Halifax
Regional Centre for Education

RFT #4240

Boiler Replacement
Bicentennial School

RFT Closing Date: Wed - May 29, 2024
RFT Closing Time: 2:00pm ATL

Ready-for-Takeover Date: August 27, 2024

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

Operations Contact:
Gary Mannette, Project Manager
Cell: (902) 497-8542
Email: gmannette@hrce.ca

School Location:
Bicentennial School
85 Victoria Road
Dartmouth, NS B3A 1T9

Mandatory Site Meeting for Bidders:
Thur – May 23 at 4pm
Bicentennial School
Please meet at School Entrance

RFT submissions will be accepted only by email at: hrcetenders@hrce.ca

To obtain documents, please register and 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 the pandemic.

The Terms and Conditions of the RFT 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 RFT prior to submitting a Proposal/Bid.

Division 24 AIR DISTRIBUTION

Division 25 INTEGRATED AUTOMATION

DRAWING LIST

ARCHITECTURAL

MECHANICAL

ELECTRICAL

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 **Boiler Replacement** at **Bicentennial School**, to remove the existing materials and equipment in areas as noted on the drawings and specifications prepared by **FBM Architecture.**

1.2 It is the intent of the Halifax Regional Centre for Education (HRCE) to have all work completed, to the point of Ready-for-Takeover, prior to **August 27, 2024**. 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.

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 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.

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

2.0 List of Drawings

ARCHITECTURAL

MECHANICAL

ELECTRICAL

END OF SECTION 00 00 15

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:

FBM Architecture
5560 Cunard Street,
Halifax, NS B3K 1C4

Greg Washer
Office: (902) 429-4100 ext117
washer@fbm.ca

END OF SECTION 00 05 00

SECTION 00 21 13 – INFORMATION FOR PROPONENTS

Invitation:

1. Bid Call

1.1. The Halifax Regional Centre for Education (HRCE) will receive offers in the form of a bid from proponents which is signed and electronically received on or before the date and time specified on the cover sheet of this document. The HRCE deems the correct time to be the time indicated on the email received date and time. 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. Bids received after the closing time/date will not be considered.

1.3. Proponents are to submit completed Request for Tender (RFT) documents by email.

The electronic file should be named:

"**Boiler Replacement_4230_Proponent Name**"

1.4. Bids will be opened at the time indicated on the cover sheet of this document. Effective April 1, 2014 public openings are no longer held for any Tenders or RFTs relating to goods, services or construction for the HRCE. All bid 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.

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 Tender (RFT) is to obtain an offer to perform all work associated with ***RFT #4230, Boiler Replacement*** at ***Bicentennial School*** 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 RFT document.

2.4. Ready-for-Takeover of the project is to be achieved on or before **August 27, 2024**, provided the contract is awarded within ten (10) business days after the RFT closing.

2.4.1. In the event that the contract is not awarded within ten (10) 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 officially 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 Division 01 requirements.

4. Availability

4.1. RFT documents can be obtained as per the directions on the cover sheet of this document.

4.2. RFT 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 Halifax Regional Centre for Education is not responsible for accuracy of documents and project postings obtained from any other source.

5. Examination

5.1. Bid documents are on display at the offices of the Construction Association of Nova Scotia (CANS), Halifax, NS.

5.2. Upon receipt of bid documents, proponents should verify that documents are complete. Proponents should notify the HRCE Procurement by email at dwalpola@hrce.ca, should the documents be incomplete, or upon finding discrepancies or omissions in the bid documents.

5.3. Bidders shall become fully aware of the content of all tender documents for the preparation of the Bidder's 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 RFT Closing regarding any questions, omissions, errors or ambiguities found in contract documents. If HRCE considers that correction, explanation or interpretation is necessary, a reply will be produced in the form of an addendum, a copy of which will be posted on the novascotia.ca/tenders and/or the HRCE website as applicable. It is the responsibility of the Bidder to ensure all addenda are received and acknowledged.

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

6.3. Verbal answers to queries are not binding. 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 Halifax Regional Centre for Education.

6.4. Proponents are to complete Tender Form (section 00 41 13) acknowledging that addenda have been received.

6.5. Where HRCE publishes an Addendum or Addenda modifying the terms of the RFT/RFP documents, or changing the Project or Contract Documents in any manner, HRCE shall not be liable for an 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 or Addenda, regardless of whether the publication occurs prior to or after a Supplier has submitted an RFT/RFP submission.

6.6. Any Addendum and all Addenda issued by HRCE shall be become part of the Contract Documents, unless specifically excluded from the Contract Documents in writing published by HRCE, and 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 bid documents stipulate a particular product, alternatives may be considered by the Consultant up to five (5) working days before the RFT closing date and time. Bidders must forward their written requests by email to 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 bid by HRCE. HRCE recommends that interested bidders ensure that their proposed subcontractors are in attendance at 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 RFT 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. Bid Submission

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

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

12. Conditions of the Request for Tender (RFT) Process

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

13. Amendment or Withdrawal of Bids

13.1. Bid packages may be **withdrawn** from the RFT 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 RFT closing time and if endorsed by the same party or parties who signed and executed the offer. If the amendment relates to the price, it must be labeled "Price Amendment" along with the RFT 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. Bid Ineligibility (Reason for Rejection)

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

14.1.1. The bid is not submitted on the required forms (Section 00 41 13) included herein.

14.1.2. The bid is submitted by facsimile or regular mail or hand delivery.

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

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

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

14.1.6. All addenda have not been acknowledged.

14.1.7. Any other defect which, in the opinion of the HRCE brings the meaning of the bid into question.

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

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

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 facsimile or mail delivery or hand delivery are not acceptable and will be rejected.

16. Right to Accept or Reject any Tender

16.1. The HRCE reserves the right to reject any bid 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 bids 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 bids.

16.3. Without limiting the generality of any other provision herein, the HRCE reserves the right to accept or reject any bid in accordance with item #14 above (Bid 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 bid received by the HRCE. The HRCE reserves the right to reject any or all bids, or to accept any bid, or portion thereof, deemed in its best interest.

16.5. In the event that more than one proponent submit bids in an identical amount, 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 RFT/RFT implies no obligation on HRCE to accept any submission, or a portion of any submission. The lowest or any RFT/RFT submission will not necessarily be accepted.

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

17.2.1. the RFT/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 RFT/RFT has been issued;

17.2.3. information has been received by HRCE after issuance of the RFT/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 RFT/RFT submission is received in response to an RFT/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 RFT/RFT on new or modified RFT/RFT Documents.

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

19. Submission and Security Forms – Signatures

19.1. All bid 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 can be submitted with the bid via email. If requested by the HRCE, the vendor should be in agreement to 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 should be in agreement 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 RFT 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 Nova Scotia Construction Safety Association or approved recognized association or program.

23.2. Bid Signing

23.2.1. The bid 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. Bids shall remain open to acceptance and shall be irrevocable for a period of ninety (90) days after the RFT closing date.

24.2. Award/Selection/Acceptance of Offer

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

24.2.1.1. Compliance with bid requirements

24.2.1.2. Bid Price Submitted

24.2.1.3. All requirements stated in the tender package

24.2.2. The Owner's evaluation of any and all bids 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 Division 01 requirements);

26.1.1.4. A detailed Schedule of Work

26.1.1.5. A completed Safety Plan; and,

26.1.1.6. 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, as of April 1, 1997 and thereafter, is to pay all Harmonized Sales Tax (HST).

27.2. 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. Purchase Orders

28.1. The official purchase order will not be issued by the HRCE Purchasing Department until the CCDC-2 Contract Documents have been fully executed.

29. Invoices

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

29.2. Applications for progress payments should be submitted to HRCE's consultant and cc'd to **operations-invoices@hrce.ca** and HRCE's Project Manager.

END OF SECTION 00 21 13

SECTION 00 41 13 – TENDER FORM

1. Salutation:

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

For: **#4230 Boiler Replacement – Bicentennial 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 RFT.

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: All work for HRCE is to be completed during hours when schools are unoccupied, unless otherwise indicated in writing by the Operations Manager 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 bid 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 bids; 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 bid 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 00 73 00 of the RFT 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

#4230 Boiler Replacement – Bicentennial School

_____ /100 Dollars ($_____)

(HST Excluded)

Award will be subject to Budget Availability.

****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**

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.

WHERE THERE IS A CONFLICT, WRITTEN WORD WILL GOVERN.

7. Completion Time:

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

7.1.1.1. **August 27, 2024**

7.1.1.2. The undersigned Proponent agrees, if awarded the Contract, to achieve the Ready-for-Takeover Date providing the contract is awarded within ten (10) business days of RFT close.

8. Addenda Acknowledgement

We have received and noted the following addenda:

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

9. Supporting Information

9.1. References: (Minimum of three)

Tenderer to furnish particulars of at least three (3) similar contracts successfully completed or currently being carried to completion. The projects quoted should preferably be approximate in nature to the work now tendered for and be of comparable or greater size. References are to be submitted with the bid prior to closing date and time.

Contact Name & Phone #	Date	Contract Value
_____	From _____ to _____	$ _____
_____	From _____ to _____	$ _____
_____	From _____ to _____	$_____
_____	From _____ to _____	$_____

9.2. Bid submission to include a minimum of two letters of endorsement from clients commenting upon the contractor's ability to deliver quality projects, similar in scope and size, which met schedule and budget.

10. Proof Of Competency Of Tenderer

10.1. Any tenderer 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.

10.1.1. The Tenderer acknowledges, as part of their bid submission, their responsibility and contract obligations to ensure that the proposed sub-contractors will fully perform the project requirements and meet the timings as detailed in this tender call.

10.2. Sub-Contractors: The Tenderer to provide the name and address of each major sub-contractor used in making up this tender. This list of sub-contractors is to be submitted with the bid prior to closing date and time. Only one sub-contractor shall be named for each part of the work to be sublet.

Subcontractor/Suppliers/Manufacturers	**Service/Material**
Site Works	
Electrical	
Mechanical	
Roof	

10.2.1. Project Personnel: The Tenderer to include below, the names, qualifications and previous experience of those people who will be directly involved with the project. The names shall, for example, include foremen, superintendent, project engineer and/or project manager, labourers and trade staff. This list of personnel is to be submitted with the bid prior to closing date and time.

Name	**Position**	**Qualifications/Experience**

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.

RFT #4230 Boiler Replacement – Bicentennial School

SIGNATURE:

SIGNED AND DELIVERED
in the presence of:

_____
Witness

CONTRACTOR

_____
Company name

_____
Signature of Signing Officer

_____
Name and Title (printed)

_____
Date

RFT #4230 Boiler Replacement – Bicentennial School

11. 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
#4230 Boiler Replacement
Bicentennial School

Note: to be completed and forwarded for each Price amendment prior to RFT closing time and date as detailed on the cover sheet of the RFT 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 RFT 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 3.9 as follows:

10 GC 3.9 CONTRACTOR RESPONSIBILITY FOR WATER TIGHTNESS

GC 3.9 The Drawings and Specifications are not intended to depict each and every condition or detail of construction. As the knowledgeable party in the field, the contractor is in the best position to verify that all construction is completed in a manner which will provide a watertight structure. The contractor has the sole responsibility for ensuring the watertight integrity of the structure.

Add new GC 3.10 as follows:

11 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.

12 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.

13 GC 5.1 FINANCING INFORMATION REQUIRED OF THE OWNER

Delete section GC 5.1 in its entirety.

14 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

15 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."

16 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.

17 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.

18 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.

19 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.

20 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.

21 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.

22 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.

23 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.

24 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.

25 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,

26 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.

27 GC 9.5 MOULD

Add in subparagraph 9.5.3.4:

9.5.3.4 “and the Consultant” after “Contractor”

28 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.

29 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”

30 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.

31 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).

32 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.

33 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. Bicentennial School, 85 Victoria Road, Dartmouth NS, B3A 1T9

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.

8.4. Removal of insulation on roof drains inside the building 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 Division 01 requirements.

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. Any area of roof having work completed is to be covered below with this fencing approximately 10' from the edge of the building. It is to be maintained at all times throughout the project. 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 entrances below the roof area are to have covered scaffolding erected to ensure a safe travel path to a distance of ten feet from edge of building. 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) the Architect 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: Division 01 requirements

2.2. Submittals: Division 01 requirements

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 Division 01 requirements.

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 Division 01 requirements, 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 Division 01 requirements.

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 Division 01 requirements.

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. Bid 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 he directs, 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 Division 01 requirements.

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 specified for submission under the following:

Section 03 20 00 Concrete Reinforcement
Section 05 12 23 Structural Steel
Section 05 31 00 Steel Deck
Section 05 50 00 Metal Fabrications
Section 06 10 11 Rough Carpentry
Section 06 40 00 Architectural Woodwork
Section 07 41 43 Aluminum Composite Panels
Section 07 46 13 Preformed Metal Siding
Section 07 55 00 Modified Bitumen Roofing System & Flashing
Section 07 84 00 Fire Stopping and Smoke Seals
Section 08 11 14 Steel Doors & Frames
Section 08 11 16 Aluminum Doors & Frames
Section 08 14 10 Wood Doors
Section 08 50 50 Aluminum Windows
Section 08 62 11 Vinyl Windows
Section 08 71 10 Door Hardware
Section 09 22 16 Non-Load Bearing Wall Framing
Section 09 30 13 Ceramic Tile
Section 10 11 13 Communication Boards
Section 10 11 23 Tackboards
Section 10 14 53 Traffic Signs
Section 10 28 10 Toilet & Bath Accessories
Section 10 50 00 Miscellaneous Specialties
Section 11 40 11 Food Services Catalogued & Custom Equipment
Section 12 21 13 Horizontal Blinds

Section 12 21 16 Roller Shades
Section 14 42 13 Wheelchair Platform Lift

All pre-manufactured Mechanical & Electrical items as noted in Mechanical & Electrical Divisions.

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. Samples are specified for submission under the following Sections:

Section 07 41 43 Aluminum Composite Panels
Section 07 46 13 Preformed Metal Siding
Section 08 14 10 Wood Doors
Section 08 50 50 Aluminum Windows
Section 09 30 13 Ceramic Tile
Section 09 51 13 Acoustical Ceiling Units
Section 09 65 19 Resilient Tile Flooring
Section 12 21 13 Horizontal Blinds
Section 12 21 16 Roller Shades
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 the Architect to location he designates.

8.3. Extra stock is specified to be supplied in the following Sections:

Section 09 30 13 Ceramic Tile
Section 09 51 13 Acoustical Ceiling Units
Section 09 65 19 Resilient Tile Flooring
Section 09 91 23 Painting
Refer to Mechanical & Electrical Divisions for Extra Stock requirements in those Trades.

9. Maintenance Manual & Operating Instructions

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

9.2. 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.

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

9.4. The Manuals shall:

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

9.4.2. 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.

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

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

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

9.4.6. Contain maintenance instructions as specified in various Sections.

9.4.7. Contain brochures and parts lists on all equipment.

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

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

9.4.10. Contain finished hardware schedule.

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

10. Extended Warranties

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

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

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

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

10.5. Submit extended warranties for:

Section 06 40 00 Architectural Woodwork – extended 4 years
Section 07 41 43 Aluminum Composite Panels – extended 10 years (panel finish)
Section 07 55 00 Modified Bitumen Roofing System & Flashing:

- 2 year CRCA materials and workmanship against leaks and blow off
- 10 year material warranty the membrane will perform as a roofing material
- 1 year CRCA warranty against defects of materials and workmanship for the sheet metal work.

Section 07 92 10 Joint Sealants – extended 5 years
Section 08 11 16 Aluminum Doors & Frames – extended 4 years
Section 08 14 10 Wood Doors – extended 4 years
Section 08 50 50 Aluminum Windows – extended 4 years
Section 08 62 11 Vinyl Windows – extended 5 years
Section 08 71 10 Door Hardware – various, refer to that Section
Section 09 30 13 Ceramic Tile – extended 4 years
Section 09 51 13 Acoustical Ceiling Units – extended 4 years
Section 09 65 19 Resilient Tile Flooring – extended 4 years
Section 10 11 13 Communication Boards – extended 24 years
Section 10 11 23 Tackboards – extended 9 years
Section 12 21 13 Horizontal Blinds – extended 5 years
Section 12 21 16 Rollers Shades – extended 5 years
Section 14 42 13 Platform Lift – extended 5 years
Refer to Mechanical & Electrical Divisions for extended Warranty requirements in those trades.

11. Inspection Laboratory Reports

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

11.2. Submit reports in accordance with requirements specified in Division 01 requirements.

12. Documentation On Suppliers & Manufacturers

12.1. 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.

6.7. Materials used in the construction and or maintenance activities are to be stored in dry areas. The introduction of materials to the activities with moisture levels above the acceptable (XXX%)CNBC states for wood, on dry weight basis, a max of 19%, I can't find info on drywall but assume it is much lower range is prohibited as these materials are highly susceptible to colonization by mould spores.

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 clothes
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 Y2 hour 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 work place.

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 ***#4230 - Boiler Replacement – Bicentennial School***

Architect .....

Contractor .....

Date .....

Halifax Regional Centre for Education – Schedule of Values		
Contract Item	**Percentage**	**Dollar Value**
Mobilization, bonding / insurance, safety , set up and schedule	10	
Boiler and heating system decommissioned	30	
New boiler and system installed	30	
Commissioning and balancing	20	
Close out documentation including copy of warranty	10	
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: Division 01 requirements.

2. Related Sections

2.1. Division 01 requirements for Submittal Procedures: Submission of samples to confirm product quality.

2.2. Division 01 requirements for Material & Equipment: Material and workmanship quality – reference standards.

2.3. Division 01 requirements for 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.

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 Division 01 requirements.

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 Division 01 requirements, 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.

8. Workmanship

8.1. 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:

- Please ensure that the submission instructions are followed carefully as noted in Section 00 21 13 – Information to Proponents to ensure your bid is compliant.
- Required Bid Security – (10% of the Contract price before HST) –
- Please include a copy of your bid security in with your Tender Form.
- Insurance Certificate
- Please submit your bid to HRCE's tender submission email address: hrcetenders@hrce.ca
- Please ensure your bid submission is ***received*** by the HRCE before 2pm ATL. The email received date and time determines bid eligibility.
- 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 RFT 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.
- Contract Security documentation – if required
- Complete Insurance Certificate – As identified in the RFT.
- Schedule of Values
- Detailed Schedule of Work
- 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.

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 07 01 50.71 - Roofing Repairs.

.2 Section 09 64 00 - Engineered Wood Flooring

1.2 REFERENCES

.1 ASTM International (ASTM)

.1 ASTM A153/A153M-16a, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

.2 ASTM A307-21, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.

.3 ASTM A653/A653M-22, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealled) by the Hot-Dip Process.

.4 ASTM B117-19, Standard Practice for Operating Salt Spray (Fog) Apparatus.

.5 ASTM C578-22, Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

.6 ASTM C954-22, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.

.7 ASTM C1289-22a, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.

.8 ASTM D1761-20, Standard Test Methods for Mechanical Fasteners in Wood.

.9 ASTM D5055-19e1, Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.

.10 ASTM D5456-21e1, Standard Specification for Evaluation of Structural Composite Lumber Products.

.11 ASTM E1333-22, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber.

.12 ASTM F1482-21, Standard Practice for Installation and Preparation of Panel Type Underlayments to Receive Resilient Flooring.

.13 ASTM F1667/F1667M-21a, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

.2 American Wood Preservers Association (AWPA):

.1 AWPA Book of Standards, 2022.

.2 AWPA M2 Standard for the Care of Preservative-Treated Wood Products

.3 ASME International:

.1 ASME B18.2.1-2012 (R2021), Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series), Includes Errata (2013).

.2 ASME B18.6.1-1981 (R2016), Wood Screws (Inch Series).

.4 California Air Resources Board (CARB):

.1 Airborne Toxic Control Measure to Reduce Formaldehyde Emissions from Composite Wood Products (2007).

.5 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-11.3-M87, Hardboard. (Withdrawn)

.2 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type. (Withdrawn)

.3 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction. (Withdrawn)

.4 CAN-CGSB 71.26-M88, Adhesive for Field-Gluing Plywood to Lumber Framing for Floor Systems. (Withdrawn)

.6 Canadian Standards Association (CSA International):

.1 CSA A123.2-03 (R2018), Asphalt-Coated Roofing Sheets, Includes Update No. 1 (2006)

.2 CAN/CSA-A247-M86 (R1996), Insulating Fiberboard.

.3 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.

.4 CSA-G164-18, Hot Dip Galvanizing of Irregularly Shaped Articles, Includes Update No 1 (2020).

.5 CAN/CSA O80 Series:21 – Wood Preservation, Includes Administrative Update (2022) and Errata (2022).

.6 CSA O112 Series-M1977 (R2006), CSA Standards for Wood Adhesives (Withdrawn).

.7 CSA O121-17 (R2022), Douglas Fir Plywood.

.8 CSA O122-16 (R2021), Structural Glued-Laminated Timber.

.9 CSA O141-05 (R2019), Softwood Lumber.

.10 CSA O151-17 (R2022), Canadian Softwood Plywood.

.11 CSA O153:19, Poplar Plywood.

.12 CSA-O325:21, Construction Sheathing (Adopted NIST PS 2-18, with Canadian deviations). Includes Administrative Update (2021).

.13 CSA O437 Series-93(R2011), Standards on OSB and Waferboard (Withdrawn).

.14 CSA T530-99, Commercial Building Standard for Telecommunications Pathways and Spaces. (Adopted ANSI/TIA/EIA-569-A)

.7 National Lumber Grades Authority (NLGA):

.1 NLGA SPS 2-2019, Special Products Standards on Machine Graded Lumber.

.2 Standard Grading Rules for Canadian Lumber 2017.

.8 South Coast Air Quality Management District (SCAQMD), California State. (SCAQMD)

.1 SCAQMD Rule 1113-16, Architectural Coatings.

.2 SCAQMD Rule 1168-22, Adhesive and Sealant Applications.

.9 Sustainable Forestry Initiative (SFI) & Forest Implementation

.10 Underwriters' Laboratories of Canada (ULC)

.1 ULC 102.2-18, Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies. (ULC S102.2)

.2 ULC-701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering (CAN/ULC-S701-11). (Withdrawn)

.3 ULC-770-15, Standard Test Method for Determination of Long-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams (CAN/ULC-S770-15).

1.3 ACTION SUBMITTALS / INFORMATIONAL SUBMITTALS

.1 Submittals shall meet the requirements of Division 01.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and data sheets.

.2 Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.

.3 Samples:

.1 Submit 100 mm x 300 mm samples of cedar to receive finish, to the Consultant for review.

.4 Material Certificates:

.1 For dimensional lumber specified to comply with minimum allowable unit stresses, indicate species, grade, and design values for each use.

.2 For exposed items, omit grade stamp and provide certificates as to species, grade, stress grade, seasoning, moisture content, and other evidence as required to show compliance with the specifications.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Deliver wood products bundled or crated to provide adequate protection during transit. Inspect wood products for damage upon delivery and remove and replace damaged materials.

.2 Store materials a minimum of 150 mm off the ground on blocking. Keep materials under cover and dry. Provide for air circulation within and around stacks and under temporary coverings.

.3 Protect sheet materials to prevent breaking of corners and damage to surfaces.

Part 2 Products

2.1 LUMBER

.1 Lumber: to CSA-O141, softwood, S-P-F, S4S, graded and stamped in accordance with National Lumber Grading Association (NLGA) Standard Grading Rules for Canadian Lumber and as follows:

.1 Moisture Content: maximum 8% at time of installation.

.2 Maximum moisture content when used for attachment of drywall: 8%.

.3 Grade: No. 2 or better.

.4 Meeting requirements of the NBC.

2.2 PANEL MATERIALS

.1 Fire Rated Plywood Panels: to CSA O325, Class A fire retardant produced under Performance Standard PS-1, certified by the American Plywood Association.

.1 Standard of Acceptance:

.1 Purekor Fire Retardant Plywood.

.2 Exterior applications: exterior-grade Douglas fir sheathing, Grade B-B; exposure durability rating shall be 'EXTERIOR', and the glue used shall be a fully waterproof structural adhesive.

.3 Interior sheathing shall be ULC labelled fire resistant, provide grade stamp or certification as noted for fire retardant pressure treated lumber.

.4 Plywood Flooring:

.1 Locations: under gymnasium stage to provide a consistent level surface for equipment trolleys.

.2 High-Density Overlaid (HDO) Plywood, to CSA O325, 3-ply.

.3 Thickness: as required to provide a smooth, flush, level transition to adjacent new hardwood sports flooring.

.5 Pressure Preservative Treated Plywood:

.1 Plywood Grade: exterior grade sheathing.

.2 Treatment: In accordance with CAN/CSA O80 Series.

.3 Product: amine copper quat (ACQ) or copper Azole (CA).

.4 Retention:

.1 Above ground application: minimum of 4.0 kg/m3.

.2 Ground Contact Application: minimum of 6.4 kg/m3

.5 Water-borne preservative treated wood shall have maximum moisture content of 19% after treatment.

2.3 MISCELLANEOUS LUMBER

.1 Provide lumber for support or attachment of other construction.

.2 Select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work for blocking and nailers.

.3 Fabricate miscellaneous lumber from dimension lumber of sizes indicated, and into shapes shown on drawings.

.4 Moisture Content: 19% maximum for lumber items not specified to receive wood preservative treatment.

.5 Grade: for dimension lumber sizes provide No. 2 or Standard grade lumber per NLGA. For board-sized lumber, provide sheathing grade, S2S.

.6 Kiln dry lumber materials to 8% moisture content or less.

2.4 WOOD PRESERVATIVE

.1 Where lumber or plywood is indicated as preservative treated or is specified to be treated, treated in accordance with CAN/CSA O80.9M and AWPA.

.2 Wood preservatives containing arsenic or chromium are not permitted.

.3 Pressure treat above ground items with waterborne preservatives to minimum retention of 4.0 kg/m^3. After treatment, kiln-dry lumber and plywood to maximum moisture content of 19% and 15% respectively. Treat indicated items and the following:

.1 Wood cants, nailing strips, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapour barriers, and waterproofing.

.2 Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry and concrete.

.3 Wood framing members less than 460 mm above grade.

.4 Wood floor plates installed over concrete slabs directly in contact with earth.

.4 Pressure treat wood members in contact with ground or freshwater with waterborne preservatives to minimum of 6.4kg/m^3

.5 Fire-Retardant Treatment: to CAN/SCA O80.9M, CAN/CSA O80.20M and CAN/CSA O80.27M, pressure impregnated, and as follows:

.1 Flame Spread Classification: FSC 25 maximum.

