100 mm	1 line	12.7 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters
Size 8	50 x 100 mm	2 lines	12.7 mm high letters

.2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.

.3 Wording on nameplates to be approved by HRCE Representative prior to manufacture.

.4 Allow for minimum of forty (40) letters per nameplate on average.

.5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.6 Disconnects: indicate switch designation (name), ampacity, fuse rating (if applicable), voltage, number of poles, and source.

.7 Starters and contactors: indicate equipment being controlled, ampacity, horsepower, or power rating, and voltage.

.8 Panelboards: Indicate panel designation (name), ampacity, voltage, number of phases, number of wires, and source.

.9 Terminal cabinets and pull boxes: indicate source, system and voltage.

.10 Transformers: indicate transformer designation (name), capacity in kVA, primary and secondary voltages, and source.

2.7 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

2.8 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, boxes and metallic sheathed cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

Type	Prime	Auxiliary
Up to 250 V	Yellow	
Up to 600 V	Yellow	Green
Up to 5 kV	Yellow	Blue
Up to 15 kV	Yellow	Red
Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security Systems	Red	Yellow

2.9 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

Part 3 Execution

3.1 INSTALLATION

.1 Do complete installation in accordance with CSA C22.1 and AHJ requirements.

3.2 FIRE STOPPING

.1 Fire stopping to be in accordance with Section 07 84 00 - Fire Stopping.

.2 Fire stopping and smoke seal materials around cable, conduit, and tray openings and inside of conduit, tray, device boxes, and sleeve penetrations as required to maintain firestop system rating.

3.3 NAMEPLATES AND LABELS

.1 Ensure manufacturer's nameplates, CSA labels, and identification nameplates are visible and legible after equipment is installed.

3.4 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete:

.1 Sleeves through concrete: plastic, sized for free passage of conduit, and protruding 50 mm.

.2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

.3 Install cables, conduits, and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.5 LOCATION OF OUTLETS

.1 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.

.2 Change location of outlets at no extra cost or credit, providing distance does not exceed 3,000 mm and information is given before installation.

.3 Locate light switches on latch side of doors:

.1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of door.

3.6 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

.3 Install electrical equipment at following heights unless indicated otherwise:

.1 Local switches: 1,400 mm.

3.7 CO-ORDINATION OF PROTECTIVE DEVICES

.1 Ensure circuit protective devices such as overcurrent trips, relays, and fuses are installed to required values and settings.

3.8 FIELD QUALITY CONTROL

.1 Load Balance:

.1 Measure phase current to panelboards with normal loads operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.

.2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

.3 Provide upon completion of work, load balance report as directed in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS, phase and neutral currents on panelboards, dry-core transformers, and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.

.2 Provide instruments, meters, equipment, and personnel required to conduct tests during and at conclusion of project.

.3 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting, and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

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

3.9 SYSTEM STARTUP

.1 Instruct HRCE Representative in operation, care and maintenance of systems, system equipment, and components.

.2 Arrange and pay for services of manufacturer's factory service representative to supervise start-up of installation, check, adjust, balance, calibrate components, and instruct operating personnel.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

3.10 COMMISSIONING

.1 Participate in commissioning in accordance with Section 01 91 13 - General Commissioning Requirements.

3.11 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.

.2 Progress Cleaning:

.1 Leave Work area clean at end of each day.

.3 Final Cleaning: upon completion remove surplus materials, rubbish, tools, and equipment.

.4 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal:

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 DEFINITIONS

.1 Demolish: Detach items from existing construction and legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.

.2 Remove: Planned deconstruction and disassembly of electrical items from existing construction including removal of conduit, junction boxes, cabling, and wiring from electrical component to panel taking care not to damage adjacent assemblies designated to remain; legally dispose of items off-site, unless indicated as removed and salvaged, or removed and reinstalled.

.3 Remove and Salvage: Detach items from existing construction and deliver them to HRCE Representative ready for reuse.

.4 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

.5 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed and salvaged, or removed and reinstalled.

.6 Hazardous Substances: Dangerous substances, dangerous goods, hazardous commodities, and hazardous products may include asbestos, mercury, and lead, PCBs, poisons, corrosive agents, flammable substances, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly as defined by Federal Hazardous Products Act (RSC 1985) including latest amendments.

1.2 REFERENCE STANDARDS

.1 CSA Group (CSA):

.1 CSA S350 M1980 (R2003), Code of Practice for Safety in Demolition of Structures.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Coordination: Coordinate work of this Section to avoid interference with work by other Sections.

1.4 SITE CONDITIONS

.1 Discovery of Hazardous Substances: It is not expected that Hazardous Substances will be encountered in Work; immediately notify HRCE Representative if materials suspected of containing hazardous substances are encountered and perform following activities:

.1 Hazardous substances will be as defined in Hazardous Products Act.

.2 Stop work in area of suspected hazardous substances.

.3 Take preventative measures to limit users' and workers' exposure, provide barriers and other safety devices and do not disturb.

.4 Proceed only after written instructions have been received from HRCE Representative.

1.5 SALVAGE AND DEBRIS MATERIALS

.1 Demolished items become Contractor's property and will be removed from Project site; except for items indicated as being reused, salvaged, or otherwise indicated to remain HRCE's property.

.2 Carefully remove materials and items designated for salvage and store in a manner to prevent damage or devaluation of materials.

Part 2 Products

2.1 MATERIALS

.1 Electrical Repair Materials: Use only new materials, CSA or ULC labelled as appropriate and matching components remaining after work associated with components identified for removal or demolition are completed

.2 Fire stopping Repair Materials: Use fire stopping materials compatible with existing fire stopping systems where removal or demolition work affects rated assemblies, restore to match existing fire rated performance.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Existing Conditions: Visit site, thoroughly examine and become familiar with conditions that may affect the work of this Section before tendering the Bid; HRCE Representative will not consider claims for extras for work or materials necessary for proper execution and completion of the contract that could have been determined by a site visit.

3.2 PREPARATION

.1 Protection of Existing Systems to Remain: Protect systems and components indicated to remain in place during selective demolition operations and as follows:

.1 Prevent movement and install bracing to prevent settlement or damage of adjacent services and parts of existing buildings scheduled to remain.

.2 Notify HRCE Representative and cease operations where safety of buildings being demolished, adjacent structures or services appears to be endangered and await additional instructions before resuming demolition work specified in this Section.

.3 Prevent debris from blocking drainage inlets.

.4 Protect mechanical systems that will remain in operation.

.2 Protection of Building Occupants: Sequence demolition work so that interference with the use of the building by the HRCE Representative and users is minimized and as follows:

.1 Prevent debris from endangering safe access to and egress from occupied buildings.

.2 Notify HRCE Representative and cease operations where safety of occupants appears to be endangered and await additional instructions before resuming demolition work specified in this Section.

3.3 EXECUTION

.1 Demolish and Remove materials as indicated on drawings. Coordinate demolition activities and sequence with other trades. Where indicated:

- .1 Disconnect electrical circuits and panel feeders; maintain electrical service and main distribution panel as is, ready for subsequent Work.
- .2 Remove existing luminaires, electrical devices, and equipment including associated conduits, boxes, wiring, and similar items unless specifically noted otherwise.
- .3 Disconnect and remove existing fire alarm system including associated conduits, boxes, wiring, and similar items unless specifically noted otherwise.
- .4 Disconnect and remove communication systems including associated conduits, boxes, cabling, and similar items unless specifically noted otherwise.
- .5 Disconnect and remove telephone outlets, associated conduit, cabling, and sub terminal backboards and related accessories; maintain telephone service and main terminal backboard as is.
- .6 Perform demolition work in a neat and workmanlike manner:
  - .1 Remove tools or equipment after completion of work, and leave site clean and ready for subsequent renovation work.
  - .2 Repair and restore damages caused as a result of work of this Section to match existing materials and finishes.
- .7 Disconnect panel feeders back to main distribution panel and re label respective circuit breaker as "SPARE".
- .8 Place weatherproof blank cover plates on exterior outlet boxes remaining after demolition and removal activities.
- .9 Remove existing conduits, boxes, cabling, and wiring associated with removed luminaires, electrical devices, and equipment.
- .10 Grind off conduits and make flush with surface of concrete where conduits are cast into concrete; seal open ends of conduit with silicone sealant and leave in place.
- .11 Seal open ends of conduit with silicone sealant and leave in place where they are inaccessible or cannot be removed without damaging adjacent construction.

3.4 CLOSEOUT ACTIVITIES

.1 Demolition Waste Disposal: Arrange for legal disposal and remove demolished materials to accredited Provincial landfill site or alternative disposal site (recycle centre) except where explicitly noted otherwise for materials being salvaged for reuse in new construction.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group (CSA):

.1 C22.2 No. 18.1-13 (R2022), Metallic Outlet Boxes.

.2 C22.2 No. 18.2:06 (R2021), Nonmetallic Outlet Boxes.

.3 C22.2 No. 18.3:12 (R2022), Conduit, Tubing, and Cable Fittings.

.4 C22.2 No. 18.4:15 (R2019), Hardware for the Support of Conduit, Tubing, and Cable.

.5 CAN/CSA-C22.2 No. 65-18 (R2022) Wire Connectors (Tri-National Standard with NMX-J-543-ANCE and UL 486A-486B).

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC):

.1 EEMAC 1Y-2-1961, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's instructions, printed product literature, and data sheets for wire, and box connectors and include product characteristics, performance criteria, physical size, finish, and limitations.

1.3 CLOSEOUT SUBMITTALS

.1 Operation and Maintenance Data: submit operation and maintenance data for wire and box connectors for incorporation into manual.

1.4 DELIVERY, STORAGE, AND HANDLING

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

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

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

.2 Store and protect materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

.1 Pressure type wire connectors to: CAN/CSA-C22.2 No. 65, with current carrying parts of copper sized to fit copper conductors as required.

.2 Fixture type splicing connectors to: CAN/CSA-C22.2 No. 65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wire and box connectors installation in accordance with manufacturer's written instructions:

.1 Visually inspect substrate in presence of HRCE Representative.

.2 Inform HRCE Representative of unacceptable conditions immediately upon discovery.

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

3.2 INSTALLATION

.1 Remove insulation carefully from ends of conductors and cables and:

.1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.

.2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CAN/CSA-C22.2 No. 65.

.3 Install fixture type connectors and tighten to CAN/CSA-C22.2 No. 65. Replace insulating cap.

.4 Install bushing stud connectors in accordance with NEMA EEMAC 1Y-2.

3.3 CLEANING

.1 Progress 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 Final Cleaning: upon completion remove surplus materials, rubbish, tools, and equipment.

END OF SECTION

Part 1 General

1.1 DELIVERY, STORAGE, AND HANDLING

.1 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.2 Storage and Handling Requirements:

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

.2 Store and protect materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG and larger. Solid for 12 AWG. Minimum size: 12 AWG.

.2 Copper conductors: size as indicated, with 600 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE, Non Jacketted.

Part 3 Execution

3.1 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

.1 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors (0-1000 V).

.2 Cable Colour Coding: to Section 26 05 00 - Common Work Results for Electrical.

.3 Conductor length for parallel feeders to be identical.

.4 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

.5 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.

.6 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e. common neutrals not permitted.

.7 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.3 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group (CSA):

.1 CSA C22.1-24, Canadian Electrical Code, Part 1, 26th Edition.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

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

.2 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.

1.3 DELIVERY, STORAGE, AND HANDLING

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

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

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

.2 Store and protect materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 JUNCTION AND PULL BOXES

.1 Construction: welded steel enclosure.

.2 Covers Flush Mounted: 25 mm minimum extension all around.

.3 Covers Surface Mounted: screw-on flat covers.

Part 3 Execution

3.1 JUNCTION, PULL BOXES, AND CABINETS INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Mount cabinets with top not higher than 2 m above finished floor except where indicated otherwise.

.3 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

3.2 IDENTIFICATION

.1 Equipment Identification: to Section 26 05 00 - Common Work Results for Electrical.

.2 Identification Labels: size 2 indicating system name and voltage/phase or as indicated.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group (CSA):

.1 CAN/CSA C22.2 No. 18-98 (R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.

.2 CSA C22.2 No. 45-M1981 (R2003), Rigid Metal Conduit.

.3 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.

.4 CSA C22.2 No. 83-M1985 (R2003), Electrical Metallic Tubing.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product data: submit manufacturer's printed product literature, specifications, and datasheets:

.1 Submit cable manufacturing data.

.2 Quality assurance submittals:

.1 Test reports: submit certified test reports.

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

.3 Instructions: submit manufacturer's installation instructions.

1.3 DELIVERY, STORAGE, AND HANDLING

.1 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.2 Storage and Handling Requirements:

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

.2 Store and protect materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 CONDUITS

.1 Electrical Metallic Tubing (EMT): to CSA C22.2 No. 83, with couplings or with expanded ends.

.2 Flexible metal conduit: to CSA C22.2 No. 56, steel or aluminum.

2.2 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits 50 mm and smaller:

.1 Two hole steel straps for conduits larger than 50 mm.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Threaded rods, 6 mm diameter, to support suspended channels.

2.3 CONDUIT FITTINGS

.1 Fittings: Manufactured for use with conduit specified. Coating: same as conduit.

.2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Weatherproof expansion fittings with internal bonding assembly suitable for 200 mm linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.

.3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 FISH CORD

.1 Polypropylene.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Conceal conduits except in mechanical and electrical service rooms.

.3 Surface mount conduits except where otherwise shown.

.4 Use Electrical Metallic Tubing (EMT) for interior work.

.5 Use rigid PVC conduit for exterior work.

.6 Use flexible metal conduit for connection to motors in dry areas.

.7 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.

.8 Install conduit sealing fittings in hazardous areas:

.1 Fill with compound.

.9 Minimum conduit size for lighting and power circuits: 21 mm.

.10 Bend conduit cold:

.1 Replace conduit if kinked or flattened more than $1/10^{th}$ of its original diameter.

.11 Mechanically bend steel conduit over 19 mm diameter.

.12 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.13 Install fish cord in empty conduits.

.14 Remove and replace blocked conduit sections:

.1 Do not use liquids to clean out conduits.

.15 Dry conduits out before installing wire.

3.3 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible on surface channels.

.5 Do not pass conduits through structural members except as indicated.

.6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

.3 Do not install conduits in terrazzo or concrete toppings.

3.5 CLEANING

.1 Progress Cleaning:

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools, and equipment.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group (CSA):

.1 CSA C22.2 No. 5-16 (R2021), Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-National Standard with UL 489 and NMX-J-266-ANCE-2016).

.2 CAN/CSA-C22.2 No. 144-M91 (R2020), Ground Fault Circuit Interrupters.

.3 CSA C22.2 No.144.1-16 (R2020), Ground-Fault Circuit-Interrupters (Tri-National Standard with UL 943 and NMX-J-520-ANCE).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's instructions, product literature, and data sheets for circuit breakers. Include product characteristics, performance criteria, physical sizes, finishes, and limitations.

1.3 DELIVERY, STORAGE, AND HANDLING

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

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

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

.2 Store and protect materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 BREAKERS - GENERAL

.1 All circuit breakers: To CSA C22.2 No. 5.

.2 Bolt-on Moulded Case Circuit Breakers: Over-centre, trip-free toggle-operating mechanism to provide quick-make, quick-break contact action, for manual and automatic operation with temperature compensation for 40 °C ambient.

.3 Common-Trip Breakers: With single handle for multi-pole applications.

.4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.

.5 Symmetrical rms interrupting capacity to match panelboard rating.

2.2 THERMAL MAGNETIC BREAKERS

.1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short-circuit protection.

2.3 GROUND FAULT CIRCUIT INTERRUPTER BREAKERS

.1 Ground Fault Circuit Interrupter (GFCI) breakers: To CAN/CSA-C22.2 No. 144 and 144.1, Class A Type, single-pole GFCI breakers, rating as scheduled, complete with test and reset facilities.

Part 3 Execution

3.1 INSTALLATION

.1 Install circuit breakers as indicated.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

.1 CSA Group:

.1 CAN/CSA-C22.2 No. 4-04 (R2009), Enclosed and Dead-Front Switches (Tri-National Standard, with ANCE NMX-J-162-2004 and UL 98).

.2 CSA C22.2 No. 39-13, Fuseholder Assemblies.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's instructions, printed product literature, and data sheets for disconnect switches - fused and non-fused and include product characteristics, performance criteria, physical size, finish, and limitations.

1.3 DELIVERY, STORAGE, AND HANDLING

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

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:

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

.2 Store and protect materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 Products

2.1 DISCONNECT SWITCHES

.1 Non-fusible, disconnect switch in CSA enclosure as per drawings, size as indicated.

.2 Provision for padlocking in on and off switch position by 2 locks.

.3 Mechanically interlocked door to prevent opening when handle in ON position.

.4 Quick-make and quick-break action.

.5 ON-OFF switch position indication on switch enclosure cover.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Indicate name of load controlled on size 4 nameplate.

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 disconnect switches - fused and non-fused installation in accordance with manufacturer's written instructions:

.1 Visually inspect substrate in presence of HRCE Representative.

.2 Inform HRCE Representative of unacceptable conditions immediately upon discovery.

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

3.2 INSTALLATION

.1 Install disconnect switches complete with fuses if applicable.

3.3 CLEANING

.1 Progress Cleaning:

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools, and equipment.

END OF SECTION

PINCHIN

Halifax
Regional Centre for Education

FINAL

Asbestos Management Program

HRCE Facilities

Prepared for:

Halifax Regional Centre for Education
33 Spectacle Lake Drive
Dartmouth, Nova Scotia B3B 1W8

August 28, 2023

Pinchin File: 322126.000

IMPORTANT CONTACTS

HRCE and Facility Management Contacts

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Contact Name	Phone	Email
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Approved Abatement Contractors

Company	Contact Name	Phone	Email
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APPENDICES

1.0 INTRODUCTION

Halifax Regional Centre for Education (HRCE) is committed to protect the health and safety of workers and occupants. This Asbestos Management Program (AMP) has been developed to meet responsibilities as an employer, and as a building owner to manage operational issues respecting asbestos and to maintain compliance with applicable regulations for disturbance of asbestos-containing materials (ACM) during demolition, renovation, alteration, maintenance, repair or other activities.

2.0 SCOPE

The AMP provides information and procedures for Asbestos Management of all HRCE owned or occupied facilities in Nova Scotia.

The AMP applies to all HRCE staff as well as all service providers and contractors performing work in HRCE facilities.

The AMP outlines requirements for HRCE personnel involved in acquisition of property which may contain ACM. It applies to all categories of property with the exception of vacant lands. If HRCE decides to lease property in the future ACM should be considered when developing their lease agreement and this AMP should be amended to address leased properties occupied by the HRCE.

The AMP is a management system to control the disturbance of ACM during demolition, renovation, alteration, maintenance, repair or other activities.

The AMP incorporates the following elements:

- Asbestos Assessments and Reassessments.
- Regulatory Requirements and HRCE Policies.
- Roles and Responsibilities.
- Notifications.
- Training Requirements.
- Emergency Reaction and Procedures.
- Record Keeping.
- Contractor Requirements.

3.0 OBJECTIVE

The AMP is a management system primarily intended to identify ACM and control disturbance of ACM by using proper procedures during demolition, renovation, alteration, maintenance, repair or other activities. The objective in preparing and instituting this AMP is to ensure that known or suspected ACM is managed

so that maintenance staff, construction workers and occupants are safeguarded in accordance with applicable regulations.

4.0 BACKGROUND INFORMATION AND HEALTH EFFECTS

The following is a very brief summary of the hazards and health effects from asbestos exposure:

- Occupational exposure to asbestos can cause fatal lung disease.
- Asbestos must become airborne and be inhaled to be hazardous. A physical disturbance or direct contact with ACM is required to cause it to become airborne. The mere presence of asbestos is not hazardous.
- Asbestos may remain in buildings so long as it is in good condition and undisturbed. No Provincial or Federal Regulations require the removal of ACM as long as it is enclosed, encapsulated or managed appropriately and removed prior to building demolition.

5.0 REGULATORY REQUIREMENTS AND HRCE POLICIES

5.1 Regulatory Requirements

This AMP was implemented in response to the following legislation in effect as of August 28, 2023.

All building operations, whether performed by HRCE, or service providers, shall adhere to the requirements outlined in this document and all applicable regulations, guidance documents and acceptable professional standards.

The following regulations and guidelines were in place at the time this AMP was prepared:

1. Occupational Health and Safety Act, N.S. Reg. 52/2013.
2. A Guide to Removal of Friable Asbestos-Containing Material.
3. A Guide to Assessment and Management of Asbestos in the Workplace.
4. Asbestos Waste Management Regulations, N.S. Reg. 53/95

6.0 HRCE POLICIES RELATED TO ASBESTOS

HRCE has established the following policies related to asbestos independent of applicable regulations:

- HRCE may opt for removal of ACM with minor damage as opposed to repair or encapsulation when cost-effective unless removal is not practicable. ACM with major damage must be removed.
- At existing leased properties where HRCE is a tenant, when ACM is discovered during any improvement, addition, renovation, demolition, maintenance, repair of any kind, or at

any other time, the Owner (Landlord) shall promptly remove the ACM from the leased premises, if possible within the existing lease agreement.

- HRCE may perform Low Risk asbestos operations, where appropriately trained to perform the work.
- All Moderate and High asbestos operations must be undertaken by an Asbestos Abatement Contractor. Asbestos Abatement Contractors may also perform Low Risk asbestos operations.

7.0 ASBESTOS-CONTAINING MATERIALS AT HRCE FACILITIES

Refer to the individual Asbestos Assessment or subsequent Asbestos Reassessment Reports prepared for the Facility, provided in Appendix G. In some cases, Hazardous Materials Assessment or Designated Substance Survey Reports have been prepared and these reports include information regarding asbestos and other hazardous materials (e.g. lead, mercury, silica, and PCBs).

All assessment reports or subsequent Asbestos Reassessment Reports have been, or will be, prepared to comply with applicable asbestos regulations and this AMP.

Asbestos Assessment Reports are key components of this AMP, as the reports define the locations of ACM and Presumed ACM (PACM) present in the facility, the condition of ACM, the friability, the type of asbestos and the approximate quantity.

7.1 Asbestos Assessments

Refer to the Asbestos Assessment or Hazardous Building Materials Assessment Report in Appendix G for further information on the methodology of the assessment(s) completed for the Facility.

HRCE will engage a Consultant to perform asbestos assessments for all facilities. The report is to be completed following a methodology compliant with applicable regulations and acceptable professional standards. The report must comment on the condition of the ACM, include recommendations for remedial action, and is to include the risk classification for any abatement required.

In facilities which are leased, copies of the initial asbestos assessment, and any subsequent reassessments, shall be provided by the Owner to HRCE, and maintained on Site, or HRCE will have an asbestos assessment report prepared and complete subsequent reassessments, limited to the leased space.

7.2 Reassessment of ACM

All ACM and PACM identified in the Facilities will be inspected at reasonable intervals, and at minimum annually, a reassessment of all ACM and PACM will be completed with written documentation.

The reassessment of ACM and PACM will be completed by a Consultant (Qualified Person) or HRCE staff, using the form provided in Appendix E.

7.2.1 Reassessment in Unassessed Areas

Where assessments have been completed in only a portion of schools, all non-sampled materials (including but not limited to ceiling tiles, vinyl floor tiles, vinyl sheet floor, etc.) are to be presumed to contain asbestos, and reassessed during their yearly inspection of the suites.

When feasible, arrangements should be made to access previously unassessed areas during the annual reassessments. If during any annual or other inspections, materials not previously sampled are found to be damaged (spalling finishes, debris, etc.), samples are to be collected and the material is to be identified as asbestos or non-asbestos. Remedial action and removal procedures are to be decided accordingly if the materials are found to contain asbestos.

7.3 Distribution of Assessment and Reassessment Reports

HRCE will ensure that each assessment and reassessment report is distributed or accessible to the following:

- HRCE JOHSC and/or Occupational Health and Safety Representative (OHS Representative).
- A hard copy will be sent to each facility. Electronic copies will be made available.
- Building Operators, Maintenance Personnel, Janitorial Staff.
- Project Managers or Construction Managers planning or performing work in a HRCE Building.
- Outside contractors that could potentially disturb ACM through their work.

8.0 PRE-CONSTRUCTION HAZARDOUS BUILDING MATERIALS ASSESSMENT

Prior to the commencement of any work that requires renovation, construction or demolition, the Facility or specific areas of the Facility to be impacted by the work shall be assessed for ACM, as well as other hazardous building materials (e.g. lead, mercury, silica, and PCBs), (the "**Pre-Construction Hazardous Building Materials Assessment**").

The Pre-Construction Hazardous Building Materials Assessment must be performed by a Consultant and include destructive or intrusive testing of enclosed areas.

Sampling may include the following:

- Prior to disturbance of materials presumed to contain asbestos listed in the assessment reports, collect samples of materials that were not previously sampled/identified (refer to Asbestos Assessment Report or Hazardous Materials Report).
- Unidentified suspect materials that were not sampled during the initial survey, but which may be present located within enclosed areas such as pipe/duct insulations in ceiling spaces, chases or shafts. If such areas will be affected by the work, entry to these areas and sampling of suspect materials shall be performed.
- Assessment of existing visible floor, wall and ceiling finishes to assess and sample concealed finishes (e.g., vinyl flooring under carpet or other vinyl flooring, drywall over plaster, etc.)
- Other hazardous building materials shall be sampled and analyzed or identified prior to disturbance as required by provincial regulatory requirements. Other hazardous building materials may include lead, mercury, silica, polychlorinated biphenyls, mould, etc.

Upon receiving the Pre-Construction Hazardous Building Materials Assessment report, if asbestos and/or other hazardous building materials are present in the area, specifications (large scale projects) or a scope of work (small scale projects) for removal shall be prepared, provided, and reviewed by the Constructor or contractor prior to any renovation, construction, or demolition work.

HRCE will employ an Abatement Contractor to perform abatement of other hazardous materials and/or ACM that may be disturbed by construction, renovation, or demolition work using appropriate regulated procedures.

9.0 REMEDIAL WORK – DAMAGED MATERIALS

Where damage is observed, HRCE will refer to the existing Asbestos or Hazardous Building Materials Assessment or subsequent Asbestos Reassessment Reports (as required) to determine if the damaged materials are ACM or PACM.