.2 Smoke developed of not more than: 75.

.6 Complete fabrication of treated items before treatment where possible. If cut after treatment apply field treatment to cut surfaces.

.7 Wood Preservatives: Maximum allowable VOC limit 350 g/L in accordance with SCAQMD Rule #1113 - Architectural Coatings.

2.5 FASTENERS

.1 Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture. Where rough carpentry is exposed to weather (during or after construction), in ground contact, pressure preservative treated, or in area of high relative humidity, provide fasteners with hot dip zinc coating complying with ASTM A153 or of Type 304 stainless steel.

.2 Nails, Spikes, and Staples: ASTM F1667.

.3 Power Driven Fasteners: Fasteners with a CCMC or ICC-ES evaluation report acceptable to authorities having jurisdiction.

.4 Through Bolts and Anchor Bolts: ASTM A307, Grade A; with ASTM A563 hex nuts and where indicated flat washers, hot dip galvanized to ASTM A153.

.5 Wood Screws: ASME B18.6.1 or as specified on Drawings.

.6 Lag Screws: ASME B18.2.1

.1 All lag screws to be machined threaded, not cast threaded.

.2 Pre-drilled hole sized in wood members for lag screws to be in accordance with CSA O86.

.3 Lag screws are acceptable only where specifically indicated on the Drawings. Do not substitute lag screws for self-tapping wood screws.

2.6 FASTENER FINISHES

.1 Galvanizing: to CSA G164, use hot dipped galvanized fasteners for exterior work, interior highly humid areas, and pressure-preservative and fire-retardant treated lumber.

2.7 ACCESSORIES

.1 Provide all accessories as required for a complete installation.

.2 Sealants: in accordance with Section 07 92 00 – Joint Sealants.

.3 Subflooring adhesive: to CGSB-71.26, cartridge loaded.

.4 General purpose adhesive: to CSA O112 Series.

.5 Nails, spikes and staples: to CSA B111, hot dipped galvanized for exterior work and pressure preservative and fire retardant treated materials.

.6 Rough Hardware (bolts, nuts, washers, etc.): Hot dip galvanized in conformity to CSA G164 or Grade A low carbon steel, conforming to ASTM A307.

Part 3 Execution

3.1 INSTALLATION

.1 Comply with requirements of NBC supplemented by following paragraphs.

.2 Install members true to line, levels and elevations, square and plumb.

.3 Construct continuous members from pieces of longest practical length.

.4 Do not splice structural members between supports unless noted otherwise.

.5 Install spanning members with "crown-edge" up.

.6 Install panel materials so that grade-marks and other defacing marks are concealed.

.7 Install plywood flooring under stage with wood screws

.8 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.

.9 Install wood cants, fascia backing, nailers, curbs and other wood supports as required and secure using hot dipped galvanized steel fasteners.

.10 Install sleepers as indicated.

.11 Use dust collectors and high quality respirator masks when cutting or sanding wood panels.

.12 Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

.13 Comply with AWPA M4 and revisions specified in CSA O80 Series, supplementary requirements to AWPA M2 for applying field treatment to cut surfaces of preservative-treated lumber.

3.2 POWER, TELECOMMUNICATIONS [AND DATA] PANEL BOARDS

.1 Install 19 mm fire rated fir plywood boards on all walls in telephone and data rooms receiving wiring and equipment; minimum 1220 mm x 2440 mm panels on periphery walls over 300 mm wide, mounted 150 mm off of finished floor.

.2 Paint panels with two coats of light coloured fire retardant intumescent paint finish; coat all sides of panels (back, front and sides) to meet the intent of fire rated panel requirements listed in CSA T530 and ANSI/TIA/EIA 569-A requirements.

3.3 ERECTION

.1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.

.2 Countersink bolts where necessary to provide clearance for other work.

.3 Use nailing disks for soft sheathing as recommended by sheathing manufacturer.

3.4 SCHEDULE

.1 Install as indicated, and as required.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 This Section includes firestopping and smoke seal systems for penetrations through fire resistance rated assemblies, including both empty openings and openings containing penetrating items.

.2 Coordinate with electrical and mechanical Subcontractors as required to determine number, sizes, and types of penetrations to be addressed under this specification section.

.3 This Section includes fire resistive joint systems.

.4 This specification section provides requirements for Rated Systems or systems requiring Engineered Judgements:

.1 Use of materials that have not been tested in a system or that are not capable of obtaining an engineered judgement will not be acceptable for use on this Project.

.2 Materials having only a ULC label will not be acceptable for use on this Project, unless supporting documentation is provided indicating its use in a listed assembly.

1.2 RELATED REQUIREMENTS

.1 Section 09 21 16 – Gypsum Board Assemblies.

.2 Section 09 22 00 – Non-Structural Metal Framing.

.3 Refer to Drawings for scope of work for:

.1 Expansion Control System.

.2 Gypsum Board Assemblies.

.4 Other Sections as indicated.

1.3 REFERENCES

.1 ASTM International (ASTM)

.1 ASTM A653/A653M-17, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 ASTM A1008/A1008M-18, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.

.3 ASTM E119-18b, Standard Test Methods for Fire Tests of Building Construction and Materials.

.4 ASTM E1966-15, Standard Test Method for Fire-Resistive Joint Systems.

.5 ASTM E2174-18, Standard Practice for On-Site Inspection of Installed Fire Stops.

.6 ASTM E2307-15be1, Standard Test Method for Determining Fire Resistance of Perimeter Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus

.7 ASTM E2393-10a(2015), 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 (MOP).

.2 FM 4991, Standard for the Approval of Firestop Contractors, 2013.

.3 International Firestop Council (IFC)

.1 Recommended IFC Guidelines for Evaluating Firestop Systems in Engineering Judgments (EJs).

.4 International Code Council (ICC) / International Building Code (IBC)

.1 2012 IBC, Chapter 7.

.5 National Fire Protection Agency (NFPA)

.1 NFPA (Fire) 251, Standard Methods of Tests of Fire Endurance of Building Construction and Materials, 2006 Edition.

.6 ULC Standards

.1 ULC Guide No. 40 U19, Firestop Systems; ULC Category Code Number XHEZC.

.2 CAN/ULC S101-14, Standard Methods of Fire Endurance Tests of Building Construction and Materials.

.3 CAN/ULC S102-18, Standard Method of Tests for Surface Burning Characteristics of Building Materials and Assemblies.

.4 CAN/ULC S114 (2018), Standard Method of Test for Determination of Non-Combustibility in Building Materials.

.5 CAN/ULC S115 (2018), Standard Method of Fire Tests of Fire stop Systems.

.6 CAN/ULC S702.1:2014-AMD1), Standard for Mineral Fibre Thermal Insulation for Buildings, Part 1: Material Specification.

.7 CAN/ULC S702.2-15, Mineral Fibre Thermal Insulation for Buildings, Part 2: Application Guidelines.

.7 Underwriters Laboratories Inc. (UL)

.1 UL 1479, Standard for Fire Test of Through-Penetration Firestops, 2015.

1.4 REGULATORY REQUIREMENTS

.1 Work of this Section shall meet or exceed the requirements of the National Building Code of Canada as amended (NBCC).

1.5 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section, with contractor's representative and to:

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Coordination with other building trades.

.4 Review manufacturer's installation instructions, and warranty requirements.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Division 01 requirements.

.2 Not later than 30 working days following Award of Contract, submit schedule and shop drawings, including room numbers from the Contract Drawings. Indicate ULC assembly number for each condition, required temperature rise and flame rating, hose stream rating, thickness, installation methods and materials of firestopping and smoke seals, damming materials, reinforcements, anchorages and fastenings, size of opening, adjacent materials, and number of penetrations. Include manufacturer’s printed instructions for each type of penetration.

.3 Where possible determine thickness to be applied from tests of assemblies identical to the assembly to be protected, conducted in accordance with CAN/ULC S101.

.4 Engineering Judgements: where a UL / ULC / c-UL Design (assembly number) has not been issued, obtain an engineering judgement from system manufacturer for a solution relevant to job conditions involved, and obtain approval of Authorities Having Jurisdiction.

.1 Determine system from available engineering studies, or correspondence with the labelling agency indicating effect of differences on fire separation of assembly. Confirm acceptance of system by Authorities Having Jurisdiction in writing.

.2 Obtain and submit firestop system manufacturer's engineering judgement(s) meeting requirements of Authorities Having Jurisdiction.

.3 Engineering judgements shall comply with "Recommended IFC Guidelines for Evaluating Firestop Systems in Engineering Judgments (EJs)."

.5 Submit product data:

.1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finishes, and limitations.

.6 Quality assurance submittals: submit following in accordance with Division 01 requirements.

.1 Obtain training letter from firestop system manufacturer, and submit to Consultant prior to firestop installation.

.2 Submit copies of engineering judgments approved by local authorities having jurisdiction to Consultant prior to installation.

.3 The firestopping system manufacturer shall submit a letter of certification to the Contractor, certifying that firestopping has been installed in compliance with approved ULC design specifications for each type of penetration. Forward one copy to Consultant and include one copy in each maintenance manual.

.1 The 'Certificate of Substantial Performance' shall not be issued until Consultant has received manufacturer's letter of certification from the Contractor indicating that fire-stopping applications comply with tested assemblies of the manufacturer.

.4 Submit manufacturer's engineering judgment identification number(s) and Shop Drawing details when no ULC or cUL system is available for an application. Engineering judgments must include Contract name and number, and Contractor's name.

.5 For those firestop applications that exist, for which no ULC or cUL tested system is available through a manufacturer, a manufacturer's engineering judgment derived from similar ULC or cUL system designs or other tests shall be submitted to local Authorities Having Jurisdiction, with a copy to Consultant, for review prior to installation. Engineering judgment Drawings must follow requirements set forth by IFC.

1.7 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer:

.1 Company or person specializing in firestopping installations, and approved by the manufacturer with minimum 5-years' documented experience.

.2 Company or person shall be member in good standing of Firestop Contractors International Association (FCIA).

.2 Use materials and methods of determining required thickness of application that have full acceptance of Authority Having Jurisdiction.

.3 Use materials tested to CAN/ULC S115. Assemblies containing materials shall be in accordance with assemblies tested and approved by agencies acceptable to Authority Having Jurisdiction.

.4 Single Source Responsibility:

.1 Obtain through-penetration firestop and joint systems for each kind of penetration and construction condition From a single source of manufacture and installation responsibility.

.2 To the extent possible, firestop and smoke seal products shall be supplied by a single manufacturer and installed by a qualified FCIA installer for entire Contract (the Work).

.5 The manufacturer's direct technical representative (not distributor or agent) shall be on-site during the initial installation of the firestop systems to provide training to the installer’s personnel in the proper product selection and installation procedures.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling, and unloading:

.1 Deliver, store and handle materials in accordance with Division 01 requirements.

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

.3 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer, and ULC markings.

.2 Storage and Protection:

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

.2 Replace defective or damaged materials with new.

.3 Use stock before its expiration date.

1.9 PROJECT CONDITIONS

.1 Install firestopping and smoke seals materials only when areas in which they are scheduled are closed-in and protected from dampness.

.2 Environmental Limitations: Install firestopping and smoke seals systems when ambient or substrate temperatures are within temperature and moisture limits permitted by firestopping and smoke seals system manufacturers or when substrates are not wet due to rain, frost, condensation, or other causes.

.3 Ventilate firestopping and smoke seals systems in accordance with manufacturer's written instructions by natural means or forced air circulation where natural means are not adequate.

Part 2 Products

2.1 MANUFACTURERS

.1 Subject to compliance with requirements specified in this Section and as established by the Standard of Acceptance Materials, manufacturers offering products that may be incorporated into the Work include; but are not limited to, the following:

.1 3M Canada Inc.

.2 A/D Fire Protection Systems Inc.

.3 Firestop Systems Inc.

.4 Hilti Canada Ltd.

.5 Nuco Self Seal Firestopping Products.

.6 Owens Corning.

.7 Specified Technologies Inc.

.8 Tremco Ltd.

2.2 PERFORMANCE AND DESIGN CRITERIA

.1 Delegated Design Requirements: Design firestopping and smoke seals required by the Contract Documents to meet fire ratings indicated, and in accordance with requirements of NBCC and amendments.

.2 Performance Requirements: Manufacturer shall design proprietary assemblies to withstand listed ratings in accordance with NBCC, Underwriters Laboratories of Canada, and authorities having jurisdiction, and as follows:

.1 Provide through-penetration firestop 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 assembly penetrated:

.1 Fire resistance rated load bearing walls, including partitions, with fire protection rated openings.

.2 Fire resistance rated non-load bearing walls, including partitions, with fire protection rated openings.

.3 Fire resistance rated floor assemblies.

.2 F-Rated Systems: Provide through penetration firestop systems with F-ratings indicated, as determined by CAN/ULC S115, but not less than that equalling or exceeding fire resistance rating of constructions penetrated.

.3 T-Rated Systems: For the following conditions, provide through penetration firestop systems with T-ratings indicated, as well as F-ratings, as determined per by CAN/ULC S115, where systems protect penetrating items exposed to potential contact with adjacent materials:

.1 Penetrations located outside wall cavities.

.2 Penetrations located outside fire resistive shaft enclosures.

.3 Penetrations located in construction containing fire protection rated openings.

.4 Penetrating items larger than 100 mm diameter nominal pipe or 100 cm^2 in overall cross-sectional area.

.4 Firestopping and Smoke seals Systems Exposed to View: Systems exposed to view, traffic, moisture, and physical damage; provide products that after curing do not deteriorate when exposed to these conditions both during and after construction, and as follows:

.1 Provide moisture resistant through penetration firestop systems for piping penetrations for plumbing and wet pipe sprinkler systems.

.2 Provide firestopping and smoke seals systems capable of supporting floor loads involved 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 firestopping and smoke seals 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 firestopping and smoke seals and joint systems exposed to view.

.5 Fire Resistance of Joint Systems: Assembly ratings and movement capabilities indicated, but with assembly ratings not less than that equalling or exceeding fire resistance rating of constructions in which joints are located.

2.3 FIRESTOPPING AND SMOKE SEALS: GENERAL

.1 Compatibility: Provide firestopping and smoke seals systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating firestopping and smoke seals systems, under conditions of service and application, as demonstrated by firestopping and smoke seals system manufacturer based on testing and field experience, and as follows:

.1 Service penetration assemblies: certified by ULC in accordance with CAN/ULC S115 and listed in ULC Guide No. 40 U19.

.2 Service penetration firestopping and smoke seals components: certified by ULC in accordance with CAN/ULC S115 and listed in ULC Guide No. 40 U19.13, under the Label Service of ULC.

.3 Fire resistance rating of installed firestopping and smoke seals assembly not less than fire resistance rating of surrounding floor and wall assembly.

.4 Firestopping and Smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal; do not use cementitious or rigid seal at such locations.

.5 Firestopping and Smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal; do not use cementitious or rigid seal at such locations. Exemption to fire dampers.

.2 Accessories: Provide components for each firestopping and smoke seals systems that are needed to install fill materials. Use only components specified by firestopping and smoke seals system manufacturer and approved by qualified testing and inspecting agency for firestopping and smoke seals systems indicated. Accessories include, but are not limited to, the following items:

.1 Permanent forming, damming, and backing materials, including the following:

.1 Slag or rock wool fibre insulation.

.2 Sealants used in combination with other forming, damming, or backing materials to prevent leakage of fill materials in liquid state.

.3 Fire-rated form board.

.4 Fillers for sealants.

.2 Temporary forming materials.

.3 Substrate primers.

.4 Collars.

.5 Steel sleeves.

.6 Primers: to manufacturer's recommendation for specific material, substrate, and end use.

.7 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.

.8 Metal fire stop: Commercial galvanized steel, to ASTM A1008/A1008M, zinc coating 260 g/m^2, minimum metal core thickness 0.912 mm.

.9 Steel Deck Moulded Flute Inserts: One piece moulded mineral fibre flute inserts, sized for steel deck profiles, for placement at top of fire rated wall assemblies:

.1 Acceptable material: Hilti CP777 Speed Plugs.

.10 Labels: Peel-and-stick labels printed with the following information:

ATTENTION: FIRE RATED ASSEMBLY. DO NOT MODIFY

Name of firestopping manufacturer

Names of products used

Hour Rating of Assembly

Manufacturers standard detail number, or Engineered Judgement identifier; ULC or $_{c}UL_{us}$ Number

Date of installation

Name of installing Trade Contractor

Contact telephone number for repair or replacement of firestopping materials.

2.4 FILL MATERIALS

.1 General:

.1 Provide firestopping and smoke seals systems containing types of fill materials indicated in Firestopping and Smoke Seals System Schedule below by reference to types of materials described in this Article. Fill materials are those referred to in directories of referenced testing and inspecting agencies as fill, void, or cavity materials.

.2 Firestopping 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, and not exceed opening sizes for which they are intended for ratings as indicated on drawings.

.2 Cast-in-Place Firestopping and Smoke seals Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of outer metallic sleeve lined with an intumescent strip, radial extended flange attached to one end of sleeve for fastening to concrete formwork, and neoprene gasket.

.3 Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.

.4 Firestopping and Smoke Seals Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrating item.

.5 Cable Penetration Devices: premanufactured fire rated cable pathway systems, the following products are acceptable:

.1 EZ-Path Fire Rated Pathway, Specified Technologies Inc.

.2 CP 653 Speed Sleeve, Hilti

.6 Intumescent Composite Sheets: Rigid panels consisting of aluminum foil faced elastomeric sheet bonded to galvanized steel sheet.

.7 Intumescent Putties: Non-hardening dielectric, water resistant putties containing no solvents, inorganic fibres, or silicone compounds.

.8 Intumescent Spray Foam: Expanding spray-in-place intumescent foam sealant.

.9 Intumescent Wrap Strips: Single component intumescent elastomeric sheets with aluminum foil on one side.

.10 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.

.11 Silicone Foams: Multi-component, silicone based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.

.12 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.

2.5 ACCESSORIES

.1 Primers: to manufacturer's recommendation for specific material, substrate, and end use.

.2 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.

.3 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.

.4 Metal fire stop: Commercial galvanized steel, to ASTM A1008/A1008M, zinc coating 260 g/m^2, minimum metal core thickness 0.95 mm (20 ga.).

2.6 MIXING

.1 For products requiring mixing before application, comply with firestopping and smoke seals system manufacturer's written 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.

Part 3 Execution

3.1 EXAMINATION

.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 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.

.3 Maintain insulation around pipes and ducts penetrating fire separation without interruption to air vapour barrier.

.4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.2 MANUFACTURER’S INSTRUCTIONS

.1 Compliance: comply with manufacturer's printed installation instructions, technical datasheets, details, and specifications.

3.3 PREPARATION

.1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials.

.2 Ensure that substrates and surfaces are clean, dry and frost free.

.3 Prepare surfaces in contact with firestopping materials and smoke seals to manufacturer's instructions.

.4 Maintain insulation around pipes and ducts penetrating fire separation without interruption to air vapour barrier.

.5 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.4 INSTALLATION

.1 Apply and install fire stopping materials to correspond with tested assemblies, or calculation procedures acceptable to authorities having jurisdiction to provide following fire resistance ratings:

.1 Floor assemblies shall be fire separations with fire-resistance rating of not less than 2 hours.

.2 Mezzanines shall have fire-resistance rating not less than 1 hour.

.3 Loadbearing walls, columns and arches shall have fire-resistance rating not less than that required for supported assembly.

.4 Other fire ratings as indicated on Drawings and NBCC Compliance Report.

.2 Install firestopping and smoke seal material and components in accordance with manufacturer's certified tested system listing.

.3 Provide firestopping assemblies at joints and penetrations of fire resistance rated assemblies as required to achieve and maintain minimum Sound Transmission Class (STC) of 60.

.4 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure 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.

.6 Tool or trowel exposed surfaces to neat finish.

.7 Remove excess compound promptly as work progresses and upon completion.

.8 At electrical boxes installed at gypsum board fire separations, Provide firestop back-coating on box.

3.5 SPECIAL REQUIREMENTS

.1 Location of special requirements for firestopping and smoke seal materials at openings and penetrations in fire resistant rated assemblies are as follows:

.1 Designed for re-entry, removable at: electrical and communications cable penetrations through partitions.

.1 Use Prefabricated Firestop Sleeves or prefabricated Cable Pathways.

3.6 SEQUENCING

.1 Proceed with installation only when submittals have been reviewed by Consultant.

.2 Install mechanical and electrical services prior to firestopping. Firestopping shall not be installed at these locations until electrical and mechanical installations have been reviewed and accepted by Consultant.

.3 Install floor firestopping before interior partition erections.

.4 Metal deck bonding: firestopping to precede spray applied fireproofing to ensure required bonding.

.5 Mechanical pipe insulation: certified firestop system component.

.1 Ensure pipe insulation installation precedes firestopping.

3.7 FIELD QUALITY CONTROL

.1 Inspections and reviews: notify Consultant when ready for inspections and reviews and prior to concealing or enclosing fire stopping materials and service penetration assemblies.

.2 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of firestop and smoke seal work, in handling, installing, applying, protecting, and cleaning of product, and submit Manufacturer's Field Reports to Consultant.

.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 Schedule site visits with manufacturer to review work before work is closed in to permit review.

3.8 PROJECT RECORD DOCUMENTATION

.1 At completion of fire stopping work, update Schedule and Shop Drawings submitted in accordance with requirements of this specification Section.

.2 Ensure that each location that fire stopping has been applied is recorded along with applicable firestop information.

.3 Ensure that each application of firestopping is documented with location and installation details provided.

.4 At location of each application of fire stop, secure identification label at both sides of penetration in convenient, easy to read location, that documents product used, manufacturer, installer, date of installation, and ULC assembly number involved.

.5 Submit updated Schedule and Shop Drawings in accordance with requirements of Section 01 78 00 - Closeout Submittals, including accurate as-built information.

3.9 CLEANING

.1 Progress Cleaning: clean in accordance with Division 01 requirements. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Division 01 requirements. Perform cleaning after installation to remove construction and accumulated environmental dirt.

.3 Manage and dispose of demolition and construction waste materials in accordance with Section 01 74 21 requirements.

3.10 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by Work of this Section.

3.11 SCHEDULE

.1 Firestop and smoke seal at the following:

.1 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.

.2 Edge of floor slabs at curtain wall and precast concrete panels.

.3 Top of fire-resistance rated masonry and gypsum board partitions.

.4 Intersection of fire-resistance rated masonry and gypsum board partitions.

.5 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.

.6 Penetrations through fire-resistance rated floor slabs, ceilings, and roofs.

.7 Openings and sleeves installed for future use through fire separations.

.8 Around mechanical and electrical assemblies penetrating fire separations.

.9 Rigid ducts: greater than 129 cm^2: fire stopping to consist of bead of fire stopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.

.10 Between floor slabs and perimeter walls.

.11 At gaps between edge of floor slabs and gypsum board at perimeter walls.

.12 Other locations shown on Drawings and as required to achieve and maintain required fire separations.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 ASTM International (ASTM)

- .1 ASTM C834-17, Standard Specification for Latex Sealants.
- .2 ASTM C919-19, Standard Practice for Use of Sealants in Acoustical Applications.
- .3 ASTM C920-18, Standard Specification for Elastomeric Joint Sealants.
- .4 ASTM C1193-16, Standard Guide for Use of Joint Sealants.
- .5 ASTM D2240-15e1, Standard Test Methods for Rubber Property, Durometer Hardness.

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

- .1 Safety Data Sheets (SDS).

1.2 COORDINATION

.1 Coordinate work of this Section with interfacing and adjoining work for proper sequencing of each installation and to provide positive weather resistance, durability of the work, and protection of materials and finishes.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals shall comply with the requirements of Division 01 requirements.

.2 Submit manufacturer’s product data as follows:

- .1 Submit manufacturer's published product literature, specifications and datasheets for all products and materials incorporated into the Work of Contract.
- .2 Provide one electronic copy of WHMIS SDS - Safety Data Sheets in accordance with WHMIS acceptable to Labour Canada, and Health and Welfare Canada.

.3 Submit manufacturer’s installation instructions for each product used.

- .1 Before performing work of this Section, submit the names of proposed materials.
- .2 When required by Consultant, submit test certificates from an approved Canadian material testing laboratory indicating that sealants meet the requirements specified, and that the tests have been conducted in accordance with ASTM D2240.

.4 Submit samples as follows:

- .1 Samples of back-up material, primer, joint fillers, and of each type and colour of sealant to be used. Cure samples under conditions anticipated at the site during application.

.5 Reports: submit written pre-installation meeting recommendations, field inspection, and test report results after each inspection.

.6 Submit Warranty.

1.4 QUALITY ASSURANCE

.1 Comply with ASTM C1193 guidelines.

.2 Pre-Installation Meeting:

.1 Arrange with manufacturer's representative to inspect substrates and to review installation procedures 48-hours in advance of installation.

.1 Review conditions under which work will be done.

.2 Joint condition and profile.

.3 Weather conditions.

.2 Submit written report of meeting to Consultant.

.3 Mock-up:

.1 Construct mock-up in accordance with Division 01 requirements.

.2 Construct mock-up to show location, size, shape, colour, and depth of joints complete with bond breaker, joint backing, primer, and sealant.

.3 Arrange for the manufacturer's representative's review and acceptance. Allow 48 hours after acceptance before proceeding with the work.

.4 Inform Consultant following construction of the mock-up. Allow 24 hours for review of mock-up by Consultant before proceeding with sealant Work.

.5 Mock-up may remain as part of the Work if accepted by Consultant. Remove and dispose of mock-ups not forming part of the Work.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, handle, store and protect materials in accordance with manufacturer’s recommendations and instructions.

.2 Deliver containers labelled and sealed, complete with written application and maintenance instructions.

.3 Store materials in a dry, heated enclosure.

1.6 PROJECT CONDITIONS

.1 Environmental Limitations:

.1 Do not proceed with installation of joint sealants under following conditions:

.1 When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4 degrees C.

.2 When joint substrates are wet.

.2 Joint-Width Conditions:

.1 Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

.3 Joint-Substrate Conditions:

.1 Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

.2 Substrate must be clean, dry, and frost free.

1.7 WARRANTY

.1 Contractor warrants that sealant work will not leak, crack, crumble, melt, shrink, run, lose adhesion or stain adjacent surfaces for not less than two years from the date of Substantial Performance.

Part 2 Products

2.1 MANUFACTURERS

.1 Standard of Acceptance: Use products meeting the requirements of this Section and suitable to the application to which the sealant is to be applied, selections restricted to the manufacturers listed below:

- .1 BASF Master Builders
- .2 Chemtron Manufacturing Ltd.
- .3 Dow Corning Canada Inc.
- .4 GE Silicones Limited.
- .5 LymTal International.
- .6 Pecora Corporation.
- .7 PRC-DeSoto.
- .8 Sika Chemical of Canada Ltd.
- .9 Tremco Ltd.

.2 Use materials as received from manufacturer without additives or adulteration. Use one manufacturer's product for each Type specified. Where sealant applications cross or contact each other, ensure compatibility, maintenance of physical properties and performance characteristics, and continuity of seal.

2.2 PERFORMANCE/DESIGN CRITERIA

.1 Sealant system shall satisfy following requirements for duration of warranty period:

- .1 Waterproof, flexible, and thermally compatible with substrate under applicable service conditions.
- .2 Provide a weather-tight seal that does not allow moisture penetration.
- .3 Shall not lose adhesion to bonding surfaces, crack, or craze.
- .4 Shall not leak.

.2 Reference to products does not relieve manufacturer of responsibility to comply fully with specified criteria.

2.3 SEALANT MATERIALS

.1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.

.2 When low toxicity caulks are not possible, confine usage to areas which off-gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off-gas time.

.3 Unless otherwise specified, VOC content limits of sealants shall be in accordance with SCAQMD Rule 1168 and as follows:

- .1 Architectural Materials:
  - .1 Sealants: VOC content limit 250 g/L.
  - .2 Sealant Primers for Non-Porous Surfaces: VOC content limit 250 g/L.
  - .3 Sealant Primers for Porous Surfaces: VOC content limit 775 g/L.
- .2 Roofing:
  - .1 Non-Membrane Related Sealants: VOC content limit 300 g/L.
  - .2 Single Ply Roofing Sealants: VOC content limit 450 g/L.
  - .3 SBS Membrane Sealant Primer: VOC content limit 500 g/L.

.3 All Other Applications:

.1 Sealants: VOC content limit 420 g/L.

.2 Sealant Primers: VOC content limit 750 g/L.

2.4 SEALANT MATERIAL DESIGNATIONS

.1 Type S-1: Silicone Sealant; mould and mildew resistant.

.1 To ASTM C920; type S; grade NS; class 100/50; use NT, M, G, and A.

.2 Standard of Acceptance:

.1 790 Silicone, Dow Corning.
.2 Spectrum 1 Silicone, Tremco Inc.
.3 890NST, Pecora.

.2 Type S-2: Silicone Sealant; general construction and air-seal sealant.

.1 To ASTM C920: type S; grade NS; class 50; use NT, M, G, A, O.

.2 Standard of Acceptance:

.1 864NST or 895NST, Pecora Corporation.

.2 Dow Corning 795, Dow Corning

.3 Spectrum 2, Tremco Sealant & Waterproofing

.3 Type S-3: Silicone Sealant; structural glazing.

.1 To ASTM C920: type S; grade NS; class 25; use NT, A, G, O.

.2 Standard of Acceptance:

.1 995 Silicone, Dow Corning.

.2 Proglaze SSG, Tremco Inc.

.3 SSG4000, General Electric.

.4 895NST, Pecora.

.4 Type S-4: Acoustical Sealant; interior, non-hardening.

.1 To ASTM C834 Type P, Grade -18°C.

.2 Standard of Acceptance:

.1 Acoustical Sealant, Tremco.

.2 Metaseal, Chemtron.

.3 QuietZone acoustic sealant, Owens Corning.

.4 BA-98, Pecora.

.5 Type S-5: Multi-component polyurethane sealant; chemical curing, exterior wall sealant.

.1 To ASTM C920: type M; grade NS; class 50; use T, NT, M, A, O.

.2 Standard of Acceptance:

.1 Dymeric, Tremco.

.2 Sikaflex 2c NS, Sika.

.3 Sonolastic NP 2, BASF Sonneborn.

.4 DynaTrol II, Pecora.

.6 Type S-6: One-component polyurethane sealant; non-sag, for general construction.

.1 To ASTM C920: type S; grade NS; class 25; use NT, M, A, O.

.2 Standard of Acceptance:

.1 Polyurethane Sealant 540, 3M Company

.2 Dymonic or Dymonic FC, Tremco Inc

.3 Multiflex, Chemtron.
.4 Sonolastic NP 1, BASF Sonneborn.
.5 Sikaflex 1a, Sika.
.6 DynaTrol I-XL, Pecora.
.7 POURTHANE NS, by W. R. Meadows.

.7 Type S-7: Horizontal joint sealant; two-component, self-levelling.

.1 To ASTM C920: type M; grade P; class 25; use T, M, O.
.2 Standard of Acceptance:
.1 Sikaflex 2c SL, Sika.
.2 Sonolastic SL 2, BASF Sonneborn.
.3 THC-901, Tremco Inc.
.4 Urexpan NR-200, Pecora.

.8 Type S-8: One-part moisture curing, low modulus polyurethane sealant for sealing joints in level and slightly slope surfaces conforming to ASTM C920, type S, grade P, class 50, use T, M, A, O.

.1 Standard of Acceptance:
.1 Sonolastic SL 1, BASF Sonneborn.
.2 Vulkem 45 SSL, Tremco Inc.
.3 Urexpan NR-201b, Pecora.

.9 Type S-9: Control joint sealant: two-component, epoxy-urethane, self-levelling, load bearing saw cut or preformed control joints.

.1 Standard of Acceptance:
.1 Loadflex, Sika.
.2 Dynapoxy EP-800, Pecora.
.3 MasterSeal CR 190, BASF Building Systems

.10 Type S-10: All exterior door thresholds, Showers, and other Wet Areas (refer to Drawing details #8, A-5-1, and #9, A-555 for examples of threshold locations): two-component gun-grade, slump-resistant elastomeric polyurethane specially formulated for sealing joints in water-immersion conditions, and highly resistant to biodegradation by both aerobic and anaerobic bacteria; to Meets ASTM C920, Type M, Grade NS, Class 25, use T, NT, M, G, A, O; certified to CAN/ULC S115; Canadian Food Inspection Agency acceptance.

.1 Standard of Acceptance:
.1 Sikaflex 2c NS EZ Mix, by Sika Canada.
.2 Sikaflex 2c NS EZ Mix TG, by Sika Canada (traffic grade option).

2.5 ACCESSORIES

.1 Preformed compressible and non-compressible back-up materials that are non-staining, compatible with joint substrate, sealants, primers, and other joint fillers, and are approved for applications indicated by sealant manufacturer based on site experience and laboratory testing.

.1 Rod Type Sealant Backings:
.1 ASTM C1330, Type C (closed cell material with a surface skin), or Type B (bi-cellular material with a surface skin).
.2 Use any of the preceding types, as approved in writing by joint sealant manufacturer for joint application indicated.

.3 Size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

.4 Non-adhering to sealant, to maintain two sided adhesion across joint.

.2 High Density Foam.

.1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m^3 density, or neoprene foam backer, size as recommended by manufacturer.

.3 Bond Breaker Tape.

.1 Polyethylene bond breaker tape which will not bond to sealant.

.2 Primer: Non-staining type as recommended by sealant manufacturer.

.3 Joint Cleaner: Non-corrosive solvent type recommended by sealant manufacturer for applicable substrate materials.

2.6 COLOURS

.1 Colours: to match adjacent materials as selected by Consultant from the manufacturer's available colour ranges.

Part 3 Execution

3.1 PROTECTION

.1 Protect installed work of other trades from staining, damage, or contamination.

3.2 EXAMINATION

.1 Verify condition of previously installed work upon which this Section depends. Report defects to Consultant. Commencement of work means acceptance of existing conditions.

.2 Ensure joints are suitable to accept and receive the sealants.

.3 Ensure surfaces are sound, dry, and free from dirt, water, frost, loose scale, corrosion, bitumen, paints, and other contaminants that may adversely affect the performance of the sealing materials.

.4 Do not apply sealant to masonry until mortar has cured.

.5 Before any sealing work is commenced, test the materials for indications of staining or poor adhesion.

.6 Ensure joints and spaces which are to receive sealants are less than 10 mm deep; not less than 6 mm wide; and not more than 19 mm wide.

3.3 SURFACE PREPARATION

.1 Perform cleaning to the extent required to achieve acceptable joint surfaces, and as approved by sealant manufacturer.

.2 Protect adjacent finishes from damage.

.3 Cleaning Procedures:

.1 Metal:

.1 Blast cleaning: Sandblast or iron shot blast surfaces requiring heavy cleaning down to bright metal. Remove loose matter by compressed air or commercial vacuum cleaner.

.2 Power tool cleaning: Clean surfaces by wire brush, impact tools, abrasive wheels or by buffing. Remove loose matter by compressed air or vacuum cleaner.

.3 Solvent cleaning: Clean with solvent applied by spray or brush. Wipe with clean, dry wiping cloths. Remove paints with paint remover and wipe with solvent. Remove residue.

.2 Concrete, Marble, Stone, Brick:

.1 Remove friable material with wire brush or by chipping, until surfaces are sound. Remove surface residue with a stiff brush, vacuum cleaner or compressed air.

.2 Concrete surfaces shall be cured for at least 28 days. Acid etch joint surfaces to remove alkaline salts and neutralize acid with a solution of tri sodium phosphate, followed by rinsing with clean, cold water.

.3 Allow joints to dry thoroughly.

.4 Completely remove resinous products used, such as curing compounds and form release agents.

.3 Glass, Ceramics, and Porcelain: Brush with solvent and wipe with clean, dry wiping cloths. Remove residue.

.4 Wood: Remove foreign matter such as soil, paint, grease, bitumen, resin with solvents, abrasives and paint removers; remove residue. Provide surfaces that are clean and dry.

.4 Do not exceed shelf life and pot life of the materials, and installation times, as stated by the manufacturers.

.5 Be familiar with the work life of the sealant to be used. Do not mix multiple component materials until required for use.

.6 Thoroughly mix multiple component sealants, and bulk sealants when recommended by manufacturer, using a mechanical mixer capable of mixing at 80-100 rpm without mixing air into the material. Continue mixing until the material is a uniform colour and free from streaks of unmixed material.

.7 Mask areas adjacent to joints to be sealed. Prevent contamination of adjacent surfaces. Remove masking promptly after the joint sealing has been completed.

3.4 INSTALLATION

.1 Install materials in compliance with the recommendations of their manufacturer.

.2 Fill joints with joint backing to produce joint profile with optimum sealant cross section. Provide joint depth of one half the joint width.

.3 Prime joints to receive sealants as recommended by the sealant manufacturer to prevent staining, to assist the bond and to stabilize pouring surfaces.

.4 Apply primer with a brush that will permit joint surfaces to be primed. Perform priming immediately before installation of sealants, allowing minimal time between priming and sealing as recommended by the sealant manufacturer.

.5 Sealants generally shall be of gun grade or knife grade non-sag consistency to suit the joint condition. Use gun nozzles of the proper sizes to suit the joints and the sealant material. Sealants for horizontal joints (other than overhead joints) shall be self-levelling type.

.6 Install sealant with pressure operated guns.

.7 Use sufficient pressure to fill all voids and joints solid. Sealant shall bond to the sides of the joint only and shall not adhere to the joint backing material. Provide bond breaker material where necessary.

.8 Pour or gun self-levelling, low viscosity grades of sealant into horizontal joints. If applied by gun, hold the nozzle to the bottom of the joints to ensure complete filling of the joints.

.9 Ensure that the correct sealant depth is maintained. Superficial coating with a skin bead will not be accepted.

.10 Except as otherwise specified, sealant installations shall be a full bead free from air pockets and embedded impurities, providing smooth surfaces, free from ridges, wrinkles, sags, air pockets and imbedded impurities.

.11 After joints have been completely filled, tool them neatly to a slightly concave surface.

.12 Tool sealants to achieve airtight joints. Use wet tools as required.

.13 Insert plastic vent tubes where required or shown, extending from the cavity to exterior face, sloped to the exterior. Seal around the tube and tool for positive adhesion. Insert joint backing for remainder of the joint. Do not plug vent tube during sealing operation.

3.5 CLEANING

.1 Immediately clean adjacent surfaces that have been soiled and leave work in a neat, clean condition. Remove excess materials and droppings using recommended cleaners and solvents.

3.6 REPAIR

.1 Cut out damaged sealant, repeat preparation, prime joints, and install new material as specified, and acceptable to the manufacturer.

3.7 FIELD ADHESION TESTING

.1 Field test joint sealant adhesion to substrates in the presence of Consultant as follows:

.1 Extent of Testing: test completed and cured sealant joints as follows:

.1 Perform 10 tests for the first 300 m of joint length for each kind of sealant and joint substrate.

.2 Perform 1 test for each 300 m of joint thereafter or 1 test per each floor per elevation.

.2 Test Method: test joint sealants according to method A, Field-Applied Sealant Joint Hand Pull Tab, Appendix X1, ASTM C1193 or Method A, Tail Procedure, ASTM C1521.

.1 For joints with dissimilar substrates, verify adhesion to each substrate separately. Extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

.3 Inspect tested joints and report on finding for the following requirements:

.1 Joint cavities filled and free of voids.

.2 Sealant dimensions and configurations comply with sealant manufacturer’s data sheet and printed installation requirements.

.3 No adhesive or cohesive failure noted during pull tests per ASTM criteria. Include data on pull distance used to test each kind of product and joint substrate.

.4 Record tests results in a field-adhesion test log. Include dates when sealants were installed, name of worker responsible in each instance, test dates, test

locations, whether joints were primed or not, adhesion results and percent elongations, sealant fill, sealant configuration and dimensions.

.5 Repair sealant test locations by applying new sealants following approved preparation and application procedures.

.2 Evaluation of Field Adhesion Test results:

.1 Sealants passing ASTM pull-tests and compliant with specifications will be considered satisfactory.

.2 Remove sealants that fail adhesion tests or do not meet specifications, and apply in accordance with approved preparation and application requirements.

.3 Retest re-applied sealants until test results are satisfactory and sealant application is compliant.

3.8 CLEANING

.1 Progress Cleaning: clean in accordance with Division 01 requirements. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Division 01 requirements. Perform cleaning after installation to remove construction and accumulated environmental dirt.

.3 Manage and dispose of demolition and construction waste materials in accordance with Section 01 74 21 requirements.

3.9 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by Work of this Section.

3.10 SCHEDULES

.1 General Provisions:

.1 Examine the Contract Drawings and determine entire extent of Work of this Section. Seal joints at terminations, perimeters, transitions and penetrations.

.2 Where no specified type of sealant is shown or specified, choose one of the sealants specified in this Section appropriate for its location and conditions as recommended by the sealant manufacturer in accordance with its warranty provisions and datasheet.

.3 Make sealant selections consistent with manufacturer’s recommendations.

.2 Materials Schedule:

.1 Where no specified type of sealant is shown or specified, choose one of the sealants specified in this Section appropriate for its location as recommended by the sealant manufacturer in accordance with its warranty provisions and datasheet.

.2 Make sealant selections consistent with manufacturer’s recommendations.

.3 Use mould & mildew resistant silicone sealant Type S-1 for non-moving joints in washrooms and kitchens. Do not use on floors.

.4 Use silicone general construction sealant Type S-2 or Type S-5 and S-6 for all joints, interior and exterior, where no other specific sealant type specified.

.5 Use structural glazing silicone Type S-3 for sealing glass, interior and exterior.

.6 Use acoustical sealant Type S-4 and air seal sealant Type S-2 only where they will be fully concealed and only where no constant or consistent air pressure difference will exist across the joint.

.7 Use multi-component sealant type S-5, priming penetration element surfaces other than concrete, for mechanical and electrical service penetrations in concrete foundation walls.

.8 Use multi-component sealant Type S-7 for horizontal joint sealant of plaza, floors and decks, exterior areas only, subject to pedestrian and vehicular traffic.

.9 Use control joint sealant S-9 as filler for interior, horizontal saw cut or preformed control joints where joints are subject to load bearing conditions.

.10 Use wet area sealant S-10 for horizontal and vertical joints, and perimeter joints, at showers, exterior door threshold plates, and other wet area applications. Use traffic grade (TG) at horizontal floor locations as required.

.3 Exterior Sealant Schedule:

.1 The following list is provided for general guidance and is not intended to exhaust all of the locations where sealant is required. Refer to item 3.10.1 General Provisions of this Section for general provisions.

.2 Exterior sealant work is part of the work of this section. Install exterior sealant to:

.1 General: seal open joints in surfaces exposed to view and as required to make the building weather-tight and airtight.

.2 Exterior joints between dissimilar materials.

.3 Perimeters of exterior openings where frames meet exterior façade of building.

.4 Movement and control joints in exterior surfaces of iin-place concrete and masonry.

.5 Exterior joints between masonry and in-place concrete.

.6 Exterior joints in horizontal wearing surfaces.

.7 Exterior intake and exhaust louvres. Provide space in sealant at bottom for drainage.

.8 Below door thresholds (2 beads).

.9 Penetrations through exterior building elements.

.10 Where indicated on drawings.

.3 Foam sealant installation: Compression when expanded in joint, shall be 25% or uncompressed thickness. Depth shall be in accordance with manufacturer's sizing table.

.4 Interior Sealant Schedule:

.1 The following list is provided for general guidance and is not intended to exhaust all of the locations where sealant is required. Refer to item 3.10.1 General Provisions of this Section for general provisions.

.2 Install interior sealant to:

.1 Movement and control joints on exposed in-place concrete walls.

.2 Interior control and expansion joints in floor and wall surfaces.

.3 Raked out joints at junctions of masonry with concrete walls and columns, and at intersection of masonry walls and partitions.

.4 Perimeters of exterior door, curtain wall and window frames.

.5 Joints at tops of non-load bearing masonry walls at the underside of metal deck or in-place concrete, except where fire sealant and smoke sealant required.

.6 Perimeter and perimeter.

END OF SECTION

1 General

1.1 GENERAL

.1 The General Conditions of the contract as well as provisions of Division 01 are part of and to be read in conjunction with this Section.

.2 This section covers items common to all sections of Division 20, 21, 22, 23, 24 and 25.

1.2 RELATED SECTIONS THAT ARE PART OF DIVISION 20 TO 25 WORK

.1 Section 25 01 11 BAS: Start-Up and Verification

.2 Section 25 05 01 BAS: Controls Short Form

.3 Section 25 30 02 BAS: Field Control Devices

.4 Section 25 30 03 BAS Field Installation

.5 Division 01 Commissioning.
  .1 Commissioning of Mechanical Systems supplied by this Division 01

1.3 INTENT

.1 It is the intent of these specifications to outline the method, materials, and quality of equipment to be furnished and installed hereinafter specified and/or shown on the drawings.

.2 The Mechanical Contractor shall be responsible for the installation of all equipment, materials, and accessories, and the labour required for the completion of this contract to the full satisfaction and acceptance of the Consultant. Misinterpretation of either the drawings or the specifications will not relieve the Contractor of responsibility.

1.4 DEFINITIONS

.1 "CONCEALED" - mechanical services and equipment in hung ceiling spaces and non-accessible chases and furred spaces.

.2 "EXPOSED" - will mean "not concealed" as defined herein.

.3 "Domestic Water" includes domestic cold water, domestic hot water, tempered hot water and domestic hot water recirculation.

.4 "Hydronic" includes hot water heating, chilled water and glycol supply and return piping.

.5 “Provide” will mean “Supply and install”.

1.5 REFERENCE STANDARDS

.1 The most stringent requirements of local municipal by-laws, provincial codes and following codes and standards shall be followed.

.2 In no instance shall the Standard established by the contract documents be reduced by the application of any other codes.

.3 General

- .1 Nova Scotia Building Code Regulations Effective April 1, 2017.
- .2 National Building Code of Canada - 2015.
- .3 National Fire Code of Canada - 2015.
- .4 National Plumbing Code of Canada - 2015.
- .5 National Energy Code of Canada for Buildings 2015.
- .6 ANSI/ASHRAE Standard 135, BACnet®.
- .7 The following standards/codes are referenced in the above codes:
  - .1 ARI 410 Forced Circulation Air Cooling and Air Heating Coils.
  - .2 ANSI/AHRI 430 Central Station Air Handling Units.
  - .3 ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
  - .4 CAN/CSA B149.1 Natural Gas and Propane Installation Code.
  - .5 CSA B51 Boiler, Pressure Vessel, and Pressure Piping Code.
  - .6 CSA B52 Mechanical Refrigeration Code.
  - .7 CSA C22.1 Canadian Electrical Code, Part 1 Safety Standard for Electrical Installations.
  - .8 CSA C22.2 No. 155 Electric Duct Heaters.
  - .9 CAN/CSA C390- Test methods, marking requirements, and energy efficiency levels for three-phase induction motors
  - .10 NFPA 13 Installation of Sprinkler Systems.
  - .11 SMACNA HVAC Duct Construction Standards - Metal and Flexible.
  - .12 ULC-S505, Fusible Links for Fire Protection Service.
  - .13 CAN/ULC-S102 Test for Surface Burning Characteristics of Building Materials and Assemblies
  - .14 CAN/ULC S110 Test for Air Ducts.
  - .15 TIAC Mechanical Insulation Best Practice Guide

1.6 EQUIPMENT INSTALLATION

.1 Unions or flanges: provide for ease of maintenance and disassembly.

.2 Space for servicing, disassembly and removal of equipment and components: provide as recommended by manufacturer or as indicated.

.3 Equipment drains: pipe to floor drains.

.4 Install equipment, rectangular cleanouts and similar items parallel to or perpendicular to building lines.

1.7 ANCHOR BOLTS AND TEMPLATES

.1 Supply anchor bolts and templates for installation by other divisions.

1.8 COORDINATION

.1 Closely coordinate the design and installation of Sprinkler System piping and placement of Sprinkler System equipment with other Trade Contractors, including but not limited to, Structural steel Contractor, Ceiling Contractor, Plumbing Contractor, Heating Contractor, Air Distribution Contractor, Controls Contractor and Electrical Contractor.

.2 Closely coordinate the installation of Plumbing System piping and placement of Plumbing System equipment with other Trade Contractors, including but not limited to, Structural steel Contractor, Ceiling Contractor, Sprinkler Contractor, Heating Contractor, Air Distribution Contractor, Controls Contractor and Electrical Contractor

.3 Closely coordinate the installation of Heating System piping and placement of Heating System equipment with other Trade Contractors, including but not limited to, Structural steel Contractor, Ceiling Contractor, Sprinkler Contractor, Plumbing Contractor, Air Distribution Contractor, Controls Contractor and Electrical Contractor

.4 Closely coordinate the installation of Air Distribution System piping and placement of Air Distribution System equipment with other Trade Contractors, including but not limited to, Structural steel Contractor, Ceiling Contractor, Sprinkler Contractor, Plumbing Contractor, Heating Contractor, Controls Contractor and Electrical Contractor

.5 Closely coordinate the installation of Controls System and placement of Controls System equipment with other Trade Contractors, including but not limited to, Structural steel Contractor, Ceiling Contractor, Sprinkler Contractor, Plumbing Contractor, Heating Contractor, Air Distribution Contractor and Electrical Contractor.

1.9 ELECTRICAL

.1 Electrical work to conform to Electrical Contract including the following:
- .1 Supplier and installer responsibility is indicated in Motor, Control and Equipment Schedule on electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule on mechanical drawings.
- .2 Control wiring and conduit is specified in Electrical Contract except for conduit, wiring and connections which are related to mechanical control systems specified in Mechanical Contractor. Refer to Electrical Contract for quality of materials and workmanship.
- .3 Power supply to boilers is by Electrical Contractor. Field wiring of boiler components is the responsibility of Mechanical Contractor.

.2 Coordinate with Electrical Contractor to ensure that all controlled equipment is correctly connected for operation in accordance with plans and specifications, including supplying all necessary electrical interconnection information and location to Electrical Contractor.

1.10 EXISTING SYSTEMS

.1 Connections into existing systems to be made at time approved by Consultant. Request written approval of time when connections can be made.

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

.3 Ensure that all plumbing, heating, ventilation and other mechanical systems and services remain operational during the course of the renovation of the existing building and, if necessary, this Contractor shall be responsible for providing such temporary services by cutting off, altering, adapting, relocating and connecting existing services and disconnecting and removing such temporary or existing services upon providing new permanent services as detailed on all drawings. The site shall be examined to determine the extent of the temporary services and all co-ordination shall be made with the Owner's Representative. All costs shall be included in the Tender Price.

.4 Existing equipment, piping, ducting, etc. not being re-used under new schemes, shall be removed whether shown on drawings or not. The General Contractor shall repair all openings resulting from the removal of existing mechanical equipment and services. All costs shall be included in the Tender Price.

1.11 CUTTING AND PATCHING

.1 Refer to Division 01.

1.12 DRAWINGS

.1 The drawings accompanying this specification are to be considered as diagrammatic only and do not show all the structural and construction details. Any information involving measurements of the building shall be taken from the architectural and structural drawings, and at the building site. Make without additional charge any necessary changes or additions to the runs to accommodate structural conditions.

.2 The Mechanical drawings are not to be scaled.

.3 The drawings and the specifications shall be considered an integral part of the contract documents. Neither the drawings nor the specifications shall be used alone. Misinterpretation of any requirements of either plans or specifications shall not change the requirements of the specifications for proper completion of the work to the full approval of the Consultant.

.4 Except where dimensioned, indicate general Mechanical layouts only. Because of the small scale of Mechanical drawings, it is not possible to show all offsets, fittings and accessories which may be required. Investigate structural and finish conditions affecting this work and arrange work accordingly, providing such fittings, valves and accessories which are required to meet the conditions.

.5 The drawings indicate the general location and route to be followed by the pipes, ducts, conduits, etc., which are installed under this contract. Where the required conduit work, piping, ductwork, etc., is not shown on the plans or only shown diagrammatically, these shall be installed as tight as possible to structural members, concrete, ceilings, and walls to interfere as little as possible with the free use of the space through which they pass.

.6 The drawings and specifications are intended to supplement each other so that any details shown on the drawings are not mentioned in the specifications, or vice versa, shall be executed in the same manner as if contained in the specifications and shown on the drawings.