Where damaged suspected asbestos-containing materials are not included in the existing Asbestos or Hazardous Building Materials Assessment Report(s), an assessment and/or sampling of these damaged materials must be conducted prior to repair of damage, unless materials are treated as ACM, and appropriate asbestos operations are followed.

If damaged materials contain asbestos and the regulated abatement procedure to be used is not detailed in the recommendations section of the existing Asbestos or Hazardous Building Assessment Materials report, HRCE will contact a Consultant to determine applicable asbestos abatement procedures and to develop a scope of work and performance specifications, as required.

HRCE will employ an Abatement Contractor to perform the remedial work required (removal of damaged ACM) and a Consultant to perform inspection and air monitoring as soon as practicable upon receiving the report/notice of damage.

10.0 NOTIFICATION

10.1 Notification to Occupants

HRCE will inform the JOSHC of any planned sampling, assessment or abatement work that is to be conducted within the applicable HRCE building(s) to ensure that all aspects of committee involvement are complied with.

Tenants must be notified of ACM in their leased space and in common areas of the building that they have access to and may disturb the ACM.

HRCE will notify all new tenants of the presence of ACM in the space they are occupying. Notification is to be completed prior to occupancy via the tenant lease agreement.

Upon institution of this AMP, and upon completion of asbestos assessments in a recently assessed or recently purchased property, where tenants have not been notified via their lease agreement, HRCE will notify occupants of the presence of asbestos in the space they are occupying.

10.2 Notification of Contractors

Contractors that perform work which may disturb ACM within the Facility must be notified of the presence of asbestos (by providing the Asbestos or Hazardous Building Materials Assessment Report). Notification will be sent to these parties prior to project or maintenance work (e.g. janitorial, telephone, cable, etc.).

Contractors are to inform all sub-trades of the presence of all ACM or PACM identified in the work area and include this information in their respective contract agreement.

If suspect ACM not identified in the contract agreement is discovered during the course of the work, the Contractors are to stop all work which might disturb the suspect ACM and notify the appropriate HRCE personnel (i.e. Property Manager and/or Project Manager as applicable) or Constructor, as the case may be.

Prior to performing work, contractors must complete and return the Contractors Notification Package (Appendix B) and HRCE will maintain acknowledgement forms from these packages.

10.3 Notification of Maintenance Personnel

HRCE will inform their own staff that will perform janitorial work, maintenance work or project work of the presence of asbestos in the Facility in which they are working. This will be completed by providing access

to the AMP and the most recent Asbestos Assessment or Hazardous Building Materials Assessment Report and training.

10.4 Notification of Project Managers, Architects and Engineers

HRCE will inform their project managers, architects and engineers of the presence of asbestos in the facility in which they are arranging for or planning work. This will be completed by providing access to the AMP, and the most recent Asbestos Assessment or Hazardous Building Materials Assessment Report.

10.5 Notification of Authorities Having Jurisdiction

Regulations in place at the time of this AMP development do not require notifications regarding asbestos-containing materials, except for:

- A major release of a hazardous substance (per Section 63 of the Occupational Health and Safety Act).

11.0 TRAINING REQUIREMENTS

HRCE will employ a Consultant to ensure staff have received appropriate training.

HRCE employees which will not undertake asbestos abatement work or will not disturb asbestos may be provided training including the following:

- Health effects of asbestos exposure.
- Overview of the existence of applicable regulations and risk classification.
- Identification of common types of ACM (so as to not disturb them).
- Understanding a typical asbestos survey report.
- Their responsibilities under the policies in this AMP and Regulations.

HRCE employees will undertake asbestos abatement work shall receive training including the following:

- Health effects of asbestos exposure.
- Applicable regulations and risk classification.
- Identification of common types of ACM.
- Asbestos Work Procedures limited to Low Risk Operations.
- Understanding a typical asbestos survey report.
- Their responsibilities under the policies in this AMP and Regulations.

HRCE will maintain a record of training of their employees.

HRCE requires all service providers, contractors, etc. to provide appropriate training to all workers who perform work in HRCE Facilities which will, or potentially may, disturb ACM.

12.0 RESPONSE TO DISTURBANCE OF ASBESTOS, PROCEDURES AND CONTACTS

HRCE staff and contractors may encounter fallen material that is suspected confirmed to contain asbestos or uncover a material that was previously unidentified and is suspected to contain asbestos. HRCE staff and contractors shall follow the protocol "Response to Disturbance of Asbestos" in Appendix C.

13.0 CLASSIFICATION OF ABATEMENT WORK

Refer to Appendix F for the classification of asbestos work.

14.0 INSPECTION AND AIR MONITORING OF ASBESTOS WORK

14.1 Visual Inspection

The primary method of ensuring compliance when conducting asbestos removal or abatement work is visual inspection of the site and work practices by a Competent Worker or Asbestos Consultant.

14.2 Air Monitoring During Asbestos Work

Per the "Asbestos in the Workplace: A Guide to the Removal of Friable Asbestos Containing Material" dated November 21, 2013:

- During the removal of friable asbestos-containing materials, where a Glove Bag is not used, and the air from the enclosure is exhausted inside the building, daily air sampling is required outside the enclosure.
- At the completion of removal of friable asbestos-containing materials, clearance air sampling must be performed prior to dismantling of the site isolation and engineering controls.

Air sampling above the regulatory requirements may be performed, as identified in the following sections.

Air monitoring and analysis during asbestos removal or abatement will be performed using Phase Contrast Microscopy (PCM) following the NIOSH 7400 method. PCM air samples must be submitted for analysis to a laboratory participating in a recognized quality control program such as the AIHA Asbestos Analysts Testing (AAT) Program or the Quality Control Program of the IRSST (the Institut de recherche Robert-Sauvé en santé et en sécurité du travail).

The PCM method does not characterize the types of fibres present. In cases where elevated fibre concentrations are identified, or the actual asbestos concentration is required, Transmission Electron Microscopy following the NIOSH 7402 method may be used.

The acceptable limit for PCM samples is as follows:

- as low as reasonably achievable (ALARA) outside the work area, and/or 0.01 fibres/cubic centimetre (f/cc).
- 0.01 f/cc for clearance air sampling.

Where TEM analysis is performed, the acceptable limits would be 0.01 asbestos fibres/cubic centimeter.

14.3 Low Risk – Inspection and Air Monitoring

14.3.1 Inspection

The Project Manager, an assigned Competent Worker, or an Abatement Consultant, will inspect the work upon completion of work to ensure all ACM has been removed and the area adequately cleaned of dust and debris.

14.3.2 Air Monitoring

Air monitoring is not required; however, projects may be evaluated on a case by case basis, and air sampling performed where desired.

14.4 Moderate Risk and Glove Bag – Inspection and Air Monitoring

14.4.1 Inspection

An Abatement Consultant will perform daily inspections throughout the abatement, and inspect the work upon completion of work to ensure all ACM has been removed and the area adequate cleaned of visible dust and debris. Upon completion of inspection and air monitoring (if required) by the Abatement Consultant, the site isolation may be dismantled.

The Project Manager or an assigned Competent Worker may inspect for final cleanliness after the site isolation has been dismantled.

14.4.2 Air Monitoring

PCM air monitoring will be conducted daily and at completion of abatement. Air monitoring will be conducted in occupied areas adjacent to the Asbestos Work Area or Glove Bag Work Area during contaminated work.

PCM air monitoring will be used for air clearance within the Asbestos Work Areas prior to re-occupancy. Where enclosures have been constructed to define the Asbestos Work Area, aggressive clearance air sampling will be performed.

14.5 High Risk – Inspection and Air Monitoring

14.5.1 Inspection

An Abatement Consultant will perform daily inspections throughout the abatement, and inspect the work upon completion of work to ensure all ACM has been removed and the area adequate cleaned of visible dust and debris. Upon completion of inspection and air monitoring by the Consultant, the site isolation may be dismantled.

The Project Manager or an assigned Competent Worker may inspect for final cleanliness after the site isolation has been dismantled.

14.5.2 Air Monitoring

PCM air monitoring will be conducted on a daily basis.

Air monitoring will be conducted at the perimeter of the Asbestos Work Area (in occupied areas adjacent to the Work Area) to ensure no leakage from the enclosure.

Aggressive clearance air monitoring must be performed within the Asbestos Work Areas. Where PCM samples fail to meet the 0.01 f/cc criteria:

- Contractors may be requested to reclean the Asbestos Work Areas, or;
- Transmission Electron Microscopy (TEM) may be used.

Once the clearance air testing is satisfactory:

a. The site isolation and engineered controls may be removed.

b. A copy of the air sample report is to be:

    a. provided and maintained on site by the Contractor, when abatement work is part of a project;

    b. provided to the Owner, and a copy is kept on file;

    c. provided to the JOHSC or the OHS representative, if any, for the workplace and for the building

15.0 RECORD KEEPING AND DOCUMENTATION RETENTION

HRCE will keep the following records:

- Asbestos and / or Hazardous Building Materials Assessment Reports.
- Reassessment Reports.
- Tenant Notification Letters and dates posted or transmitted.
- Contractor Notification Packages and Acknowledgement Forms.
- Asbestos Project Work Records.
- Consultant Asbestos Abatement Completion Reports (including Daily Inspection and Air Monitoring Reports).
- Bulk sample analytical results from any sampling.
- Emergency response project records.

16.0 CONSULTANT QUALIFICATIONS

Consultants employed by HRCE for asbestos work are to meet the following minimum requirements:

- Display competency in asbestos and hazardous materials consulting
- Maintain a health and safety management system that meets provincial standards.
- Maintain a Comprehensive General Liability Policy, with a minimum of $5,000,000 in coverage.
- Maintain an Errors and Omissions Policy, with a minimum of $5,000,000.
- Maintain an Automobile or Fleet Policy, and Non-Owned Automobile Policy with a minimum of $2,000,000 in coverage.
- Maintain valid provincial worker's compensation coverage
- Accredited to analyze PCM air samples or use an accredited laboratory.

17.0 ASBESTOS ABATEMENT CONTRACTOR QUALIFICATIONS

Contractors employed by HRCE are to meet the following minimum requirements:

- Maintain a Comprehensive General Liability Policy, provided on an "occurrence" basis, for a minimum of $5,000,000 in coverage.
- Maintain an Asbestos Liability or Contractors Pollution Liability Policy, provided on an "occurrence" basis, with a minimum of $5,000,000 in coverage.

- Maintain an Automobile or Fleet Policy, and Non-owned Automobile Policy with a minimum of $2,000,000 in coverage.
- Maintain valid provincial worker's compensation coverage.
- All supervisors and workers performing abatement work are to be trained in the procedures being used, health effects or asbestos, applicable personal hygiene procedures, personal protection equipment used and respirator care.
- All workers are to be fit tested for respirators.
- Maintain a health and safety management system that meets provincial standards.

18.0 MAINTENANCE AND JANITORIAL WORK

HRCE personnel and contracted janitorial staff will not:

- Sweep/vacuum in areas of damaged ACM.
- Sweep/vacuum/remove ACM debris.
- Disturb ACM.
- Remove ACM.

HRCE will employ an Abatement Contractor to perform these tasks, where required.

Alternately, HRCE will employ the appropriately trained trade contractor if there is other work to be completed that will disturb ACM (e.g. installing electrical equipment through an asbestos-containing plaster wall).

19.0 MAINTENANCE OF THE AMP

This AMP is to be re-evaluated, and possibly revised, each time there is a substantial change to the any provincial regulation, or policy change. This AMP must be reviewed at least annually and updated as necessary.

20.0 ROLES AND RESPONSIBILITIES

This section defines the roles and responsibilities of HRCE personnel instituting this AMP and provide effective management of ACM at their facilities.

The AMP Facilitator has the primary responsibility to administer the AMP and ensure it is instituted and effective.

The following table summarizes the responsibilities of HRCE personnel:

Reference No.	Responsibility/Task	AMP Section Reference	AMP Facilitator	Facility Manager	Project Team	Client Staff	Consultant
1	Maintenance of the AMP	19.0	X				
2	Employ a Consultant to prepare Asbestos Assessment Reports for any facility where one is not available/prepared	7.1	X	X			
3	Employ a Consultant to prepare Asbestos Assessment Reports in newly purchased facilities	7.1	X	X			
4	Employ a Consultant to reassess facilities where ACM has been confirmed	7.2	X	X			
5	Distribute Asbestos Assessment and Reassessment Reports	7.3	X				
6	Upon receiving assessment and reassessment reports, employ a contractor to perform remedial abatement work to remove damaged ACM. Use applicable provincial procedures	9.0	X	X			
7	As required, prior to performing asbestos work, engage a Consultant to perform inspection and air monitoring	14.0	X	X	X		
8	Ensure that an intrusive pre-construction assessment for ACM is performed prior to any renovation, alteration or demolition	8.0		X	X		X
9	Conduct bulk sampling of suspect materials that have not been sampled or presume the materials to be an ACM	8.0		X	X		X
10	Employ a Consultant (as applicable) to prepare a scope of work prior to large scale abatement as part of construction, renovation or demolition.	9.0		X	X		
11	Provide existing occupants at the outset of this AMP, or occupants in newly purchased facilities, a letter notifying the lessee of ACM within their space, and instruction not to disturb the ACM.	10.1	X	X			

Reference No.	Responsibility/Task	AMP Section Reference	AMP Facilitator	Facility Manager	Project Team	Client Staff	Consultant
12	Ensure all Project Managers, Architects, Engineers and others arranging for, or planning, work in the Facility are provided with the most current asbestos (re)assessment report.	10.4	X	X	X	X	
13	Provide contractors working in HRCE facilities the most current asbestos information and notification via the Contractor Information Package	10.2		X	X	X	
14	Employ a Consultant to train HRCE personnel	11.0	X				
15	Response to an uncontrolled spill or disturbance of asbestos following emergency procedures in Appendix C	12.0	X	X	X	X	
16	Keep all records as required by this program (excepting contractor package acknowledgement)	15.0	X				
17	Keep records of contractor package acknowledgement for each project (contractors to submit via email and keep record)	15.0	X	X	X		
18	Ensure Consultants meet the required qualifications	16.0	X	X	X		
19	Ensure contractors meet the required qualifications	17.0		X	X		X
20	Ensure maintenance and janitorial work is performed so that it does not disturb ACM and unnecessary disturbance of ACM is avoided	18.0				X	
21	Report any unplanned disturbance to ACM or damage to ACM	12.0	X	X	X	X	

GLOSSARY

Amended Water	Water with wetting agent added for purpose of reducing surface tension to allow thorough wetting of ACM.
Asbestos-Containing Material(s) (ACM)	Material identified by an appropriate laboratory analytical method (e.g. EPA 600/R-93/116, NIOSH 9000, or NIOSH 9002) to contain at least 0.5% of any type of asbestos, and vermiculite that is identified to contain any amount of asbestos using EPA method 600/R-04/004 if other analytical methods do not identify the presence of asbestos.
Asbestos	Any and all types of asbestos (generally considered as Actinolite; Amosite; Anthophyllite; Chrysotile; Crocidolite; Tremolite, and Libby Amphibole).
Asbestos Work Area	Area where work is being performed which will or may disturb ACM including overspray and fallen material or settled dust that may contain asbestos.
Competent Worker	In relation to specific work, means a worker who, • qualified because of that person's knowledge, training and experience to do the assigned work in a manner that will ensure the health and safety of every person in the workplace; and • knowledgeable about the provisions of the Occupational Health and Safety Act and regulations that apply to the assigned work, and the potential or actual danger to health or safety associated with the assigned work.
Encapsulation	The application of a liquid sealant to asbestos-containing materials; the sealant may penetrate and harden the material (penetrants) or cover the surface with a protective coating (bridging sealants). Also called encasement. This is generally not advisable.
Enclosure	Enclosure of ACM means the construction of solid enclosure (walls, ceiling, bulkhead etc.) around ACM, or An Enclosure means the site isolation including hoarding walls, polyethylene sheeting and seals that isolates an Asbestos Work Area.
Friable Material	Material that: when dry, can be crumbled, pulverized or powdered by hand pressure, or is crumbled, pulverized or powdered. Includes previously non-friable asbestos-containing material that has become damaged to the extent that it may be crumbled, pulverized, or reduced to powder by hand pressure.
Glove Bag Removal	A method of removing friable insulation from a piping system using a prefabricated bag which isolates the section of insulation being removed.
HEPA Filter	High Efficiency Particulate Aerosol filter that is at least 99.97 percent efficient in collecting a 0.3 micrometre aerosol.
HEPA Filtered Negative Pressure Unit:	Portable air handling unit which extracts air directly from the Asbestos Work Area and discharges the air to the exterior of the building after passing through a HEPA filter.

JOHSC	Joint Occupational Health and Safety Committee.
Phase Contrast Microscopy (PCM)	A method which uses an optical microscope to determine airborne fibres, normally in an occupational setting. Results are presented as a number of fibres per cubic centimetre (f/cc). The method of analysis is based on the US National Institute for Occupational Safety and Health (NIOSH) Manual of Analytical Methods, Method 7400, issue 2, Asbestos and Other Fibres by PCM (August 15, 1994).
Transmission Electron Microscopy (TEM)	A method which uses an electron microscope to determine airborne asbestos fibres. Results are presented in fibres per cubic centimetre of air (f/cc). The method of analysis is The U.S. National Institute of Occupational Safety and Health (NIOSH) Manual of Analytical Methods, Method 7402, Issue 2: Asbestos by TEM (Aug 15, 1994).
Low, Moderate and High Procedures	Work classifications and procedures defined under provincial health and safety regulations.
US EPA	United States Environmental Protection Agency.

APPENDIX A

Letter of Notification to Tenants Regarding Asbestos in Premises

LETTER OF NOTIFICATION TO TENANTS REGARDING ASBESTOS IN PREMISES

The following wording should be utilized in communicating the presence of asbestos to a tenant or lessee.

To Occupant

This letter is being provided as notification of the presence of asbestos within the building at [building name and/or address]. HRCE has recently had an asbestos assessment performed of the entire building and has established a program to manage all asbestos in a safe and prudent fashion.

Our Consultant inspected all areas of the building and made recommendations, where necessary, for removal or repair of asbestos. All such work [has been completed/will be completed shortly] with appropriate inspection and supervision. All asbestos remaining is subject to the Asbestos Management Program (AMP) as required by Provincial Regulations and our own due diligence. A copy of the assessment report and the AMP are available for review at the [Office].

The continuing presence of the remaining asbestos does not pose a risk of exposure to occupants as long as it remains under this management program. Staff have been given appropriate training and are aware of its presence.

If you have any concerns, please contact the AMP Facilitator at [phone number].

APPENDIX B

Contractor Notification and Acknowledgement Form

CONTRACTOR NOTIFICATION AND ACKNOWLEDGEMENT FORM

HRCE has identified the presence of various asbestos-containing materials (ACM) within [HRCE Facility name] located at [address]. An asbestos inventory report showing the locations and amounts of these materials is available for viewing from the AMP Facilitator.

The disturbance of ACM is to be undertaken by Asbestos Abatement Contractors that maintain the appropriate insurance coverage and meet the requirements set out in the Asbestos Management Program (AMP).

The following activities may disturb asbestos materials. The AMP Facilitator must be notified of the following:

- Any removal, repair or disturbance of any ACM.
- Ceiling entry which may disturb sprayed-fireproofing or pipe insulation, or debris on the ceiling.
- Any other operation which may generate airborne asbestos from friable asbestos.
- The disturbance of any material excluded from the Facility's asbestos assessment report.
- Discovery of any material excluded from the survey.

Declaration by Contractor

The Contractor and their sub-contractors shall follow the work procedures as specified by HRCE's AMP and shall not disturb ACM without using proper procedures in accordance the provincial regulations and guidelines, and this AMP, including prior notification to the AMP Facilitator. All asbestos waste will be packaged, transported and disposed of in accordance with applicable regulations.

Notification of Asbestos Abatement

All Contractors who perform work at facilities where ACM is present must be notified of the presence of the ACM if their work may bring them into contact, or close proximity to, the ACM. This notification may include janitorial, security, telephone, computer cabling suppliers, mechanical maintenance contractors, etc.

All contractors who perform work, including telephone, computer cabling suppliers, electrical and mechanical contractors, etc., at HRCE facilities, where asbestos-containing spray-applied insulation is present above ceilings are to be notified that Moderate Risk Procedures may be required for any entry to, or work within the ceiling space, determined by condition of material, scope of work, and potential for disturbance of the material.

Contractors are to:

- Notify municipal Landfill site as per provincial regulations.
- Inform all sub trades of the presence of ACM identified in the contract documents.
- If suspect ACM not identified in the contract documents are discovered during the course of the work, the Contractors are to stop all work which might disturb the suspect ACM. The contractor is to notify the Constructor (if applicable), HRCE and the JOHSC or OHS Representative for the workplace.

By signing below, the Contractor acknowledges they have received, read and understand the requirements of HRCE's AMP.

Building (Address): _____

Project: _____

Contractor: _____

Name and Title: _____

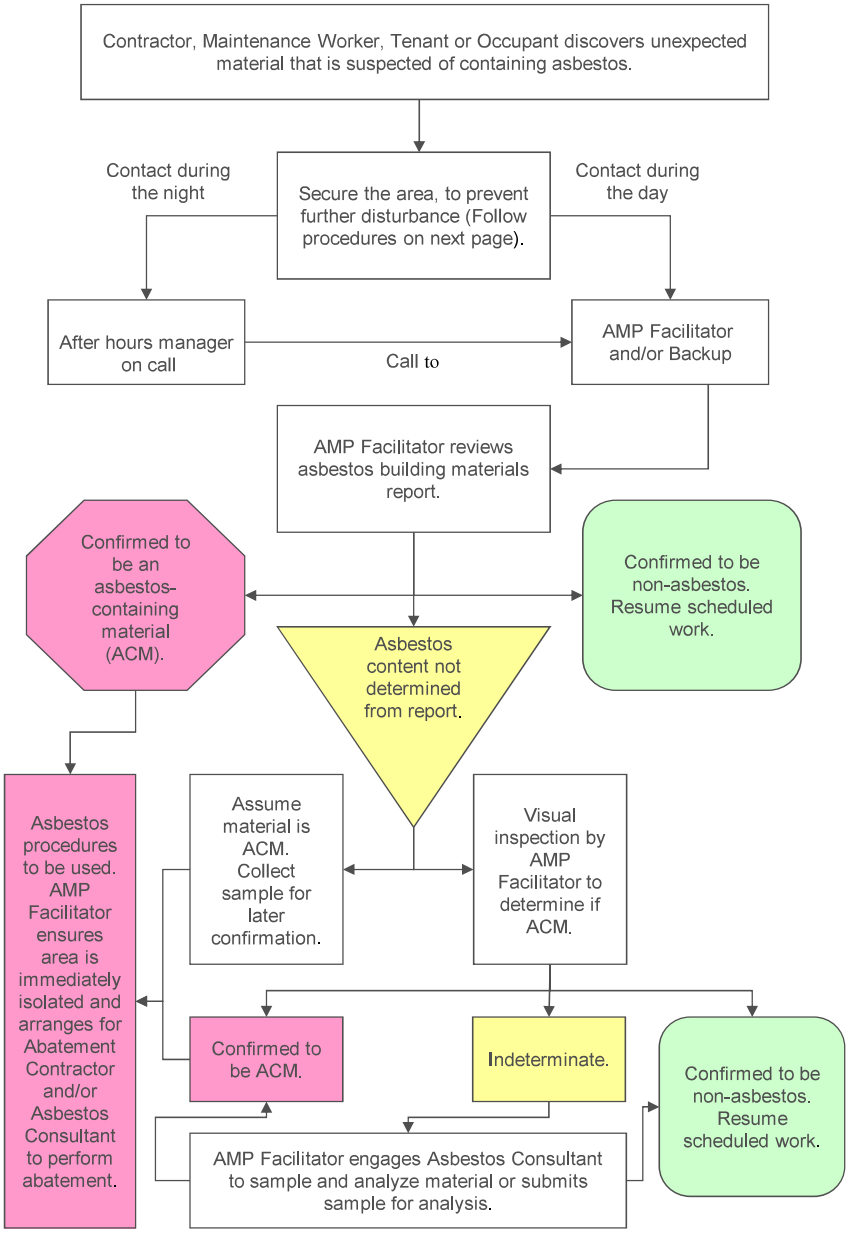
Signature: _____

Date: _____

APPENDIX C

Response to Disturbance of Asbestos

EMERGENCY RESPONSES AND NOTIFICATION IN THE EVENT OF ASBESTOS-SUSPECT MATERIAL DISCOVERED DURING MAINTENANCE OR CONTRACTED WORK OR REPORTED BY OCCUPANT/TENANT



EMERGENCY REACTION IN THE EVENT OF SUSPECTED ASBESTOS SPILL

If asbestos-containing materials or suspect materials have been disturbed improperly, follow these directions:

- Do not clean up, cover, move or contact asbestos-containing or suspect material. Cease work in the area and do not resume work that risks disturbing the suspect material. Workers are to leave the area and the HRCE AMP Facilitator is to be notified immediately.
- Isolate the area by locking doors if this can be done without blocking emergency or fire routes.
- If it is not possible to safely isolate the area, the AMP Facilitator will notify appropriate persons not to enter the area. If possible, post security to prevent unnecessary access.
- The AMP Facilitator will arrange to shut down ventilation systems to the affected area including supply, return and exhaust.
- The AMP Facilitator will determine if asbestos is contained in the debris. If material cannot be confirmed asbestos-free by records or appearance, follow procedures below.
- The AMP Facilitator will contact an Asbestos Consultant to sample the material or identify the material visually.
- If the material is confirmed or assumed to contain asbestos, the AMP Facilitator is to contract an Asbestos Abatement Contractor to clean-up contaminated area.
- At their option, the AMP Facilitator may decide to employ an Asbestos Consultant to perform air monitoring and consulting, prior to, during, and/or after clean-up to determine airborne fibre concentrations prior to, and during, the work and to ensure airborne fibre levels are within acceptable limits to re-occupy the space. The AMP Facilitator must notify the Joint Occupational Health and Safety Committee of the results of air monitoring or testing.
- Enable ventilation systems after air monitoring or clean up of ACM.

APPENDIX D

Asbestos Project Work Record

ASBESTOS PROJECT WORK RECORD

Building: _____
(Building Address or Name)

Date: _____
(Today's Date)

Project Number: _____
(HRCE Project Number or Purchase Order Number)

Project Type:

☐ Emergency ☐ Planned Project

☐ Low Risk ☐ Moderate Risk ☐ Glove Bag ☐ High Risk

Area of Work: _____
(Room Name, Number, Floor etc.)

_____

Description: _____
(Brief description of abatement, material, system, etc.)

_____

Project Start Date: _____
(Mobilization date)

Project End Date: _____
(After dismantling/clean-up)

Contractor: _____
(Contracting firm or employee)

Telephone: _____
(Contractor or employee telephone)

Consultant: _____
(Name of consulting firm/contact if any)

Telephone: _____
(Consultant telephone)

Pre-Construction Assessment for asbestos-containing material (ACM) and other hazardous building materials (e.g. lead, mercury, silica, and PCBs) performed and report provided to Contractor?

☐ Yes ☐ No (Explain) _____

Air Sampling during abatement?

☐ Yes ☐ No

Clearance Air Monitoring performed after abatement?

☐ Yes ☐ No

Air Monitoring results to Joint Occupational Health and Safety Committee (if applicable)?

☐ Yes ☐ No

Asbestos Survey Updated to Reflect Changes in ACM Inventory?

☐ Yes ☐ No, no changes to ACM inventory resulted

☐ No, to forward copies to Consultant prior to next re-assessment

Asbestos waste removed from site and disposed of?

☐ Yes, ACM waste documentation attached ☐ No, ACM waste not generated

☐ No, ACM waste remains on site for later disposal

Append the following information relating to asbestos abatement to this work record, if applicable, and file Asbestos Work Record and attachments with Asbestos Management Program. Check where attached.

Submittals including Insurance	☐ Yes	☐ No
Waste Documentation	☐ Yes	☐ No
Specifications, Change Orders, Drawings	☐ Yes	☐ No
Consultant Inspection Reports	☐ Yes	☐ No
Air Monitoring Results	☐ Yes	☐ No
Analytical Certificates	☐ Yes	☐ No
Provincial Regulatory reports	☐ Yes	☐ No
Additional Correspondence	☐ Yes	☐ No

APPENDIX E

Reassessment of ACM

REASSESSMENT OF ACM

Upon completion of Reassessment, fill out the following form in its entirety and file with this facility's Asbestos Management Program and Assessment Report.

Use of this form is not necessary if an Asbestos Consultant has produced a detailed Reassessment Report which identified the damaged ACM identified in the building during the Reassessment (along with the associated locations, quantities, accessibility, and any required abatement recommendations).

Building: _____

Dates of Reassessment: _____

Name of person completing reassessment: _____

Signature of surveyor: _____

Others present: _____

_____

_____

Summary of Findings:

(If no deterioration was noted, indicate here): _____.

(Specifically indicate only areas requiring action in the table below).

(Attached photographs to this form as required).

Room or Location	Material	Comments Regarding Condition: Disturbed/Undisturbed (if other, explain)	Action Required

Room or Location	Material	Comments Regarding Condition: Disturbed/Undisturbed (if other, explain)	Action Required

Page _____ of _____

APPENDIX F

Classifications of Abatement Work

CLASSIFICATIONS OF ABATEMENT WORK

Nova Scotia regulations/guidelines do not specifically classify asbestos work procedures, and only prescribe removal of friable materials including the use of Glove Bags.

In the absence of defined work classifications, the following are the generally accepting work classifications:

Low Risk

- installation or removal of ACM ceiling tiles (less than 7.5 m²) without damage*.
- installation or removal of non-friable ACM, other than ceiling tiles, without damage*.
- damaging* non-friable ACM that is wetted and where the work is done using non-powered hand-held tools.

Moderate Risk

- removal of less than one square metre of drywall where ACM joint-filling compounds were used.
- enclosure of friable ACM.
- application of tape, a sealant or other covering to pipe or boiler insulation that is ACM.
- installing or removing ACM ceiling tiles that cover an area of 7.5 m^2 or more if the work is done without damaging the tiles.
- damaging non-friable ACM using non-powered hand-held tools if the material is not wetted.
- cleaning or removing filters used in air handling equipment in a building that has sprayed ACM insulation.
- glove bag removals of ACM insulation.
- Work that may expose a worker to asbestos and that is not classified as a Low Risk or High Risk operation, is also to be classified as a Moderate Risk operation.

High Risk

- removal or disturbance of friable ACM.
- the removal of all or part of a false ceiling to access a work area, if ACM is likely to be lying on the surface of the false ceiling.
- spray application of a sealant to friable ACM.

- cleaning or removal of air-handling equipment, including rigid ducting but not including filters, in a building that has sprayed ACM insulation.
- repair, alteration or demolition of a kiln or furnace made, in part, of refractory materials that are ACM.
- Use of power tools not attached to dust-collecting devices with HEPA filters on non-friable ACM.

* ***damage*** *includes breakage, cutting, abrading, grounding, sanding, and vibration.*

APPENDIX G

Site Specific Report(s)

Facility Specific Contacts

Contact Name	Title	Address	Phone Number	Email Address

ASBESTOS SURVEY,
St. Francis Elementary School
5985 Inglis Street
Halifax, N.S., B3H 1K7

Prepared by:

Maritime Testing (1985) Limited
116-900 Windmill Rd
Dartmouth, N.S.

Prepared for:

Halifax Regional School Board
90 Alderney Dr., 3rd floor
Dartmouth, N.S.
B2Y 4S8

February 17, 1999

NEO-1256.41

INTRODUCTION

The Halifax Regional School Board has undertaken a mandate to conduct asbestos inventories in each of the schools in the School Board region. Maritime Testing (1985) Limited (MTL) was retained by the Board to conduct these inventories and prepare the asbestos survey reports. This report on St. Francis Elementary School represents one of the schools surveyed as part of this comprehensive inventory.

METHODS

Each school was inspected for building materials that might be composed of asbestos containing minerals (ACMs). Types of materials examined and sampled as needed could include but not necessarily be limited to:

mechanical systems:	insulation on pipes, fittings, boilers, air conveyance systems, structural materials
flooring:	sheet flooring, vinyl tiles
ceilings:	suspended ceilings, rigid ceilings, texture coats
walls:	texture coats, wallboards, plasters
building exterior:	wall panels, panels under entrances

Please note the following limitations regarding these surveys:

1. Sampling and inspection was not conducted if permanent visible damage would result from these activities. In such circumstances, inference is made to the potential for ACMs to be present based upon other observations made in the building (for example, holes are not cut into wall cavities to determine if insulated pipe work is present).

2. In each school, every room that was accessible was surveyed. In cases where access to a room was not possible, inference on that room is made based on what was observed throughout the rest of the school.

All inspections were scheduled such that sampling could be conducted after normal school hours. This school was surveyed on January 20, 1999.

Samples collected at the school were examined under both stereo and polarised light microscopy to determine fibre types and relative percentages of each asbestos mineral if it was present. As well, any ACMs were further categorised into one of three categories as noted below:

Priority 1: materials representing a potential health risk with normal routine building use and which require immediate removal. Such materials may include damaged ceiling tiles, damaged pipe insulation, damaged friable boiler insulation.

Priority 2: materials which do not pose a health risk under normal school usage but which pose a periodic risk to maintenance and custodial staff or which are currently undamaged but which might easily be damaged in the future; these materials require removal during the next suitable time (ie a major school break, next planned renovation project). Such materials may include undamaged ceiling tiles, damaged pipe insulation above ceilings, undamaged texture coats.

Priority 3: Non-friable materials or materials that are in good condition, are not generally accessible, and which currently pose no risk to any occupant. Such materials may include floor tiles, transite panels, mechanical insulation in good repair.

Refer to Appendix A for a summary of the Priorities of the ACMs.

Data are also available on an asbestos inventory data base, accessible from the school board offices prepared specifically by MTL for this project.

For a list of materials sampled, refer to Appendix B. Refer to Appendix C for a diagram of the school floor plan and sample locations. For a list of locations and quantities of asbestos containing materials, refer to Appendix D. Refer to Appendix E for a room by room account of ACM's. Refer to Appendix F for photos of Priority 1 ACMs.

INVENTORY RESULTS.

Boiler Room: The insulating materials in the Boiler Room have all been recently replaced with fibreglass insulation. There are no asbestos containing materials in the Boiler Room.

Exterior: There are no materials containing asbestos.

Floors: Floors are covered with a combination of various coloured 9" and 12" tiles and seamless flooring. The 9" tiles contain asbestos(15% chrysotile). The tiles are in good condition and a Priority 3.

Walls: Several samples of plaster were collected and analysed for asbestos content. Some of the samples contained 1-3% chrysotile asbestos whereas others appearing to be morphologically identical did not have any fibrous material. Plaster is fabricated on-site and, as such, samples collected side-by-side may not be identical. Any differences will be accentuated by the relative small size of the samples. We recommend that where some samples contain asbestos and where there are no morphological differences among various plaster types that all samples be assumed to contain asbestos in low concentrations. None of the other wall materials contain asbestos.

Ceilings: The ceiling plaster throughout the school contains 2-3% chrysotile asbestos. Damaged areas of ceiling plaster are a Priority 2 and undamaged areas are a Priority 3. None of the other ceiling materials in this school contain asbestos.

Pipe Systems: The pipes throughout the school are insulated with aircell (90% chrysotile) on the runs and asbestos cement (50% chrysotile) on the elbows. Asbestos insulation on pipes located above the ceiling are a Priority 3 and below the ceiling are a Priority 2. The Boys Change Room, the storage area in the Boys Change Room, the Girls Change room have pipes with damaged asbestos insulation and are a Priority 1.

Appendix A:

Summary: The following is a summary of Priorities of the various ACMs at this school:

Priority 1:	• Boys Change Room and storage area, pipes below the ceiling with damaged asbestos insulation
	• Girls Change room, pipes below the ceiling with damaged asbestos insulation
Priority 2:	• asbestos insulation on pipes located below the ceiling
Priority 3:	• throughout school, asbestos floor tile
	• throughout school, asbestos wall plaster
	• throughout school, asbestos ceiling plaster
	• asbestos pipe insulation on pipes located above the ceiling

Appendix B:

Samples taken and locations

#	Sample description	Location	ACM
	Floors		
41.1	9" tile, black	Room 106	yes
41.2	9" tile, grey with black and beige spots	Room 106	yes
41.3	9" tile, black with green and beige spots	Room 106	yes
41.7	9" tile, green with beige and black spots	Room 107	yes
41.8	9" tile, black with beige spots	Room 107	yes
41.9	12" tile, white with black specks	Room 103	no
41.13	9" tile, red with beige and black spots	Room 114	yes
41.15	12" tile, orange with black specks	Lower level corridor	no
41.16	Seamless, pinkish beige	Room 206	no
41.17	Seamless, green with black specks	Room 206	no
41.18	Seamless, black	Room 207	no
41.22	Seamless, beige	Room 312	no
	Walls		
41.5	Plaster	Room 106	yes
41.20	Plaster	Room 205	no
41.21	Plaster	Room 301	no
	Ceilings		
41.4	Plaster	Room 106	yes
41.10	16" glued on tile	Room 103	no
41.12	2'x2' suspended tile	Room 112	no
41.19	2'x4' suspended tile	Room 207	no
41.6	Insulation on pipe run	Behind room 106	yes

Appendix B:

Samples taken and locations			
#	**Sample description**	**Location**	**ACM**
	Pipes		
41.11	Insulation on pipe elbow	Room 110	yes
41.14	Cement on pipe run	Electrical room	yes

Appendix D:

Quantity and locations of ACMs.

Boiler Room

No ACM's

Exterior

No ACM's

Floors

Description	Locations	Quantity ($ft.^2$)
9" tile, black	Room 106	38
9" tile, black	Room 108/109	27
9" tile, black	Entry to room 104	5
9" tile, black	Room 110/111	32
9" tile, black	Room 112/113	26
9" tile, black	Room 114	17
9" tile, black	Entry to room 200	5
9" tile, black	Lower corridors	166
9" tile, black	Entry to room 205	5
9" tile, black	Corridors (ground floor)	243
9" tile, black	Entry to room 300	4
9" tile, black	Girls change room	57
9" tile, black	Storage in girls change room	26
9" tile, black	Boys change room	57
9" tile, black	Storage in boys change room	26
9" tile, black	Entry to room 306	5
9" tile, black	Corridor (upper floor)	247
9" tile, black	Stairwell (south west)	52
9" tile, grey with black and beige spots	Room 106	83

Floors

Description	Locations	Quantity (ft.^{2})
9" tile, grey with black and beige spots	Girls change room	211
9" tile, grey with black and beige spots	Storage room in girls change room	29
9" tile, grey with black and beige spots	Boys change room	211
9" tile, grey with black and beige spots	Storage room in boys change room	29
9" tile, black with green and beige spots	Room 106	83
9" tile, black with green and beige spots	Girls change room	211
9" tile, black with green and beige spots	Storage in girls change room	29
9" tile, black with green and beige spots	Boys change room	211
9" tile, black with green and beige spots	Storage room in boys change room	29
9" tile, green with beige and black spots	Room 107	180
9" tile, green with beige and black spots	Room 108/109	418
9" tile, green with beige and black spots	Entry to room 104	7
9" tile, green with beige and black spots	Room 110/111	488
9" tile, green with beige and black spots	Room 112/113	378
9" tile, green with beige and black spots	Entry to room 200	118
9" tile, green with beige and black spots	Lower corridor	917
9" tile, green with beige and black spots	Entry to room 205	10

Floors

Description	Locations	Quantity (ft.^{2})
9" tile, green with beige and black spots	Room 204	6
9" tile, green with beige and black spots	Corridor (ground floor)	689
9" tile, green with beige and black spots	Entry to room 300	11
9" tile, green with beige and black spots	Entry to room 306	10
9" tile, green with beige and black spots	Corridor (upper floor)	675
9" tile, green with beige and black spots	Stairwell (south west)	85
9" tile, green with beige and black spots	Stairwell (north west)	85
9" tile, black with beige spots	Room 107	180
9" tile, black with beige spots	Room 108/109	419
9" tile, black with beige spots	Entry to room 104	8
9" tile, black with beige spots	Room 110/111	488
9" tile, black with beige spots	Room 112/113	378
9" tile, black with beige spots	Entry to room 200	10
9" tile, black with beige spots	Corridor (lower level)	917
9" tile, black with beige spots	Entry to room 205	10
9" tile, black with beige spots	Room 204	6
9" tile, black with beige spots	Corridor (ground floor)	688
9" tile, black with beige spots	Entry to room 300	12
9" tile, black with beige spots	Entry to room 306	10
9" tile, black with beige spots	Corridor (upper floor)	675
9" tile, black with beige spots	Stairwell (south west)	85
9" tile, black with beige spots	Stairwell (north west)	85

Floors

Description	Locations	Quantity (ft.^{2})
9" tile, black with beige spots	Room 114	118
9" tile, red with beige and black spots	Room 114	118

Walls

Description	Locations	Quantity
Plaster	Throughout the school	Total = 54,786 ft^2

Ceilings

Description	Locations	Quantity (ft.^{2})
Plaster	Throughout the school	Total = 17,080 ft^2

Pipes

Description	Locations	Quantity
Insulation on pipe run	Behind room 106	20 ft
Insulation on pipe run	Room 110/111	15 ft
Insulation on pipe run	Underneath south-west stairwell	6 ft
Insulation on pipe run	Electrical room	33 ft
Insulation on pipe run	Pipe chase in south-east corner of building	400 ft
Insulation on pipe run	Room 209 washroom	18 ft
Insulation on pipe run	Room 312 washroom	8 ft
Insulation on pipe run	Room 311 washroom	10 ft
Cement on pipe run	Electrical room	36
Insulation on pipe elbow above ceiling	Room 110/111	10
Insulation on pipe elbow above ceiling	Room 112/113	9

Pipes

Description	Locations	Quantity
Insulation on pipe elbow above ceiling	Electrical room	22
Insulation on pipe elbows below ceiling	Pipe chase in south east corner of building	26
Insulation on pipe elbows below ceiling	Girls change room	8
Insulation on pipe elbows below ceiling	Storage in girls change room	3
Insulation on pipe elbows below ceiling	Boys change room	5
Insulation on pipe elbows below ceiling	Storage in boys change room	2
Insulation on pipe elbows below ceiling	Gymnasium	8

Appendix E:

ACM's Room by Room (for quantities refer to Appendix D).

Room	ACMs
Boys change room	9" floor tile, black, 9" floor tile, grey with black and beige spots, 9" floor tile, black with green and beige spots, Insulation on pipe elbow above ceiling
Corridor (upper floor)	9" floor tile, black with beige spots, 9" floor tile, green with beige and black spots, 9" floor tile, black
Corridor (ground floor)	9" floor tile, green with beige and black spots, 9" floor tile, black with beige spots, 9" floor tile, black
Corridor (lower level)	9" floor tile, black with beige spots
Entry to room 104	9" floor tile, black, 9" floor tile, green with beige and black spots, 9" floor tile, black with beige spots
Entry to room 200	9" floor tile, black, 9" floor tile, green with beige and black spots, 9" floor tile, black with beige spots
Entry to room 205	9" floor tile, black, 9" floor tile, green with beige and black spots, 9" floor tile, black with beige spots
Entry to room 300	9" floor tile, black, 9" floor tile, green with beige and black spots, 9" floor tile, black with beige spots
Entry to room 306	9" floor tile, black, 9" floor tile, green with beige and black spots, 9" floor tile, black with beige spots
Girls change room	9" floor tile, black, 9" floor tile, grey with black and beige spots, 9" floor tile, black with green and beige spots, Insulation on pipe elbow above ceiling
Lower corridors	9" floor tile, black, 9" floor tile, green with beige and black spots
Room 106	9" floor tile, black with green and beige spots, 9" floor tile, grey with black and beige spots, 9" floor tile, black, Insulation on pipe run
Room 107	9" floor tile, black with beige spots, 9" floor tile, green with beige and black spots
Room 108/109	9" floor tile, green with beige and black spots, 9" floor tile, green with beige and black spots, 9" floor tile, black with beige spots
Room 110/111	9" floor tile, black, 9" floor tile, black with beige spots, 9" floor tile, green with beige and black spots, Insulation on pipe run,

ACM's Room by Room (for quantities refer to Appendix D).

Room	ACMs
	Insulation on pipe elbow above ceiling
Room 112/113	9" floor tile, green with beige and black spots, 9" floor tile, black, 9" floor tile, black with beige spots, Insulation on pipe elbow above ceiling
Room 114	9" floor tile, red with beige and black spots, 9" floor tile, black, 9" floor tile, black with beige spots
Room 204	9" floor tile, green with beige and black spots, 9" floor tile, black with beige spots
Stairwell (south west)	9" floor tile, black, 9" floor tile, green with beige and black spots, 9" floor tile, black with beige spots
Stairwell (north west)	9" floor tile, green with beige and black spots, 9" floor tile, black with beige spots
Storage in girls change room	9" floor tile, black, 9" floor tile, grey with black and beige spots, 9" floor tile, black with green and beige spots, Insulation on pipe elbow above ceiling Insulation on pipe elbow above ceiling
Storage in boys change room	9" floor tile, black, 9" floor tile, grey with black and beige spots, 9" floor tile, black with green and beige spots, Insulation on pipe elbow above ceiling
Underneath south-west stairwell	Insulation on pipe run,
Electrical room	Insulation on pipe run, Insulation on pipe elbow above ceiling,
Pipe chase in south-east corner of building	Insulation on pipe run
Room 209 washroom	Insulation on pipe run
Room 312 washroom	Insulation on pipe run
Room 311 washroom	Insulation on pipe run
Pipe chase in south east corner of building	Insulation on pipe elbow above ceiling
Gymnasium	Insulation on pipe elbow above ceiling

EASTPOINT

Halifax
Regional Centre for Education

INGLIS STREET ELEMENTARY SCHOOL
HEATING SYSTEM UPGRADES

LOCATION: HALIFAX
CLIENT: HRCE
JOB NUMBER: 382009
DATE: JUNE 02, 2025
ISSUED FOR TENDER

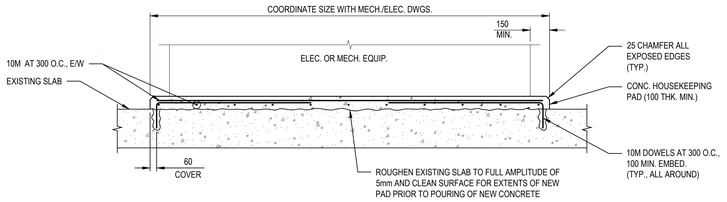
DRAWING LIST

STRUCTURAL

MECHANICAL

ELECTRICAL

SHEET SIZE: B1 (1000mm x 707mm)



1 / S-401 DETAIL - TYP. INTERIOR CONC. PAD

SCALE: 1:20

NOTE:
TOP SURFACE OF CONCRETE PAD TO BE SLOPED 0.5% AWAY FROM PERIMETER OF EQUIPMENT.

GENERAL STRUCTURAL SPECIFICATIONS:

1. DRAWINGS TO BE READ IN CONJUNCTION WITH THE PROJECT SPECIFICATIONS.
2. DRAWINGS NOT TO BE SCALED. ONLY FIGURED DIMENSIONS TO BE FOLLOWED.
3. LINEAR DIMENSIONS SHOWN ON DRAWINGS ARE IN MILLIMETERS. ELEVATIONS ARE IN METERS.
4. PRIOR TO PROCEEDING WITH WORK, CONTRACTOR TO VERIFY ALL DIMENSIONS, ELEVATIONS AND ALIGNMENT OF THE NEW AND EXISTING WORK AND SUBMIT FOR REVIEW ANY INCONSISTENCIES AND ALTERATIONS TO THE WORK PRIOR TO COMMENCING CONSTRUCTION.
5. CO-ORDINATE WORK ON THESE DRAWINGS WITH MECHANICAL AND ELECTRICAL DRAWINGS AND REPORT ANY INCONSISTENCIES PRIOR TO PROCEEDING WITH THE WORK.
6. LOCATION OF SERVICES WHERE INDICATED ARE FOR GUIDANCE ONLY. COMPLETENESS AND ACCURACY ARE NOT GUARANTEED.
7. THE CARRYING OUT OF ANY WORK PRIOR TO THE REVIEW AND ACCEPTANCE OF DETAILED SHOP DRAWINGS TO BE AT THE CONTRACTOR'S OWN RISK.
8. ALL WORK AND MATERIALS TO CONFORM TO THE REQUIREMENTS OF THE NATIONAL BUILDING CODE OF CANADA, 2020.
9. CONTRACTOR IS TO ASSUME FULL RESPONSIBILITY FOR THE INTEGRITY OF THE STRUCTURES DURING ERECTION. CONTRACTOR IS TO PROVIDE ADEQUATE TEMPORARY BRACING SYSTEM TO MAINTAIN STRUCTURAL SAFETY, PLUMB AND IN TRUE ALIGNMENT UNTIL COMPLETION OF WORK.
10. CONTRACTOR TO REINSTATE ALL AREAS AFFECTED BY NEW CONSTRUCTION TO THEIR ORIGINAL CONDITION.
11. ALL STRUCTURAL DESIGN WORK IS TO BE PERFORMED IN ACCORDANCE WITH THE FOLLOWING CODES AND STANDARDS:
    - NATIONAL BUILDING CODE OF CANADA 2020
    - CSA STANDARD A23.3:19 (CONCRETE)

STRUCTURAL DESIGN CRITERIA AND LOADS:

1. ANY INDICATED LOADS ARE UNFACTORED UNLESS NOTED OTHERWISE.
2. UNIFORM FLOOR LOADS AS PER THE ORIGINAL BUILDING DESIGN.
3. FOR CONCENTRATED LOADS OF NEW EQUIPMENT, REFER TO MANUFACTURER DATA SHEETS.
4. SEISMIC LOAD FOR EQUIPMENT CONNECTIONS SHALL BE DETERMINED PER NBC 2020 USING THE FOLLOWING SITE SPECIFIC CRITERIA FOR 2%/50 YEARS PROBABILITY:
    a. IMPORTANCE FACTOR (I_E): 1.0
    b. SITE CLASS AND SPECTRAL RESPONSE VALUES TO BE DETERMINED BASED ON SITE SPECIFIC GEO-TECHNICAL PARAMETERS.
6. SUPPORTS AND ANCHORAGE FOR NEW EQUIPMENT INCLUDING PROVISIONS FOR SEISMIC RESTRAINT TO BE DETERMINED BY EQUIPMENT SUPPLIER. CONTRACTOR TO PROVIDE STAMPED DRAWINGS FOR REVIEW.