.7 Should any discrepancy appear between these specifications and the drawings to cause doubt as to the true meaning and intent of the drawings ad specifications, a ruling shall be obtained from the Consultant before submitting the tender. If this is not done it will be assumed that the more expensive alternative has been included in the contract.

.8 Layouts on the Mechanical drawings are based on the specified Standard of Acceptance, including mechanical and electrical connections and physical dimensions and weights. Other listed Acceptable Manufacturers chosen by the Contractor for use on this project, which necessitates changes in service connections to perform the specified functions, differs in dimensions or weights, may be used, however, any required modifications or additions to the project and other trade contractors resulting from this shall be done at no additional cost to the Owner.

1.13 CONTRACT DOCUMENTS

.1 Before submitting tender for his work, each Contractor shall examine the contract documents (entire specifications, electrical drawings, structural drawings and architectural drawings) to ascertain that the work can be carried out as shown on these drawings and herein specified. No extra will subsequently be allowed to cover any omission and/or oversight for not having made a thorough inspection of the contract documents.

1.14 EXAMINE THE SITE AND CONDITIONS

.1 Each Contractor shall visit and examine the site and the local conditions affecting this work. No allowance will be made later for any expenses occurred through failure to make these examinations.

1.15 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with the Project Waste Reduction Workplan. Refer to Division 01.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Project Waste Management Plan

1.16 LOW VOC MATERIALS

.1 All site applied coatings, adhesives & sealants must conform to low VOC content requirements.

.2 Provide Material Safety Data Sheets for all products and materials of these types incorporated into the work.

2 Products

2.1 MATERIAL

.1 For the purpose of uniformity similar materials shall be by one manufacturer.

.2 Standard of Acceptance and/or Acceptable Material:
- .1 Means that item named and specified by manufacturer and/or catalogue number forms part of specification and sets standard regarding performance, quality of material and workmanship and when used in conjunction with a referenced standard, shall be deemed to supplement the standard.

.3 Acceptable Manufacturer:
- .1 Means that item manufactured by named and specified manufacturer, meeting the specification and referenced standard regarding performance, space constraints, electrical requirements, quality of material and workmanship shall be deemed acceptable.

.4 Refer to "Instruction to Bidders" for method of applying for Alternatives Products/Systems prior to close of tender.

2.2 ELECTRICAL DEVICES AND PANELS.

.1 All electrical equipment and devices to be CSA certified and manufactured to standard quoted.

.2 The assembly of combinations of electrical components, such as, relays, current transformers, BAS devices, transformers, fuse blocks, transducers or other certified components in an enclosure to form an overall electrical assembly shall be CSA certified.

.3 Where field modifications are made to certified electrical equipment, arrange and pay for field certification by CSA.

2.3 MOTORS

.1 Provide motors for mechanical equipment as specified.

.2 If delivery of specified motor will delay delivery or installation of any equipment, install motor approved by Consultant for temporary use. Final acceptance of equipment will not occur until specified motor is installed.

.3 3 phase motors, 745 Watts (1.0 HP) and larger: Minimum (NEMA Premium) nominal efficiency in accordance with CAN/CSA C390 "*Test Methods, Marking Requirements and Energy Efficiency Levels for Three-Phase Induction Motors*"

.4 Definite Purpose Inverter-Ready Motors and meet NEMA MG 1 Part 31.4.4.2.
- .1 Suitable for current and/or future variable frequency drives (VFD's).
- .2 Exceptions: Sump pumps, wet rotor pumps, multi speed pumps, ECM pumps, oil and gas burners, unit heaters, cabinet heaters, cabinet fans and where noted.

.5 Motors under 370 Watts (1/2 HP): speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, 120 V, 60 Hertz, unless otherwise specified or indicated.

.6 Motors 370 Watts (1/2 HP) and larger: EEMAC Class B, squirrel cage induction, speed as indicated, continuous duty, drip proof, ball bearing, 3 phase, 208 V, 60 Hertz, maximum temperature rise 40° C, unless otherwise specified or indicated.

.7 Service factor 1.15.

.8 Totally enclosed fan cooled (TEFC) where specified.

2.4 BELT DRIVES

.1 Fit reinforced belts in sheaves matched to drive. Multiple belts to be matched sets.

.2 Use cast iron or steel sheaves secured to shafts with removable keys unless otherwise specified.

.3 For motors under 7.5kW (10 HP): standard adjustable pitch drive sheaves, having plus or minus 10% range. Use mid-position of range for specified r/min.

.4 Minimum drive rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.

.5 Tension belts to manufacturer's recommendations before start-up and after first (100) hours of operation using calibrated belt tensioning gauge. Submit report showing the recommended and actual tension on all units.

2.5 GUARDS

.1 Provide guards for unprotected drives.

.2 Provide means to permit lubrication and use of test instruments with guards in place.

.3 Guards for belt drives:
- .1 Expanded metal screen welded to steel frame.
- .2 Minimum 1.3 mm (18 Ga.) thick sheet metal tops and bottoms.
- .3 38 mm (1 1/2") diameter holes on both shaft centers for insertion of tachometer.
- .4 Removable for servicing.

.4 Install belt guards to allow movement of motors for adjusting belt tension.

.5 Unprotected fan inlets or outlets:
- .1 Wire or expanded metal screen, galvanized, 20 mm (3/4") mesh.
- .2 Net free area of guard: not less than 80% of fan openings.
- .3 Securely fasten in place.
- .4 Removable for servicing.

2.6 EQUIPMENT SUPPORTS

.1 Equipment supports supplied by equipment manufacturer: specified elsewhere in Mechanical Contractor.

.2 Equipment supports not supplied by equipment manufacturer: fabricate from structural grade steel.

.3 Exterior supports to be hot dipped galvanized. Touch up field welds and bolt holes with cold galvanized paint.

.4 Mount interior base mounted equipment on chamfered edge housekeeping pads, supplied by General Contractor.
- .1 Nominal 100 mm (4") high and minimum 100 mm (4") larger all around than equipment.
- .2 Slabs to be pinned to floor by General Contractor.
- .3 Provide detailed drawing to Others showing location of pads.
- .4 Ensure bases are level prior to placement of equipment.

2.7 PAINT

.1 Apply at least one coat of primer paint to ferrous supports, pipe hangers and site fabricated work.

.2 Primer to be The Master Painters Institute MPI #23 with VOC < 351 grains/L

2.8 SMOKE SEAL AND/OR ACOUSTIC SEAL

.1 Firestop all pipe penetration through fire rated walls and fire rated floor.
- .1 Refer to Section 20 05 04 Firestopping for Mechanical

.2 Where nonrated walls extend from floor to floor or floor to roof deck and non-rated floors.
- .1 Smoke seal and/or acoustic seal all pipes, both sides of wall/floor.
- .2 Smoke seal and/or acoustic seal between duct and wall, both sides of wall/floor.

2.9 FIRESTOPPING

.1 Firestopping material and installation within annular space between pipes, ducts, insulation and adjacent fire separation
- .1 Refer to Section 20 05 02 Mechanical Submittals for firestopping submittals.
- .2 Refer to Section 20 05 04 Firestopping for Mechanical and Section 07 84 00 Firestopping.

2.10 ACCESS DOORS

.1 Supply access doors to concealed mechanical equipment for operating, inspecting, adjusting and servicing.

.2 Size:
- .1 Sized to access concealed services
- .2 Minimum 600 x 600 mm (24" x 24") for body entry
- .3 Minimum 300 x 300 mm (12" x 12") for hand entry
- .4 Minimum 150 mm (6”) larger than access door in ductwork.
- .5 Unless otherwise noted.

.3 Door flush with frame.

.4 For unrated construction
- .1 Allen Key lock(es)
- .2 Flat door type
  - .1 Rounded safety corners
  - .2 One piece outer flange welded to mounting frame
  - .3 One piece concealed hinge
- .3 Formed door type

.5 For fire rated construction
- .1 Pull ring or raised knurled knob operated latch bolt
- .2 Interior latch release
- .3 Automatic closer
- .4 Hinged door
- .5 Flanged frame
- .6 For walls:
  - .1 1- 1/2 hour 'B' label
- .7 For ceiling membrane:
  - .1 1 hour label

.6 Material:
- .1 Special areas such as tiled or marble surfaces: use stainless steel with brushed satin or polished finish as directed by Consultant.
- .2 Remaining areas: use prime coated steel.

.7 Installation:
- .1 Locate so that concealed items are accessible.
- .2 Locate so that hand or body entry (as applicable) is achieved.
- .3 Install in accordance with manufacturer's recommendation

.8 Acceptable material:

	Unrated Walls	**Fire Rated Walls**	**Fire Rated Ceilings**
Acudor	EB-2002 or UF-5000	FB-5050	FW-5050
Cendrex	AHD	PFI	
Mifab	UA	MPFR	MPFR

2.11 DRAINS VALVES

.1 In accordance with Section 23 05 23 Valves.

2.12 HANGERS AND SUPPORTS

.1 As per Section 23 05 29 Hangers and Supports.

2.13 IDENTIFICATION

.1 As per Section 23 05 53 Mechanical Identification.

2.14 INSULATION

.1 As per Section 23 07 00 Mechanical Thermal Insulation.

3 Execution

3.1 INSTALLATION

.1 Install all work in accordance with authorities having jurisdiction and manufacturer's requirements. In case of conflicting requirements, the more stringent shall apply.

3.2 PROTECTION OF OPENINGS

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

.2 No fans to be started until the project has been cleaned to the satisfaction of the Consultant.

3.3 TESTS

.1 Give 4 working days written notice of date for tests.

.2 Insulate or conceal work only after testing by contractor and review by Consultant.

.3 Conduct tests in presence of Consultant or representative authorized by the Consultant.

.4 Bear costs including retesting and making good.

.5 Test domestic hot, recirculation and cold water piping at 1 1/2 times system operating pressure or minimum 860 kPa (125 psig), whichever is greater. Maintain test pressure without loss for a minimum of 2 hours otherwise specified.

.6 Test backflow preventers in accordance with manufacturer's recommendation and the requirements of the local water utility.

.7 Test gas piping to CAN/CGA B149.1 Natural Gas and Propane Installation Code.

.8 Hydronic Piping:

- .1 Maintain test pressure without loss for 4 h unless otherwise specified.
- .2 Hydraulically test hydronic piping systems at 1 1/2 times system operating pressure or minimum 860 kPa (125 psig), whichever is greater.

.9 Equipment: test as specified in relevant sections.

.10 Prior to tests, isolate all equipment or other parts which are not designed to withstand test pressures of test medium.

.11 Provide signed copies of all tests within 2 weeks of completion of each test.

3.4 PAINTING

.1 Prime and touch up marred finished paintwork to match original.

.2 Restore to new condition, finishes which have been damaged too extensively to be merely primed and touched up.

.3 Paint the balancing damper handles where concealed.

3.5 BACnet

.1 When equipment is specified to be supplied with a communication card and is to be connected to the BAS network and "communicate to the BAS" using the BACnet standard, the equipment includes:
- .1 BACnet communication media
  - .1 For unitary equipment, BACnet communication over RS485 2- wire network and a 76,800 baud rate is acceptable.
  - .2 For major mechanical equipment BACnet communication over an Ethernet is acceptable.
- .2 Equipment shop drawings are to include:
  - .1 Job specific wiring diagrams with details on interface wiring including, wire type and detailed wire termination drawings.
  - .2 Details on site specific addressing requirements and confirmation there will be no conflicts with the existing system architecture.
  - .3 Details as to what type of information can be read from the device and also what type of information can be written or defined from the BAS.
  - .4 Specified or intended sequence of the equipment and how the equipment will operate to meet your sequence a building requirements.
- .3 Complete with all configuration and programming software. Including any specific cables and proprietary software required to connect to and program the equipment. The owner will have full access to the equipment sequence at turnover of project. Equipment sequence is to be fully programmable by the Factory Trained Authorized Manufacturer Service Technician on site.
- .4 Field start-up to be performed by Factory Trained Authorized Manufacturer Service Technician.
- .5 Factory Trained Authorized Manufacturer Service Technician to be on site for start-up, commissioning and be available for technical support when required during the installation, setup and customer training.

.2 BAS ready equipment.
- .1 Complete with a terminal strip and receive direct hardwired control commands from the BAS.
- .2 BAS will directly control the equipment using analog and digital signals. This will allow the BACnet BAS to have direct control of the equipment and sequence. The only internal controls are the high/low safety limits that are “hardwired” inside the equipment.

3.6 ALTERNATIVES

.1 Refer to Division 1

3.7 SEPARATE PRICES

.1 Refer to Division 1

.2 Provide separate prices for the following:
- .1 Control maintenance contract for 12 month immediately after building warranty.
- .2 Mechanical maintenance service contract for 12 month immediately after building warranty.

3.8 CEILING MOUNTED EQUIPMENT.

.1 Locate ceiling space mounted equipment (e.g. exhaust fans, heat pumps, motorized dampers) within 900 mm (36") of the finished ceiling for safe access.

.2 Locate ceiling space mounted equipment (e.g. exhaust fans, heat pumps, motorized dampers) with minimum 600 mm (24") access on service side.

.3 Locate valves mounted in ceiling space valves, within 450 mm (18") of the finished ceiling for safe access.

END OF SECTION

1 General

1.1 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements

1.2 SHOP DRAWINGS AND PRODUCT DATA

.1 In accordance with Division 01

.2 Shop Drawings to be Project Specific

.3 All Shop Drawings to be Imperial.

.4 Where specified in Division 01, submit electronic copies of shop drawings. In addition to the electronic shop drawing, The Mechanical or General Contractor must submit one hard copy of each mechanical shop drawing to the office of the mechanical consultant.

.5 Shop drawings that consist of technical data sheets (letter size) and larger detail drawing, such as, sprinkler, controls, etc., to be submitted in separate packages. Data sheets separated from detail drawings.

.6 Prior to submitting shop drawings, the Mechanical Contractor to review the shop drawing to ensure that they meet the requirements of the contract documents in all respects, that they are clear and **legible**, all options are being provided are clearly indicated and that the dimensions, weights, power requirements, quantities and capacity are consistent with the requirements of the contract documents.

.7 Assembled in groups by individual **Specification Section** and bound in sets.

.8 Where possible, submit all items specified in one section as one shop drawing package.

.9 On cover/front page indicate total number of pages in submission.

.10 Consecutively number each page.

.11 Shop Drawings to list components that are shipped loose.

.12 Shop Drawings to include **Project Specific** wiring diagrams.

.13 Shop Drawings for items with BACnet® control to include **Project Specific** list of BACnet® read/write variables. Also refer to Section 20 05 01 Mechanical General Requirements and Section 25 05 02 BAS: Submittals

.14 Fill in and attach “Shop Drawing Submittal Form” from Division 1. When “Shop Drawing Submittal Form” not part of Division 1 attach a Mechanical Contractor’s Shop Drawing Review Confirmation to each shop drawing confirming the following:

- .1 The mechanical shop drawings have been reviewed by the Mechanical Contractor and all items are in conformance with the contract documents __ Yes __ No
- .2 Project specific model numbers and/or options are indicated __ Yes __ No
- .3 Mechanical Contractor: _____
- .4 Mechanical Contractor Project Representative: _____

.5 Mechanical Contractor Signature: _____
.6 Item: _____
.7 Specification Section and item number: _____
.8 Drawing reference: _____

.15 Installation and Operation Manuals to be submitted to the contractor independent of shop drawing submission.

.16 Section 20 05 04 Through – Penetration Firestopping for Mechanical Systems
.1 Submit Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of ULC or cUL firestop systems to be used and manufacturer's installation instructions to comply with Division 1.
.2 Provide data showing firestopping method for mechanical services specific to this project.
.3 Name of qualified installer.
.4 Manufacturer's engineering judgment identification number and drawing details when no ULC or cUL system is available for an application. Consultant judgment must include both project name and contractor's name who will install firestop system as described in drawing.
.5 Submit material safety data sheets provided with product delivered to job-site.

.17 Section 22 42 01 Plumbing Specialties and Accessories.
.1 Water Hammer Arrestors.
.2 Backflow Preventers.
.3 Water Make-Up Assembly.

.18 Section 23 05 19 Thermometers and Pressure Gauges
.1 Direct reading thermometers.
.2 Remote Reading Thermometers.
.3 Pressure Gauges.

.19 Section 23 05 23 Valves
.1 Gas Valves
.2 Valves NPS 2 and under
.3 Valves NPS 2-1/2 and over for Hydronic
.4 Grooved Valves NPS 2-1/2 and over for Hydronic
.5 Grooved Valves NPS 2-1/2 and over for Domestic Water
.6 Drain Valves
.7 Circuit Balancing Valves.
.1 Provide schedule showing size, flow and pressure drop.

.20 Section 23 05 29 Hangers and Supports
.1 Upper attachments for ducts.
.2 Upper attachments for pipes.
.3 Pipe hangers
.4 Description of where each type of upper attachment and hanger will be utilized

.21 Section 23 07 00 Mechanical Thermal Insulation
.1 Each type of insulation
.2 Canvas

.22 Section 23 11 23 Facility Gas Piping
- .1 Copy of information being submitted for gas permit in accordance with fuel safety act including but not limited to the following:
  - .1 Business name, building name and civic address.
  - .2 Regulator and line pressure relief locations and pressure settings.
  - .3 Arrangement of building piping/tubing, material used, size, type of fittings, length of runs, supports and identification method.
  - .4 Location of all shut-off valves and the make and model number of valve to be used.
  - .5 Flexible connectors make and model number.
  - .6 Appliance arrangement along with the individual make, model and BTU/hr input of each appliance.
  - .7 Venting arrangement of vented appliances including material used, size and length of vent, method of insulating and vent termination.
  - .8 Combustion air method.

.23 Section 23 21 23 Hydronic Pumps.
- .1 Pump Performance Curves.

.24 Section 23 21 13 Hydronic Systems
- .1 Roll groove coupling and fittings.
- .2 Press coupling and fittings.
- .3 Rolled Groove Valves

.25 Section 23 21 14 Hydronic Specialties
- .1 Expansion Tanks.
- .2 Air Separators.

.26 Section 23 52 01 Condensing Boilers.
- .1 Accessories.
- .2 Field wiring diagram specific to project.

.27 Section 23 51 00 Breeching, Chimneys and Stacks.

.28 Section 25 05 01 BAS: General Requirements.
- .1 Refer to Section 25 05 02 BAS: Submittals
- .2 Copy of Control Wiring Electrical Wiring Permit

.29 Shop drawings and product data shall show:
- .1 Mounting arrangements.
- .2 Operating and maintenance clearances, e.g. access door swing spaces.

.30 Shop drawings and product data shall be 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 as to current model production.
- .5 Certification of compliance to applicable codes.
- .6 Wiring diagrams and electrical characteristics specified for unit supplied.

1.3 MATERIAL ON SITE

.1 Refer to General Conditions of Contract.

.2 All claims for material on site must be supported by supplier's invoices showing supplier's unit prices including taxes.

.3 Material on site shall not be claimed under the "work complete" portion of the claim.

.4 Material eligible to be claimed as "material on site" must be project specific equipment, such as Boiler, tanks, pumps, exhaust fans, control panels, control valves, etc.

.5 General material which is not considered project specific such as piping, fittings, control conduit, control wire, ductwork, small tools, etc., are not eligible to be claimed as "material on site."

.6 Project specific equipment may be claimed as "material on site" subject to the following:
- .1 Claim to show previous material on site and deduct the amount of previously claimed material that was incorporated into the work during the current month.
- .2 Claim to show material brought on site this month supported by a copy of the supplier's invoices showing supplier's unit prices including taxes.

.7 Invoices submitted for a "material on site" claim will not be considered by the engineer unless they are examined and initialed by both the mechanical contractor and the General Contractor.

1.4 PROGRESS ESTIMATES

.1 Refer to General Conditions of Contract.

.2 Submit monthly progress estimates broken down as follows:
- .1 Mechanical Contractor Mobilization
- .2 Section 20 05 03 Common Work Results for Mechanical Contract Closeout.
  - .1 Minimum 1% of mechanical contract for items included with application for Substantial Performance certificate.
  - .2 Minimum 1% of mechanical contract for items included with application for release of final payment
- .3 Section 22 42 01 Plumbing Specialties and Accessories
- .4 Section 23 07 00 Mechanical Thermal Insulation
- .5 Section 23 11 23 Gas Piping
- .6 Section 23 21 23 Hydronic Pumps and Section 23 21 14, Hydronic Specialties.
- .7 Section 23 21 13 Hydronic Systems
- .8 Section 23 52 01 Condensing Boilers and Section 23 51 00, Breeching, Chimneys and Stacks.
- .9 Section 25 05 01 BAS: General Requirements.
  - .1 BAS Control Rough-in, BAS Control Equipment and Installation
  - .2 BAS Control Programming and verification.

.3 The first mechanical progress estimate may be withheld until such time as the shop drawings, interference drawings, progress estimate break down and hourly labor rate are submitted.

.4 Claims for Material on Site to have itemized list which are updated monthly.

1.5 CONTRACT CHANGES

.1 Hourly Labor Rates
- .1 Refer to General Conditions of Contract.
- .2 Submit separate hourly labor rate for each of the following:
  - .1 Insulator
  - .2 Plumber
  - .3 Heating Installer
  - .4 BAS Control Electrician.
  - .5 BAS Control Technician
- .3 Total Payroll costs as follows:

Base Rate	$
Vacation and Holiday Pay	$
Apprentice Council	$
Promotion fund	$
Training and Union Fund	$
Pension	$
Safety Training	$
Health Benefits	$
Liability Insurance	$
Worker's Compensation Board	$
Employment Insurance	$
CPP	$
Safety Equipment	$
SUBTOTAL	$
Small Tools 5% of Subtotal	$
Site Supervision 5% of Subtotal	$
TOTAL	**$**

- .4 Overhead and Fee as per General Condition of Contract.

.2 Contract Changes
- .1 Less than $1,000.00, provide lump sump price.
- .2 Over $1,000 provide breakdown showing the following:
  - .1 Labour hours times hourly labor rate.
  - .2 List of Materials with unit costs.
- .3 Provide breakdown for credit materials and labour.

1.6 PROJECT SCHEDULE

.1 Refer to General Conditions of Contract.

.2 In co-operation with General Contractor submit a mechanical schedule broken down as follows:
- .1 Mechanical Thermal Insulation
- .2 Plumbing Rough-In
- .3 Plumbing Fixtures and Equipment Installation
- .4 Hydronic Rough-In
- .5 Hydronic Equipment and Installation
- .6 Boilers and Chimney
- .7 BAS Control Rough-in.

.8 BAS Control Equipment and Installation
.9 BAS Control Programming and verification.
.10 Testing Adjusting and Balancing (TAB) of Mechanical Systems
.11 Submittal of Contract Close Out Documentation.

1.7 OPERATING AND MAINTENANCE (O&M) MANUAL

.1 Operating and maintenance manual to be reviewed by the Consultant and final copies deposited with Consultant before application for substantial performance certificate

.2 Organize by specification section.

.3 O&M Manuals to be custom designed and contain material pertinent to this project only and to provide full and complete coverage of subjects referred to in this section.

.4 Customize O&M data from manufacturer's to suit this project.
.1 Provide site specific manual or
.2 Neatly cross out non applicable generic information in the manual.
.3 In Manufacturer's literature, highlight model supplied for this project.

.5 Provide Maintenance Program Schedule in table format (See Below) for each mechanical system and each piece of mechanical equipment including all items for which shop drawings have been submitted. Reference specification sections. List piece of equipment, items to be checked and frequency, tab in manual and page within section.

EQUIPMENT	ITEMS TO BE CHECKED	FREQUENCY	TAB & PAGE
Section 22 42 01 Plumbing Specialties	Clean and confirm flow from trap primer.	Monthly or as required.	22 42 01

.6 Conform to requirements of Division 01, supplemented and modified by requirements specified in this section.

.7 Project records and O&M manuals specified in this section are to be completely separate entity from those specified in Division 01.

.8 Operation data to include:
.1 Control schematics for each system including environmental controls.
.2 Description of each system and its controls.
.3 Description of operation of each system at various loads together with reset schedules and seasonal variances.
.4 Operation instruction for each system and each component.
.5 Description of actions to be taken in event of equipment failure.
.6 Valves schedule.
.7 Color coding chart.

.9 Maintenance data shall 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.

.10 Submittals:
- .1 Include a copy of all reviewed mechanical shop drawings.
- .2 Submit a copy of the complete O&M Manual to Consultant for Review.
- .3 Submission of individual data will not be accepted unless so directed by Consultant.
- .4 Make changes as required and re-submit as directed by Consultant.
- .5 Refer to Division 01 for quantity of Manuals (minimum 2).
- .6 Hard-back, 50 mm (2") 3 ring, D-ring binders.
- .7 Binders to be 2/3 maximum full.
- .8 Provide index to full volume in each binder.
- .9 Identify contents of each manual on cover and spine.
- .10 Include names, addresses, telephone numbers of each sub-contractor having installed equipment, local representative for each item of equipment, each system.
- .11 Provide full Table of Contents in each manual. Assemble each manual to conform to Table of Contents with tab sheets placed before instructions covering subject.

.11 Provide maintenance data for the following:
- .1 Section 22 42 01 Plumbing Specialties and Accessories.
  - .1 Backflow preventer
- .2 Section 23 21 23 Hydronic Pumps.
- .3 Section 23 25 00 HVAC Water Treatment Systems.
- .4 Section 23 52 01 Condensing Boilers

.12 Prepare and insert into operation and maintenance manual, additional data when need for same becomes apparent during demonstrations and instructions specified above.

1.8 SPARE PARTS AND MAINTENANCE MATERIAL

.1 Section 23 05 19 Thermometers and Pressure Gauges.
- .1 Two Thermometers. for each type and range
- .2 Two Pressure Gauges for each type and range.

.2 Section 23 21 23 Hydronic Pumps.
- .1 One set of mechanical seals for each size of pump.

1.9 AS BUILT DRAWINGS

.1 In accordance with Division 01.

.2 Site Records:
- .1 Make available for reference purposes and inspection at all times. Provide sets of white prints as required for each phase of the work. Mark thereon all changes as work progresses and as changes occur. This shall include change orders, site instructions, and changes to existing mechanical systems, control systems and low voltage control wiring.
- .2 Obtain AutoCAD drawing files from the consultant. The Contractor to update at his own expense the AutoCAD files to show the as-built conditions.
- .3 On a regular basis, transfer information to the AutoCAD files, revising drawings to show all work as actually installed. These AutoCAD files will at their completion, become the as-built drawings for this project.