CONCRETE NOTES:

1. DO ALL CONCRETE WORK TO CSA A23.1-19/A23.2-19.
2. DELIVER CONCRETE TO SITE OF WORK AND DISCHARGE WITHIN 120 MINUTES MAXIMUM AFTER BATCHING.
3. PLACING CONCRETE DURING RAIN OR WEATHER EVENTS THAT COULD DAMAGE CONCRETE IS PROHIBITED. PROTECT NEWLY PLACED CONCRETE FROM RAIN OR WEATHER EVENTS PER CSA A23.1/A23.2. COLD AND HOT WEATHER CONCRETING PROCEDURES AND PROTECTION PER CSA A23.1/A23.2.
4. CONCRETE MIX SHALL BE IN ACCORDANCE WITH "ALTERNATIVE 1 - PERFORMANCE" TO CSA A23.1/A23.2, AND CONFORMING TO THE FOLLOWING REQUIREMENTS:

INTENDED APPLICATION	INTERIOR HOUSEKEEPING PADS
CLASS OF EXPOSURE	N
COMPRESSIVE STRENGTH	25 MPa AT 28 DAYS
MAXIMUM COARSE AGGREGATE SIZE	20 mm
W/C RATIO	AS REQUIRED
AIR CONTENT	NONE
SLUMP AT TIME AND POINT OF DISCHARGE	80 ± 20 mm

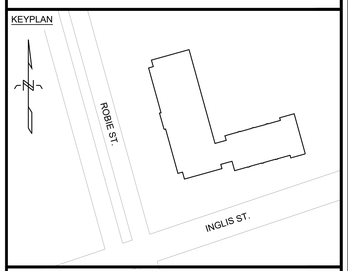
5. CONCRETE ADMIXTURES SHALL COMPLY WITH ASTM C494/C494M.
6. REINFORCING STEEL SHALL BE BILLET STEEL, GRADE 400, DEFORMED BARS TO CSA G30.18 AND CSA A23.1/A23.2. REINFORCING STEEL DETAILING TO BE IN ACCORDANCE WITH RSIC REINFORCING STEEL MANUAL OF STANDARD PRACTICE.
7. CONCRETE COVER TO REINFORCING STEEL: AS INDICATED IN DRAWING DETAILS.
8. LAP SPLICES SHALL BE MINIMUM "CLASS B" TENSION LAP SPLICE IN ACCORDANCE WITH CSA A23.3-19.
9. ALL BENDS TO BE STANDARD BENDS UNLESS NOTED OTHERWISE. DO NOT FIELD BEND OR WELD REINFORCEMENT.
10. REINFORCING STEEL, EMBEDDED PARTS, ANCHOR RODS AND DOWELS, ETC. TO BE SECURED IN POSITION PRIOR TO PLACING CONCRETE AND HELD RIGIDLY DURING PLACEMENT OF CONCRETE. CONTRACTOR IS RESPONSIBLE FOR LAYOUT AND VERIFICATION OF ANCHOR BOLTS AND OTHER HARDWARE BEFORE AND AFTER PLACING CONCRETE. COORDINATE WITH APPROVED EQUIPMENT DRAWINGS FOR LOCATIONS.
11. SLOPE TOP OF PADS AWAY FROM EQUIPMENT AS INDICATED.
12. FINISH CONCRETE TO CSA A23.1/A23.2. PROVIDE 25mm CHAMFER ON EXTERIOR EDGES UNLESS SPECIFIED OTHERWISE. RUB EXPOSED SHARP EDGES OF CONCRETE WITH CARBORUNDUM TO PRODUCE 3 mm MINIMUM RADIUS EDGES UNLESS OTHERWISE INDICATED. SCREED TO PLANE SURFACES AND USE MAGNESIUM FLOATS. TROWEL SMOOTH.
13. LEAVE FORMWORK IN PLACE FOR 7 DAYS OR UNTIL CONCRETE HAS REACHED 70% OF ITS 28 DAY STRENGTH. REPLACE IMMEDIATELY WITH RESHORING OR BACKFILL AS INDICATED.
14. SITE TESTS AS FOLLOWS: CONCRETE POURS, SLUMP, AIR CONTENT, COMPRESSIVE STRENGTH AT 7 AND 28 DAYS, AIR AND CONCRETE TEMPERATURE. INSPECTIONS AND TESTS TO BE CARRIED OUT BY TESTING LABORATORY DESIGNATED FOR REVIEW TO CSA A23.1/A23.2. CONTRACTOR WILL TAKE ADDITIONAL TEST CYLINDERS DURING COLD WEATHER CONCRETING. CURE CYLINDERS ON JOB SITE UNDER SAME CONDITIONS AS CONCRETE WHICH THEY REPRESENT.

EASTPOINT

CLIENT NAME / LOGO

Halifax Regional Centre for Education

KEYPLAN



PROFESSIONAL SEAL

REGISTERED PROFESSIONAL ENGINEER
PROVINCE OF NOVA SCOTIA
DATE 2025-06-02
J. M. Tucker
11796

NO.	DATE	REVISION	APPR.
A	2025/06/02	ISSUED FOR TENDER	JRM

PROJECT TITLE

INGLIS ELEMENTARY
PIPE REPLACEMENT

HARRIETSFIELD, NOVA SCOTIA

DRAWING TITLE

STRUCTURAL DETAILS

DRAWN	DESIGNED	CHECKED	PROJECT MGR
ACH	RPM	JMT	JRM

SCALE: AS NOTED

PROJECT NO. 382009

DWG. NO. S-401

2025/May/30, 10:38am andrew.chow I:\382 HRCE\382009 - Inglis Elementary - Heating System Upgrades\05 Drawings\382009_S-401.dwg

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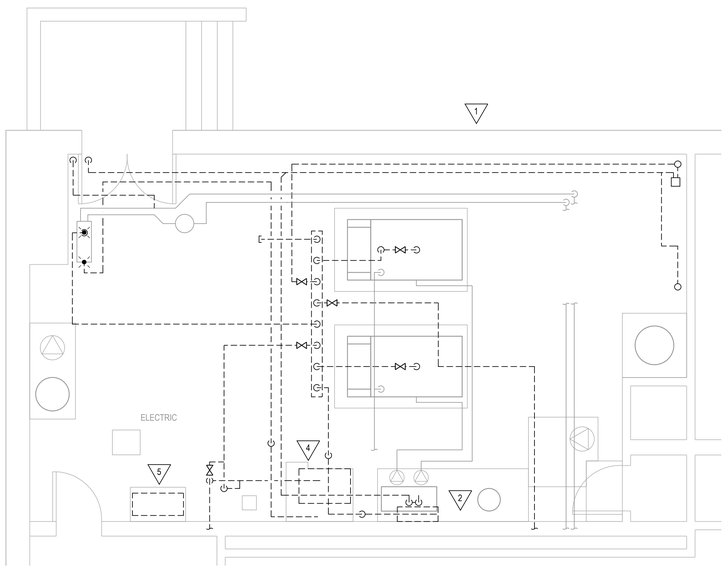
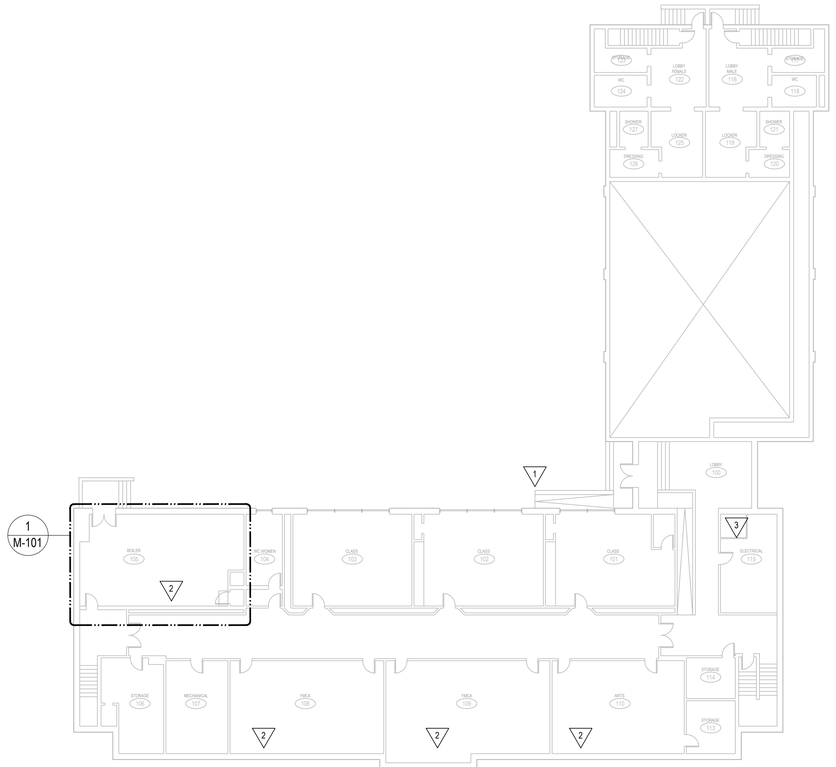


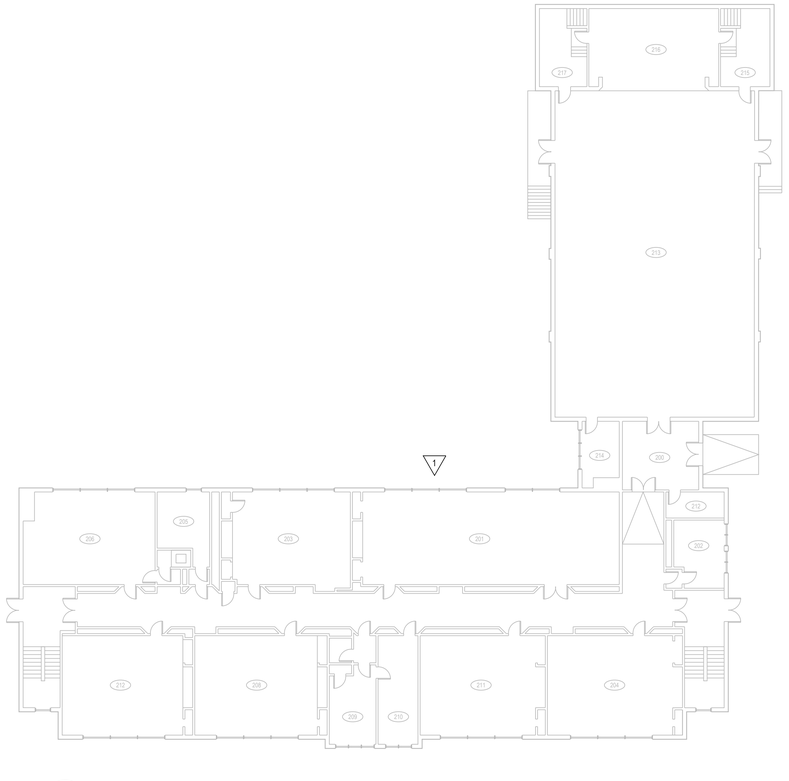
1 M-101 PLAN - BOILER ROOM (DEMOLITION)

SCALE: 1:50 (1:50)



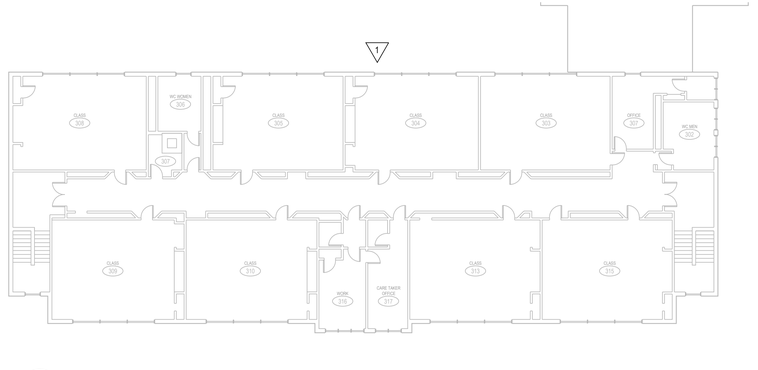
2 M-101 PLAN - LEVEL 1 (DEMOLITION)

SCALE: 1:200 (1:200)



3 M-101 PLAN - LEVEL 2 (DEMOLITION)

SCALE: 1:200 (1:200)



4 M-101 PLAN - LEVEL 3 (DEMOLITION)

SCALE: 1:200 (1:200)

DEMOLITION KEYNOTES:

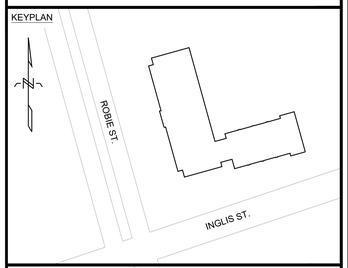
1. ALL EXISTING STEAM AND CONDENSATE PIPING EXPOSED THROUGHOUT THE BUILDING SHALL BE REMOVED, INCLUDING ALL STEAM RADIATORS AND FIN-TUBE CONVECTORS. ANY INACCESSIBLE PIPING IN WALLS OR CHASES SHALL BE CAPPED AT WALL AND MARKED AS ABANDONED. THIS INCLUDES ALL PIPING RISERS IN CLASSROOMS.
2. EXISTING HEATING WATER CIRCULATION PIPING AND ASSOCIATED HEATERS IN THE BASEMENT LEVEL CLASSROOMS SHALL BE REMOVED, C/W HEAT EXCHANGER AND INLINE PUMPS.
3. EXISTING CONDENSATE RECEIVER IN ELECTRICAL ROOM SHALL BE REMOVED, C/W WITH ALL ASSOCIATED PIPING.
4. EXISTING ABANDONED FEEDWATER TANK IN MECHANICAL ROOM SHALL BE REMOVED. CONCRETE HOUSEKEEPING PAD SHALL REMAIN FOR INSTALLATION OF NEW STEAM HEAT EXCHANGER SKID.
5. EXISTING CONTROLS AIR COMPRESSOR SHALL BE REMOVED, C/W ALL EXPOSED PNEUMATIC TUBING THROUGHOUT THE BUILDING.

EASTPOINT

CLIENT NAME / LOGO

Halifax Regional Centre for Education

KEYPLAN



LEGEND:

- EXISTING TO REMAIN
- DEMOLITION
- NEW CONSTRUCTION
- POINT OF CONNECTION / REMOVAL

PROFESSIONAL SEAL

REGISTERED PROFESSIONAL ENGINEER — PROVINCE OF NOVA SCOTIA — DATE Jun 02, 2025 — M. W. Newman — 11485

NO.	DATE	REVISION	APPR.
0	2025/06/02	ISSUED FOR TENDER	JRM

PROJECT TITLE

INGLIS ELEMENTARY
PIPE REPLACEMENT

HARRIETSFIELD, NOVA SCOTIA

DRAWING TITLE

MECHANICAL
LEVEL 1 AND
BOILER ROOM
(DEMOLITION)

DRAWN	DESIGNED	CHECKED	PROJECT MGR
HJF	MWN	MWN	JRM

SCALE: AS NOTED

PROJECT NO. 382009

DWG. NO. M-101

I:\382-HRCE\382009 - Inglis Elementary - Heating System Upgrades\05 Drawings\382009_M-101_M-102.dwg
M-101 DEMO
Hunter Freeman
2025/Jun/02, 4:04pm

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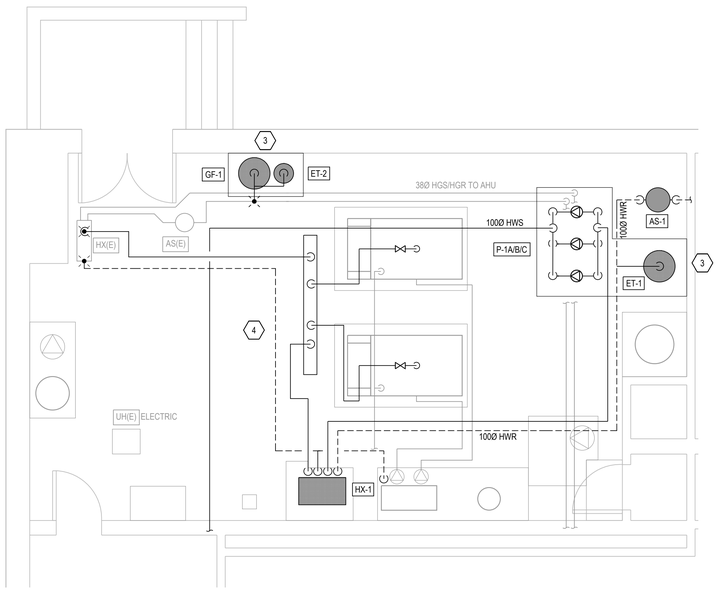
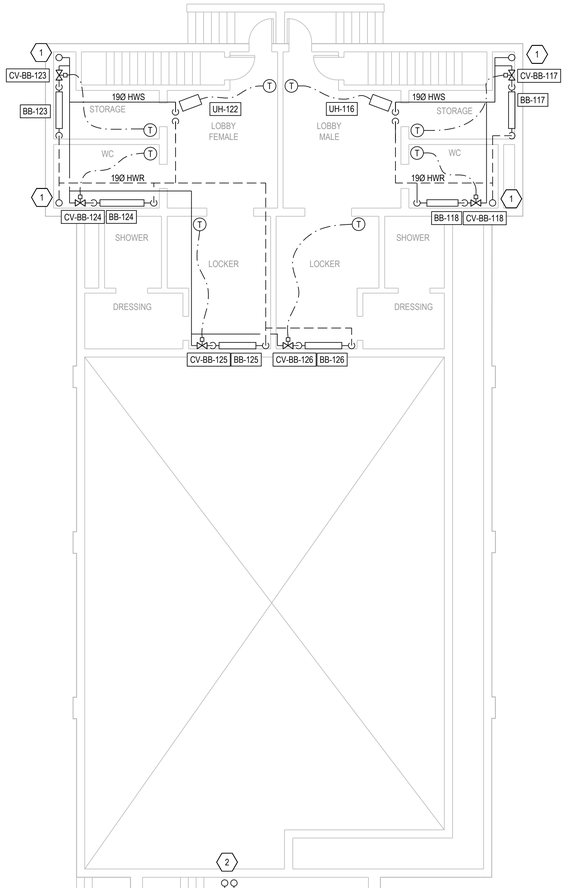
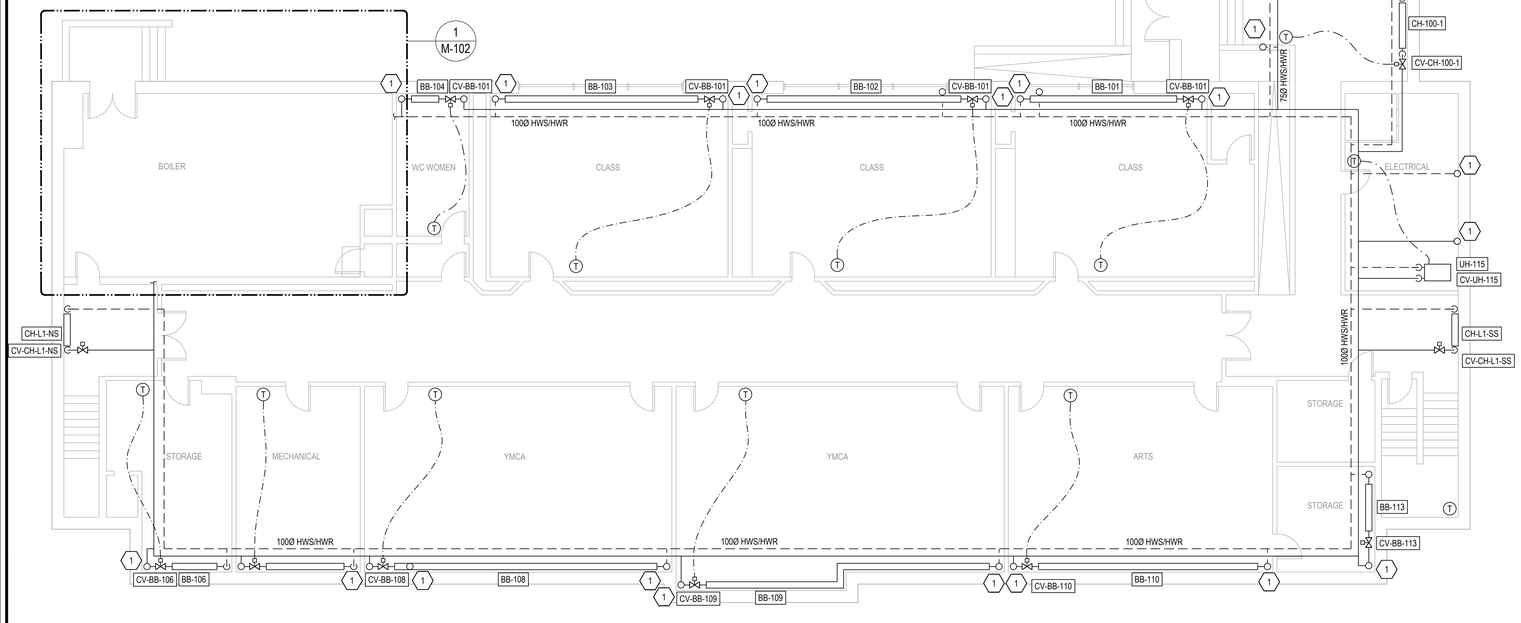


1 M-102 PLAN - BOILER ROOM (NEW CONSTRUCTION)

SCALE: N.T.S.

1:50





2 M-102 PLAN - LEVEL 1 (NEW CONSTRUCTION)

SCALE: 1:100

1:100

NEW CONSTRUCTION KEYNOTES:

1. 25Ø RISER UP TO LEVEL 2 ABOVE. PROVIDE FULL-PORT BALL VALVE FOR ISOLATION ON EACH RISER, DIRECTLY ADJACENT THE MAIN.
2. 75Ø HWS/HWR UP TO LEVEL 2 ABOVE, TO SERVE GYMNASIUM AND LOCKER ROOM HEATERS.
3. PROVIDE HOUSEKEEPING PAD WITH APPROXIMATE EXTENTS SHOWN. REFER TO STRUCTURAL PLANS FOR CONSTRUCTION DETAILS.
4. STEAM PIPING SIZING FOUND ON 1 / M-402

GENERAL NOTES:

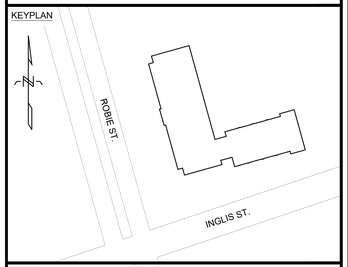
1. ALL PIPING FROM TERMINAL HEATING EQUIPMENT SHALL BE THE SIZE AS INDICATED FOR UNIT CONNECTION TO HWS/HWR MAINS UNLESS OTHERWISE NOTED ON PLAN DRAWINGS.

EASTPOINT

CLIENT NAME / LOGO

Halifax Regional Centre for Education

KEYPLAN



LEGEND:

- EXISTING
- NEW CONSTRUCTION
- LOW VOLTAGE CONTROL WIRING
- XXXØ HWS — HEATING WATER SUPPLY PIPING
- XXXØ HWR — HEATING WATER RETURN PIPING
- PIPE AT CEILING LEVEL BELOW
- GATE VALVE
- CONTROL VALVE
- PUMP
- T — WALL-MOUNTED TEMPERATURE SENSOR BY CONTROLS CONTRACTOR.
- POINT OF CONNECTION / REMOVAL

PROFESSIONAL SEAL

REGISTERED PROFESSIONAL ENGINEER — PROVINCE OF NOVA SCOTIA — DATE Jun 02, 2025 — M. W. Nicholson — 11485

NO.	DATE	REVISION	APPR.
0	2025/06/02	ISSUED FOR TENDER	JRM

PROJECT TITLE

INGLIS ELEMENTARY
PIPE REPLACEMENT

HARRIETSFIELD, NOVA SCOTIA

DRAWING TITLE

MECHANICAL
LEVEL 1 AND
BOILER ROOM
(NEW CONSTRUCTION)

DRAWN	DESIGNED	CHECKED	PROJECT MGR
HJF	MWN	MWN	JRM

SCALE: AS NOTED

PROJECT NO. 382009

DWG. NO. M-102

I:\382 HRCE\382009 - Inglis Elementary - Heating System Upgrades\05 Drawings\382009_M-101_M-102.dwg
M-102 NEW
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2025/Jun/02, 4:04pm

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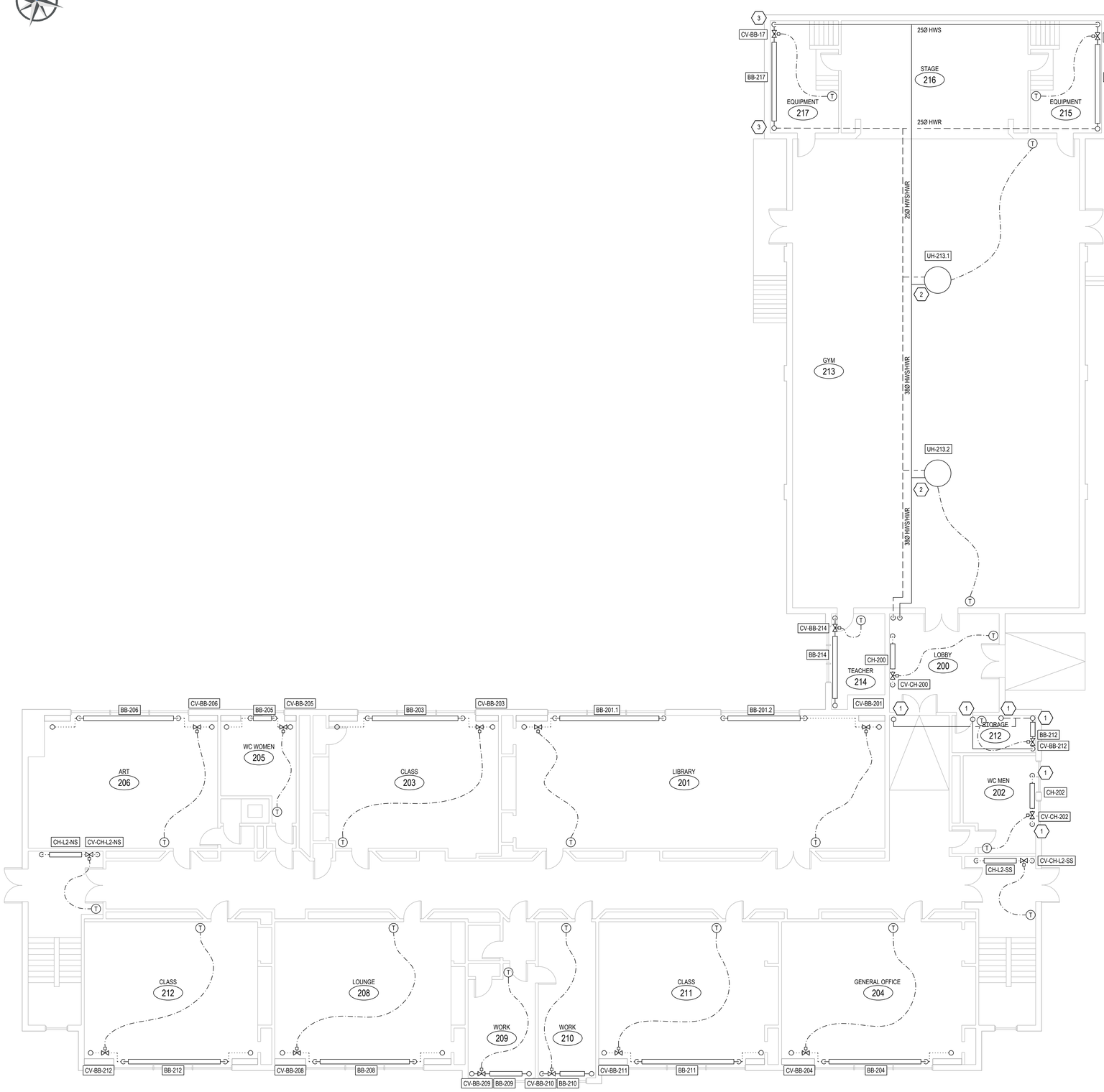

1 M-103 PLAN - LEVEL 2 (NEW CONSTRUCTION)
SCALE: 1:100

NEW CONSTRUCTION KEYNOTES:

1. 25Ø HEATING WATER PIPING UP TO LEVEL 3 HEATER
2. PROVIDE PRESSURE INDEPENDENT BALANCING VALVE ON SUPPLY BRANCH PIPING TO UNIT HEATER
3. 25Ø HEATING WATER RISER FROM LEVEL 1 BELOW

GENERAL NOTES:

1. ALL PIPING FROM TERMINAL HEATING EQUIPMENT SHALL BE THE SIZE AS INDICATED FOR UNIT CONNECTION TO HWS/HWR MAINS UNLESS OTHERWISE NOTED ON PLAN DRAWINGS.

EASTPOINT

CLIENT NAME / LOGO

Halifax Regional Centre for Education

KEYPLAN

LEGEND:

- EXISTING
- NEW CONSTRUCTION
- LOW VOLTAGE CONTROL WIRING
- XXXØ HWS — HEATING WATER SUPPLY PIPING
- XXXØ HWR — HEATING WATER RETURN PIPING
- PIPE AT CEILING LEVEL BELOW
- GATE VALVE
- CONTROL VALVE
- PUMP
- T — WALL-MOUNTED TEMPERATURE SENSOR BY CONTROLS CONTRACTOR.
- POINT OF CONNECTION / REMOVAL

PROFESSIONAL SEAL

REGISTERED PROFESSIONAL ENGINEER — PROVINCE OF NOVA SCOTIA
DATE Jun 02, 2025
M. W. Nicholson
11485

NO.	DATE	REVISION	APPR.
0	2025/06/02	ISSUED FOR TENDER	JRM

PROJECT TITLE

INGLIS ELEMENTARY PIPE REPLACEMENT

HARRIETSFIELD, NOVA SCOTIA

DRAWING TITLE

MECHANICAL LEVEL 2 (NEW CONSTRUCTION)

DRAWN	DESIGNED	CHECKED	PROJECT MGR
HJF	MWN	MWN	JRM

SCALE 1:100

PROJECT NO. 382009

DWG. NO. M-103

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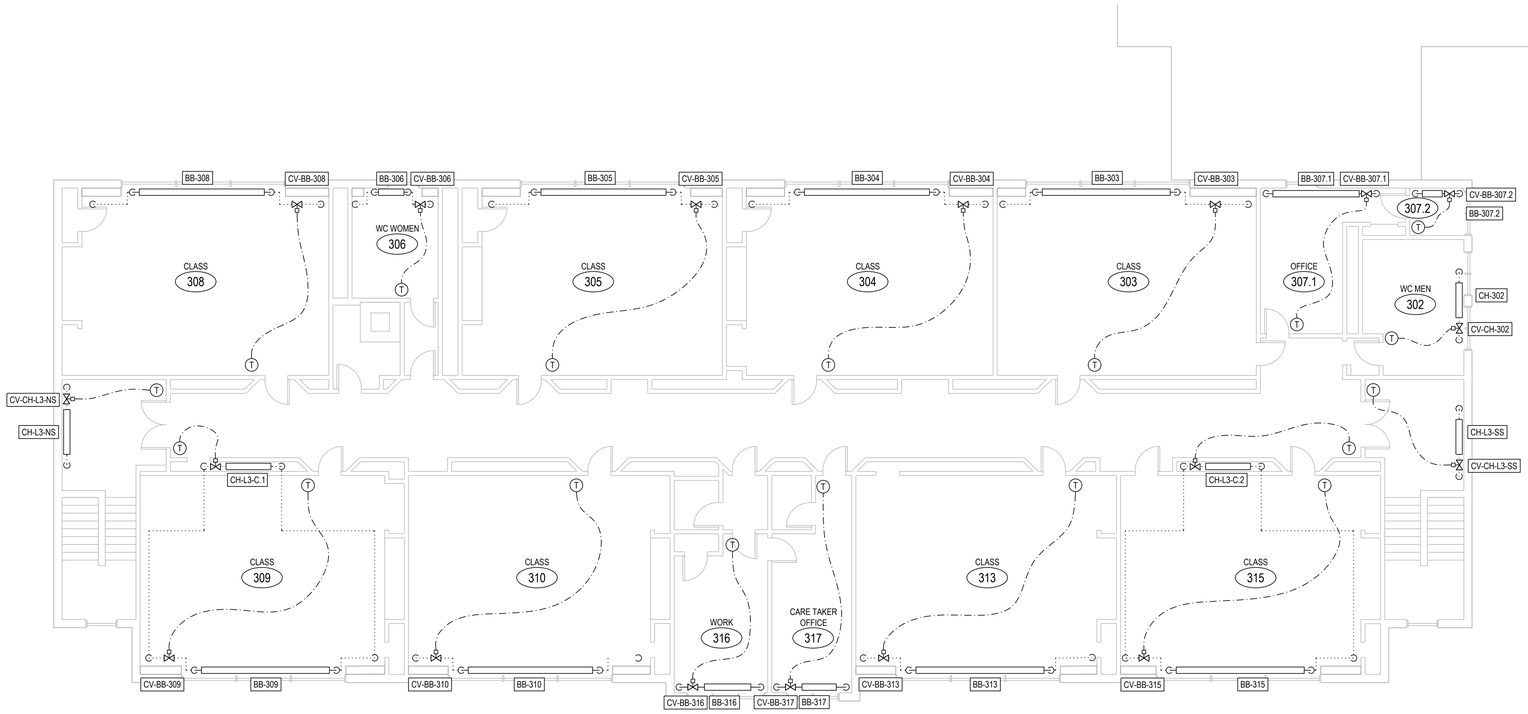
M-103
Hunter-Freeman
2025/Jun/02, 3:35pm

SHEET SIZE: B1 (1000mm x 707mm)

N

GENERAL NOTES:

1. ALL PIPING FROM TERMINAL HEATING EQUIPMENT SHALL BE THE SIZE AS INDICATED FOR UNIT CONNECTION TO HWS/HWR MAINS UNLESS OTHERWISE NOTED ON PLAN DRAWINGS.



1 / M-104 PLAN - LEVEL 3 (NEW CONSTRUCTION)

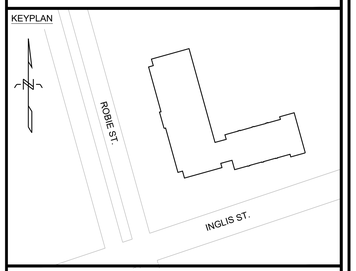
SCALE: 1:100

EASTPOINT

CLIENT NAME / LOGO

Halifax Regional Centre for Education

KEYPLAN



LEGEND:

- EXISTING
- NEW CONSTRUCTION
- LOW VOLTAGE CONTROL WIRING
- XXXØ HWS — HEATING WATER SUPPLY PIPING
- XXXØ HWR — HEATING WATER RETURN PIPING
- PIPE AT CEILING LEVEL BELOW
- GATE VALVE
- CONTROL VALVE
- PUMP
- T — WALL-MOUNTED TEMPERATURE SENSOR BY CONTROLS CONTRACTOR.
- POINT OF CONNECTION / REMOVAL

PROFESSIONAL SEAL

REGISTERED PROFESSIONAL ENGINEER — Pprovince of NOVA SCOTIA — DATE Jun 02, 2025 — M. W. Nicholson — 11485

NO.	DATE	REVISION	APPR.
0	2025/06/02	ISSUED FOR TENDER	JRM

PROJECT TITLE

INGLIS ELEMENTARY
PIPE REPLACEMENT

HARRIETSFIELD, NOVA SCOTIA

DRAWING TITLE

MECHANICAL
LEVEL 3
(NEW CONSTRUCTION)

DRAWN	DESIGNED	CHECKED	PROJECT MGR
HJF	MWN	MWN	JRM

SCALE 1:100 (1000 0 1000 2000 3000 4000 5000 6000 7000 mm)

PROJECT NO. 382009

DWG. NO. M-104

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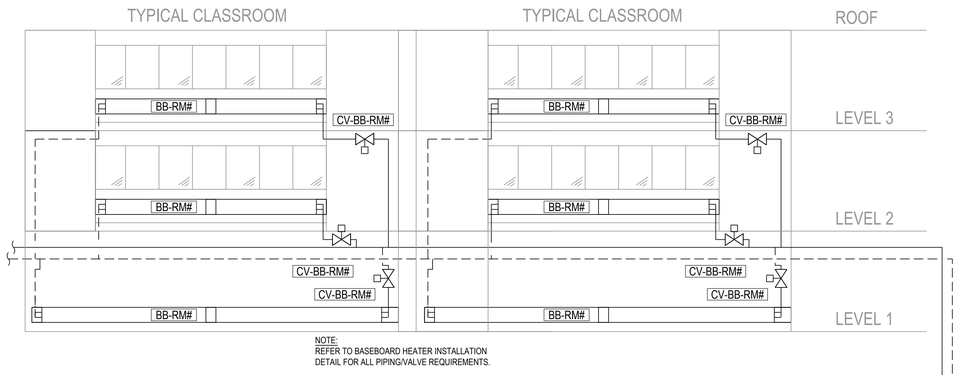
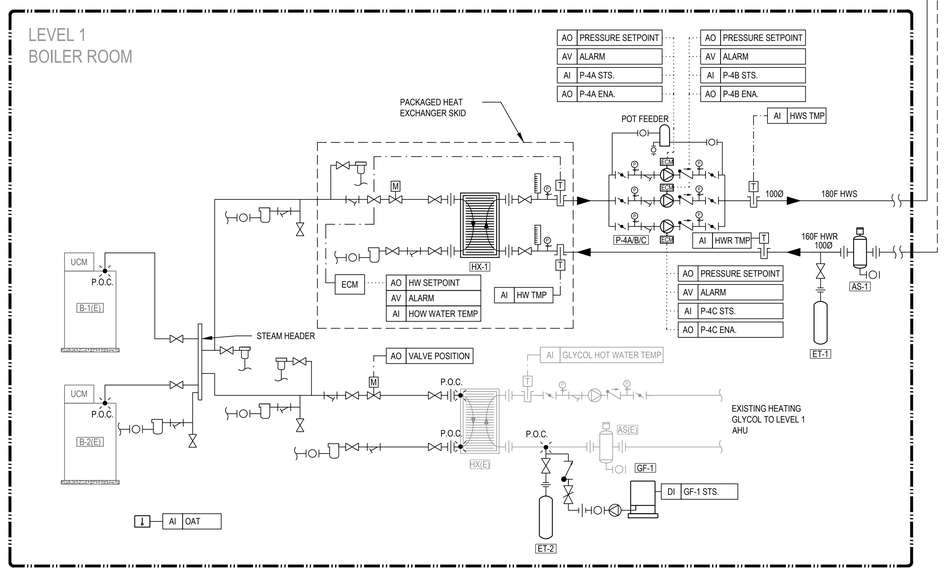
Hunter Freeman M-104
2025/Jun/02, 3:55pm

SHEET SIZE: B1 (1000mm x 707mm)



NOTE:
REFER TO BASEBOARD HEATER INSTALLATION DETAIL FOR ALL PIPING/VALVE REQUIREMENTS.



1 M-401 SCHEMATIC - HEATING SYSTEM PIPING AND CONTROLS

SCALE: N.T.S.

NOTE:
CONTROLS ARE TO INTEGRATE WITH EXISTING AEM BAS. CONNECTION TO NEW EQUIPMENT CONTROL MODULES TO BE BACNET IP. MS/TP MAY BE USED IF CURRENT CONTROLS ARCHITURE DOES NOT SUPPORT BACNET IP.

SEQUENCE OF OPERATIONS

1. HX-1 CONTROL MODULE SHALL MODULATE TO MAINTAIN A SUPPLY WATER TEMPERATURE OF 82 DEG C (ADJ.). BAS SHALL UPDATE SETPOINT TEMPERATURE TO ACCOMODATE A DYNAMIC TEMPERATURE RESET OF THE HEATING SYSTEM. BAS SHALL ADJUST TEMPERTURE SETPOINT SO THAT THE VALVE SERVING THE WORST ZONE IS 95% OPEN.
2. HX-1 SHALL RELAY ALARMS TO THE BAS.
3. HOT WATER HEATING PUMPS SEQUENCE OF OPERATION:
   - 3.1. PUMPS SHALL MODULATE SPEED TO MAINTAIN A PRESASURE SETPOINT IN THE DISTRIBUTION SYSTEM AS DETERMINED DURING BALANCING. PUMPS SHALL OPERATING IN TANDUM AND BE HARDWIRED SO THE A PUMP IS DESIGNATED MATER TO CONTROL THE SLAVE UNITS.
   - 3.2. ALL PUMPS SHALL OPERATE SIMULTANEOUSLY. BAS SHALL DESIGNATE PUMP OPERATION.
   - 3.3. PUMPS SHALL RELAY ALARMS TO THE BAS.
4. HX-2 CONTROLS SEQUENCE OF OPERATIONS:
   - 4.1. BAS SHALL MODULATE CONTROL VALVE TO MAINTIAN GLYCOL HEATING SUPPLY TEMPERATURE OF 82 DEG C (ADJ.). BAS SHALL UPDATE SETPOINT TEMPERATURE TO ACCOMODATE A DYNAMIC TEMPERATURE RESET OF THE AHU HEATING COILS. BAS SHALL ADJUST TEMPERTURE SETPOINT SO THAT THE VALVE SERVING THE WORST ZONE IS 95% OPEN.

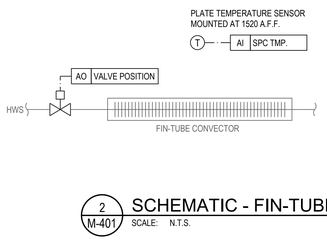
CONTROLS NOTES

1. PROVIDE EXPANSION TO EXISTING BUILDING AUTOMATION SYSTEM (BAS), FOR ALL NEW EQUIPMENT AS SHOWN. FRONT-END GRAPHICS SHALL BE PROVIDED AS PART OF CONTROLS SHOP DRAWINGS. EXISTING SYSTEM IS PROVIDED BY AEM, AND ALL NEW WORK SHALL BE COMPLETED BY AEM.
2. ALL NEW CONTROL WIRING SHALL BE INSTALLED IN CONDUIT.
3. ALL WORK SHALL BE IN CONFORMANCE WITH THE REQUIREMENTS OF THE NATIONAL BUILDING CODE AS WELL AS PROVINCIAL AND MUNICIPAL AUTHORITIES HAVING JURISDICTION.
4. ALL WIRING SHALL CONFORM TO THE REQUIREMENTS OF THE CANADIAN ELECTRICAL CODE.
5. ALL WORK SHALL BE SCHEDULED TO THE SATISFACTION OF THE OWNER.
6. CONTROLS CONTRACTOR SHALL PROVIDE ONE DAY OF TRAINING FOR FACILITY OPERATIONS STAFF.
7. MOUNTING HEIGHT OF OCCUPANT ADJUSTABLE THERMOSTATS SHALL BE 1200mm FROM FINISHED FLOOR. MOUNTING HEIGHT OF NON-ADJUSTABLE THERMOSTATS SHALL BE 1525mm FROM FINISHED FLOOR.
8. ANY WIRING ASSOCIATED WITH THE CONTROL OF MECHANICAL SYSTEMS SHALL BE THE RESPONSIBILITY OF THE MECHANICAL CONTRACTOR.
9. PROVIDE ALL NECESSARY EMT CONDUIT, FITTINGS, AND WIRE TO PROVIDE A COMPLETE AND OPERATIONAL CONTROL SYSTEM.

CONTROL VALVE SCHEDULE

TAG	MANUFACTURER/MODEL	FLUID	TYPE	NORMAL POSITION	FLOW (LPM)	NOTES
CABINET HEATERS						
CH-100-1	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	12.9	1
CH-L1-SS	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	7.7	1
CH-L1-NS	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	7.7	1
CH-L3-NS	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	7.7	1
CH-L3-SS	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	7.7	1
CH-302	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	9.0	1
CH-200	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	19.3	1
CH-202	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	9.0	1
CH-L3 C.1	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	12.9	1
CH-L3 C.2	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	12.9	1
CH-L2 NS	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	19.3	1
CH-L2 SS	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	19.3	1
UNIT HEATERS						
UH-115	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	6.4	1
UH-213.1	NO CONTROL VALVE	-	-	-	-	-
UH-213.2	NO CONTROL VALVE	-	-	-	-	-
UH-116	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	6.4	1
UH-122	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	6.4	1
BASEBOARD HEATERS						
BB-101	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	9.0	1
BB-102	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	10.3	1
BB-103	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	10.3	1
BB-104	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	3.2	1
BB-106	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	3.9	1
BB-108	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	10.3	1
BB-109	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	10.3	1
BB-110	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	9.0	1
BB-113	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	1.9	1
BB-117	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	2.6	1
BB-118	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	2.6	1
BB-123	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	2.6	1
BB-124	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	2.6	1
BB-125	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	2.6	1
BB-126	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	2.6	1
BB-201.1	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	11.0	1
BB-201.2	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	9.0	1
BB-203	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	10.3	1
BB-204	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	11.0	1
BB-205	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	6.4	1
BB-206	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	12.9	1
BB-208	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	11.0	1
BB-209	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	3.9	1
BB-210	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	3.9	1
BB-211	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	11.0	1
BB-212	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	2.6	1
BB-214	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	3.2	1
BB-215	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	6.4	1
BB-217	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	6.4	1
BB-303	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	15.5	1
BB-304	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	15.5	1
BB-305	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	15.5	1
BB-306	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	6.4	1
BB-307.1	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	6.4	1
BB-307.2	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	1.3	1
BB-308	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	15.5	1
BB-309	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	15.5	1
BB-310	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	15.5	1
BB-313	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	15.5	1
BB-315	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	15.5	1
BB-316	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	5.2	1
BB-317	VICTAULIC TA SERIES 7MP	WATER	2-WAY MOD	OPEN	5.2	1

NOTES:
1. PRESSURE-INDEPENDENT CONTROL VALVE C/W TA SLIDER ACTUATOR. ENSURE PICV IS INSTALLED WITH MINIMUM STRAIGHT LENGTHS AT INLET/OUTLET OF VALVE AS PER MANUFACTURER'S INSTRUCTIONS



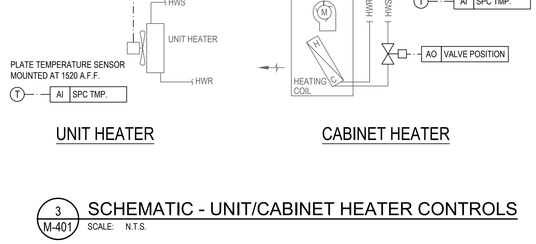
SEQUENCE OF OPERATIONS

HEATING MODE

1. HEATING IS TO BE CONTROLLED ACCORDING TO THE FACILITY OCCUPANCY SCHEDULE
2. ZONE SETPOINTS ARE TO BE RESET BY THE BMS TO DEFAULTS EACH MORNING AT 12AM
3. OCCCUPIED HEATING SETPOINT = 20C +/- 1C (15C +/- 1C IN VESTIBULES)
4. UNOCCUPIED HEATING SETPOINT = 15C +/- 1C (10C +/- 1C IN VESTIBULES)
5. VALVE SHALL OPEN UNTIL SPACE TEMPERATURE SETPOINT IS MET.
6. IF P-4 A/B/C IS DISABLED, HEATERS SHALL BE DISABLED, AND VALVE CLOSED.

2 M-401 SCHEMATIC - FIN-TUBE CONVECTOR CONTROLS

SCALE: N.T.S.



UNIT HEATER

CABINET HEATER

SEQUENCE OF OPERATIONS

HEATING MODE

1. HEATING IS TO BE CONTROLLED ACCORDING TO THE FACILITY OCCUPANCY SCHEDULE
2. ZONE SETPOINTS ARE TO BE RESET BY THE BMS TO DEFAULTS EACH MORNING AT 12AM
3. OCCCUPIED HEATING SETPOINT = 20C +/- 1C (15C +/- 1C IN VESTIBULES)
4. UNOCCUPIED HEATING SETPOINT = 15C +/- 1C (10C +/- 1C IN VESTIBULES)
5. FAN SHALL ENERGIZE UNTIL SPACE TEMPERATURE SETPOINT IS MET.
6. CABINET HEATER VALVE SHALL OPEN UNTIL SPACE TEMPERATURE SETPOINT IS MET.
7. IF PUMPS P-1 A/B/C ARE DISABLED, UNIT/CABINET HEATERS SHALL BE DISABLED, AND FAN OFF.

3 M-401 SCHEMATIC - UNIT/CABINET HEATER CONTROLS

SCALE: N.T.S.

EASTPOINT

CLIENT NAME / LOGO

Halifax Regional Centre for Education

KEYPLAN

LEGEND:

- EXISTING
- NEW CONSTRUCTION
- LOW VOLTAGE CONTROL WIRING
- 100Ø HWS — HEATING WATER SUPPLY PIPING
- 100Ø HWR — HEATING WATER RETURN PIPING
- GATE VALVE
- CHECK VALVE
- PRESSURE REDUCING VALVE
- PRESSURE RELIEF VALVE
- BUTTERFLY VALVE
- STRAINER
- BALL VALVE
- PRESSURE GAUGE
- TEMPERATURE SENSOR
- THERMOMETER
- UNION
- PUMP
- FLOAT AND THERMOSTATIC STEAM TRAP
- BALANCED PRESSURE THERMOSTATIC AIR VENT
- M — CONTROL VALVE
- POINT OF CONNECTION / REMOVAL
- ** POINT NAME — SCHEMATIC POINT TAG
- AO, AI, DO, DI, AV — ANALOG OUTPUT, ANALOG INPUT, DIGITAL OUTPUT, DIGITAL INPUT, ANALOG VARIABLE
- ECM — EQUIPMENT CONTROL MODULE

PROFESSIONAL SEAL

REGISTERED PROFESSIONAL ENGINEERS — PROVINCE OF NOVA SCOTIA — DATE Jun 02, 2025 — M. W. Nicholson — 11485

NO.	DATE	REVISION	APPR.
0	2025/06/02	ISSUED FOR TENDER	JRM

PROJECT TITLE

INGLIS ELEMENTARY PIPE REPLACEMENT

HARRIETSFIELD, NOVA SCOTIA

DRAWING TITLE

MECHANICAL CONTROLS AND PIPING SCHEMATICS

DRAWN	DESIGNED	CHECKED	PROJECT MGR
HJF	MWN	MWN	JRM

SCALE: N.T.S.

PROJECT NO. 382009

DWG. NO. M-401

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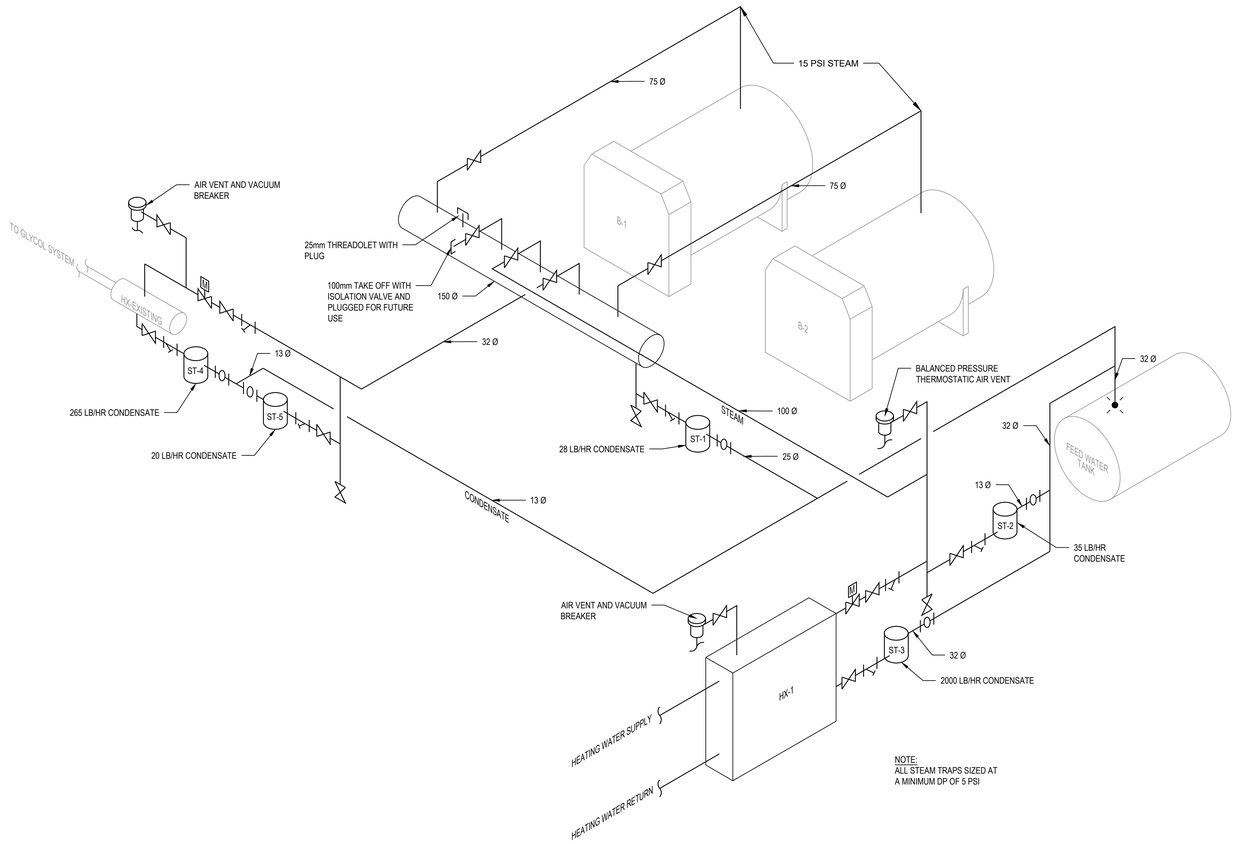
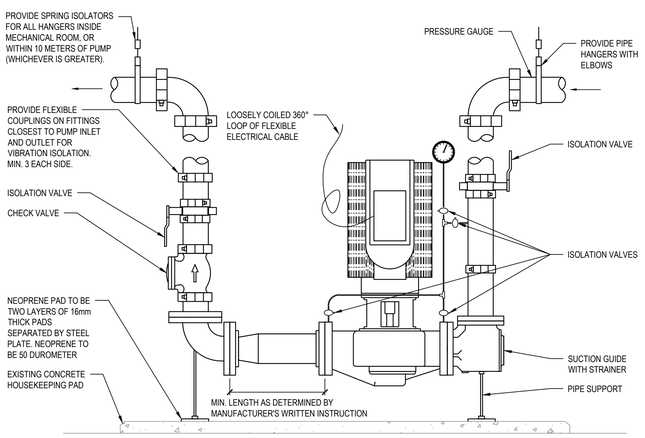


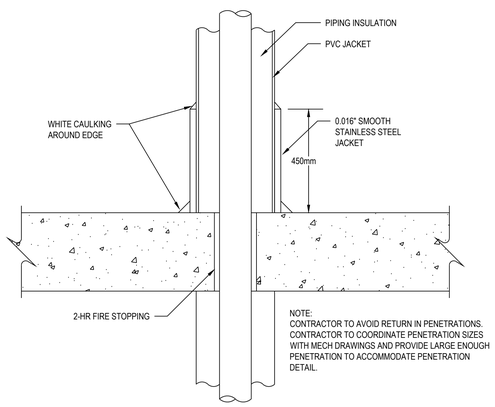
1 / M-402 DETAIL - STEAM AND CONDENSATE PIPING INSTALLATION

SCALE: N.T.S.