.4 Ensure that the modifications follow the same standard as the original file, that is, layer control, line weights, line types, etc.
.5 Make available for reference purposes and inspection at all times.

.3 As Built Drawings:
.1 Prior to start of Testing, Adjusting and Balancing (TAB), finalize production of As Built Drawings.
.2 Identify each drawing in lower right hand corner in letters at least 13 mm (1/2") high as follows: -"AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (date).
.3 Include on the As Built Drawings the identification number off all terminal units and as installed location.
.4 Include on the As Built Drawings as installed location of all temperature sensors and/or thermostats
.5 Submit to Consultant for approval and make corrections as directed.
.6 TAB to be performed using as-built drawings.
.7 Submit completed hard copy of as-built drawings with Operating and Maintenance Manuals.
.8 Submit computer disk with the AutoCAD files to the consultant at the time specified in Division 01.
.9 Include all sections shown on interference drawings.

.4 Where products are specified by manufacturer and/or model, update AutoCAD file to show installed manufacturer and model.

2 Products N/A

3 Execution N/A

END OF SECTION

1 General

1.1 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Common Work Results for Mechanical.

1.2 SUBMITTALS

.1 Start-up Report.
- .1 Provide start-up reports as listed below.
- .2 Reports to show model number, serial number, voltage and rated amperes.
- .3 If during start up there is an operation concern, repeat start-up after operation concern has been corrected.

.2 Section 20 05 02 Mechanical Submittals.
- .1 Maintenance Materials and Spare Parts.
- .2 Operation and Maintenance Manuals.
- .3 As Built drawings.

.3 Section 20 05 03 Common Work Results for Mechanical Contract Closeout.
- .1 Confirmation of Demonstration and Operating and Maintenance Instruction.

.4 Section 20 91 13 Mechanical Systems Testing and Verification
- .1 Form V-23 21 23 - Hydronic Pumps
- .2 Form V-23 52 00 – Boiler
- .3 Form V-23 34 00 - Fans

.5 Section 23 05 53 Mechanical Identification.
- .1 Valve Chart.

.6 Section 22 42 01 Plumbing Specialties.
- .1 Backflow Preventer Test Report.

.7 Section 23 11 23 Gas Piping
- .1 Gas system test report

.8 Section 23 21 23 Hydronic Pumps.
- .1 For each Variable Frequency Drive, perform output waveform tests. Submit test results to the Consultant.

.9 Section 23 52 01 Condensing Boilers.
- .1 Factory Boiler Test Report.
- .2 On site Boiler Test Report.

.10 Section 24 05 93 Balancing (TAB) of Mechanical Systems.
- .1 TAB Report.

.11 Section 25 05 01 BAS: General Requirements.
- .1 BAS Point by Point verification report
- .2 BAS start-up report including all field programmable software settings including demand expand setpoint and schedules.
- .3 Final Inspection certificate from Inspection Authority for Control Wiring Electrical Wiring Permit

.12 With application for substantial performance certificate
- .1 Section 20 05 02 Mechanical Submittals.
  - .1 Operation and Maintenance Manuals.
- .2 Section 20 05 02 Mechanical Contract Closeout.
  - .1 Confirmation of Demonstration and Operating and Maintenance Instruction.
  - .2 Letter confirming testing and commissioning to satisfaction of Owner.
- .3 Section 20 91 13 Mechanical Systems Testing and Verification forms.
- .4 Section 22 42 01 Plumbing Specialties.
  - .1 Backflow Preventer Test Report.
- .5 Section 23 52 01 Condensing Boilers.
  - .1 On site Boiler Test Report.
- .6 Section 24 05 93 Balancing (TAB) for Mechanical Systems.
  - .1 TAB Report.
- .7 Section 25 05 01 BAS: General Requirements.
  - .1 BAS Point by Point verification report
  - .2 BAS start-up report including all field programmable software settings including demand expand setpoint and schedules.
  - .3 Final Inspection certificate from Inspection Authority for Control Wiring Electrical Wiring Permit

.13 With application for release of final payment
- .1 Section 20 05 02 Common Work Results for Mechanical - Submittals.
  - .1 Maintenance Materials and Spare Parts.
  - .2 AS Built drawings.
- .2 Section 20 91 13 Mechanical Systems Testing and Verification Forms not previously submitted.
- .3 Section 23 05 53 Mechanical Identification.
  - .1 Valve Chart.

.14 During Warranty Period
- .1 20 05 01 Common Work Results for Mechanical - General.
  - .1 Maintenance Service Reports
- .2 Section 25 05 01 BAS: General Requirements
  - .1 Quarterly Control Maintenance report.

1.3 DEMONSTRATION AND OPERATING AND MAINTENANCE INSTRUCTIONS

.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, audio visual aids, etc. as part of instruction materials.

.3 Instruction duration time requirements at Substantial Performance as follows:
- .1 Heating: 4 hours.
- .2 Boilers: 4 hours.
- .3 Controls: 4 hours.

.4 Instruction duration time requirements at month 8 of building warranty as follows:
- .1 Heating: 2 hours.
- .2 Boilers: 2 hours

.5 Where deemed necessary, Owner may record these demonstrations on video tape for future reference.

2 Products N/A

3 Execution

3.1 CLEANING

.1 Clean mechanical (building) systems in accordance with Division 01.

.2 Clean all pipe systems strainers.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE SECTIONS

.1 Section 07 84 00 Firestopping

1.3 SUBMITTALS

.1 In accordance with the following Sections:
- .1 Section 07 84 00 Firestopping
- .2 Section 20 05 02 Mechanical Submittals

2 Products

.1 Provide by Section 07 84 00 Firestopping

3 Execution

3.1 INSTALLATION

.1 Provide by Section 07 84 00 Firestopping

3.2 FIRESTOPPING

.1 Firestopping material and installation within annular space between pipes, ducts, insulation and adjacent fire separation

.2 Uninsulated unheated pipes not subject to movement: no special preparation.

.3 Uninsulated heated pipes subject to movement: wrap with non-combustible smooth material to permit pipe to move without damaging firestopping material.

.4 Insulated pipes and ducts: ensure integrity of insulation and vapor barrier at fire separation.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

1.3 RELATED WORK

.1 General requirements: Division 1.

.2 Section 24 05 93 Testing, Adjusting and Balancing (TAB) of Mechanical Systems

1.4 GENERAL

.1 The verification of all Mechanical systems installed on this project is the responsibility of the Mechanical Contractor. Manufactured systems or components shall be commissioned by factory trained technicians representing the manufacturer, in the presence of the Owner's designated representatives, and under the direction of the Mechanical contractor.

.2 The Mechanical contractor will provide assistance to the Owner's representatives and ensure that the manufacturer's representative is on site during functional performance testing.

.3 Tests shall be performed by qualified plumber, heating technicians, sheet metal technician, electricians or other technicians as required by the nature and complexity of the test.

1.5 QUALITY ASSURANCE

.1 Be responsible for quality assurance and whenever necessary, to ensure compliance with operating requirements, CSA, these contract documents, the Authority having Jurisdiction and other requirements and codes as applicable.

.2 Perform services under direction of supervisor qualified under certification requirements of sponsoring association.

1.6 SCOPE

.1 Testing are called for throughout the individual specifications, however, this does not relieve this Division from providing all testing necessary to ensure that systems and equipment operate as required and that they interface other systems and equipment as required.

.2 Testing of manufactured systems or components shall be performed by factory trained technicians representing the manufacturer.

.3 Perform test by qualified technicians as required by the nature and complexity of the test.

1.7 SYSTEM PERFORMANCE VERIFICATION

.1 When systems are ready for performance verification, arrange a time with the Consultant.

.2 Tested systems prior to this demonstration and be confident that all systems will operate as required.

.3 Systems shall be ready for performance verification at the time prior to final inspection.

1.8 CLEANING

.1 Clean mechanical (building) systems in accordance with Division 1.

.2 Clean all pipe systems strainers.

.3 Wipe down exterior of air handling units.

.4 Wash interior of air handling units.

.5 In preparation for final acceptance, clean and refurbish all equipment and leave in operating condition including replacement of all filters in all air and piping systems.

1.9 CONTRACTOR'S RESPONSIBILITIES

.1 Prepare each system for testing and verification.

.2 Co-ordinate the efforts of testing and verification.

.3 Provide personnel to operate systems at designated times, and under conditions required for proper testing and adjusting.

.4 Provide all necessary test and calibration equipment, temporary facilities, meters, sensors, etc. necessary to simulate and verify correct operating conditions.

.5 Co-ordinate and pay for all costs associated with testing and verification, including but not limited to costs for travel, labour, equipment, testing agencies, manufacturers, testing and any other costs incurred to test and verify equipment and systems.

.6 Make test instruments available to Consultant to facilitate spot checks during testing.

.7 Retain possession of test instruments and remove at completion of services.

.8 Verify system installation is complete and in continuous operation.

.9 Where systems or equipment do not operate as required, make the necessary corrections or modifications, re-test and re-commission.

1.10 FINAL REPORT

.1 Assemble all testing data and verification reports and submit them to the Consultant.

.2 Each form shall bear signature of recorder, date of test, and all relevant information in clear and legible form.

.3 Identify each instrument used, and latest date of calibration of each.

.4 Include written confirmation by Owner's representatives that all verification, testing, instruction and demonstrations have been completed to the Owner's satisfaction.

2 Products N/A

3 Execution

3.1 SYSTEM PERFORMANCE VERIFICATION

.1 When systems are ready for performance verification, arrange a time with the Consultant.

.2 Tested systems prior to this demonstration and be confident that all systems will operate as required.

.3 Systems shall be ready for performance verification at the time prior to final inspection.

3.2 VERIFICATION

.1 In context of this paragraph "verify" to include "demonstrate" to consultant.

.2 Timing: verification only after start-up deficiencies rectified.

.3 Access doors: verify size and location relative to items to be services.

.4 Verification reports:
- .1 Record all results on approved report forms.
- .2 Include signature of tester and supervisor.

.5 Verification:
- .1 Notify Consultant 24 hr before commencing tests.

Form V-23 21 23 Hydronic Pumps

EQUIPMENT DETAILS: (Identification)

Hydronic Pump # _____
Manufacturer: _____ Model: _____ Serial #: _____
Hydronic Pump # _____
Manufacturer: _____ Model: _____ Serial #: _____
Hydronic Pump # _____
Manufacturer: _____ Model: _____ Serial #: _____

PRE-REQUISITES: Heating System complete.

PROCEDURES: (Place checkmark in space provided)	*Pump #*	*Pump #*	*Pump #*
1. Use balancing report to verify water flow with design.	_____	_____	_____
2. Verify shut-off valve works by closing, then opening it.	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____

COMMENTS/EVALUATIONS:

_____

_____

_____

SIGN OFF:
Mechanical Contractor: _____ **Signature:** _____ **Date:** _____

Form V-23 52 00 - Boiler

EQUIPMENT DETAILS: (Identification)
Boiler
Boiler #_____ Manufacturer: _____ Model: _____
Serial #: _____ Relief Valve Model: _____
PRE-REQUISITES: Water available. Waste pipe pressure tested.
Hydronic System Complete.

PROCEDURES: (Place checkmark in space provided)		*Boiler*
.1	*Verify installation in accordance with manufacturer's recommendation.*	_____
.2	*Verify there is no unusual vibration.*	_____
.3	*Verify power is correct.*	_____
.4	*Verify lamecoid identification mechanically fastened.*	_____
.5	*Verify accessibility.*	_____
.6	*Verify shut-off valve works by closing, then opening it.*	_____
.7	*Verify makeup water operation.*	_____
.8	*Relief valve setting.*	_____
.9	*Verify relief valve operation.*	_____
.10	*Verify gas pressures.*	_____
.11	*Fire boiler and test all safety control operation including low water cut-off.*	_____
.12	*High limit setting.*	_____
.13	*Verify boiler has a smooth start/stop.*	_____
.14	*Verify modulation rates are suitable under low load conditions.*	_____
.15	*Verify all condensate drains are piped and drain properly.*	_____
.16	*Verify acid neutralizer is charged with media.*	_____

COMMENTS/EVALUATIONS:

_____

_____

_____

SIGN OFF:
Mechanical
Contractor: _____ Signature: _____ Date: _____

Form V-23 21 23 Hydronic Pumps

EQUIPMENT DETAILS: (Identification)
Hydronic Pump # _____
Manufacturer: _____ Model: _____ Serial #: _____
Hydronic Pump # _____
Manufacturer: _____ Model: _____ Serial #: _____
Hydronic Pump # _____
Manufacturer: _____ Model: _____ Serial #: _____

PRE-REQUISITES: Heating System complete.

PROCEDURES: (Place checkmark in space provided)	*Pump #* _____	*Pump #* _____	*Pump #* _____
3. Use balancing report to verify water flow with design.			
4. Verify shut-off valve works by closing, then opening it.	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____
	_____	_____	_____

COMMENTS/EVALUATIONS:

_____

_____

_____

SIGN OFF:
Mechanical
Contractor: _____ Signature: _____ Date: _____

Form V-22 42 01 - Backflow Preventer

EQUIPMENT DETAILS: (Identification)
Backflow Preventer
Manufacturer: _____ Model: _____

PRE-REQUISITES: Water system operation, Drainage system operational.

PROCEDURES: (Place checkmark in space provided)	*BFP #*	*BFP #*	*BFP #*
	_____	_____	_____
.17 Verify installation of correct type to suit application.	_____	_____	_____
.1 Adjust as necessary to ensure proper operation.	_____	_____	_____
.2 Verify visibility of discharge.			
	_____	_____	_____

COMMENTS/EVALUATIONS:

_____

_____

_____

_____

SIGN OFF:
Mechanical Contractor: _____ **Signature:** _____ **Date:** _____

Form V-23 52 00 - Boiler

EQUIPMENT DETAILS: (Identification)
Boiler
Boiler #_____ Manufacturer: _____ Model: _____
Serial #: _____ Relief Valve Model: _____
PRE-REQUISITES: Water available. Waste pipe pressure tested.
Hydronic System Complete.

PROCEDURES: (Place checkmark in space provided)		*Boiler*
.1	*Check water side of boiler*	_____
.2	*Check fire side of boiler.*	_____
.3	*Verify installation in accordance with manufacturer's recommendation.*	_____
.4	*Verify there is no unusual vibration.*	_____
.5	*Verify power is correct.*	_____
.6	*Verify rotation by "bumping" burner.*	_____
.7	*Verify lamecoid identification mechanically fastened.*	_____
.8	*Verify accessibility.*	_____
.9	*Verify shut-off valve works by closing, then opening it.*	_____
.10	*Verify makeup water operation.*	_____
.11	*Relief valve setting.*	_____
.12	*Verify relief valve operation.*	_____
.13	*Verify oil pressure.*	_____
.14	*Fire boiler and test all safety control operation.*	_____
.15	*Aquastat high limit setting.*	_____
.16	*Aquastat cut-in setting.*	_____
.17	*Aquastat cut-out setting*	_____
.18	*Stack temperature after 15 minutes of operation.*	_____

COMMENTS/EVALUATIONS:

_____

_____

_____

SIGN OFF:
Mechanical
Contractor: _____ **Signature:** _____ **Date:** _____

Form V-24 34 25 - Fans

EQUIPMENT DETAILS: (Identification)
Fan # _____ Replacement Belt # _____
Manufacturer: _____ Model: _____ Serial #: _____
Fan # _____ Replacement Belt # _____
Manufacturer: _____ Model: _____ Serial #: _____
Fan # _____ Replacement Belt # _____
Manufacturer: _____ Model: _____ Serial #: _____

PRE-REQUISITES: Power and ductwork complete.
Balancing Report complete.
BAS Control report complete.

PROCEDURES: (Place checkmark in space provided)	*Fan #* _____	*Fan #* _____	*Fan #* _____
5. Use balancing report to verify air flow with design.			
6. Verify there is no unusual vibration (i.e.: belt guard is secure).	_____	_____	_____
7. Check belt tension (if applicable.)	_____	_____	_____
8. Verify power is correct.			
9. Verify rotation by "bumping" fan.	_____	_____	_____
10. Verify lamecoid identification mechanically fastened.	_____	_____	_____
	_____	_____	_____

COMMENTS/EVALUATIONS:

_____

_____

_____

_____

SIGN OFF:
Mechanical Contractor: _____ Signature: _____ Date: _____

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

1.3 LEAD FREE

.1 In accordance with NSF/ANSI 372 Drinking water system components – Lead Content or California Health and Safety Code (Section 116875; commonly known as AB1953) or Vermont Bill S.152

2 Products

2.1 PIPING

.1 Domestic hot, tempered, cold and recirculation tubing, within building.
- .1 Buried: copper tube, soft annealed, type K: to ASTM B88. In long lengths and with no buried joints.
- .2 Above ground: copper tube, hard drawn, type L to ASTM B88.

2.2 FITTINGS FOR COPPER

.1 ASME/ANSI B16 Series

.2 Brass or bronze flanges and flanged fittings.

.3 Cast brass or bronze threaded fittings, Class 125 & 250.

.4 Cast bronze or wrought copper and bronze.
- .1 NPS 2 and under: Lead free solder to ASTM B32.
- .2 NPS 2 1/2 and over: Roll Grooved or Silfos.

.5 Press Fitting:
- .1 Copper and copper alloy press fittings conforming to material requirements of ASME B16.18 or ASME B16.22 and performance criteria of IAPMO PS 117.
- .2 EPDM sealing elements for press fittings.
- .3 Factory installed sealing elements.
- .4 Press ends with leakage path feature that assures leakage of liquids from inside the system past the sealing element of an unpressed connection. The function of this feature is to provide the installer quick and easy identification of connections which have not been pressed prior to putting the system into operation.
- .5 Acceptable Material: Viega Copper ProPress fittings.

2.3 JOINTS FOR COPPER

.1 Solder/brazing: lead free to ASTM B32.

.2 Press connections: Copper and copper alloy press connections in accordance with the manufacturer's installation instructions.

2.4 HANGERS AND SUPPORTS

.1 Support as per manufacturer's requirements and National Plumbing Code of Canada.

.2 Copper
.1 As per Section 23 05 29 Hangers and Supports.

2.5 VALVES

.1 As per Section 23 05 23 Valves.

2.6 INSULATION

.1 As per Section 23 07 00 Mechanical Thermal Insulation

3 Execution

3.1 INSTALLATION

.1 Connect to fixtures and equipment in accordance with manufacturer's instructions unless otherwise indicated.

.2 Install pipes close to building structure to minimize furring, conserve headroom and space. Run piping parallel to walls. Group piping wherever possible.

.3 Install groups of piping parallel to each other, spaced to permit application of insulation, identification, and service access, on individual hangers or trapeze hangers.

.4 Cut square, ream and clean tubing and tube ends, clean recesses of fittings and assemble without binding.

.5 Wipe all pipes of soldering flux as the joint is completed.

.6 Assemble all piping using fittings manufactured to ANSI standards.

.7 Install DCW piping below and away from DHW and DHWR and all other hot piping so as to maintain temperature of cold water as low as possible.

.8 Where pipe sizes differ from connection sizes of equipment, install reducing couplings close to equipment. Reducing bushings are not permitted.

.9 Lay copper tubing so that it is not in contact with dissimilar metal and will not be kinked or collapsed.

.10 Use non-corrosive lubricant or Teflon tape applied to male thread.

.11 Provide di-electric couplings wherever piping of dissimilar metals are joined.

.12 Install swing or swivel joints to connect risers to mains.

3.2 PRESS CONNECTION INSTALLATION

.1 In accordance with the manufacturer's installation instructions.

.2 Fully inserted tubing into the fitting and the tubing marked at the shoulder of the fitting.

.3 Check the fitting alignment against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting.

.4 Pressed the joints using the tool(s) approved by the manufacturer.

3.3 DISINFECTION & TESTING

.1 Potable Water

.1 Flush out, disinfect and rinse entire potable water system to requirements of authority having jurisdiction.

.2 Upon completion, provide bacteria analysis laboratory test reports.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

1.3 LEAD FREE

.1 In accordance with NSF/ANSI 372 Drinking water system components – Lead Content or California Health and Safety Code (Section 116875; commonly known as AB1953) or Vermont Bill S.152

2 Products

2.1 BACK FLOW PREVENTERS

.1 CSA B64.4 Certified.

.2 Reduced pressure zone backflow preventer.
- .1 NPS 3/4 to 2.
  - .1 Lead Free
  - .2 Bronze body construction.
  - .3 Quarter turn ball valve shut-offs.
  - .4 Bronze ball valve test cocks.
  - .5 Replaceable seats.
  - .6 Soft seat check valve
  - .7 Air gap piped to drain.
  - .8 Acceptable Material:
    - .1 Watts LF009 QT with 909 AG and LF601 Maxi-flo check valve.
    - .2 Wilkins 975XL with AG and 40XL In-Line Check Valve
    - .3 Apollo 4ALF with AGD and 61-100/200 In-Line Check Valve

2.2 WATER MAKE-UP

.1 Pressure reducing valve type complete with integral strainer.
- .1 Acceptable Material:
  - .1 Apollo 36C
  - .2 Watts N256.

3 Execution

3.1 BACK FLOW PREVENTERS

.1 Pipe discharge to nearest drain.

3.2 WATER MAKE-UP ASSEMBLY

.1 Pipe relief valve to nearest drain.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

2 Products

2.1 GENERAL

.1 Design point to be midpoint of scale or range.

.2 Dual Scale:
- .1 Water and Glycol Thermometers: 0 to 115° C, 30° to 240° F.
- .2 Pressure Gauges:
  - .1 Domestic water 0 to 700 kPa, 0 to 100 psi.
  - .2 Hydronic 0-400 kPa, 0 to 60 psi.
- .3 Air Thermometers: -30° to 40° C, -20° to 100° F.

.3 Direct Reading Thermometers
- .1 Industrial variable angle type 225 mm (9") scale length.
- .2 Liquid filled or Solar powered
- .3 Aluminum case

.4 Thermometer Wells
- .1 Copper pipe: use copper or bronze. For steel pipe use stainless steel.
- .2 Steel Pipe:
  - .1 Open systems use stainless steel.
  - .2 Closed systems use brass.

.5 Pressure Gauges
- .1 100 mm (4 1/2") dial type: liquid filled having 1% accuracy unless otherwise specified.
- .2 Provide gauge cock. Ball valve in accordance with Section 23 05 23 Valves

.6 Acceptable Material

	Direct Reading Thermometers	**Remote Reading Dial Thermometers**	**Pressure Gauges**
Trerice	BX 9140 or SX9140305	V80342	700 LFB
Weiss	A9VS9	VTR-45BL38	NF4S-1
Winters	9IT with Aluminum case	R33452	FPQ-4
Weksler	EG5H-9 with Aluminum Case	-	EA14

3 Execution

3.1 GENERAL

.1 Provide thermometers and gauges so they can be easily read from floor or platform. If this cannot be accomplished, install remote reading thermometers and gauges.

.2 Provide between equipment and first fitting or valve.

.3 Increase pipe size at well to minimum NPS 2 to accommodate well.

.4 Well to extend 6 mm to 12 mm into the pipe.

3.2 DIRECT READING THERMOMETERS

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

.2 Provide in the following locations:
- .1 Water boiler headers.
- .2 Programmed water control valves outlet.
- .3 In other locations as indicated.

.3 Use extensions where thermometers are installed through insulation.

3.3 PRESSURE GAUGES

.1 Provide in following locations:
- .1 Suction and discharge of pumps and circulators over 373 kW (1/2 hp).
- .2 For heating coils in air handling units, at inlet of coil pump, at outlet of coil pump and at outlet of coil
- .3 In other locations as indicated.

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

END OF SECTION

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

1.3 MANUFACTURED ITEMS

.1 All valves of one type to be by one manufacturer.

1.4 LEAD FREE

.1 In accordance with NSF/ANSI 372 Drinking water system components – Lead Content or California Health and Safety Code (Section 116875; commonly known as AB1953) or Vermont Bill S.152

2 Products

2.1 GAS VALVES NPS 2 AND UNDER

.1 Ball Valves NPS 2 and under, screwed.
- .1 Application.
  - .1 Section 23 11 23 Facility Gas Piping
- .2 ULC or CGA approved for Natural Gas and Propane.
- .3 Quarter-turn: bronze.

.2 Acceptable material:

NPS 2 and under	**Ball Gas**
Crane Canada Inc.	9302 CGA
Jenkins Valves 92 Inc.	901CJ
Kitz	58
Red-White/Toyo	5044A CGA
Newman Hattersley	1969F
Nibco	T-FP-600

2.2 VALVES NPS 2 AND UNDER

.1 Lead Free Ball Valves NPS 2 and under soldered and screwed:
- .1 Application
  - .1 Section 23 21 13 Hydronic Systems
- .2 Quarter-turn: 4130 kPa (600 psi) W.O.G., bronze, large port.

.2 Lead Free Swing Check Valves NPS 2 and under, soldered and screwed:
- .1 Application
  - .1 Section 23 21 13 Hydronic Systems
- .2 1380 kPa (200 psi) W.O.G., bronze body, bronze swing disc, screw in cap, regrindable seat.

.3 Acceptable material:

NPS 2 and under	Lead Free Ball	Lead Free Check
Apollo	77CLF-100/77CLF-200	161S-LF/161T-LF
Crane	LF9201/LF9202	LF37/LF1340
Milwaukee	UPBA150/ UPBA100	UP1509/UP509
Nibco	S-685-80-LF /T -685-80-LF	S-413-Y-LF / T-413-Y-LF
Kitz	868/869	822T/823T
Watts	LFB6080/ LFB6081	LFCV/LFCVS

2.3 VALVES NPS 2 AND OVER FOR HYDRONIC

.1 Gate Valves NPS 2 1/2 and over, flanged
- .1 Application
  - .1 Section 23 21 13 Hydronic Systems
- .2 Rising stem: class 125, 1380 kPa (200 psi) W.O.G., FF flange, cast-iron body, OS&Y bronze trim.

.2 Check Valves NPS 2-1/2 and up, flanged:
- .1 Application
  - .1 Section 23 21 13 Hydronic Systems
  - .2 Condensate
- .2 Class 125, 1380 kPa (200psi) W.O.G., cast iron body, FF flange, renewable seat, bronze disc, bolted cap.

.3 NPS 2-1/2 to 10, lug wafer butterfly:
- .1 Application: Section 23 21 13 Hydronic Systems
- .2 200 CWP @ 93° C, cast iron body with uncoated bronze disc and 316 stainless steel stem, replaceable EPDM seat, locking handle, gear operators NPS 6 and over.