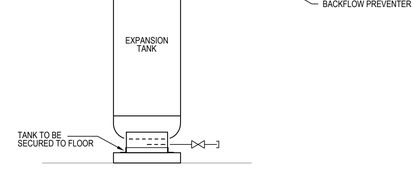
2 / M-402 DETAIL - VERTICAL INLINE PUMP INSTALLATION

SCALE: N.T.S.



3 / M-402 DETAIL - PIPE PENETRATION/PROTECTION

SCALE: N.T.S.



4 / M-402 DETAIL - DIAPHRAGM EXPANSION TANK

SCALE: N.T.S.

EASTPOINT

CLIENT NAME / LOGO

Halifax Regional Centre for Education

KEYPLAN

LEGEND:

	EXISTING
	NEW CONSTRUCTION
	LOW VOLTAGE CONTROL WIRING
	ETHERNET CABLE
	GATE VALVE
	CHECK VALVE
	PRESSURE REDUCING VALVE
	PRESSURE RELIEF VALVE
	BUTTERFLY VALVE
	STRAINER
	BALL VALVE
	PRESSURE GAUGE
	TEMPERATURE SENSOR
	THERMOMETER
	UNION
	PUMP
	FLOAT AND THERMOSTATIC STEAM TRAP
M	BALANCED PRESSURE THERMOSTATIC AIR VENT
M	CONTROL VALVE
	POINT OF CONNECTION / REMOVAL
** POINT NAME	SCHEMATIC POINT TAG
AO AI DO DI AV	ANALOG OUTPUT ANALOG INPUT DIGITAL OUTPUT DIGITAL INPUT ANALOG VARIABLE
ECM	EQUIPMENT CONTROL MODULE

PROFESSIONAL SEAL

REGISTERED PROFESSIONAL ENGINEER — PROVINCE OF NOVA SCOTIA — DATE Jun 02, 2025 — M. W. Nicholson — 11485

NO.	DATE	REVISION	APPR.
0	2025/06/02	ISSUED FOR TENDER	JRM

PROJECT TITLE

INGLIS ELEMENTARY PIPE REPLACEMENT

HARRIETSFIELD, NOVA SCOTIA

DRAWING TITLE

MECHANICAL DETAILS

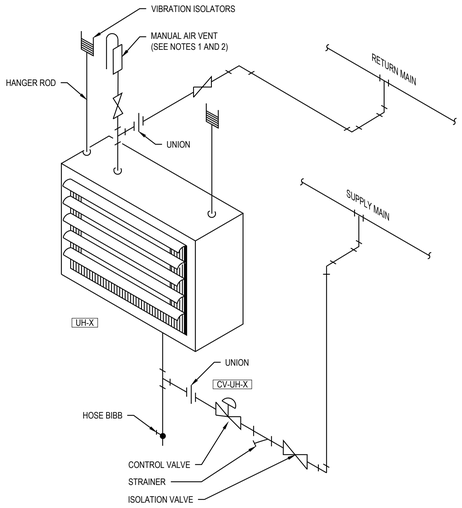
DRAWN	DESIGNED	CHECKED	PROJECT MGR
HJF	MWN	MWN	JRM

SCALE: N.T.S.

PROJECT NO. 382009

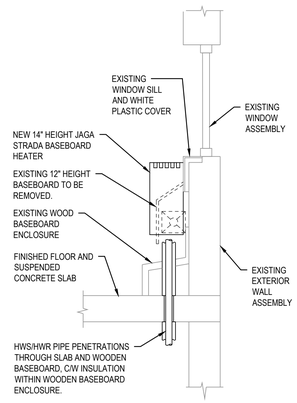
DWG. NO. M-402

SHEET SIZE: B1 (1000mm x 707mm)

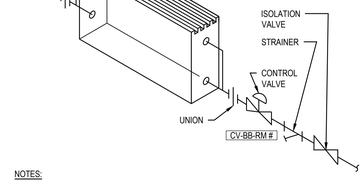


NOTES:
1. IF THE MAINS ARE BELOW THE HEATER THE MANUAL AIR VENT IS REQUIRED.
2. IF THE MAINS ARE ABOVE THE HEATER, DELETE THE AUTO AIR VENT.

1 M-403 DETAIL - UNIT HEATER INSTALLATION
SCALE: N.T.S.

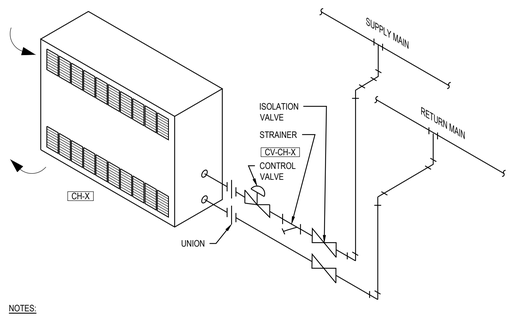


2 M-403 DETAIL - TYPICAL CLASSROOM HEATER INSTALLATION
SCALE: N.T.S.



NOTES:
1. RIGHT HAND PIPING CONNECTION SHOWN. LEFT OR RIGHT HAND PIPING MAY BE USED AS INSTALL CONDITIONS REQUIRE. SEE FLOOR PLAN DRAWINGS.

3 M-403 DETAIL - CABINET HEATER INSTALLATION
SCALE: N.T.S.



NOTES:
1. RIGHT HAND PIPING CONNECTION SHOWN. LEFT OR RIGHT HAND PIPING MAY BE USED AS INSTALL CONDITIONS REQUIRE. SEE FLOOR PLAN DRAWINGS.

4 M-403 DETAIL - CABINET HEATER INSTALLATION
SCALE: N.T.S.

FIN-TUBE CONVECTOR SCHEDULE

GENERAL INFORMATION				LIQUID SIDE DATA					SPECIFICATION SECTION
TAG	MANUFACTURER/MODEL	ROOM NO.	CAPACITY (kW)	CV FLOW (LPM)	FLUID MEDIUM	EWT (°C)	LWT (°C)	PD (kPa)	
BB-101	JAGA STRADA TYPE 15	101	7.0	9.0	WATER	82	71	57.0	23 36 00
BB-102	JAGA STRADA TYPE 15	102	8.0	10.3	WATER	82	71	64.2	23 36 00
BB-103	JAGA STRADA TYPE 15	103	8.0	10.3	WATER	82	71	60.7	23 36 00
BB-104	JAGA STRADA TYPE 15	104	2.5	3.2	WATER	82	71	27.5	23 36 00
BB-106	JAGA STRADA TYPE 15	106	3.0	3.9	WATER	82	71	21.6	23 36 00
BB-108	JAGA STRADA TYPE 15	108	8.0	10.3	WATER	82	71	59.9	23 36 00
BB-109	JAGA STRADA TYPE 15	109	8.0	10.3	WATER	82	71	66.1	23 36 00
BB-110	JAGA STRADA TYPE 15	110	7.0	9.0	WATER	82	71	50.5	23 36 00
BB-113	JAGA STRADA TYPE 15	113	1.5	1.9	WATER	82	71	12.4	23 36 00
BB-117	JAGA STRADA TYPE 15	117	2.0	2.6	WATER	82	71	15.4	23 36 00
BB-118	JAGA STRADA TYPE 15	118	2.0	2.6	WATER	82	71	14.6	23 36 00
BB-123	JAGA STRADA TYPE 15	123	2.0	2.6	WATER	82	71	15.4	23 36 00
BB-124	JAGA STRADA TYPE 15	124	2.0	2.6	WATER	82	71	15.6	23 36 00
BB-125	JAGA STRADA TYPE 15	125	2.0	2.6	WATER	82	71	15.4	23 36 00
BB-126	JAGA STRADA TYPE 15	126	2.0	2.6	WATER	82	71	15.4	23 36 00
BB-201.1	JAGA STRADA TYPE 15	201.1	8.5	11.0	WATER	82	71	70.1	23 36 00
BB-201.2	JAGA STRADA TYPE 15	201.2	7.0	9.0	WATER	82	71	54.5	23 36 00
BB-203	JAGA STRADA TYPE 15	203	8.0	10.3	WATER	82	71	63.2	23 36 00
BB-204	JAGA STRADA TYPE 15	204	8.5	11.0	WATER	82	71	69.9	23 36 00
BB-205	JAGA STRADA TYPE 15	205	5.0	6.4	WATER	82	71	21.1	23 36 00
BB-206	JAGA STRADA TYPE 15	206.1	10.0	12.9	WATER	82	71	83.0	23 36 00
BB-208	JAGA STRADA TYPE 15	208	8.5	11.0	WATER	82	71	67.1	23 36 00
BB-209	JAGA STRADA TYPE 15	209.1	3.0	3.9	WATER	82	71	20.1	23 36 00
BB-210	JAGA STRADA TYPE 15	210	3.0	3.9	WATER	82	71	17.3	23 36 00
BB-211	JAGA STRADA TYPE 15	211	8.5	11.0	WATER	82	71	65.4	23 36 00
BB-212	JAGA STRADA TYPE 15	212	2.0	2.6	WATER	82	71	65.1	23 36 00
BB-214	JAGA STRADA TYPE 15	214	2.5	3.2	WATER	82	71	15.9	23 36 00
BB-215	JAGA STRADA TYPE 15	215	5.0	6.4	WATER	82	71	40.6	23 36 00
BB-217	JAGA STRADA TYPE 15	217	5.0	6.4	WATER	82	71	40.6	23 36 00
BB-303	JAGA STRADA TYPE 16	303	12.0	15.5	WATER	82	71	89.2	23 36 00
BB-304	JAGA STRADA TYPE 16	304	12.0	15.5	WATER	82	71	89.2	23 36 00
BB-305	JAGA STRADA TYPE 16	305	12.0	15.5	WATER	82	71	89.2	23 36 00
BB-306	JAGA STRADA TYPE 16	306	5.0	6.4	WATER	82	71	25.5	23 36 00
BB-307.1	JAGA STRADA TYPE 16	307.1	5.0	6.4	WATER	82	71	39.6	23 36 00
BB-307.2	JAGA STRADA TYPE 16	307.2	1.0	1.3	WATER	82	71	20.6	23 36 00
BB-308	JAGA STRADA TYPE 16	308	12.0	15.5	WATER	82	71	89.2	23 36 00
BB-309	JAGA STRADA TYPE 16	309	12.0	15.5	WATER	82	71	89.2	23 36 00
BB-310	JAGA STRADA TYPE 16	310	12.0	15.5	WATER	82	71	89.2	23 36 00
BB-313	JAGA STRADA TYPE 16	313	12.0	15.5	WATER	82	71	89.2	23 36 00
BB-315	JAGA STRADA TYPE 16	315	12.0	15.5	WATER	82	71	89.2	23 36 00
BB-316	JAGA STRADA TYPE 16	316.1	4.0	5.2	WATER	82	71	21.1	23 36 00
BB-317	JAGA STRADA TYPE 16	317.1	4.0	5.2	WATER	82	71	19.6	23 36 00

1. SINGLE-PIECE COVER MOUNTS ON WALL BRACKETS. 18 Ga COVER. BAKED ENAMEL FINISH. PIPING CONNECTION ON EACH UNIT TO BE COMPLETE WITH PRESSURE INDEPENDENT CONTROL VALVE, STRAINER, AND ISOLATION VALVE.

GLYCOL FEEDER SCHEDULE

TAG	MANUFACTURER/ MODEL	SERVICE	TYPE	TANK SIZE (L)	ELECTRICAL DATA		REMARKS AND OPTIONS
					V/PH/HZ	HP	
GF-1	AXIOM SF-100	HEATING GLYCOL	SINGLE PUMP	204	120/1/60	1/4	C/W MECHANICAL FLOAT FOR CONNECTION TO BAS

AIR SEPARATOR SCHEDULE

TAG	TYPE	FLUID	BASIS OF DESIGN	CAPACITY	CONN. SIZE	ACCESSORIES & REMARKS
				(L/min)	(mm)	
AS-1	COMBINATION HYDRAULIC, AIR, DIRT AND MAGNETIC SEPARATOR	WATER	CALEFFI 5495	606	100	FLANGED CONNECTIONS

CABINET/UNIT HEATER SCHEDULE

GENERAL INFORMATION					LIQUID SIDE DATA					NOTES
TAG	TYPE	OUTPUT CAPACITY (kW) AT 82C EWT, 71LWT, 20C EAT	ELECTRICAL (V/PH/HZ)	FAN HP	FLOWRATE (LPM)	FLUID	EWT (°C)	LWT (°C)	PD (kPa)	
CH-100-1	SURFACE-MOUNT CABINET HEATER	10.0	115/1/60	1/12	12.9	WATER	82	71	5.0	-
CH-L1-SS	SURFACE-MOUNT CABINET HEATER	6.0	115/1/60	1/20	7.7	WATER	82	71	5.0	-
CH-L1-NS	SURFACE-MOUNT CABINET HEATER	6.0	115/1/60	1/20	7.7	WATER	82	71	5.0	-
CH-L3-NS	SURFACE-MOUNT CABINET HEATER	6.0	115/1/60	1/20	7.7	WATER	82	71	5.0	-
CH-L3-SS	SURFACE-MOUNT CABINET HEATER	6.0	115/1/60	1/20	7.7	WATER	82	71	5.0	-
CH-302	SURFACE-MOUNT CABINET HEATER	7.0	115/1/60	1/20	9.0	WATER	82	71	5.0	-
CH-200	SURFACE-MOUNT CABINET HEATER	15.0	115/1/60	1/12	19.3	WATER	82	71	5.0	-
CH-202	SURFACE-MOUNT CABINET HEATER	7.0	115/1/60	1/20	9.0	WATER	82	71	5.0	-
CH-L3 C.1	SURFACE-MOUNT CABINET HEATER	10.0	115/1/60	1/12	12.9	WATER	82	71	5.0	-
CH-L3 C.2	SURFACE-MOUNT CABINET HEATER	10.0	115/1/60	1/12	12.9	WATER	82	71	5.0	-
CH-L2 NS	SURFACE-MOUNT CABINET HEATER	15.0	115/1/60	1/3	19.3	WATER	82	71	5.0	-
CH-L2 SS	SURFACE-MOUNT CABINET HEATER	15.0	115/1/60	1/3	19.3	WATER	82	71	5.0	-
UH-115	HORIZONTAL UNIT HEATER	5.0	115/1/60	1/20	6.4	WATER	82	71	5.0	-
UH-213.1	VERTICAL UNIT HEATER	60.0	115/1/60	3/4	77.3	WATER	82	71	5.0	-
UH-213.2	VERTICAL UNIT HEATER	60.0	115/1/60	3/4	77.3	WATER	82	71	5.0	-
UH-116	HORIZONTAL UNIT HEATER	5.0	115/1/60	1/20	6.4	WATER	82	71	5.0	-
UH-122	HORIZONTAL UNIT HEATER	5.0	115/1/60	1/20	6.4	WATER	82	71	5.0	-

FRONT BAR GRILLE INLET, TOP BAR GRILLE OUTLET ON CABINET HEATERS, C/W PRESSURE INDEPENDENT CONTROL VALVE, STRAINER, AND ISOLATION VALVE.

PUMP SCHEDULE

TAG	TYPE	SERVES	FLUID	DESIGN FLOW (LPM)	HEAD (kPa)	POWER TYPE (V/PH/HZ)	MOTOR SIZE (HP)	BASIS OF DESIGN	SPECIFICATION SECTION
P-1A, P-1B, P-1C	VERTICAL INLINE CENTRIFUGAL, ECM MOTOR WITH SENSORLESS CONTROL	FACILITY HEATING CIRCULATOR	WATER	202	240	240/1/60	2.0	ARMSTRONG 4380	23 21 23

HEAT EXCHANGER SKID SCHEDULE

GENERAL INFORMATION				HOT SIDE DATA		COLD SIDE DATA				ELECTRICAL			NOTES
TAG	MANUFACTURER/MODEL	TYPE	CAPACITY (kW)	FLOW (KG/HR)	FLUID MEDIUM	FLOW (LPM)	FLUID MEDIUM	ELT (°C)	LLT (°C)	PD (kPa)	V/PH/HZ	MOP	CONN SIZE	
HX-1	PRESTON PHIPPS	PACKAGED FLOODED STEAM HEAT EXCHANGER	471	754	15 PSI STEAM	606	100% WATER	71	82	10	120/1/60	15	100	PACKAGED SKID HEAT EXCHANGER.

EXPANSION TANK SCHEDULE

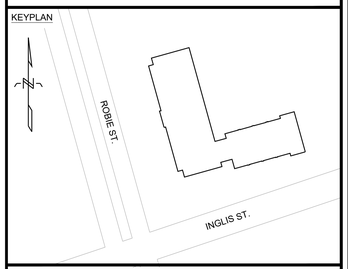
TAG	TYPE	SERVICE	LOCATION	TOTAL VOLUME (L)	ACCEPTANCE VOLUME (L)	SET PRESS (kPa)	MAX PRESS (kPa)	MAX TEMP. (°C)	CONN SIZE (MM DIA)	LENGTH (MM)	DIAMETER (MM)	BASIS OF DESIGN	SPECIFICATION SECTION
ET-1	PARTIAL ACCEPTANCE DIAPHRAGM	BOILER LOOP	BOILER ROOM	168.1	85.5	80	860	115	25	725	610	AMTROL AX-80 (V)	23 21 16
ET-2	PARTIAL ACCEPTANCE DIAPHRAGM	AHU GLYCOL	BOILER ROOM	88	43	80	860	115	20	838	381	AMTROL AX-40DD (V)	23 21 16

EASTPOINT

CLIENT NAME / LOGO

Halifax Regional Centre for Education

KEYPLAN



PROFESSIONAL SEAL

REGISTERED PROFESSIONAL ENGINEER
PROVINCE OF NOVA SCOTIA
DATE Jul 02, 2025
M. W. Nicholson
11485

NO.	DATE	REVISION	APPR.
0	2025/06/02	ISSUED FOR TENDER	JRM

PROJECT TITLE

INGLIS ELEMENTARY
PIPE REPLACEMENT

HARRIETSFIELD, NOVA SCOTIA

DRAWING TITLE

MECHANICAL DETAILS AND
EQUIPMENT SCHEDULES

DRAWN	DESIGNED	CHECKED	PROJECT MGR
HJF	MWN	MWN	JRM

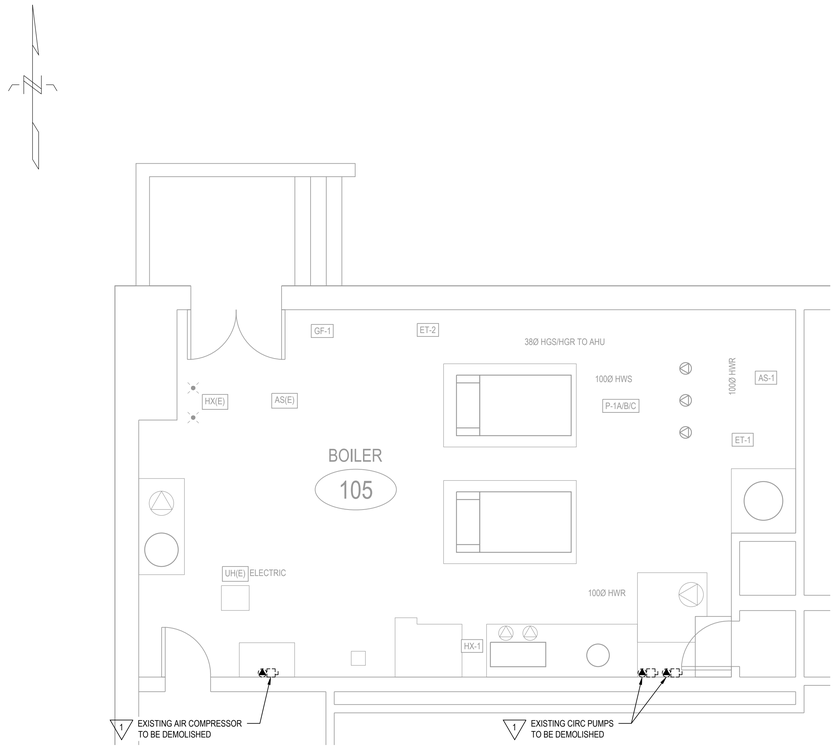
SCALE: N.T.S.

PROJECT NO. 382009

DWG. NO. M-403

2025/Jun/02, 3:00pm I:\382 HRCE\382009 - Inglis Elementary - Heating System Upgrades\05 Drawings\382009_M-403.dwg Hunter.Freeman M-501

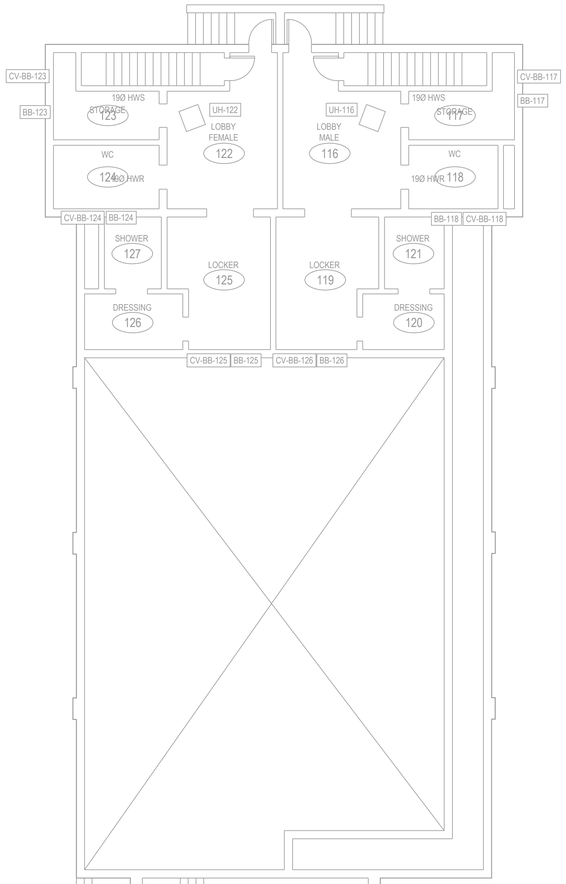
SHEET SIZE: B1 (1000mm x 707mm)

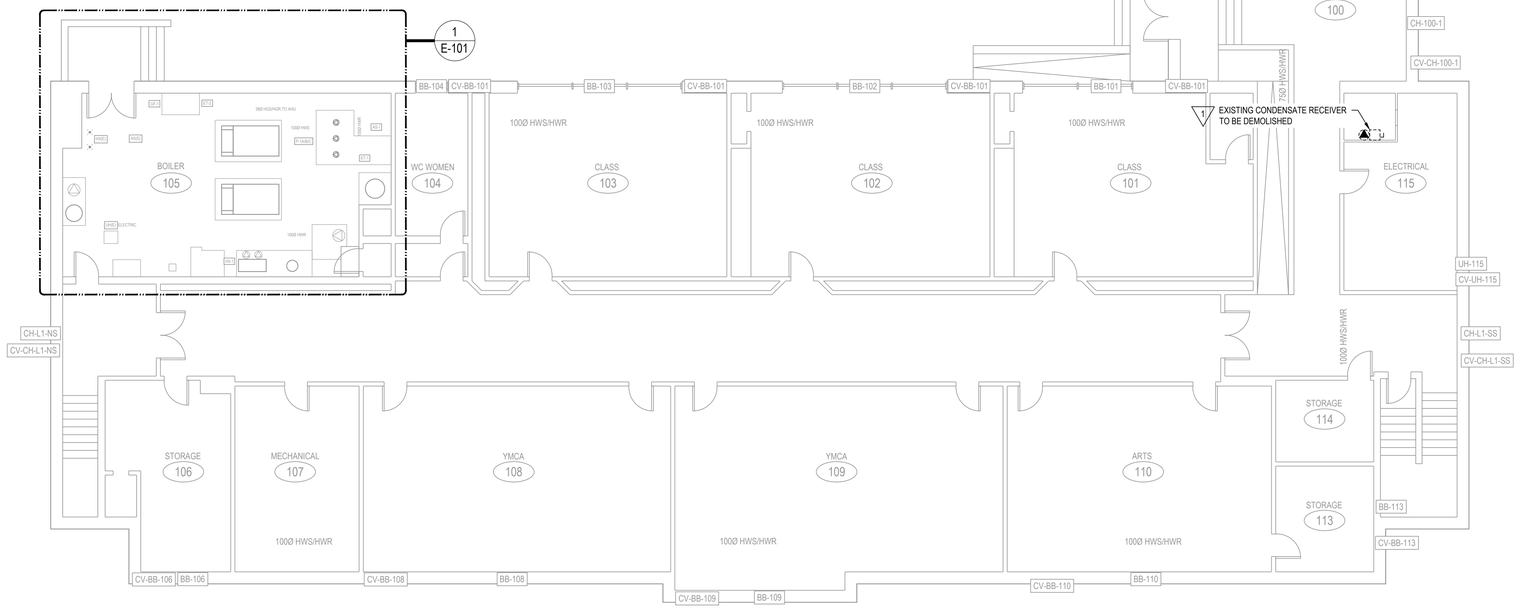


1 E-101 PLAN - BOILER ROOM (DEMOLITION)

SCALE: 1:50

1:50





2 E-101 PLAN - LEVEL 1 (DEMOLITION)

SCALE: 1:100

1:100

GENERAL NOTES:

1. ALL CONSTRUCTION TO COMPLY WITH THE 2020 NOVA SCOTIA BUILDING CODE ACT, NOVA SCOTIA OCCUPATIONAL HEALTH AND SAFETY ACT AND CSA/ASC STANDARD B651-23 ACCESSIBLE DESIGN FOR THE BUILT ENVIRONMENT.
2. THESE GENERAL NOTES APPLY TO ALL DRAWINGS, DESIGN, EQUIPMENT, FABRICATION, CONSTRUCTION AND ANY OTHER ASPECTS ASSOCIATED WITH THIS WORK.
3. THE CONTRACTOR IS TO CONSTRUCT BASED UPON THE DESIGN AND TYPICAL DETAILS PROVIDED HERE IN AND IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE. DEVIATIONS ARE TO BE APPROVED BY THE OWNER OR THEIR DESIGNATE. CONSTRUCTION THAT IS NOT DETAILED WILL BE THE RESPONSIBILITY OF THE CONTRACTOR, AND MUST MEET CANADIAN ELECTRICAL CODE (CEC), AND ACCEPTED INDUSTRIAL PRACTICES, SUBJECT TO THE APPROVAL OF THE OWNER. THE CONTRACTOR IS TO IDENTIFY ANY DISCREPANCIES BETWEEN THE DRAWINGS, CANADIAN ELECTRICAL CODE, OR ACCEPTED INDUSTRY PRACTICES TO THE OWNER FOR CLARIFICATION.
4. THE CONTRACTOR IS RESPONSIBLE FOR THE INSTALLATION, TESTING, AND COMMISSIONING OF ALL NEW ELECTRICAL EQUIPMENT INSTALLED UNDER THIS WORK SCOPE.
5. REMOVE ALL DEMOLISHED MATERIAL FROM SITE AND PAY ALL TRANSPORTATION, TIPPING AND OTHER FEES ASSOCIATED WITH MATERIAL DISPOSAL.
6. UNLESS SPECIFICALLY NOTED, DEMOLITION TO BE HANDLED BY CONTRACTOR.
7. LOCATION OF EQUIPMENT IS SHOWN APPROXIMATE. DO NOT SCALE LOCATION OFF DRAWINGS. SELECT THE FINAL LOCATION TO SUIT ACTUAL SITE SITUATION.
8. REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PLACING ORDERS AND PROCEEDING WITH THE CONSTRUCTION.
9. SUPPLY AND INSTALL ALL NEW ITEMS UNLESS SPECIFICALLY NOTED OTHERWISE.
10. PROVIDE ALL LIFTING, HOISTING, RIGGING, AERIAL ACCESS AND OTHER EQUIPMENT REQUIRED FOR PERFORMANCE OF WORK.
11. PROVIDE ALL NECESSARY EQUIPMENT, ANCILLARIES, LABOUR, WARRANTIES, CERTIFICATIONS AND LICENSES AS REQUIRED FOR A COMPLETE WORKING SYSTEM, REGARDLESS IF SPECIFICALLY LISTED.
12. RECORD THE ACTUAL INSTALLATION ON A SET OF CONSTRUCTION DRAWINGS AND RETURN TO THE OWNER UPON COMPLETION OF WORK.
13. PROVIDE THE OWNER WITH 12 MONTHS WRITTEN GUARANTEE OF MATERIALS AND WORKMANSHIP WITHIN THAT PERIOD, REPAIR AND REPLACE ALL DEFECTS AT NO ADDITIONAL COST TO THE OWNER.
14. DO NOT ALLOW CONSTRUCTION MATERIAL TO ACCUMULATE ON SITE. CLEAN UP AT THE END OF EACH DAY AND AT THE COMPLETION OF THE JOB.
15. THE CONTRACTOR IS TO REPAIR ANY DAMAGE TO THE EXISTING WALLS, CEILING, ROOF, OR FLOOR CAUSED BY THE WORK INVOLVED WITH THIS PROJECT AND FILL IN AND COVER IN KIND ANY HOLES THAT ARE LEFT FROM THE REMOVAL OF ANY WIRING, ELECTRICAL MATERIALS, OR ELECTRICAL EQUIPMENT.
16. ALL WALL PENETRATIONS WHERE CONDUIT OR CABLE PASS THROUGH FIRE WALLS AND PARTITIONS SHALL BE FIRE STOPPED. REFER TO SPECIFICATION SECTION 07 84 00.
17. WIRE SIZE TO BE AS INDICATED ON THE DRAWINGS, INCREASE WIRE SIZE FOR VOLTAGE DROP IF REQUIRED.
18. ELECTRICAL CONTRACTOR IS TO VISIT SITE PRIOR TO BIDDING TO FAMILIARIZE THEMSELVES WITH EXISTING CONDITIONS AS THEY EFFECT THE ELECTRICAL INSTALLATION. FAILURE TO DO SO WILL NOT RELIEVE THE CONTRACTOR OF RESPONSIBILITY TO PROVIDE A COMPLETE INSTALLATION. NO EXTRA MONEY CLAIMS WILL BE CONSIDERED FOR WORK RELATING TO THIS SECTION BECAUSE OF FAILURE TO THOROUGHLY EXAMINE THE SITE.
19. OBTAIN AND PAY FOR ALL FEES AND PERMITS AND C.S.A. APPROVALS REQUIRED BY ANY AUTHORITY HAVING JURISDICTION.
20. ALL MATERIAL SHALL BE NEW AND C.S.A. APPROVED UNLESS OTHERWISE NOTED. ALL MODIFICATIONS TO BE C.S.A. APPROVED AS REQUIRED.
21. ALL WORK IN THIS CONTRACT TO BE COORDINATED WITH OTHER DISCIPLINE DRAWINGS TO DETERMINE EXACT LOCATIONS OF EQUIPMENT, ETC. REPORT ANY DISCREPANCIES TO THE OWNER REPRESENTATIVE.
22. PROVIDE AN INSPECTION CERTIFICATE BY ELECTRICAL INSPECTION AUTHORITY ON COMPLETION OF WORK.
23. ALL CONDUITS AND CABLES TO BE SECURELY FASTENED WITH APPROVED MOUNTING HARDWARE. EXCEPT IN SERVICE ROOMS, ALL CONDUIT AND CABLING IS TO BE CONCEALED WITHIN WALLS OR ABOVE CEILING UNLESS OTHERWISE NOTED.
24. THE CONTRACTOR IS RESPONSIBLE FOR FOLLOWING THE OWNER'S SAFE LOCK OUT PROCEDURES WHEN ISOLATING POWER CIRCUITS. ALL WORK AND POWER INTERRUPTIONS ARE TO BE COORDINATED WITH THE OWNER.
25. THE CONTRACTOR IS TO SUPPLY ALL NECESSARY EQUIPMENT, FIELD DEVICES, AND MATERIALS FOR THE INDICATED WORK.
26. THE CONTRACTOR IS TO PROVIDE A NEW TYPED PANEL SCHEDULE TO REFLECT NEW CIRCUITS.
27. REFER TO DRAWING E-104 FOR MECHANICAL EQUIPMENT SCHEDULE, INCLUDING LOAD RATING, SOURCE PANEL, FEEDER SIZE, AND DISCONNECT REQUIREMENTS.

DEMOLITION KEY NOTES:

1 CONTRACTOR TO DEMOLISH EXISTING ELECTRICAL FEED TO MECHANICAL EQUIPMENT BACK TO SOURCE PANEL INCLUDING DISCONNECT SWITCH, WIRING, CONDUIT, AND RELATED SUPPORTS.CIRCUIT BREAKER TO REMAIN IN PANEL AS SPARE.

LEGEND :

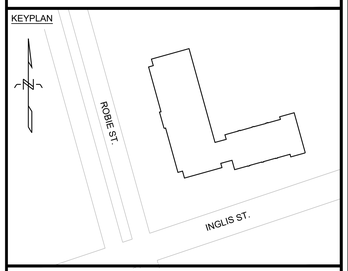
- EXISTING
- DEMOLITION
- NEW
- ELECTRICAL PANEL
- DIRECT POWER CONNECTION
- DISCONNECT SWITCH

EASTPOINT

CLIENT NAME / LOGO

Halifax Regional Centre for Education

KEYPLAN



PROFESSIONAL SEAL

REGISTERED PROFESSIONAL ENGINEER
2025-06-02
T. P. Baker
12198
PROVINCE OF NOVA SCOTIA

NO.	DATE	REVISION	APPR.
0	2025/06/02	ISSUED FOR TENDER	JRM

PROJECT TITLE

INGLIS ELEMENTARY
PIPE REPLACEMENT

HARRIETSFIELD, NOVA SCOTIA

DRAWING TITLE

ELECTRICAL
BOILER ROOM,
LEVEL 1, 2 & 3 PLANS
(DEMOLITION)

DRAWN	DESIGNED	CHECKED	PROJECT MGR
SMM	DEM	JMT	JRM

SCALE: AS NOTED

PROJECT NO. 382009

DWG. NO. E-101

2025/Jun/02, 5:08pm Sydney.Matheson I:\382 HRCE\382009 - Inglis Elementary - Heating System Upgrades\05 Drawings\382009_E-101_E-102.dwg

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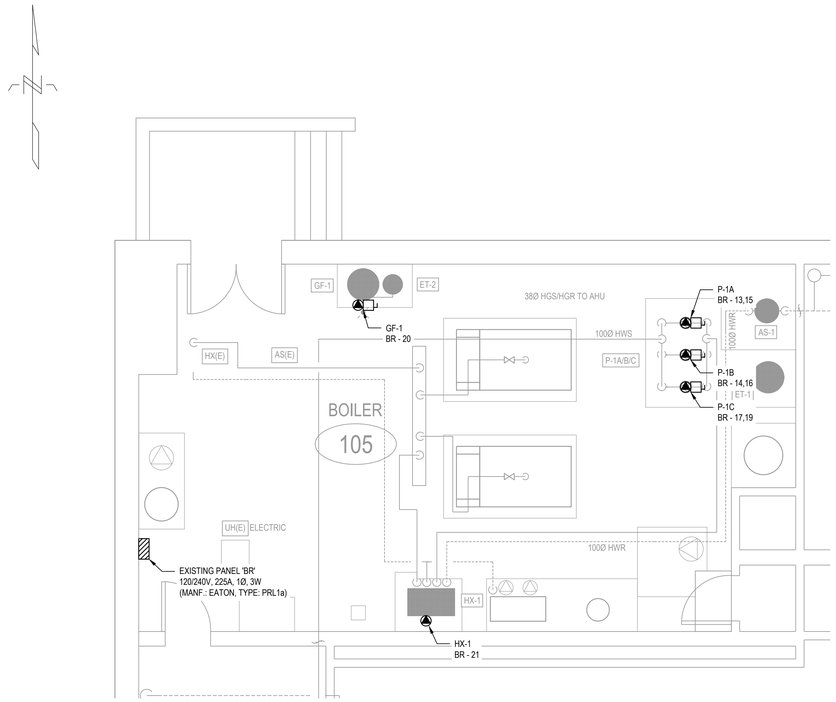
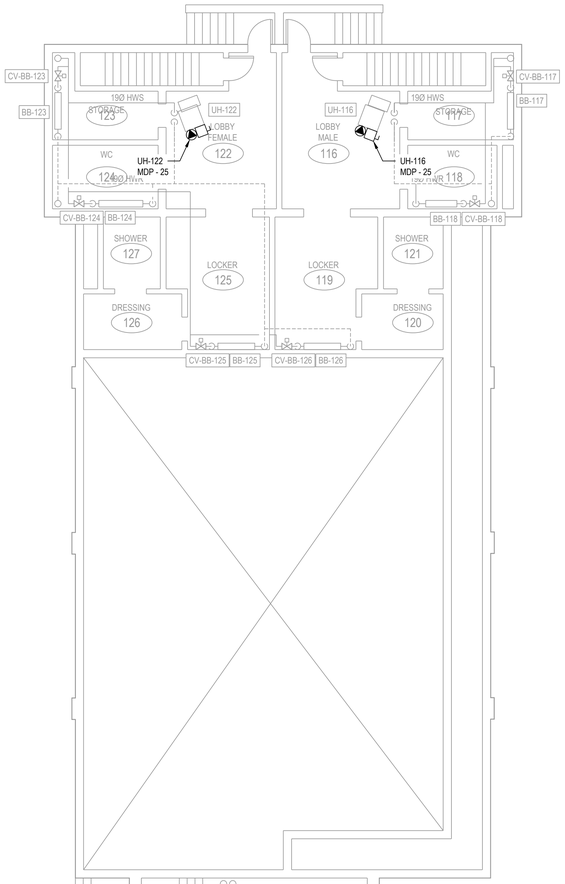
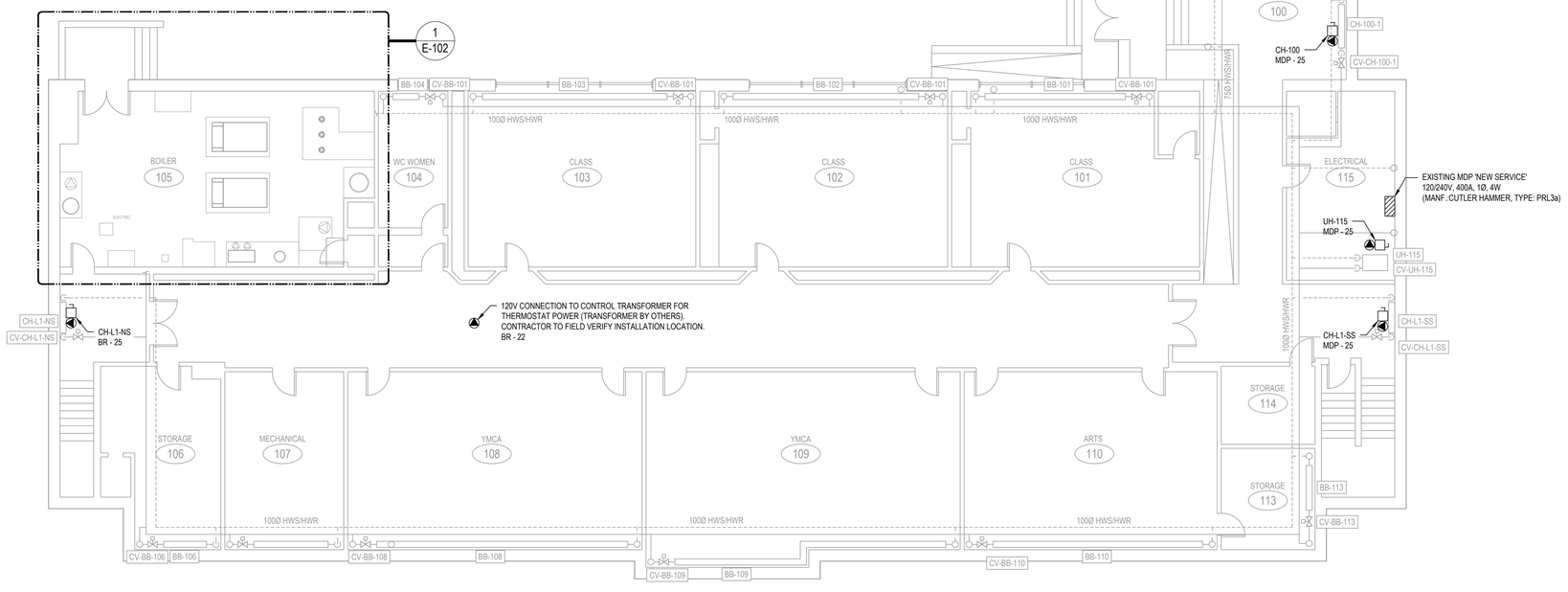


1 E-102 PLAN - BOILER ROOM (NEW CONSTRUCTION)

SCALE: N.T.S.

1:50





2 E-102 PLAN - LEVEL 1 (NEW CONSTRUCTION)

SCALE: 1:100

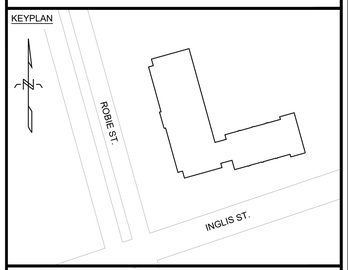
1:100

EASTPOINT

CLIENT NAME / LOGO

Halifax
Regional Centre for Education

KEYPLAN



PROFESSIONAL SEAL

NO.	DATE	REVISION	APPR.
0	2025/06/02	ISSUED FOR TENDER	JRM

PROJECT TITLE

INGLIS ELEMENTARY
PIPE REPLACEMENT

HARRIETSFIELD, NOVA SCOTIA

DRAWING TITLE

ELECTRICAL
BOILER ROOM
AND LEVEL 1 PLAN
(NEW CONSTRUCTION)

DRAWN	DESIGNED	CHECKED	PROJECT MGR
SMM	DEM	JMT	JRM

SCALE
AS NOTED

PROJECT NO.
382009

DWG. NO.
E-102

2025/Jun/02, 5:11pm Sydney.Matheson I:\382 HRCE\382009 - Inglis Elementary - Heating System Upgrades\05 Drawings\382009_E-101_E-102.dwg

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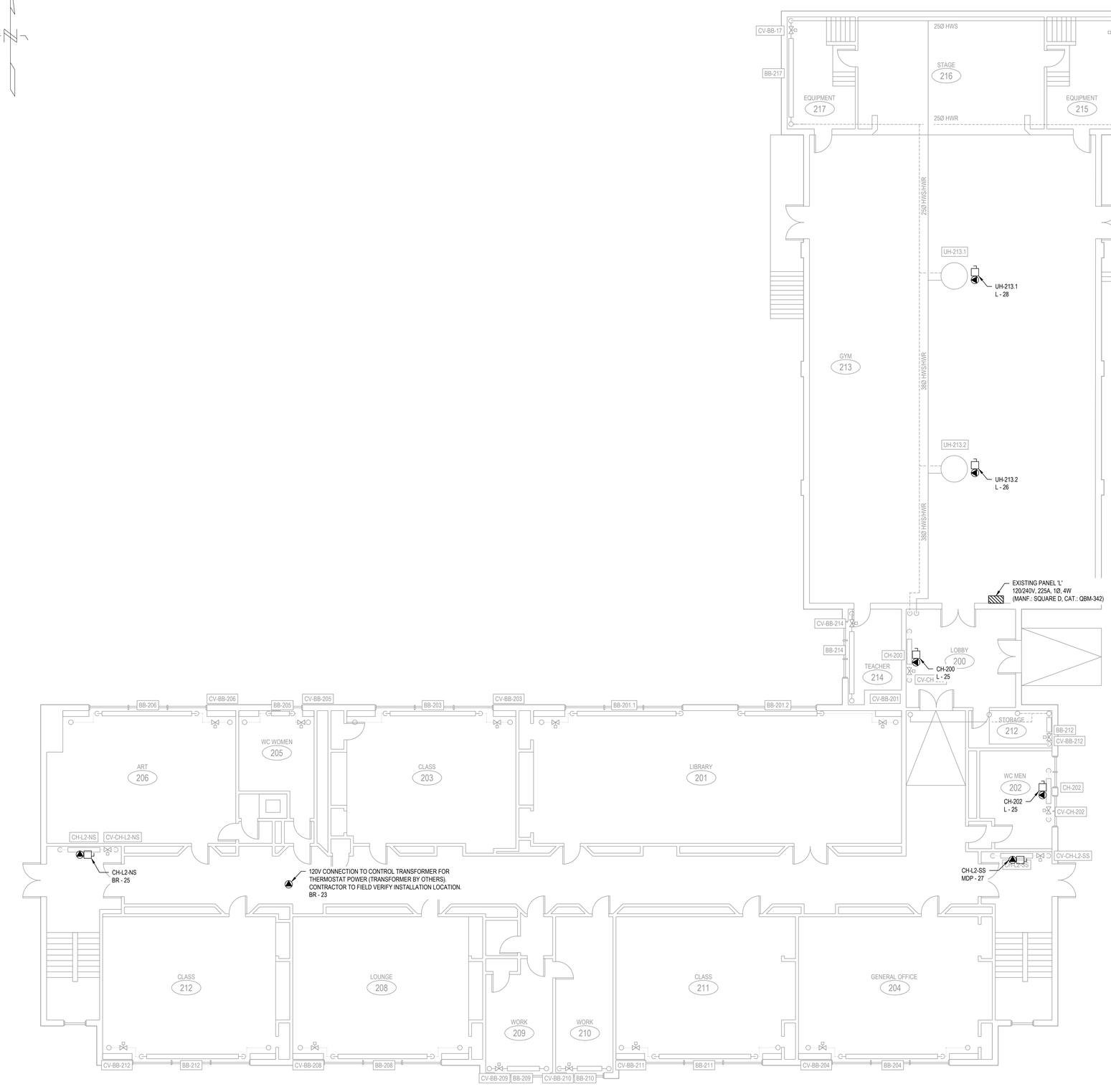


1 / E-103 PLAN - LEVEL 2 (NEW CONSTRUCTION)

SCALE: 1:100

1:100

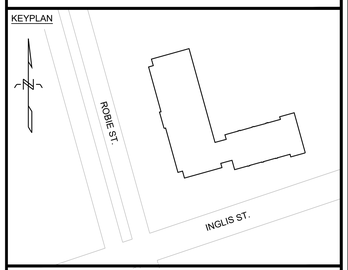
1000 0 1000 2000 3000 4000 5000 6000 7000 mm

EASTPOINT

CLIENT NAME / LOGO

Halifax
Regional Centre for Education

KEYPLAN



PROFESSIONAL SEAL

NO.	DATE	REVISION	APPR.
0	2025/06/02	ISSUED FOR TENDER	JRM

PROJECT TITLE

INGLIS ELEMENTARY
PIPE REPLACEMENT

HARRIETSFIELD, NOVA SCOTIA

DRAWING TITLE

ELECTRICAL
LEVEL 2 PLAN
(NEW CONSTRUCTION)

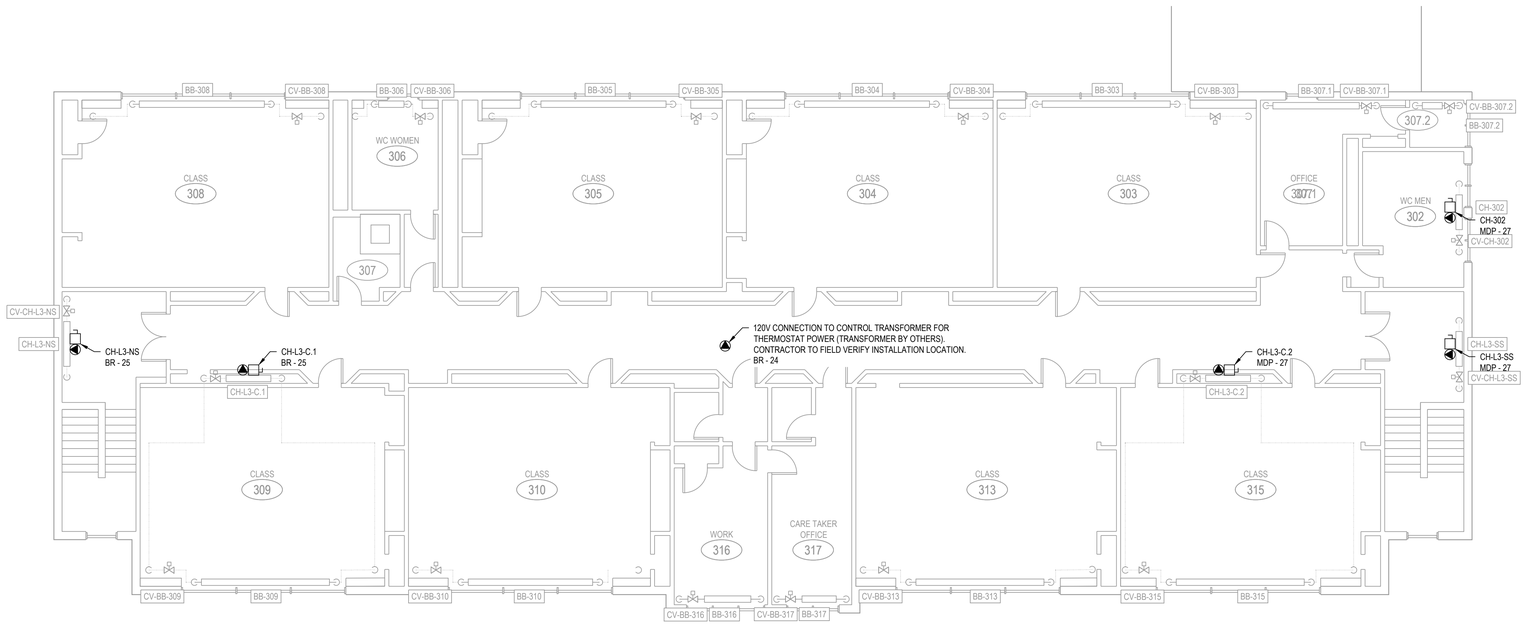
DRAWN	DESIGNED	CHECKED	PROJECT MGR
SMM	DEM	JMT	JRM

SCALE
AS NOTED

PROJECT NO. 382009

DWG. NO. E-103

2025/Jun/02, 5:13pm Sydney.Matheson I:\382 HRCE\382009 - Inglis Elementary - Heating System Upgrades\05 Drawings\382009_E-103.dwg