.4 Acceptable material:

NPS 2-1/2 and up Flanged	Cast Iron Gate	Check	Lug Wafer Butterfly
Crane Canada Inc.	465 1/2	373	44-BSZ-L/G
Jenkins Valves 92 Inc.	454J	587J	2231-ELJ/GJ
Kitz	72	78	6122EL/G
Red-White/Toyo	421 A	435A	
Milwaukee	F-2885-M	F2974M	CL2/3-24E L/G
Newman Hattersley	T504	T651	Series 45-313321/2
Nibco	FE-617-0	FE918B	LC2008-3/5
Bray	-	-	34-01/04
Keystone	-	-	F1020 CBE2

2.4 GROOVED END VALVES NPS 2 AND OVER FOR HYDRONIC

.1 Check Valves NPS 2 ½ to 4 for grooved end pipe:
- .1 Class 125, 860 kPa (125 psi), ductile iron body, stainless steel discs, stainless steel spring, stainless steel shaft, EPDM seat.

.2 Butterfly Valves NPS 2-1/2 and over grooved end body:
- .1 Housing: Ductile iron conforming to ASTM A-536, grade 65-45-12 or ASTM A-

395, grade 65-45-15
.2 Body: Carbon steel, electroplated
.3 Seat/Liner: Grade "E" EPDM. Temperature range –34° C to +110° C.
.4 ANSI/NSF 61 for cold +86°F/+30°C and hot 180°F/+82°C potable water service.
.5 Stem-Upper/Lower: 416 stainless steel
.6 Disc: Aluminum bronze
.7 Locking handle, gear operators NPS 6 and over.

.3 Acceptable material:

NPS 2-1/2 and up Grooved	Check	Butterfly
Victaulic	Vic 716	Vic 300 MasterSeal
Anvil	7800	Series 7600
Nibco	-	GD-4765-3/5

2.5 DRAIN VALVES AND GAUGE COCKS

.1 Lead Free Drain Valves
.1 Locate at low points of mains, branches and risers.
.2 At domestic water branch isolation valves, provide drain unless branch can be drained through a fixture.
.3 At hydronic branch isolation valves, provide drain unless branch can be drained through a hydronic unit.
.4 At pumps locate drain between pump and suction diffuser. Don't use suction diffuser drain plug.
.5 Equipment drain valves line size.
.6 Minimum NPS 1/2 unless otherwise specified.
.7 Ball valve with hose end male thread and cap with chain.

.2 Lead Free Gauge Cocks
.1 NPS 1/4 screwed.
.1 Application
.1 Pressure Gauge
.2 Air vents
.3 Where indicated
.2 Quarter-turn: 1725 kPa (250 psi) W.O.G., bronze.

.3 Acceptable material:

	Drain valves	Gauge Cocks
Apollo	77CLF-100-HC/77CLF-200-HC	77CLF-100/77CLF-200
Kitz	868/869 w/cap and chain.	868/869
Nibco	S-685-80-LF-HC /T -685-80-LF-HC	S-685-80-LF /T -685-80-LF
Watts	LFB6080/ LFB6081 w/cap and chain	LFB6080/ LFB6081
Milwaukee	UPBA150/ UPBA100 w/cap and chain	UP1509/UP509

2.6 CIRCUIT BALANCING VALVES

.1 Hydronic Heating:

.1 Y style globe valve, designed to provide precise flow measurement and control, with valved ports for connected to differential pressure meter.
.2 Accuracy: Readout to be within plus or minus 2% of actual flow at design flow rate.
.3 Flow control: At least four (4) full turns of handwheel with digital handwheel and tamperproof concealed mechanical memory.
.4 Positive shut-off.
.5 Memory stop.
.6 Connections:
  .1 Screwed or soldered: NPS ½ and NPS ¾
  .2 Screwed: NPS 1 to NPS 2.
  .3 Flanged or Grooved: NPS 2 1/2 and over.
.7 Standard of Acceptance Heating:
  .1 S. A. Armstrong CBV.
    .1 NPS ½ LF for 0.03 to 0.125 l/s (0.5 to 2.0 USgpm)
    .2 NPS ¾ LF for 0.03 to 0.19 l/s (0.5 to 3.0 USgpm)
    .3 Standard CBV for other flows
.8 Acceptable Material Heating:
  .1 Hattersley 1710 and 737
  .2 Tour and Anderson STA-D/F.
  .3 Anvil Series GBV and MBV
  .4 Oventrop Hydrocontrol 106 Series
  .5 Victaulic 78 TA Series

3 Execution

3.1 GENERAL

.1 Install valves with stems upright or horizontal unless approved otherwise.

.2 Line size.

3.2 CIRCUIT BALANCING VALVES

.1 Maintain Manufacturer's recommended minimum straight pipe diameters.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

2 Products

2.1 GENERAL

.1 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

2.2 UPPER ATTACHMENTS

.1 Preformed metal supports with 3 fasteners per side
- .1 Steel Deck
- .2 Galvanized.
- .3 Min 45 kg Static Load
- .4 Application:
  - .1 NPS ½ or ¾ domestic water piping or heating piping.
  - .2 Up to NPS 2 Plumbing vent.
  - .3 Maximum size duct: 400 mm (16").
- .5 Acceptable material: Brak-It

.2 Welded eye rod:
- .1 Wood.
- .2 Zinc plated.
- .3 Application: Piping and ductwork

.3 Coach screw with flatten end with hole for threaded rod:
- .1 For side attachment to Wood.
- .2 Application: Piping and ductwork

.4 Coach screw and machine thread rod:
- .1 Wood.
- .2 Zinc plated.
- .3 Application: Piping and ductwork

.5 Caddy clip for 6 mm (¼") rod Min 90 kg Static Load.
- .1 Steel beam, channel, joist or angle.
- .2 Application: Ductwork.

.6 Steel washer plate with double locking nuts.
- .1 Steel Joist.

.2 Application: Cold and hot, plumbing and hydronic piping, any size and ductwork.

.7 Universal C-Clamp.
.1 Top of steel beam, top of channel, top of joist or angle.
.2 Application: Cold and hot, plumbing and hydronic piping, NPS 6 and under and ductwork.

.8 Acceptable material:

	CCTF/Hunt	**E. Myatt & Co**	**Taylor Pipe Supports**	**Anvil**	**Carpenter and Paterson Pipe Hangers Ltd.**
Welded eye rod	95	440		278	
Coach screw with Flattened end		#3 size 2			
Coach screw	58N	461	61	142	
Steel washer plate	560	545	80	60	260
Universal C-Clamp	56/56N/56NW		406/407	92/93/94	
C-Clamp	57	586	301	86	238

.9 For pipes and ducts parallel to steel structure:
.1 Insert into floor slab above or
.2 Steel member from structural member to structural member.
.3 Double locking nuts.

.10 Concrete:
.1 Inserts for cast-in-place concrete: galvanized steel wedge to MSS-SP-58, type 18. ULC listed for pipe NPS 3/4 through NPS 8.

2.3 MIDDLE ATTACHMENT (ROD)

.1 Cadmium plated steel threaded rod:
.1 Acceptable Material:
.1 Carpenter & Paterson Pipe Hangers Ltd. Fig. 94.
.2 CCTF/Hunt Fig. 99P.
.3 Anvil Fig. 146.

2.4 PIPE ATTACHMENT

.1 Protecting Shield:
.1 Minimum 1.3 x 300 mm (18 Ga. x 12”) long for NPS 6 and under.
.2 Minimum 1.6 x 450 mm (16 Ga. x 18") long for over NPS 6.
.3 Shop fabricated or as per table below

.2 Adjustable clevis hanger: to MSS-SP69, type 1, ULC listed.

.3 Long adjustable clevis hanger: to MSS-SP69, Type 1 ULC listed.

.4 Copper plated or epoxy coated adjustable clevis hanger:

.5 Adjustable steel yoke pipe roll: to MSS-SP69, Type 43.

.6 Adjustable clevis hanger for cast iron pipe:
.1 Application: Insulated and uninsulated cast iron pipe. All sizes.

.7 Black carbon steel riser clamp to MSS-SP69, Type 8, ULC listed.
.1 Application: Steel pipes and Cast iron pipe.

.8 Copper plated carbon steel to MSS-SP69, Type 8, ULC listed:
.1 Application: Copper pipes.

.9 Acceptable material:

	CCTF/ Hunt	**E. Myatt & Co**	**Taylor Pipe Supports**	**Anvil**	**Carpenter and Paterson Pipe Hangers Ltd.**
Protecting Shield	102		69H	167	
Protection Saddle	71	210 to 240	70 to 75	160 to 166	351 to 356
Adjustable clevis hanger	32N	124	24Z	260	100
Long adjustable clevis hanger	32U	124L	24L	300	286
Copper plated or epoxy coated clevis hanger	30C/E	151CT or 56	52	CT65	100CT
Adjustable steel yoke pipe roll	3436	258	93	181	140
Clevis hanger for cast iron pipe	33AC	126	27AC	590	
Black carbon steel riser clamp	40	183	82	261	126
Copper plated riser clamp	42C	150CT	85	CT121	126CT

3 Execution

3.1 PIPE SUPPORT SPACING

.1 Plumbing and Hydronic: Spacing and middle attachment (rod) diameter as specified in paragraphs below or as in table below, whichever is more stringent
.1 Plumbing piping: to National Plumbing Code of Canada.
.2 Authority having jurisdiction.
.3 Flexible joint roll groove pipe: in accordance with table below, but not less than one hanger at joints and not less than one hanger per pipe length over 1200 mm (4’0”).
.4 Within 300 mm (12") of each elbow.
.5 Risers at each floor.
.6 Minimum hanger rod size as per full size manufacturer's recommendation and table below, whichever is greater.

Pipe Size: NPS	**Rod Diameter**	**Maximum Spacing Steel**	**Maximum Spacing Copper**
up to ¾	10 mm (3/8")	2100 mm (7’0”)	1500 mm (5’0”)
1 to 1-1/4	10 mm (3/8")	2100 mm (7’0”)	1800 mm (6’0”)
1-1/2	10 mm (3/8")	2750 mm (9’0”)	2400 mm (8’0”)
2	10 mm (3/8")	3000 mm (10’0”)	2750 mm (9’0”)
2-1/2	10 mm (3/8")	3350 mm (11’0”)	3000 mm (9’10”)
3	13 mm (1/2")	3650 mm (12’0”)	3000 mm (9’10”)
4	13 mm (1/2")	4250 mm (14’0”)	3000 mm (9’10”)
6	20 mm (3/4")	4570 mm (15’0”)	3000 mm (9’10”)
Over 8	22 mm (7/8")	4570 mm (15’0”)	3000 mm (9’10”)
Pipe Size: NPS	**Rod Diameter**	**Maximum Spacing Cast Iron**	**Maximum Spacing PVC**
Up to 4	10 mm (3/8")	3000 mm (9’10”)	1200 mm (4’0”)

Over 4	13 mm (1/2")	3000 mm (9’10”)	1200 mm (4’0”)

.7 PEX: Support horizontal pipe at National Plumbing Code of Canada and manufacturer’s requirements.

.2 Gas piping:

.1 To CAN/CGA B149.1.

.2 Minimum hanger rod size as per full size manufacturer's recommendation and table below, whichever is greater.

Pipe Size: NPS	Rod Diameter	Maximum Spacing Steel	Maximum Spacing Copper
1/2	10 mm (3/8")	1800 mm (6’0”)	1800 mm (6’0”)
3/4 and 1	10 mm (3/8")	2400 mm (8’0”)	1800 mm (6’0”)
1 1/4 to 2 1/2	10 mm (3/8")	3000 mm (10’0”)	1800 mm (6’0”)
3 and 4	13 mm (1/2")	4570 mm (15’0”)	3000 mm (10’0”)

.3 Rooftop: Less than NPS 1 support at 1200 mm (4’0”)

.3 At Steel Joists

.1 Locate hangers at panel points of OWSJ for piping perpendicular to OWSJ.

.2 Locate steel support members at panel points of OWSJ for piping parallel to OWSJ.

.3 For parallel runs of piping NPS 2 ½ and over.

.1 Where perpendicular to OWSJ support on alternating OWSJ.

3.2 PLUMBING AND HYDRONIC PIPE ATTACHEMENT APPLICATIONS

.1 Upper Attachment as noted above.

.2 Middle attachment as noted above.

.3 Pipe Attachment Application

.1 Uninsulated steel pipe: All sizes.

.1 Adjustable clevis hanger.

.2 Hot insulated steel pipe: NPS 4 and under.

.1 Long adjustable clevis hanger.

.3 Hot insulated steel pipe: over NPS 4.

.1 Adjustable clevis hanger with protection saddle: Over NPS 4 with less than 25 mm (1") horizontal movement and with more than 300 mm (12”) middle attachment (rod) length.

.2 Adjustable steel yoke pipe roll with protection saddle: Over NPS 4 with horizontal movement in excess of 25 mm (1") and with middle attachment rod 300 mm (12”) or less.

.3 Insulate between saddle and pipe.

.4 Uninsulated copper pipe: All sizes.

.1 Copper plated or epoxy coated adjustable clevis hanger.

.5 Hot Insulated plumbing copper pipe: All sizes

.1 Copper plated or epoxy coated adjustable clevis hanger.

.6 Cold Insulated plumbing copper pipe: NPS 1 ¼ and under.

.1 Copper plated or epoxy coated adjustable clevis hanger.

.7 Cold insulated plumbing copper pipe: NPS 1 ½ and over.

.1 Adjustable clevis hanger with protection shield and P-5 insulation (Section 23 07 00) between shield and pipe.

3.3 DUCT HANGERS

.1 In accordance with Section 24 31 13 Metal Ducts - Low Pressure to 500 Pa

3.4 MIDDLE ATTACHMENT (ROD)

.1 Trim excess threaded rod off within 13 mm (1/2") of attachment nut.

3.5 HANGER INSTALLATION

.1 Offset hanger so that rod is vertical in operating position.

.2 Adjust hangers to equalize load.

.3 Provide double nuts at middle attachment (rod) top and bottom.

.4 Where building structural members or inserts are not suitably located provide supplementary steel channels or angles, support these channels and angles only from the top of structural members. Drill holes in the channels and angles for insertion of hanger rods. If the holes are cut out with a torch, provide a back-up steel plates with drilled holes for inserting hanger rods. Secure each hanger rod to the channels and angles using a steel back-up plate where applicable and steel washers and a lock-nut system. All channels, angles and hanger rod upper supports shall have a load capacity of five (5) times the load to be supported from them.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

2 Products

2.1 MANUFACTURERS NAMEPLATES

.1 Provide metal nameplate on each piece of equipment, mechanically fastened complete with raised or recessed letters. Locate nameplates so that they are easily read. Do not insulate or paint over nameplates.

.2 Include registration plates (e.g. Pressure vessel, Underwriters' Laboratories and CSA Approval). Indicate size, equipment model, manufacturer's name, serial number, voltage, cycle, phase and power of motors.

2.2 SYSTEM NAMEPLATES

.1 Color:
- .1 Hazardous: white letters, red background
- .2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).

.2 Construction:
- .1 2.4 mm (3/32") thick, laminated plastic or white anodized aluminum, matte finish, square corners, letters accurately aligned and machine engraved into core.

.3 Minimum Sizes:
- .1 Conform to following table:

Size 1	10 mm x 50 mm (3/8" x 2")	1 line	5 mm (0.2") high letters
Size 3	16 mm x 75 mm (3/4" x 3")	2 line	5 mm (0.2") high letters
Size 7	25 mm x 100 mm (1" x 4")	2 line	6 mm (1/4") high letters
Size 8	50 mm x 150 mm (2" x 6")	2 line	13 mm (1/2") high letters

- .2 Equipment type, number and service or area or zone of building it serves to be identified.
- .3 Use average of 25 letters/numbers (maximum) per nameplate.
- .4 Use Size 1.
  - .1 Control Components.
- .5 Use Size 3.
  - .1 Inline circulators.
  - .2 Backflow preventers
  - .3 Mixing valves
- .6 Use Size 7.

.1 Base mounted pumps.
.2 Vertical Inline pumps
.3 Fans
.4 Control panels.
.5 Junction boxes.
.6 Relay panels.

.7 Use Size 8.
.1 Boilers.

.4 Mechanically fasten nameplates.

2.3 PIPE IDENTIFICATION

.1 General: Identify medium by lettered legend, classification by primary and secondary colors, direction of flow by arrows.

.2 Primary color bands: 50 mm (2") wide.

.3 Secondary color bands: 50 mm (2") wide, 75 mm (3") in from one end of primary color band.

.4 Legend: block capitals to following table:

Outside Diameter of Pipe or Insulation	**Size of Letters**
Up to 1 1/4"	1/2"
1 1/2" to 2"	3/4"
2 1/2" to 6"	1 1/2"
Over 6"	2"

Outside Diameter of Pipe or Insulation	**Size of Letters**
Up to 30 mm	13 mm
38 mm to 50mm	20 mm
63 mm to 150 mm	38 mm
Over 150 mm	50 mm

.5 Arrows:
.1 Outside diameter of pipe/insulation 75 mm (3") and greater: 150 mm long x 50 mm high. (6" long x 2" high.)
.2 Outside diameter of pipe/insulation less than 75 mm (3"): 100 mm long x 50 high (4" long x 2" high.)
.1 Use double headed arrows where flow is reversible.

.6 Material:
.1 Paint for Stencil: Low VOC and environmentally friendly
.2 Color bands:
.1 Plastic coated cloth material with protective overcoating and waterproof contact adhesive undercoating, suitable for 100% RH and continuous operating temperature of 150° C and intermittent temperature of 200° C. Apply to prepared surfaces. Wrap tape around pipe or pipe covering with ends overlapping one (1) pipe diameter. Cut band to length, don't tear off.
.2 Acceptable Manufacturer:
.1 WH Brady Inc.

.2 Seton Name Plate Corp.

.7 Colors:
.1 Where not covered by table below, submit legend, primary and secondary classification colors to Consultant for approval.

.8 Table: Pipe and valve identification.

Pipe Marker Legend	Valve Legend	Tag Primary Color	Secondary Color
Dom. Cold Water	DCW	Green	None
Hot Water Heating Supply	HWS	Yellow	Black
Hot Water Heating Return	HWR	Yellow	Black

.9 Legend and arrows:
.1 Black or white to contrast with primary color.

.10 Heating: Label zones.

.11 Natural Gas and Propane Piping
.1 To CAN/CGA B149.1-00, Natural Gas and Propane Installation Code.
.2 Paint entire piping or tubing system yellow.
.3 In addition, on interior piping provide yellow labels marked “Gas” at 6 meter (20') intervals. Secure label with color band tape wrapped around pipe with ends overlapping one (1) pipe diameter. Cut band to length, don’t tear off.

2.4 VALVE TAGS

.1 38 mm (1 1/2") square laminated plastic with corner hole.

.2 Horizontal 13 mm (1/2") letters accurately aligned and machine engraved into core.

.3 Face color to match primary color of piping identification.

.4 Core color to match secondary color of piping identification.

2.5 ELECTRICAL COMPONENTS SUPPLIED BY DIVISION 20 TO 25

.1 Identify electrically fed equipment supplied by Division 25 as per Section 25 05 03 BAS Identification.

2.6 WARNING SIGNS

.1 Equipment (e.g. motors, starters) under remote automatic control: provide orange colored signs warning of automatic starting under control of BAS.

.2 Sign to read: "Caution: This equipment is under automatic remote control of BAS" or equivalent to Consultant's approval.

3 Execution

3.1 GENERAL

.1 Provide ULC and CSA registration plates as required by Respective agency.

3.2 MANUFACTURERS NAMEPLATES

.1 Locate nameplates so that they are easily read.

.2 Do not insulate or paint over plates.

3.3 SYSTEM NAMEPLATES

.1 In conspicuous location to facilitate easy reading from operating floor to properly identify equipment and/or system.

.2 Provide stand-offs for nameplates on hot surfaces and insulated surfaces.

3.4 LOCATION OF PIPING AND DUCTWORK IDENTIFICATION

.1 On long straight runs in open areas in boiler rooms and equipment rooms, so that at least one is clearly visible from any one viewpoint in operating areas or walking isles and not at more than 50' intervals.

.2 Adjacent to all changes in direction.

.3 Both sides of visual obstruction or where run is difficult to follow.

.4 On both sides of any separation such as walls, floors and partitions.

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

.6 At point immediately upstream of major manually operated or automatically controlled valves or damper. Where this is not possible, place identification as close to valve or damper as possible, preferably on upstream side.

.7 Legend to be easily and accurately readable from usual operating areas and all readily accessible points.

.8 Plane of legend to be approximately at right angles to most convenient line of sight with consideration of operating positions, lighting conditions, reduced visibility of color or legends caused by dust and dirt and risk of physical damage.

.9 Stencil over final finish only.

.10 Beside each access door.

3.5 VALVE TAGS

.1 Secure tags to valve handle with non-ferrous chains or closed "S" hooks for valves except at plumbing fixtures and radiation.

.2 Provide one copy of valve schedule mounted in frame with non-glare glass where directed by Consultant. Provide one copy in each operating and maintenance instruction manual.

.3 Consecutively number valves in system.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

1.3 DEFINITIONS

.1 Refer to Section 20 05 01 Mechanical General Requirements.

.2 Legend
- .1 ASJ: All Service Jacket
- .2 SSL: Self-Sealing Lap
- .3 FSK: Foil-Scrim-Kraft; jacketing
- .4 PSK: Poly-Scrim-Kraft; jacketing
- .5 PVC: Polyvinyl Chloride

1.4 ENVIRONMENTAL REQUIREMENTS

.1 Maintain ambient conditions required by manufacturers of tapes, adhesives, mastics, cements and insulation materials.

.2 Follow manufacturer’s recommended handling practices.

2 Products

2.1 GENERAL

.1 Components of insulation system to have maximum flame spread rating of 25 and maximum smoke developed rating of 50 in accordance with CAN/ULC-S102.

.2 Materials to be tested in accordance with ASTM C411.

2.2 PIPE INSULATION

.1 P-2 Formed Mineral Fiber with ASJ Vapour Barrier to 454° C
- .1 Application for piping, valves and fittings on:
  - .1 Domestic water piping
  - .2 Hydronic piping
  - .3 Condensate.
  - .4 Where indicated.
- .2 Material:
  - .1 CAN/CGSB 51.9 Mineral Fiber Thermal Insulation for Piping
  - .2 CGSB 51-GP-52 Vapour Barrier Jacket and Facing Material.
  - .3 Self-seal lap closure including ASJ butt strips.
- .3 Thermal Conductivity "k" shall not exceed 0.034 W/m° C at 24° C mean

temperature when tested in accordance with ASTM C335.

.4 Thickness:
- .1 Domestic Cold Water
  - .1 13 mm (1/2") on NPS 1/2 pipe.
  - .2 25 mm (1") on NPS 3/4 and over.
- .2 Hydronic: Interior of building
  - .1 25 mm (1") on NPS ¾ to NPS 2
  - .2 38 mm (1 ½") on NP NPS 2 1/2 and over.
- .3 Infloor heating system.
  - .1 25 mm (1")
- .4 Condensate 38 mm (1 ½")

.5 All pipe insulation shall be by one manufacturer.

.6 Copper tube size for copper pipe.

.2 P-5 Insulation Support System
- .1 Application at:
  - .1 Pipe Hangers.
- .2 Thickness: As per adjacent insulation.
- .3 Material for steel pipe NPS 6 and smaller:
  - .1 CAN/CGSB-51.2 Calcium Silicate Insulation.
  - .2 Buckaroo Insulation with ASJ Support System.
- .4 Material for Steel Pipe NPS 8 and larger: Buckaroo Insulation Support System with ASJ.
- .5 Material for Copper Pipe: Buckaroo Insulation Support System with ASJ.

.3 Acceptable Material:

	Owens-Corning	**Manson Insulation Inc.**	**Knauf Fiber Glass**	**Johns Manville Insulations**
P-2	Fiberglas SSL-II	Alley K-APT	ASJ-SSL	Micro Lok AP-T
P-5	Calcium Silicate	Calmax	Temperlite 1200	Thermo-12/Blue

2.3 EQUIPMENT INSULATION

.1 E-1 Mineral Fiber Blanket Hot Curved Surfaces 20° to 400° C
- .1 Applications:
  - .1 38 mm (1 1/2") thickness for hydraulic separator.
- .2 Materials: CAN/CGSB-51.11 Mineral Fiber Blanket.
- .3 Thermal Conductivity "k" shall not exceed 0.040 W/m° C at 24° C mean temperature when tested in accordance with ASTM C177.

.2 E-6 Calcium Silicate Block 40° C to 400° C
- .1 Application:
  - .1 Breeching
- .2 Thickness: 50 mm (2").
- .3 Materials: CGSB 51-GP-2 Calcium Silicate Insulation.

.3 Acceptable Material:

	Owens-Corning	**Manson**	**Knauf Fiber**	**Johns Manville**

		Insulation Inc.	**Glass**	**Insulations**
E-1	Pipe and Tank Insulation	AK Board	Pipe and Tank Insulation	Pipe and Tank Insulation
E-6	Calcium Silicate	Temperlite 1200	Calmax	Thermo-12/Blue

2.4 FASTENINGS

.1 Tape: self-adhesive, 100 mm (4") wide. ULC labeled for less than 25 flame spread and less than 50 smoke developed.
- .1 Standard of Acceptance:
  - .1 S. Fattal Insultape.

.2 Fire resistive lap seal adhesive: quick-setting for joints and lap sealing of vapour barriers.
- .1 Standard of Acceptance:
  - .1 Monsey Bakor Inc. 230-39.

.3 Fire resistive lagging adhesive: for cementing canvas lagging cloths to pipe insulation.
- .1 Standard of Acceptance:
  - .1 Monsey Bakor Inc. 120-09.

.4 Fire restrictive contact adhesive: quick setting.
- .1 Standard of Acceptance:
  - .1 Monsey Bakor 230-38.

.5 Pins:
- .1 Weld pins 4 mm (5/32") diameter, with 32 mm (1 1/4") diameter head for installation through the insulation. Length to suit thickness of insulation.
- .2 Standard of Acceptance:
  - .1 Duro Dyne, Clip-Pin
- .3 Weld pins 4 mm (5/32") diameter, for installation prior to applying insulation. Length to suit thickness of insulation. Nylon retain clips 32 mm (1 1/4") round.
- .4 Standard of Acceptance:
  - .1 Duro Dyne Spotter Pins with Spotter-Clips.

2.5 JACKETS

.1 Canvas.
- .1 Plain weave, cotton fabric at 6.5 oz/yd² (220 g/m²).
- .2 ULC label every 600 mm (2 ft.)
- .3 Standard of Acceptance:
  - .1 S. Fattal Thermocanvas
- .2 Application:
  - .1 Exposed insulated piping
  - .2 Steam Humidifier piping and elbows to Manifolds
  - .3 Heat exchanger.
  - .4 Air separator.
  - .5 Domestic hot water tanks.
  - .6 Exposed insulated ductwork

.2 PVC.
- .1 CGSB 51-GP-53M PVC sheets.
- .2 0.4 mm (0.015") thick minimum.

.3 Fitting covers, one piece, premoulded to match.
.4 Application on exposed insulated piping where noted below:
  .1 Section 22 11 16 Domestic Water Piping for elbows and mechanical couplings only
  .2 Section 23 21 13 Hydronic Systems for elbows and mechanical couplings only except humidification steam.
.5 Standard of Acceptance:
  .1 Proto.
  .2 The Sure-Fit System.
  .3 Zeston 2000 PVC.

2.6 FINISHING CEMENT TO 450° C

.1 Thickness: 13mm (1/2").

.2 Applications:
  .1 Breechings.

2.7 REMOVABLE PREFABRICATED INSULATION PADS

.1 Application:
  .1 Backflow preventers.
  .2 Circuit Balancing Valves over NPS 1
  .3 3 way control valves.
  .4 Flanged equipment connections
  .5 Valves and strainers over NPS 2.

.2 To permit periodic removal and replacement without damage to adjacent insulation.

3 Execution

3.1 APPLICATION

.1 Apply insulation after required tests have been completed and approved by Consultant.

.2 Verify that all piping, equipment, and ductwork are tested and approved prior to insulation installation.

.3 Verify that all surfaces are clean, dry and without foreign material before applying insulation materials.

.4 Surfaces shall be clean and dry when installed and during application of insulation and finishes.

.5 Apply insulation materials, accessories and finishes in accordance with manufacturer's recommendations and as specified herein.

.6 All surface finishes shall be extended in such a manner as to protect all raw edges, ends and surfaces of insulation.

.7 On piping with insulation and vapour barrier, maintain integrity of vapour barrier over

full length of pipe without interruption at sleeves, fittings and supports.

.8 On equipment with insulation and vapour barrier, maintain integrity of vapour barrier over full length without interruption at sleeves, fittings and supports.

3.2 PIPE INSULATION INSTALLATION

.1 Performed: sectional up to NPS 12, sectional or curved segmented above NPS 12.

.2 Multi-layered: staggered butt joint construction.

.3 Vertical pipe over NPS 3: insulation supports welded or bolted to pipe directly above lowest pipe fitting. Thereafter, locate on 15' centers.

.4 Expansion joints in insulation: terminate single layer and each layer of multiple layers in straight cut at intervals recommended by manufacturer. Leave void of 25 mm (1”) between terminations. Pack void tightly with P-3 flexible mineral insulation.

.5 Seal and finish exposed ends and other terminations with insulating cement.

.6 Insulation on roof drain body to be held in place with 100% coverage of adhesive. If the Roof Drain Body above the roof deck foam in place the cavity around the body.

.7 Provide P-5 insulation at pipe shields. Refer to Section 23 05 29 Hangers and Supports.

.8 Expansion joints in piping: provide for adequate movement of expansion joint without damage to insulator or finishes.

.9 Insulation is not required for:
- .1 Chrome plated piping, valves and fittings.

.10 Insulation on heating pipes to up fed radiation to terminate below floor.

.11 Fastenings
- .1 Secure pipe insulation by tape at each end and center of each section, but not greater than 900 mm (36") on centers.

.12 On exterior piping, provide weather barrier membrane.

3.3 EQUIPMENT INSULATION INSTALLATION

.1 Insulation supports where welding or bolting is permitted:
- .1 Angle anchors: weld or bolt to equipment at lowest point of insulation. Thereafter, locate every 4500 mm (15') vertically.
- .2 Welded steel clips: at 200 mm (8") maximum on centers, but not less than 2 rows per side.

.2 Multi-layered: staggered butt joints and expansion joints in insulation, secured with wire or bands at 400 mm (16") on center intervals.

.3 Expansion joints in insulation: leave 25 mm (1”) space in each layer at 6000 mm (20') intervals. Pack space tightly with mineral fiber.

.4 Insulation at bolts, studs, nuts, instrumentation: bevel to permit removal without damage to insulation or finish.

.5 Fastenings: secure insulation with stainless steel wire at 900 mm (36") on center before application of finishing cement.

.6 Vapour barriers: adhere and seal with vapour seal adhesive.

.7 Finishes:
- .1 Cement: apply over insulation in two 6 mm (1/4") thick layers, reinforced by 25 mm (1") mesh stainless steel wire netting.
- .2 Canvas: sewn and pasted on to all insulation and over cement finishes. Seams inconspicuously placed.
- .3 Metal Jacket:
  - .1 Apply over insulation in lieu of cement finish where specified.
  - .2 Apply over insulation in lieu of canvas finish where specified.

.8 Final surface: to be clean, smooth, ready for painting.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

1.3 NATURAL GAS SERVICE

.1 This Contractor is to include and pay for any and all contributions to construction required by the Natural Gas Supply Utility for the work associated with the service entrances.

.2 This work will include modifications to existing gas service within boiler room.

1.4 PERMIT

.1 Mechanical Contractor to arrange and pay for the required permits and approvals by the Office of the Provincial Fire Marshal.

.2 Mechanical Contractor to engage a licensed gas installer for gas pipe work including but not limited to the following:
- .1 Above grade piping at and in building

.3 Mechanical Contractor to apply for the gas permit in accordance with fuel safety act.

2 Products

2.1 PIPE

.1 Minimum NPS ¾

.2 Steel pipe: to ASTM A53, Grade B Schedule 40 as follows:
- .1 NPS 3/4 to 2, socket welded joints
- .2 NPS 3/4 to 2, screwed.
- .3 NPS 2 1/2 and over, plan end.
- .4 Exterior: Galvanized piping with joints coated with cold galvanized paint.

2.2 FITTINGS

.1 Steel pipe fittings, screwed, flanged or welded:
- .1 Malleable iron: screwed, banded, Class 150.
- .2 Steel pipe flanges and flanged fittings: to ANSI/ASME B16.5.
- .3 Welding: butt-welding fittings.
- .4 Unions: malleable iron, brass to iron, ground seat, to ASTM A47M.
- .5 Bolts and nuts: to ANSI B18.2.1.
- .6 Nipples: schedule 40, to ASTM A53.

.2 Copper pipe fittings, screwed, flanged or soldered:
.1 Cast copper fittings: to ANSI B16.18.
.2 Wrought copper fittings: to ANSI/ASME B16.22.

2.3 JOINTING MATERIAL

.1 Steel pipe:
.1 Welded fittings: to CSA W47.1
.2 Flange gaskets: to nonmetallic flat.
.3 Screwed fittings: pulverized lead paste.

2.4 VALVES

.1 Refer to Section 23 05 23 Valves.

2.5 IDENTIFICATION

.1 As per Section 23 05 53 Mechanical Identification.

3 Execution

3.1 PIPING

.1 Install in accordance with applicable Provincial/Codes by licensed installer.

.2 Assemble piping using fittings manufactured to ANSI standards.

.3 Slope piping down in direction of flow to low points.

.4 Install drip points:
.1 At low points in piping system.
.2 At each connection to equipment.

.5 Provide clearance for access and for maintenance.

.6 Ream pipes, clean scale and dirt, inside and out.

.7 Install piping to minimize pipe dismantling for equipment removal.

3.2 IDENTIFICATION

.1 Refer to Section 23 05 53 Mechanical Identification.

.2 Paint entire pipe system yellow.

3.3 HEATING EQUIPMENT AND VENTILATION EQUIPMENT

.1 Make final gas connections to equipment.

.2 Pipe relief vents as per CAN/CSA B149.1 Natural Gas and Propane Installation Code.

.3 Connect to equipment in accordance with manufacturer's instruction unless otherwise indicated.

3.4 PURGING

.1 Purge after pressure test.

3.5 VALVES

.1 Install valve with stems upright or horizontal unless approved otherwise.

.2 Install valves at all branch take-offs to isolate each piece of equipment, and as indicated.

.3 Install shut-off valves in recessed valve box approved for propane gas by Office of the Fire Marshal. Affix to each such recessed valve box a sign with an inscription identifying the shut-off valve in compliance with the Office of the Fire Marshal.

3.6 TESTING

.1 Test gas system in accordance with CAN/CGA B149.1, Natural Gas and Propane Installation Code and the Office of the Provincial Fire Marshal.

.1 At minimum, test to the requirements of a system operation over 14kPA (2 psig), but not more than 230kPa (33 psig) with greater than 60 M (200 feet) of piping.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

2 Products

2.1 PIPE, FITTINGS, COUPLINGS AND JOINTS

.1 ASME/ANSI B16 series

.2 Welded pipe and fitting connections where noted on drawing

.3 Steel Pipe to ASTM A-53/A-135 Grade B.
- .1 Application: Hydronic
- .2 NPS 2 and Smaller Pipe Joints:
  - .1 Schedule 40: Screwed or Roll Grooved Couplings.
- .3 NPS 2½ up to NPS 8 Pipe Joints:
  - .1 Schedule 40: Welded, Flanged, Roll Grooved Couplings.
- .4 Screwed fittings with Teflon tape.
- .5 Flanges: plain or raised face.
- .6 Pipe fittings
  - .1 Screwed, flanged or welded: to ASME/ANSI B16 series
  - .2 Cast iron pipe flanges: Class 125.
  - .3 Malleable iron screwed fittings: Class 150.
  - .4 Steel pipe flanges and flanged fittings, Steel butt-welding fittings
  - .5 Unions, malleable iron
  - .6 Bolts and nuts: to ASME/ANSI B18.2.1 and ASME/ANSI B18.2.2.
  - .7 Cold Press Mechanical Joint Fitting:
    - .1 EPDM sealing elements for press fittings.
    - .2 Factory installed sealing elements.
    - .3 Press ends with leakage path feature that assures leakage of liquids from inside the system past the sealing element of an unpressed connection. The function of this feature is to provide the installer quick and easy identification of connections which have not been pressed prior to putting the system into operation.
    - .4 Acceptable Material: Viega MegaPress fittings with the Smart Connect feature

.4 Copper Tube: Type L hard drawn to ASTM B88M.

.1 Pipe fittings
  .1 Solder/brazing: lead free to ASTM B32.
  .2 Brazed with Sil-Fos BCuP5: to ANSI/AWS A5.8.
  .3 Cast bronze threaded fittings.
  .4 Wrought copper and copper alloy solder joint pressure fittings.
  .5 Cast copper alloy solder joint pressure fittings.
  .6 Press Fitting:
    .1 Copper and copper alloy press fittings conforming to material requirements of ASME B16.18 or ASME B16.22 and performance criteria of IAPMO PS 117.
    .2 EPDM sealing elements for press fittings.
    .3 Factory installed sealing elements.
    .4 Press ends with leakage path feature that assures leakage of liquids from inside the system past the sealing element of an unpressed connection. The function of this feature is to provide the installer quick and easy identification of connections which have not been pressed prior to putting the system into operation.
    .5 Acceptable Material: Viega Copper ProPress fittings.

2.2 ROLL GROOVED COUPLINGS AND FITTINGS

.1 Where rolled grooved couplings and fittings are used, they shall be of the same manufacturer.

.2 Grooved products to have current CRN Numbers.

.3 Ductile iron to ASTM A-536 or malleable iron to ASTM A-47 coupling housings painted with alkyd enamel.

.4 Rigid Grooved type Couplings: Housings cast with offsetting angle-pattern bolt pads to provide rigidity and system support and hanging in accordance with ANSI B31.1 and B31.9.

.5 Gaskets: Molded EPDM Compound to ASTM D-2000, -34° C to +120° C temperature range. Suitable all hydronic piping including hot water heating, glycol and chilled water supply and return piping.

.6 Ductile iron to ASTM A-536 or malleable iron to ASTM A-47 fittings painted with alkyd enamel.

.7 Coupling Bolts/Nuts: Heat treated carbon steel, track head to ASTM A-183 minimum tensile 110,000 psi.

.8 Standard of Acceptance:
  .1 Victaulic Co. of Canada Style 07 Zeroflex couplings with Grade “EHP” EPDM gaskets and grooved-end fittings.
  .2 Victaulic Co. of Canada Style 107 Quick-Vic Installation ready rigid coupling, with grade “EHP” EPDM gaskets for direct stab installation without field disassembly.

.9 Acceptable Manufacturers: Anvil Gruvlok

2.3 VALVES

.1 In accordance with Section 20 05 01 Common Work Results for Mechanical – General.

2.4 RELIEF VALVE PIPING AND DRAINS

.1 All sizes: Steel Pipe as noted above.

2.5 HANGERS SUPPORTS

.1 As per Section 23 05 29 Hangers and Supports.

2.6 INSULATION

.1 As per Section 23 07 00 Mechanical Thermal Insulation

3 Execution

3.1 INSTALLATION

.1 Cut piping square, ream, ensure free of cuttings and foreign material.

.2 Install pipes close to building structure to minimize furring, conserve headroom and space. Run piping parallel to walls. Group piping wherever possible.

.3 Slope piping in direction of flow wherever possible. Slope for positive drainage and venting.

.4 Where pipe sizes differ from connection sizes of equipment, install reducing fittings close to the equipment. Reducing bushings are not acceptable.

.5 Provide clearance for installation of insulation and access for maintenance of equipment, valves and fittings. Install piping, unions and flanges so that any fixed piping does not interfere with removal of coils, tubes or tube bundles.

.6 Assemble piping using fittings manufactured to ANSI standards.

.7 Saddle type branch fittings may be used on mains if branch line is half size or smaller than main. Hole saw or drill and ream main to maintain full inside diameter of branch line prior to welding saddle or installing mechanical T.

.8 Minimum size NPS 3/4.

.9 Ensure that proper clearance around equipment permits performance of service maintenance, that height clearance for piping is adequate. Check final location with Consultant if different from that shown prior to installation. Allow removal space for removal of all coils. Install piping, unions and flanges so that any fixed piping does not interfere with removal of coils, tubes or tube bundles.

3.2 RELIEF VALVE PIPING AND DRAINS

.1 Turn down at floor drain.

.2 Cut end of discharge pipe at 45°.

3.3 WELDED PIPE

.1 Welded connections where noted on drawing

3.4 ROLL GROOVED COUPLINGS AND FITTINGS

.1 Roll grooved product manufacturer to supply on site product installation training.

3.5 PRESS CONNECTION INSTALLATION

.1 In accordance with the manufacturer's installation instructions.

.2 The pipe cut and the outside of the pipe end prepared to fitting manufacturer's requirements.

.3 Fully inserted tubing into the fitting and the tubing marked at the shoulder of the fitting.

.4 Check the fitting alignment against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting.

.5 Pressed the joints using the tool(s) approved by the manufacturer.

3.6 TESTING

.1 Test system in accordance with Section 20 05 01 Mechanical General Requirements

.2 Repair any leaking joints, fittings or valves and retest.

3.7 CONTROLS

.1 Install sensor wells and control valves supplied by Controls.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

2 Products

2.1 EXPANSION TANK

.1 Constructed in accordance with ASME requirements.

.2 Capacity as indicated.

.3 Suitable for 115° C operating temperature.

.4 Working pressure: 860 kPa (125 psig).

.5 Air precharged to 85 kPa (12 psig) (initial fill pressure of system) or as noted on drawings.

.6 Base mount for vertical installation.

.7 Bladder type
- .1 Pressurized bladder type expansion tank.
- .2 Replaceable Butyl Bladder.
- .3 Standard of Acceptance:
  - .1 Bell & Gossett Series B
- .4 Acceptable Manufacturer:
  - .1 Calefactio/Expanflex AL Series
  - .2 Taco Canada Ltd. CA Series
  - .3 S.A. Armstrong L Series.
  - .4 Amtrol L Series

2.2 AUTOMATIC AIR VENT

.1 Standard float vent with brass body and NPS 1/8 connection and rated at 690 kPa (100 psig) working pressure.
- .1 Provide separate gauge cock. Refer to section 23 05 23 Valves

.2 Industrial high capacity float vent with cast iron body and NPS 3/4 connection and rated at 690 kPa (100 psig) working pressure. Provide ball valve on inlet.

.3 Float: solid material suitable for 115° C working temperature.

.4 Standard of Acceptance
- .1 Standard Vent: Amtrol 701.

.2 High Capacity Vent: Amtrol 720.

.5 Acceptable Manufacturer:
.1 Bell & Gossett
.2 Taco Canada Ltd.

2.3 MAGNETIC DIRT/AIR HYDRAULIC SEPARATOR

.1 Hydronic separator: To keep connected hydronic circuits totally independent from each other.

.2 Dirt remover: To permit the separation and collection of any impurities present in the circuits. Provided with a valved connection with discharge piping.

.3 Automatic air vent valve: For automatic venting of any air contained in the circuits. Provided with a valved connection for maintenance purposes.

.4 Magnetic particle removal: Neodymium rate-earth magnet with brass proble.

.5 Working pressure: 860 kPa (125 psig).

.6 Size based on maximum primary flow.

.7 Acceptable Material:
.1 Caleffi Series NA549 SEP 4 Combination hydraulic, air, dirt and magnetic separator.

3 Execution

3.1 GENERAL

.1 Install according to piping layout. Pipe drains and blow off connections to nearest drain.

.2 Maintain proper clearance around equipment to permit performance of service maintenance. Check final location with Consultant if different from that indicated prior to installation.

.3 Should deviations beyond allowable clearances arise, request and follow Consultant's directive.

.4 Check that all openings for appurtenances and equipment operating weight conform to shop drawings.

.5 If accessories, ancillaries, are received knocked down, check assembly with Consultant.

3.2 AIR VENTS

.1 Install at high points of systems and where indicated.

.2 Provide high capacity air vents at air separators. Pipe to floor drain.

3.3 AIR SEPARATORS

.1 Pipe blowdown to floor drain

3.4 EXPANSION TANKS

.1 Install lockshield type valve at inlet to tank.

3.5 TEST

.1 Test percentage of glycol in system and provide written confirmation of percentage.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

2 Products

2.1 GENERAL

.1 Non overloading design.

.2 Capacity: As per schedule on drawing.

.3 Motors: In accordance with Section 20 05 01 Common Work Results for Mechanical - General

2.2 ECM TYPE

.1 Canned-rotor type: The pump and motor form an integral unit without shaft seal and with only two gaskets for sealing.

.2 Bearings lubricated by the pumped liquid.

.3 Pump features
- .1 Controller integrated in the terminal box
- .2 Control panel on the terminal box
- .3 Terminal box prepared for optional modules
- .4 Differential-pressure and temperature detection
- .5 Cast-iron or stainless-steel pump housing
- .6 Motor and electronic controller
  - .1 Single-phase motor
  - .2 4- or 8-pole, synchronous, permanent-magnet motor (PM motor).
  - .3 Pump speed controlled by an integrated frequency converter. P

.4 Capable of operating continuously at temperatures from -10° C to 110° C for closed systems

.5 Maximum working pressure shall be 1000 kPa.

.6 Volute constructed of close-grained cast iron for closed systems

.7 Acceptable Material:
- .1 Grundfos Magna as per drawings.
- .2 Bell and Gossett Eco-Circ
- .3 Wilo

3 Execution

3.1 INSTALLATION

.1 In line circulators: Install with flow vertically up or down and as indicated by flow arrows. Support at flanges or near unions on outlets of unit. Install with bearing lubrication points accessible. Check rotation.

.2 Ensure that pump body does not support piping or equipment. Provide stanchions or hangers for this purpose. Refer to manufacturer's installation instructions for details.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

2 Products

2.2 CONDENSING GAS POSITIVE PRESSURE CHIMNEY, BREECHING

.1 ULC labeled, 248° C rated, Condensing gas.

.2 Application: condensing appliances with pressurized venting systems serving Category I, II, III and IV appliances.

.3 Suitable for positive venting applications with maximum 1.5 kPa (6” water column) internal static pressure.

.4 Sectional, prefabricated, double wall with mated fittings and couplings.

.5 Material
- .1 Liner for Condensing Boilers: Stainless Steel AL 29 4C
- .2 Shell: type 304 stainless steel.
- .3 Minimum of 1” Insulation.

.6 Joints
- .1 Slip fit with Viton O-Ring seals with mechanical locking clips.

.7 Exterior roof construction has combustible insulation. Manufacturer to provide fitting listed for combustible penetration.

.8 Application: Breeching within boiler room and exterior chimney.

.9 Acceptable Material:
- .1 Metal Fab Inc. Corr/Guard II
- .2 Selkirk Metalbestos Saf-T Vent CI Plus
- .3 Security Chimney SSID
- .4 ICC VIC

2.3 ACCESSORIES

.1 Cleanouts: bolted, gasketted type, full size of breeching.

.2 Hangers and supports: in accordance with recommendations of SMACNA.

.3 Discharge cone

.4 Expansion sleeves with heat resistant caulking, held in place as indicated.

.5 Bellows sections with cover.

.6 Ventilate wall thimble with full angle ring and storm collar.

3 Execution

3.1 GENERAL

.1 Install in accordance with manufacturer's and SMACNA recommendations for shop fabricated components.

.2 Support breeching at minimum 1500 mm (5') centers and at each joint.

.3 Support breeching to ensure weight of breeching does not rest upon the boiler smoke stack connection.

.4 90^0 Elbows to be 5 Gore radius (inside and outside)

.5 Connections from vertical to horizontal to be 45^0 elbow and 45^0 connection.

.6 Support chimneys at bottom and guide as indicated on drawings.

.7 Provide thimbles where penetrating roof, floor, ceiling and where breeching enters masonry chimney. Pack annular space with rope.

.8 Provide flashing on chimneys penetrating roofs.

.9 Provide cleanouts as required to access the entire breeching.

.10 Trap and pipe drain to floor drain.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

1.3 WARRANTY

.1 For boilers, the non-prorated warranty period is extended to ten (10) years. Signed by authorized representative of the original manufacturer.

.2 For burner, controls and other included equipment, the non-prorated warranty period is extended to two (2) years. Signed by authorized representative of the original manufacturer.

.3 If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. This warranty does not include labor.

2 Products

2.1 GENERAL

.1 Boiler(s) complete with burner, necessary accessories, boiler controls and chimney(s).

.2 Training: As per Section 20 05 03 Mechanical Contract Closeout

.3 Trial usage:
- .1 Consultant may use boilers for test purposes prior to acceptance and commencement of warranty period.
- .2 Supply labor, materials and instruments required for tests.

2.2 CHIMNEYS

.1 Supplied by this section.

.2 Refer to Section 23 51 00 Breeching, Chimney and Stacks for materials.

.3 Refer to drawings for chimney height.

.4 Boiler Manufacturers listed are required to carry all costs for the chimneys as required for proper operation of their boilers.

.5 Boiler manufacturer to confirm in writing that the chimney size shown on the shop drawings is the recommended size for this project.

2.3 BOILER GENERAL

.1 Factory Tested High-efficiency gas-fired condensing boiler

.2 ULC and / or CSA approved Boiler/Burner package including any field installed devices.

.3 Designed and constructed to ANSI/ASME Boiler and Pressure vessel Code Section IV and bear the "H" stamp.

.4 CRN (Canadian Registration Number) to CSA B51 for the Province of Nova Scotia.

.5 Complete with boiler fittings and automatic controls.

.6 Factory package, with all piping and wiring.

.7 Low flow resistance.

.8 Provide auxiliaries for each boiler and to meet ANSI/ASME requirements

.9 Burner turndown ratio: minimum of 5:1.

.10 O2 levels: maximum of 3% at high fire and 4.5% at low fire.

.11 CO: Less than 20 ppm at all rates.

2.4 BOILER TRIM AND ACCESSORIES

.1 ASME Section IV approved Safety valve(s) side outlet type mounted on the boiler air vent outlet. Sized in accordance with code requirements and set to open at 210 kPa to release entire boiler capacity.

.2 Pressure gauge: 100 mm diameter complete with gauge cock.

.3 Thermometer: 100 mm diameter range 10° C to 150° C.

.4 Float Type Low water cut-off with manual reset and Test-N-Check Valves

.5 Manual Reset High Limit Temperature sensor; range not to exceed 210 ^{0} F and an integral device of the Boiler Burner Control and UL recognized as a limit control.

.6 Outlet water supply temperature sensing probe for operating water limit setpoint.

.7 Return water temperature sensing probe for operating water limit setpoint.

.8 Condensate neutralizing box complete with limestone chips shipped loose for field installation by Mechanical Contractor.

.9 Stack thermometer 65° to 400° C.

.10 Threaded air vent connection for field piping.
.1 Automatic brass air vent complete with gauge cock chain by Mechanical

Contractor.

.11 Threaded boiler drain connection for field piping.
.1 Boiler drain valve, manual full size ball type complete with cap and chain by Mechanical Contractor. Refer to Section 23 05 23 Valves

.12 One 1 set of cleaning tools.

2.5 GAS TRAIN

.1 In accordance with the requirements of CSA/UL and ASME CSD-1 and include:
.1 Low Gas Pressure Interlock, manual reset.
.2 High Gas Pressure Interlock, manual reset.
.3 Upstream and downstream manual test cocks.
.4 Ball Type manual shutoff valve upstream of the main gas valve.
.5 Unibody double safety gas valve assembly.
.6 Gas Pressure Regulator
.7 Union connection to permit burner servicing.

2.6 DOWN-FIRED FIRETUBE TYPE

.1 Noise Sound Levels: Based on ABMA test code for packaged boilers measured at 1400 mm (4 ½ feet) vertically above the bottom of the base and 900mm (3’0”) horizontally in front of the end of the burner or front surface of control cabinet. Sound levels dBA on the scale in reference to 0.0002 microbars.

.2 Compact, single-pass, vertical down-fired Firetube type, with Duplex stainless steel tubes, tube sheets and combustion chamber. The boiler pressure vessel completely insulated with a minimum of 2” of insulation and encased in an 18 gauge metal cabinet with powder coated finish. To prevent installation damage, the casing shall be packaged

.3 Duplex Stainless Steel tubes and fitted with Aluminum Alloy internal heat transfer fins creating no less than 10 square feet of fireside heating surface per boiler horsepower.