1 / E-104 PLAN - LEVEL 3 (NEW CONSTRUCTION)

SCALE: 1:100

1:100

1000 0 1000 2000 3000 4000 5000 6000 7000 mm

MECHANICAL EQUIPMENT CONNECTION SCHEDULE

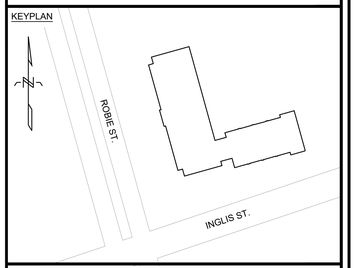
EQUIPMENT					RATING				DISCONNECT SWITCH					SOURCE INFO.			
ID	LOCATION	DESCRIPTION	SUPPLIED BY	WIRED BY	FULL LOAD RATING	F.L.A. / kW / HP	VOLTAGE	PHASE	LOCATION	SUPPLIED BY	WIRED BY	ENCLOSURE	SWITCH RATING	PANEL	CIRCUIT BREAKER	FEEDER	CONDUIT
P-1A	BOILER ROOM 105	INLINE PUMP	MECH	ELEC	2.0	HP	240	1	BOILER ROOM 105	ELEC	ELEC	NEMA 1	20A	PANEL BR	30A / 1P	2 - #12 AWG + #12 BND	21mm EMT
P-1B	BOILER ROOM 105	INLINE PUMP	MECH	ELEC	2.0	HP	240	1	BOILER ROOM 105	ELEC	ELEC	NEMA 1	20A	PANEL BR	30A / 1P	2 - #12 AWG + #12 BND	21mm EMT
P-1C	BOILER ROOM 105	INLINE PUMP	MECH	ELEC	2.0	HP	240	1	BOILER ROOM 105	ELEC	ELEC	NEMA 1	20A	PANEL BR	30A / 1P	2 - #12 AWG + #12 BND	21mm EMT
HX-1	BOILER ROOM 105	HEAT EXCHANGER CONTROLLER	MECH	ELEC	12.0	FLA	120	1	N/A	N/A	N/A	N/A	N/A	PANEL BR	15A / 1P	2 - #12 AWG + #12 BND	21mm EMT
GF-1	BOILER ROOM 105	GLYCOL FEEDER	MECH	ELEC	1/4	HP	120	1	BOILER ROOM 105	ELEC	ELEC	NEMA 1	15A	PANEL BR	15A / 1P	2 - #12 AWG + #12 BND	21mm EMT
CH-100-1	LOBBY 100	CABINET HEATER	MECH	ELEC	1/12	HP	120	1	LOBBY 100	ELEC	ELEC	NEMA 1	15A	MDP 'NEW SERVICE'	15A / 1P	2 - #12 AWG + #12 BND	21mm EMT
CH-L1-SS	STAIRWELL	CABINET HEATER	MECH	ELEC	1/20	HP	120	1	STAIRWELL	ELEC	ELEC	NEMA 1	15A	MDP 'NEW SERVICE'	15A / 1P	2 - #12 AWG + #12 BND	21mm EMT
CH-L1-NS	STAIRWELL	CABINET HEATER	MECH	ELEC	1/20	HP	120	1	STAIRWELL	ELEC	ELEC	NEMA 1	15A	PANEL BR	15A / 1P	2 - #12 AWG + #12 BND	21mm EMT
CH-L3-NS	STAIRWELL	CABINET HEATER	MECH	ELEC	1/20	HP	120	1	STAIRWELL	ELEC	ELEC	NEMA 1	15A	PANEL BR	15A / 1P	2 - #12 AWG + #12 BND	21mm EMT
CH-L3-SS	STAIRWELL	CABINET HEATER	MECH	ELEC	1/20	HP	120	1	STAIRWELL	ELEC	ELEC	NEMA 1	15A	MDP 'NEW SERVICE'	15A / 1P	2 - #12 AWG + #12 BND	21mm EMT
CH-302	WC MEN 302	CABINET HEATER	MECH	ELEC	1/20	HP	120	1	WC MEN 302	ELEC	ELEC	NEMA 1	15A	MDP 'NEW SERVICE'	15A / 1P	2 - #12 AWG + #12 BND	21mm EMT
CH-200	LOBBY 200	CABINET HEATER	MECH	ELEC	1/12	HP	120	1	LOBBY 200	ELEC	ELEC	NEMA 1	15A	PANEL L	15A / 1P	2 - #12 AWG + #12 BND	21mm EMT
CH-202	WC MEN 202	CABINET HEATER	MECH	ELEC	1/20	HP	120	1	WC MEN 202	ELEC	ELEC	NEMA 1	15A	PANEL L	15A / 1P	2 - #12 AWG + #12 BND	21mm EMT
CH-L3 C.1	LEVEL 2 CORRIDOR	CABINET HEATER	MECH	ELEC	1/12	HP	120	1	LEVEL 2 CORRIDOR	ELEC	ELEC	NEMA 1	15A	PANEL BR	15A / 1P	2 - #12 AWG + #12 BND	21mm EMT
CH-L3 C.2	LEVEL 2 CORRIDOR	CABINET HEATER	MECH	ELEC	1/12	HP	120	1	LEVEL 2 CORRIDOR	ELEC	ELEC	NEMA 1	15A	MDP 'NEW SERVICE'	15A / 1P	2 - #12 AWG + #12 BND	21mm EMT
CH-L2 NS	STAIRWELL	CABINET HEATER	MECH	ELEC	1/3	HP	120	1	STAIRWELL	ELEC	ELEC	NEMA 1	15A	PANEL BR	15A / 1P	2 - #12 AWG + #12 BND	21mm EMT
CH-L2 SS	STAIRWELL	CABINET HEATER	MECH	ELEC	1/3	HP	120	1	STAIRWELL	ELEC	ELEC	NEMA 1	15A	PANEL L	15A / 1P	2 - #12 AWG + #12 BND	21mm EMT
UH-115	ELECTRICAL ROOM 115	UNIT HEATER	MECH	ELEC	1/20	HP	120	1	ELECTRICAL ROOM 115	ELEC	ELEC	NEMA 1	15A	MDP 'NEW SERVICE'	15A / 1P	2 - #12 AWG + #12 BND	21mm EMT
UH-213.1	GYM 213	UNIT HEATER	MECH	ELEC	3/4	HP	120	1	GYM 213	ELEC	ELEC	NEMA 1	20A	PANEL L	30A / 1P	2 - #12 AWG + #12 BND	21mm EMT
UH-213.2	GYM 213	UNIT HEATER	MECH	ELEC	3/4	HP	120	1	GYM 213	ELEC	ELEC	NEMA 1	20A	PANEL L	30A / 1P	2 - #12 AWG + #12 BND	21mm EMT
UH-116	LOBBY 116	UNIT HEATER	MECH	ELEC	1/20	HP	120	1	LOBBY 116	ELEC	ELEC	NEMA 1	15A	MDP 'NEW SERVICE'	15A / 1P	2 - #12 AWG + #12 BND	21mm EMT
UH-122	LOBBY 122	UNIT HEATER	MECH	ELEC	1/20	HP	120	1	LOBBY 122	ELEC	ELEC	NEMA 1	15A	MDP 'NEW SERVICE'	15A / 1P	2 - #12 AWG + #12 BND	21mm EMT

EASTPOINT

CLIENT NAME / LOGO

Halifax Regional Centre for Education

KEYPLAN



PROFESSIONAL SEAL

NO.	DATE	REVISION	APPR.
0	2025/06/02	ISSUED FOR TENDER	JRM

PROJECT TITLE

INGLIS ELEMENTARY
PIPE REPLACEMENT

HARRIETSFIELD, NOVA SCOTIA

DRAWING TITLE

ELECTRICAL
LEVEL 3 PLAN
(NEW CONSTRUCTION)

DRAWN	DESIGNED	CHECKED	PROJECT MGR
SMM	DEM	JMT	JRM

SCALE: AS NOTED

PROJECT NO. 382009

DWG. NO. E-104

Halifax Regional Centre for Education

Hot Work Policy

2018-19 School Year

Rev. 1

Hot Work Permit Follows This Document

Introduction

Hot work comes in a variety of applications each with its own heat source severity. All hot work is a fire hazard that left unmanaged will create high probability conditions for injury and/or property loss. Under the right conditions, hot work heat sources with the lowest temperature ratings can ignite products that seem most difficult to burn.

A hot work management system is required to reduce the risk of hot work causing personal injury and fire or other property damage. The following information is intended to establish the programs and processes designed to manage this risk.

Definition

Hot work is ***any temporary or permanent operation involving open flames or producing heat and/or sparks***. This includes but is not limited to: brazing, cutting, grinding, soldering, torch applied roofing and welding. The definition of hot work can be applied to activities within a facility such as periodic/planned maintenance activities, new construction work and emergency repairs.

Hot work may only be conducted on HRCE premises if authorized by designated Operations Services personnel and only after the following conditions are verified:

1. No other suitable non-hot work means can be found to produce the desired result;
2. No other safe location can be found to do the hot work; and
3. The designated/trained person(s) involved with authorizing and conducting the hot work have complied with all hot work permitting process requirements, including all precautions and required follow-up actions

All employees assigned to perform hot work on HRCE premises will receive the necessary education to be able to accept responsibility for safe, loss-free hot work operations.

Hot Work Management Process

Hot Work Management contains three components:

1. Avoid Hot Work where possible;
2. Prohibit Hot Work where it can not be conducted safely;
3. Conduct Hot Work in areas containing hazards by:
    - relocating the hot work
    - manage hot work by using the hot work permit system described below.

1) Avoid hot work when possible. Consider all alternative methods to hot work. Some alternative methods include:

- Mechanical removal and relocation of frozen piping to a heated area vs. thawing of piping in place with any form of hot work.
- Manual hydraulic shears vs. saw/torch cutting.
- Mechanical bolting vs. welding.
- Screwed or flanged pipe vs. sweat soldering.
- Reciprocating saw vs. radial saw.
- A roof covering system that does not require a hot work process.

2) Prohibit hot work in areas where hot work cannot be conducted safely under any conditions or where extensive preparation and planning are required to make the area and/or equipment involved fire safe. When these conditions exist, the area and/or equipment involved will be designated as a "No Hot Work Area". Examples of a "No Hot Work Area" include:

- Areas/equipment that contain/handle flammable liquids, flammable gases, combustible dusts, combustible metals and explosives
- Partitions, walls, ceilings or roofs with combustible plastic covering or cores (i.e., expanded plastic insulation, sandwich panels)
- Rubber lined equipment.
- Oxygen enriched atmosphere.
- Storage and handling of oxidizer materials.

Within HRCE schools and worksites, "No Hot Work Areas" include:

- Chemical storage rooms (unless and until all chemicals have been removed from the room);
- Cleaning products storage rooms (unless and until all chemicals have been removed from the room);
- Partitions, walls, ceilings or roofs with combustible plastic covering or cores;

3) When hot work must be conducted in areas or on equipment containing hazardous processes as described above, follow the specific precautions outlined below.

Hot work conducted outside of a designated, fixed hot work station will be managed using a **formal hot work permit system**. Within HRCE, hot work is defined as either **"minor hot work"** or **"major hot work"**, each of which requires a different level of permit and mitigation methods.

Minor Hot Work is defined as hot work which has a low risk of causing injury, fire or property damage because of the method of hot work, tools and equipment used and the materials in or near the hot work area. Designated workers can issue their own permit for conduct of minor hot work.

The hazard assessment on the hot work permit will be used to determine if the work is minor hot work. In most cases, the worker is his/her own "fire watch". The fire watch is maintained until the material being worked on is cool to the touch at which time an inspection of the work area and adjacent areas is conducted by the worker. While not normally required, the worker may re-inspect the work area or have another employee re-inspect the work area after a period of time if they feel a re-inspection is warranted.

Major Hot Work is defined as hot work where there is a moderate to high risk of injury, fire or property damage because of the method of hot work, tools and equipment used and the materials in or near the hot work area. Workers must be issued a hot work permit by their immediate Supervisor in order to complete major hot work.

The hazard assessment on the hot work permit will be used to determine if the work is major hot work. During major hot work, a fire watch will be posted to give continuous surveillance of the work area. Also, a continuous fire watch will be conducted for the length of time noted on the permit after the work is complete. A re-inspection will occur by the worker or another designated employee at the time indicated on the permit.

Hot Work Permit Process

The following is a step-by-step description of the Hot Work Permit process:

- The worker assigned the task of conducting hot work must complete the hazard assessment which forms the first part of the hot work permit.
- The worker determines if the work is "minor hot work" or "major hot work". If it is minor hot work, they issue a permit to complete the work. If it is "major hot work", they will request their immediate Supervisor issue the permit.
- The hot work permit is posted in a visible place within the work area. HRCE employees and supervisors in the area are informed about the hot work activity and the need to support the implemented precautions for this hazardous operation.
- While the hot work proceeds, the fire watch maintains a constant vigil (even during employees breaks and meal times) to maintain the hot work area in a fire-safe condition, keeps watch for any stray sparks, smoldering fires, or other fire hazards, and is ready to provide the initial fire response.
- **Once the work is completed, the fire watch remains in the area for the designated period, as noted: For minor hot work, until material is cool to the touch and area inspected; For major hot work the fire watch remains in place as indicated on the permit. The fire watch must then conduct an inspection, carefully inspecting the work and the adjacent**

areas for smoldering fires. This inspection extends to floors above and below the work and adjacent rooms.

- When work is completed the permit is removed and must be retained as a record of the work.

Fire Watch for "Major Hot Work"

The fire watch should be assigned and initiated when the hot work permit is issued, and this function should be maintained throughout the hot work operation including break/lunch and for the period noted on the permit, continuously following the completion of hot work. A fire watch should be posted and maintained in the immediate area of the hot work and in any adjacent areas that may be exposed by this operation.

The fire watch has responsibility to make sure the hot work area is maintained in a fire-safe condition throughout this work and has the authority to stop the hot work if unsafe conditions are observed. This person must understand the basic hazards of any combustible construction involved with the hot work area, the fire exposure hazard hot work creates to occupancies adjacent to and below the hot work operation, the hazards associated with the occupancy, and the need to maintain proper isolation of all hot work operations from combustible or flammable materials. The fire watch also must be properly trained in use of manual, portable fire extinguishers and emergency notification procedures within the school/worksite.

Second Fire Watches

For any hot work operations on a building roof or adjacent to building walls where a combustible occupancy exists within the structure or the building has any combustible construction, a second fire watch should be posted in the exposed adjacent areas.

For roof level hot work, a second fire watch should be posted on the floor immediately below for roof hot work. Where suspended ceilings are present between the building occupancy and the underside of the structural roof, this space should be inspected periodically during the hot work operation.

Hot work conducted on any building floors and walls or adjacent to building walls with unprotected openings where a combustible occupancy or construction exists on the opposite side, should include assignment of a second fire watch on the opposite side of the wall. This same approach should apply when hot work is conducted on pipe/building shafts, HVAC ductwork, etc.

Fire Prevention Measures

Based on the Hot Work Permit System, implement hot work fire prevention precautions as follows for **minor hot work**:

- Maintain automatic sprinkler protection and other fixed fire protection systems in service and fully operational.
- Provide manual firefighting equipment appropriate for the construction/occupancy hazards in the hot work area.
- Maintain hot work equipment in good repair.
- Separate hot work operations from combustibles using fire resistive blankets or screens to properly isolate the hot work from the adjacent combustible materials.
- The following fire safety precautions listed on the Hot Work Permit apply to the surface area within 35 ft (11 m) of the hot work. The major purpose is to isolate fuels from sparks. Within this area:
    a) Sweep floors clean, removing any spilled grease or oil
    b) Remove any flammable materials (wood, cardboard, etc) or liquids (paints, oils and lacquers) from the hot work area.
    c) Protect combustibles that cannot be moved with fire resistive tarpaulins or metal shields
- Hot work is prohibited on partitions, walls, ceilings or roofs with combustible plastic coverings or cores (i.e., expanded plastic insulation, sandwich panels).
- Schedule hot work during shutdown periods if possible.

Based on the Hot Work Permit System, implement hot work fire prevention precautions as follows for **major hot work**:

- Maintain automatic sprinkler protection and other fixed fire protection systems in service and fully operational.
- Provide manual firefighting equipment appropriate for the construction/occupancy hazards in the hot work area.
- Maintain hot work equipment in good repair.
- Separate hot work operations from combustibles by a minimum of 35 ft (11 m) of open space from grade level hot work areas. An alternative is to use proper fire resistive welding blankets and screens to properly isolate the hot work from the adjacent combustible occupancies.
- The following fire safety precautions listed on the Hot Work Permit apply to the surface area within 35 ft (11 m) of the hot work. The major purpose is to isolate fuels from sparks. Within this area:
    a) Sweep floors clean, removing any spilled grease or oil. Cover floors made of combustible material (i.e., boards on joist, plank on steel, wood block) with fire-resistant tarpaulins or other noncombustible material.
    b) Remove any flammable liquids (paints, oils and lacquers) from the hot work area.

c) Protect combustibles that cannot be moved with fire resistive tarpaulins or metal shields. This includes all storage or machinery with grease or lint deposits. Hot work blankets used to cover combustible materials or construction that cannot be relocated from the hot work area should always be “tented”.
d) Cover all wall and floor openings. Plug floor openings with an approved fire stop material. Seal ductwork and duct openings with metal covers or cover them with fire-resistive tarpaulins. Close all doors and fire doors to prevent sparks from escaping.

- Either eliminate explosive atmospheres (dust or vapor) or prohibit the hot work. Shut down any process that produces explosive atmospheres, and continuously monitor the area for accumulation of combustible gases before, during and after hot work. Prohibit hot work where accumulations of volatiles or combustibles are severe and cannot be eliminated.
- Prohibit hot work on partitions, walls, ceilings or roofs with combustible plastic coverings or cores (i.e., expanded plastic insulation, sandwich panels).
- Schedule hot work during shutdown periods if possible.
- Secure, isolate and vent pressurized vessels, piping and equipment as needed prior to initiating hot work. Clean combustible and/or flammable liquids, gases and solids whenever present within the equipment, prior to initiating hot work.
- For hot work on vessels or boilers, use only contractors who are qualified by a nationally or internationally recognized boiler and pressure vessel code.
- Assign a designated fire watch to the hot work operation before this work is started. Maintain a continuous fire watch during the hot work activity, throughout all break and lunch periods, and for at least one hour following the completion of the hot work. Beyond this, monitor the area for up to an additional 3 hours, depending on local conditions.
- Avoid hot work of any kind in areas handling, **processing or storing flammable liquids or gases**. Hot work provides an ignition source in an area where fuel is available in significant quantities and in a readily ignitable form. Ideally, relocated any hot work operation within a flammable liquid or gas occupancy to a non-hazardous location. When relocation is not possible, the following additional precautions should be implemented:
  a) Drain all equipment or piping in the area of flammable and combustible liquids.
  b) Steam clean equipment or pipe to be worked on or provide with an inert atmosphere, to prevent creation of a flammable atmosphere.
  c) Shut off pipe supplying the area with flammable and combustible liquids off at the source (valve should be locked shut to prevent unexpected opening). If the piping is to be worked on, blank if off.

d) Check equipment or piping with a portable oxygen analyzer before and during the hot work. This is to ensure that sufficient oxygen to support combustion is not present inside the equipment or piping.
e) Protect all permanent storage tanks or piping (that cannot be moved or drained) against physical contact and heat from hot work equipment. Preferably all equipment that is within reach of the hot work equipment (grinder, welding rod holder, cutting torch, etc.) will be drained, purged and made inert. If this is not possible due to the quantities of flammable liquids involved, provide physical protection for closed flammable liquid equipment by placing welding curtains and temporary barriers between the equipment and the hot work. Carefully review the area to ensure that no vents or other opening are near the hot work that could allow fumes to come into contact with any sparks or hot surfaces.
f) Keep mechanical exhaust ventilation in the room/building in operation.
g) Use a portable combustible gas analyzer before and during the work. If any detectable readings are obtained, then work cannot begin or continue until the source is found and suitably mitigated such that the concentration is maintained below 10% of the LFL.

Alternative to the 35 ft (11 m) Rule

An alternative to the 35 ft (11 m) rule is to physically isolate the hot work operation from adjacent combustible occupancies or construction using properly fire rated hot work shields and/or blankets. “Boxing” the hot work operation can be accomplished through vertically suspending hot work shields or blankets around the hot work extended at least 15 ft (4.6 m) above the highest elevation of the hot work or to the bottom of a solid/smooth ceiling/roof and extending to floor.

When “boxing” is used in buildings with structural members that create an open space between the top of the member and the floor or roof above, this space should be sealed to prevent liberation of sparks/spatter/slag through the open space. The lower elevation of the “boxing” materials should overlap onto the floor at least 6 in. (152 mm) and this layer should be constructed of a noncombustible, fire resistive hot work blanket material. The process of “boxing” the hot work hazard requires a proper understanding of the limitations of the hot work shields or blankets being used.

Hot work shields or screens should be used only as vertical barriers for hot work operations. Where these shields or screens are required to extend onto the floor in the hot work area, the bottom 2 ft (0.6 m) of the screen should be constructed of noncombustible hot work blanket material. ***Hot work shields or screens are typically constructed of translucent plastic materials that are combustible and will fail under extended exposure to severe hot work in positions other than a vertical position.***

Where severe hot work (torch cutting, arc stick welding) will be conducted and the area beneath this activity needs to be protected against the hot work, hot work pads should be provided.

Elevated Hot Work

For elevated hot work, combustible materials should be either relocated a minimum of 50 ft (15.2 m) from the hot work area; or properly protected with fire retardant welding blankets; or the hot work operation isolated with welding screens. Suspend fire-resistive welding blankets under hot work conducted near the ceiling. Place noncombustible screens around hot work at the floor to trap sparks. Every elevated hot work operation needs to be evaluated on a case-by-case basis to determine a reasonable safe distance from hot work to combustible occupancies or construction. The physical conditions involved may dictate relocation of combustibles beyond 50 ft (15.2 m).

Outside Contractors

Many hot work operations are performed by outside contractors; these include cutting, welding, joint soldering, paint removal, roofing, etc. When outside contractors are involved, the risk of fire may increase simply because contractors may not understand the hazards at the school/worksite.

Contractors working for HRCE, and conducting hot work, must have their own Hot Work Permit/Management System that provides equal or greater risk mitigation than those methods and procedures mention herein.

Contractors must inform HRCE when hot work will be conducted at any of our schools/worksites.

HOT WORK PERMIT

STOP!
Avoid hot work when possible! Consider using an alternative cold work method.

This Hot Work Permit is required for any temporary operation involving open flames or producing heat and/or sparks conducted outside a Hot Work Designated Area. This includes, but is not limited to: brazing, cutting, grinding, soldering, torch-applied roofing and welding.

Instructions for Permit Authorizer

1. Specify the precautions to take.
2. Fill out and keep **Part 1** during the hot work process.
3. Issue **Part 2** to the person doing the job.
4. Keep **Part 2** on file for future reference, including signed confirmation that the post-work fire watch and monitoring have been completed.
5. Sign off the final check on **Part 2**.

HOT WORK BY
☐ Employee
☐ Contractor _____

DATE	JOB NUMBER

LOCATION OF WORK (BUILDING/FLOOR/OBJECT)

WORK TO BE PERFORMED

NAME OF PERSON PERFORMING HOT WORK

NAME OF PERSON PERFORMING FIRE WATCH

I verify the above location has been examined, the Required Precautions have been taken, and permission is authorized for this work.

PERMIT AUTHORIZER (PRINT AND SIGN)

THIS PERMIT EXPIRES ON (LIMIT AUTHORIZATION TO ONE SHIFT):

DATE: TIME: AM/PM

Note: Emergency notification on back of form.

Additional FM Global Resources:
Property Loss Prevention Data Sheet 10-3, *Hot Work Management*
Hot Work Permit App via fmglobal.com/apps
Hot Work Permit form (F2630) via fmglobalcatalog.com
Online training at training.fmglobal.com
FM Approved equipment via fmapprovals.com

FM Global

Part 1

Required Precautions

Y	NA	
☐	☐	The fire pump is in operation and switched to automatic.
☐	☐	Control valves to water supply for sprinkler system are open.
☐		Extinguishers are in service/operable.
☐		**Hot work equipment is in good working condition.**

Requirements within 35 ft. (10 m) of hot work

☐	☐	Shield combustible construction using listed (e.g., FM Approved) welding pads, blankets and curtains.
☐	☐	Remove or shield nonremovable combustibles using listed (e.g., FM Approved) welding pads, blankets and curtains.
☐	☐	Isolate potential sources of flammable gas, ignitable liquid or combustible dust/lint (e.g., shut down equipment).
☐	☐	Remove ignitable liquid, combustible dust/lint and combustible residues.
☐	☐	Shut down ventilation and conveying systems.
☐	☐	Remove combustibles and consider a second fire watch on opposite side of floor, wall, ceiling or roof when openings exist or thermally conductive materials pass through.
☐	☐	Is work on a combustible building assembly (e.g., Torch-Applied Roofing)? If yes, provide **ADDITIONAL REQUIRED PRECAUTIONS** below.

Hot work on/in closed equipment, ductwork or piping

☐	☐	Isolate equipment from service.
☐	☐	Remove ignitable liquid and purge flammable gas/vapor.
☐	☐	Prior to work, and/or during work, monitor for flammable gas/vapor. LEL reading(s): _____
☐	☐	Remove combustible dust/lint or other combustible materials.
☐	☐	Is work on/in equipment with nonremovable combustible linings or parts? If yes, provide **ADDITIONAL REQUIRED PRECAUTIONS** below.

Fire watch/fire monitoring the hot work area
Times listed are sufficient for majority. Use Table at back of permit for guidance for combustible concealed cavities, roof work or favorable factors.

☐		Perform a continuous fire watch during hot work.
☐		Perform a continuous fire watch post-work for
	☐	1 hour or Other ___ hours.
☐	☐	Perform fire monitoring for
	☐	3 hours or Other ___ hours.

ADDITIONAL REQUIRED PRECAUTIONS:

Halifax

Regional Centre for Education

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