.4 Vessel mounted on a structural steel stand with exhaust gasses collected in a polymer drain collection box complete with drain fitting for draining condensation from the products of combustion.

.5 Top tubesheet fully accessible without burner disassembly or removal from the boiler. Burner assembly complete with lifting hinges and pneumatic lifters. Built in hinged platform allowing the operator to access the tubesheet, burner, ignition assembly and flame rod without the use of a ladder.

.6 The vessel fully insulated with a minimum of 50 mm (2”) of insulation, guaranteeing external convection and radiation heat losses to the boiler room from the boiler less than 0.5% of the rated input.

.7 Condensing capability allowing the boiler to be operated without the use of a 3-way valve for the boiler supply water temperature reset. No minimum boiler return water temperature or secondary pump or minimum flow rate shall be required to protect the

boiler against thermal shock or for minimum temperature water.

.8 Top rear water flanged outlet and bottom rear water flanged inlet. The water inlet (return) equipped with internal baffling.

.9 Second water return connection that will permit low temperature returns to be utilized for condensing, regardless of the primary return temperature water above condensing conditions.

.10 Suitable for operation with a water condition of 8.0 - 9.5 pH range.

.11 Burner Design
- .1 Forced draft burner mounted in and integral with the boiler hinged top door so when the door is opened the burner head, furnace, tubesheet and tubes are exposed.
- .2 Burner door utilizing easy removable threaded handles
- .3 Burner swings upward on hydraulic piston arms, one on each side to provide open support of the burner assembly.
- .4 Drop down hinged service platform furnished to provide service personnel an easy means of accessing the burner and controls for service and maintenance. When out of use, this platform folds up beneath the front service boiler panel.
- .5 Unitized Venturi, Gas Valve, Blower and burner head design.
- .6 Pre-mix design utilizes a variable speed fan connected to a venturi to simultaneously modulate fuel and air for a minimum a 5:1 turndown ratio.
- .7 Venturi design acts as a method for compensating for changes in barometric pressure, temperature and humidity so the excess air levels are not adversely affected by changes in atmospheric conditions.
- .8 Burner head constructed of a Fecralloy-metal fiber for solid body radiation of the burner flame.
- .9 Combustion takes place on the surface of the burner mantle, which shall be constructed of a woven Fecralloy material creating a 360 degree low temperature radiant flame.
- .10 Emissions: Limit NOx emissions to 20 PPM or less, as certified by an independent testing lab. NOx emission levels shall not be exceeded at full operating conditions and at designed turndown of the burner.
- .11 Combustion Air Proving Switch to ensure sufficient combustion airflow is present for burner ignition firing.
- .12 High Air Pressure Switch sensing the outlet pressure connection relative to stack back draft.

2.7 INOX-CROSSALL HEAT EXCHANGER TYPE

.1 Combustion chamber and Heat Exchanger
- .1 Fabricated of high grade stainless steel (SA240-316Ti).

.2 Utilizing the heating surface for maximum heat transfer and condensation for optimum energy savings.
.3 Smooth, non-fin heat exchanger surfaces providing a self-cleaning effect while promoting clean combustion through low heat exchanger loading and a straight-through design.
.4 Heat exchanger of a compact design for ease of handling, and incorporate a full-swing door, left- or right-hinge, to allow for easy inspection and cleaning.
.5 Combustion chamber, heat exchanger and condensate collector constructed of high-alloy stainless steel and titanium.

.2 R-value of the insulation equivalent to 4" (100 mm) mineral wool with nylon backing.

.3 Flue gas and condensate collector made of single mould polypropylene (PPs) material.

.4 Insulation R-value equivalent to 100 mm (4”) mineral wool with nylon backing.

.5 Flue gasses pass by the return water in a counter-flow direction only, for maximum heat transfer effectiveness.

.6 Burner
.1 Modulating compact pre-mix cylindrical stainless steel gas burner with a high-alloy stainless steel surface capable of operating with consistently high efficiency
.2 Equipped with a variable speed combustion fan for quiet and economical operation.
.3 Burner constructed from high-grade stainless steel for universal use with natural gas or propane gas.
.4 Direct spark ignition system.
.5 Capable of operating at natural gas pressures from 1.75 kPa to 3.5 kPa (4 up to 14" W.C)
.6 Incorporate the electronic high limit, and the manual reset fixed high limit.

2.8 ELECTRICAL

.1 Electrical power supply 120 volts, 60 cycle single phase for the fan and 120 volts for control circuit requirements.

2.9 BOILER CONTROLS

.1 On/Off switch.

.2 Operating status indication light.

.3 Fault Indicator light.

.4 Operating condition scans.

.5 Integrated, solid state digital micro-processing modulating device computerized Boiler Burner control, complete with sequence indication, fault reset, mode selection, and parameter set point.
.1 Mounted at the front of the boiler panel for easy access and viewing.
.2 Provide for both flame safeguard and boiler control through separate power

supplied CPU's (to meet NFPA)
.3 EPROM memory is maintained without main power.
.4 Control algorithms are PID-based.
.5 Quick connect plug & play system for low voltage controls.
.6 LON ready with gateway for BACnet

.6 Touch screen Keyboard display module for set up, trouble shooting, and operational display.
.1 Capable of displaying temperatures as °C or °F.
.2 Able to display all system temperatures and set points.
.3 Displays unique fault message during an alarm.
.4 A program selection mode.
.5 Information indicator with confirmation.
.6 Boiler operating hours display.
.7 Number of burners starts display.
.8 Operating status check.
.9 Emission/service test switch (TUV).
.10 Adjust the display contrast.
.11 Temporary occupied mode function.
.12 Slope and shift adjustment for heating curve.

.7 Performs the following functions:
.1 Burner sequencing with safe start check, pre-purge, Electronic direct spark ignition or pilot ignition and post purge. Flame rod or UV scanner to prove combustion.
.2 Flame Supervision. Pre-purge and post-purge and maintain a running history of operating hours, number of cycles, and the most recent six faults.
.3 Safety Shutdown with display of error.
.4 Modulating control of the variable speed fan for fuel/air input relative to load requirements.
.5 Gas pressure supervision, high and low.
.6 Combustion Air Proving Supervision.
.7 High Air Pressure [back draft too high] Supervision.
.8 Supply temperature and set-point temperature displayed at all times on the touch screen display.
.9 All parameter input control set-points factory downloaded with jobsite conditions programmed at the time of initial jobsite operation.

.8 Fault Management
.1 If a fault occurs on a boiler, indicate the fault code in the display window and flash red fault lamp.
.2 Close compiled failure alarm contact in order to signal the alarm condition to a Building Automation System (BAS).
.3 Save error history to memory.

.9 All controls panel mounted and located on the boiler as to provide ease of servicing the boiler without disturbing the controls and also located to prevent possible damage by water according to CSA requirements.

2.10 TEMPERATURE SENSORS

.1 All water sensors to be immersion sensors.

.2 External water sensors to be suitable for conduit connection.

2.11 ACCEPTABLE MATERIAL FOR DOWN-FIRED FIRETUBE TYPE

.1 Lochinvar Crest Series
.2 Cleaver Brooks ClearFire-CE series

2.12 ACCEPTABLE MATERIAL FOR INOX-CROSSALL HEAT EXCHANGER TYPE

.1 Viessmann Vitocrossal 200 series

3 Execution

3.1 INSTALLATION

.1 Install in accordance with ANSI/ASME Boiler and Pressure Vessels Code Section IV, regulations of Province having jurisdiction, except where specified otherwise, and manufacturer's recommendations.

.2 Make all required piping connections to all inlets and outlets recommended by boiler manufacturer.

.3 Maintain clearances as indicated or if not indicated, as recommended by manufacturer for operation, servicing and maintenance without disruption of operation of any other equipment/system.

.4 Mount unit level.

.5 Natural Gas fired installations - in accordance with CAN/CGA B149.1, Natural Gas and Propane Installation code.

3.2 WIRING

.1 Make all required connections recommended by boiler manufacturer including control connections from boiler to supplied accessories.

.2 Refer to Electrical Contract for Materials and Methods

.3 Wiring to sensors, etc. to be in an approved raceway or in conduit, no exposed wiring.

.4 Provide all necessary adaptors for conduit connections to devices.

3.3 RELIEF VALVES

.1 Pipe hot water relief valves full size to nearest drain.

.2 Cut end of discharge pipe at 45°.

.3 Provide unions on discharge piping of relief valves.

3.4 START UP

.1 Boiler supplier's factory authorized service organization to:
- .1 Perform inspections, start up and testing of the package boiler and accessory equipment and materials furnished under this Section.
- .2 Perform a detailed written record of the start-up performance, including burner setting data over the entire load range
- .3 All labor, equipment and test apparatus furnished by the authorized service organization.
- .4 Provide jobsite assistance to inspect boilers and other equipment upon arrival, verifying completeness of equipment supplied and potential damages.
- .5 Pre start-up walk through: Visit jobsite reviewing installation with mechanical contractor prior to startup.
- .6 Start-up conducted by experienced and factory authorized licensed burner technician (who also is to sign the report) in the regular employment of the authorized service organization including but not limited to the following:
  - .1 Demonstrate that boiler, burner, controls and accessories comply with requirements of this Section
  - .2 Pre-test all items prior to scheduling the final testing that will be witnessed by the Consultant.
  - .3 Take readings at different firing rates (20, 50, 75 and 100%) of load for the modulating burner. Provide to the Consultant a written report of the tests Include readings for each firing rate tested and include stack temperatures, O_2, CO, NOx, and overall boiler efficiency.
  - .4 Auxiliary Equipment and Accessories: Observe and check all valves, draft fans, electric motors and other accessories and appurtenant equipment during the operational and capacity tests for leakage, malfunctioning, defects, and non-compliance with referenced standards or overloading as applicable.
  - .5 Verification Requirements:
    - .1 Fireside inspection
    - .2 Set up fuel train and combustion air system
    - .3 Set up operating set points
    - .4 Check all safeties, including Flame safeguard, LWCO, Airflow, Fuel pressures, High limits.
    - .5 Set up and verify efficiencies at 20%, 50%, 75%, and 100%
    - .6 Set up and verify burner turndown.
- .7 Demonstrate operation and maintenance.

.2 Provide Consultant at least 24 h notice prior to inspections, tests and demonstrations.

.3 Submit written report of inspections and test results.

.4 Provide copies of the actual analyzer test printouts to be provided. Report shall also include boiler and burner manufacturer's literature with acceptable ranges for the parameters tested.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

2 Products

2.1 SEAL CLASSIFICATION

.1 Ductwork classification as follows:

Maximum Pressure	SMACNA Seal Class
500 Pa	C

.2 Class C: transverse joints and connections made air tight with gaskets, sealant and tape or combination thereof. Longitudinal seams unsealed.

2.2 GALVANIZED STEEL

.1 Lock forming quality: to ASTM A653, Z90 zinc coating.

.2 Thickness, fabrication and reinforcement: to ASHRAE and SMACNA or as indicated.

.3 Minimum 26 gauge

.4 Satin coat for all exposed ductwork outside mechanical rooms.

.5 Use oil free material and take all necessary measures to prevent contamination

.6 Joints: to ASHRAE and SMACNA and/or proprietary manufactured duct joint.

.1 Acceptable Material: for proprietary joints:

.1 Ductmate Canada Ltd.

.2 Exanno Nexus

2.3 RECTANGULAR DUCTWORK

.1 Cross break ducts 450 mm (18") and larger for stiffening.

.2 Same gauge on all sides and based on the greater cross sectional dimension.

.3 Reinforce flat slip joints of ducts over 450 mm (18").

2.4 ROUND DUCTWORK

.1 Factory fabricated conduit consisting helically wound galvanized steel straps with spiral lock seams.

.2 For concealed branch ductwork up to 350 mm (14") diameter, longitudinal seams.

.3 Rectangular ductwork may be converted to equivalent size round provided that the project space limitations are properly addressed.

.4 Use conical "T"s for 90^0 Branch takeoff

.5 Use long radius elbows where space permits.

.6 Galvanized steel of the following minimum gauges:

Duct Diameter	Straight Lengths of Spiral Duct Gauge	Round Duct fittings	Plain Duct Gauge
8" and smaller	26	24	24
9"-14"	26	24	24
15"-26"	24	20	N/A
27"-36"	22	20	N/A
37"-50"	20	20	N/A

2.5 FITTINGS

.1 Fabrication: to SMACNA.

.2 Radiused elbows:
- .1 Rectangular: Standard radius (Centerline radius 1.5 times width of duct) or short radius with single thickness turning vanes.
- .2 Round: Smooth radius or 5 piece. Centerline radius is 1.5 times diameter.

.3 Mitered elbows, rectangular:
- .1 To and including 400 mm: Single thickness turning vanes.
- .2 Over 400 mm: Double thickness turning vanes.

.4 Branch Ducts
- .1 Rectangular: Refer to Details on drawings.
- .2 Round: Conical T as per SMACNA

.5 Main supply duct branches without splitter damper. Provide branch and main duct balancing dampers.

.6 Sub branch duct with 45° entry and balancing damper on branch.

.7 Transitions:
- .1 Diverging: 20° maximum included angle.
- .2 Converging: 30° maximum included angle.

.8 Offsets: square elbows and/or full radiused elbows as indicated.

.9 Obstruction deflectors: maintain full cross-sectional area. Maximum included angles as for transitions.

2.6 FIRESTOPPING

.1 Retaining angles all around duct, on both sides of fire separation.

.2 Firestopping material and installation must not distort duct.

2.7 SEALANT

.1 Sealant: non-flammable, water base duct sealant.

.2 Temperature range of -30° C to +93° C.

.3 Flame spread rating of not more than 25.

.4 Smoke developed classification of not more than 50.

.5 Standard of Acceptance:
.1 Duro Dyne DSW

2.8 TAPE

.1 Poly-vinyl treated, open weave fiberglass tape.

.2 50 mm (2") wide.

.3 Standard of Acceptance.
.1 Duro Dyne FT-2.

2.9 HANGERS AND SUPPORTS

.1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.

.2 Maximum size rectangular and round duct supported by strap hanger: 500 mm (20").

.3 Rectangular Hangers: angle iron with steel rods to ASHRAE and SMACNA following table:

Duct Size	Angle Size	Rod Size	Spacing
up to 30"	1" x 1" x 1/8"	1/4"	8'
31 to 36"	1 1/2" x 1 1/2" x 1/8"	1/4"	8'
37 to 60"	1 1/2" x 1 1/2" x 1/8"	3/8"	8'
61 to 84"	2" x 2" x 1/8"	3/8"	5'
85 to 96"	2" x 2" x 1/4"	3/8"	5'

.4 Round Hangers: strap/band with steel rods to ASHRAE and SMACNA following table:

Duct Size	Strap Size	Rod Size	Spacing
up to 610 mm	25 x 0.85 mm	6 mm	2400 mm
611 to 900 mm	25 x 1 mm	10 mm	2400 mm

Duct Size	Band Size	Rod Size	Spacing
901 to 1270 mm	25 x1.3 mm	2 @ 10 mm	2400 mm
1271 to 2130 mm	25 x 1.6 mm	2 @ 10 mm	2400 mm

.5 Upper attachment:
.1 As per Section 23 05 29 Hangers and Supports

.6 Middle attachment (Rod):
.1 As per Section 23 05 29 Hangers and Supports

3 Execution

3.1 GENERAL

.1 Install ducts in accordance with ASHRAE and SMACNA.

.2 Support risers in accordance with ASHRAE and SMACNA.

.3 Install breakaway joints in ductwork on each side of fire separation.

.4 Seal between ducts and walls of mechanical room.

3.2 HANGERS

.1 Strap hangers: install in accordance with SMACNA.
.1 Minimum 25 mm (1") wide extending down 2 sides and 50 mm (2") under duct.
.2 Fasten to sides and bottom of duct.

.2 Angle hangers: complete with locking nuts and washers.
.1 Rod attached to angle within 50 mm (2") of the duct sides.

3.3 SEALING & TAPING

.1 Apply sealant to outside of joint to manufacturer's recommendations.

.2 Bed Tape in sealant and recoat with minimum of 1 coat of seal and to manufacturer's recommendation.

3.4 WATERTIGHT DUCT

.1 Provide water tight duct for:
.1 Outside air intake plenums.
.2 Exhaust air plenums.
.3 Plenums at roof exhaust fans.
.4 As indicated.

.2 Form bottom of horizontal duct without longitudinal seams. Weld joints of bottom and 150 mm (6") up side sheets. Seal all other joints with duct sealer and tape.

.3 Slope bottom of duct/plenum to drain.

.4 Duct connections to plenum to be minimum 50 mm (2") above bottom of plenum.

.5 Provide NPS 1 1/4 drain with deep seal trap from outside air intake plenums and louvered exhaust air plenums to floor drain. Provide 150 mm deep trap for drains.

3.5 PROTECTION AND CLEANING

.1 Seal and protect open ends of ductwork continuously during construction.

.2 Wash down inside of intake duct and plenum from louver to unit prior to starting units.

3.6 CONTROL DAMPERS

.1 Install control dampers supplied by Section 24 33 15 Dampers - Operating and supplied with fans.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

2 Products

2.1 OPERATING DAMPERS

.1 Sizes:
- .1 Blades maximum 150 mm (6") wide and 1200 mm (48") long.
- .2 Modular maximum 1525 mm (60") wide and 1525 mm (60") high.
- .3 Multiple sections with stiffening mullions and separate actuators.

.2 Materials:
- .1 Frame: extruded aluminum.
- .2 Blades: extruded aluminum.
- .3 Bearings: Nylon.
- .4 Provide additional thrust bearings for vertical blades.
- .5 Linkage: zinc plated steel.
- .6 Seals: PVC and/or SS spring on side, top and bottom of frame and along all blade edges and blade ends.

.3 Performance characteristics:
- .1 2% maximum allowable leakage against 2.5 kPa (10" w.g.) differential.
- .2 Temperature range minus 40° C to 90° C.

.4 Flanged to duct connection

.5 Insulated Dampers:
- .1 For outside air damper and exhaust air damper at all air handling units.
- .2 For outside air dampers.
- .3 Boiler room ventilation system, outside air and exhaust dampers.
- .4 Mechanical room ventilation system, outside air and exhaust dampers.
- .5 R6 insulation.

.6 Low Leakage Dampers:
- .1 For return air dampers.
- .2 For individual exhaust fans except where noted above.

.7 Standard of Acceptance:
- .1 Low Leakage: T. A. Morrison Series 1000.
- .2 Insulated: T. A. Morrison Series 9000.

.8 Acceptable Manufacturer
- .1 Alumavent
- .2 Nailor Industries
- .3 Ruskin with T-Flange Frame
- .4 Trolec
- .5 Ventex

3 Execution

3.1 INSTALLATION

.1 Install in accordance with recommendations of SMACNA

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

2 Products

2.1 FANS GENERAL

.1 Capacity: airflow, static pressure, rpm, bhp, motor, model, size, sound power data and as indicated on schedule.

.2 Fans: statically and dynamically balanced, constructed in conformity with AMCA 99.

.3 Sound ratings: comply with AMCA (Air Moving and Conditioning Association) 301, tested to AMCA 300.

.4 Performance ratings: based on tests performed in accordance with ANSI/AMCA 210, and ANSI/ASHRAE 51.

.5 Motors: In accordance with Section 20 05 01 Common Work Results for Mechanical General.

.1 Include bearing protection in the form of a device to divert shafts currents to ground for all motors driven by variable frequency drives (VFDs). Maintenance free device constructed of highly conductive bronze with an integral sleeve.

.6 Accessories and hardware: matched sets of V-belt drives, adjustable slide rail motor bases, belt guards, coupling guards, fan safety screens, and as indicated.

.7 Factory primed before assembly in colour standard to manufacturer.

.8 Scroll casing drains: as indicated.

.9 Bearing lubrication systems plus extension lubrication tubes where bearings are not easily accessible.

.10 Vibration isolation: to Section 23 05 48 - Vibration Controls.

.11 Flexible duct connections: to Section 24 33 00 – Air Duct Accessories.

2.2 CENTRIFUGAL FANS

.1 Fan wheels:
- .1 Welded steel construction.
- .2 Maximum operating speed of centrifugal fans not more than 50% of first critical speed.
- .3 Air foil, forward curved, backward inclined blades, as indicated.

.2 Bearings: split pillow-block grease lubricated ball or roller self-aligning type with oil retaining, dust excluding seals and a certified minimum rated life of 200,000 h in accordance with (Anti-Friction Bearing Manufacturers Association) AFBMA L-10 life standard. Bearings to be rated and selected in accordance with AFBMA 9 and AFBMA 11.

.3 Housings:
- .1 Volute with inlet cones: fabricated steel for wheels 300 mm or greater, steel for smaller wheels, braced, and with welded supports.

2.3 IN-LINE CENTRIFUGAL FANS

.1 Characteristics and construction: as for centrifugal fan wheels, with axial flow construction and belt drive.

.2 Provide AMCA arrangements 1 or 9 as indicated with stiffened flanges, smooth rounded inlets, and stationary guide vanes.

2.4 FAN SELECTIONS

.1 Based on Manufacturer named as Standard of Acceptance. The approval of equipment of other manufacturers named in the acceptable materials list shall be subject to meeting the performance and sound power levels. The fan manufacturer shall also be responsible for all electrical changes caused by the change in motor size.

3 Execution

3.1 FAN INSTALLATION

.1 Install fans as indicated, complete with resilient mountings specified in Section 23 05 48 - Vibration Controls, flexible duct connections in accordance with Section 24 33 00 – Air Duct Accessories.

.2 Provide sheaves and belts required for final air balance.

.3 Access doors and access panels to be easily accessible.

.4 Provide fan restraining snubbers for suspended in line fans over 2.2 kW (3 HP).

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

2 Products

2.1 FANS GENERAL

.1 In accordance with Section 24 34 00 HVAC Fans.

.2 Motors:
- .1 In accordance with Section 20 05 01 Mechanical General Requirements and as per this section.
- .2 In accordance with Section 24 34 00 HVAC Fans and as per this section.

.3 Capacity: airflow/static pressure rpm, motor, model and size and sound ratings as per schedule on drawings.

.4 Statically and dynamically balanced.

.5 Bear AMCA Certified Air Performance Rating Seal.

.6 Bearings: sealed lifetime bearings or of self-aligning type with oil retaining, duct excluding seals and a certified minimum rated life of 80,000 h in accordance with AFBMA L10 life standard. Bearings to be rated and selected in accordance with AFBMA9 and AFBMA 11.

2.2 ROOF EXHAUST FAN

.1 Centrifugal V belt driven.

.2 Spun aluminum housing complete with resilient mounted motor and fan.

.3 Aluminum backward inclined wheel.

.4 Aluminum pre-punched base with continuously welded curb cap corners.

.5 Adjustable motor sheave.

.6 Mesh 13 mm (1/2") diameter aluminum birdscreen.

.7 Disconnect within fan housing.

.8 Cadmium plated securing bolts and screws.

.9 Standard of Acceptance:
.1 Loren Cook Co. as per schedule on drawings.

.10 Acceptable Manufacturer:
.1 Acme with curb cap as specified above.
.2 PennBarry
.3 Greenheck with curb cap as specified above.
.4 Jenco Fan Inc.
.5 Carnes with curb cap as specified above.
.6 Twin City Fan

2.3 ROOF CURB

.1 1.3 mm (18 gauge) aluminum

.2 38 mm, 3 lb. density thermal and acoustical insulation.

.3 Continuously welded corners.

.4 CCA pressure treated wood nailer.

.5 Suitable for sloped roof construction.

.6 Height indicated on the drawings is on the upper side of the roof slope.

.7 Standard of Acceptance:
.1 Loren Cook Co. RCA Sloped

.8 Acceptable Manufacturer:
.1 Acme
.2 PennBarry
.3 Greenheck.
.4 Jenco Fan Inc.
.5 Carnes
.6 Twin City Fan

2.4 CENTRIFUGAL CABINET FAN

.1 Centrifugal direct drive.

.2 Back draft damper.

.3 Galvanized steel housing.

.4 Disconnect within fan housing.

.5 Inlet grille or inlet collar as indicated.

.6 Acoustically lined housing.

.7 Standard of Acceptance:
.1 Loren Cook Co. as per schedule on drawings.

.8 Acceptable Manufacturer:
- .1 Acme
- .2 PennBarry
- .3 Greenheck.
- .4 Jenco Fan Inc.
- .5 Carnes
- .6 Twin City Fan

2.5 TUBULAR IN LINE CENTRIFUGAL

.1 In accordance with Section 24 34 00 HVAC Fans.

.2 Centrifugal V-belt or direct driven as indicated.

.3 Non-overloading backward inclined wheel.

.4 Belt guard on belt driven.

.5 Galvanized steel housing.

.6 Inlet and discharge duct collars.

.7 Bearing and drive components isolated from air stream.

.8 Extended lubrication lines.

.9 Provide thrust restraint.

.10 Standard of Acceptance:
- .1 Loren Cook Co. as per schedule on drawings.

.11 Acceptable Manufacturer:
- .1 Acme
- .2 PennBarry
- .3 Greenheck.
- .4 Jenco Fan Inc.
- .5 Carnes
- .6 Twin City Fan

3 Execution

3.1 INSTALLATION

.1 Coordinate of top of curb dimensions and roof openings with general Contractor.

.2 Provide fan sheaves required for final air balance.

.3 Coordinate roof and wall openings with other trades.

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

1.3 DEFINITIONS

.1 AEL: ratio between total test period less any system downtime accumulated within that period and test period.

.2 Downtime: results whenever BAS is unable to fulfill all required functions due to malfunction of equipment defined under the responsibility of BAS contractor. Downtime is measured by duration, in time, between the time that the Contractor is notified of failure and the time system is restored to proper operating condition. Downtime not to include following:

- .1 Outage of main power supply in excess of back-up power sources, provided that:
  - .1 Automatic initiation of back-up was accomplished.
  - .2 Automatic shut-down and re-start of components was as specified.
- .2 Failure of communications link, provided that:
  - .1 Controller automatically and correctly operated in stand-alone mode.
  - .2 Failure was not due to failure of any specified BAS equipment.
  - .3 Functional failure resulting from individual sensor inputs or output devices, provided that:
    - .1 System recorded said fault.
    - .2 Equipment defaulted to fail-safe mode.
    - .3 AEL of total of all input sensors and output devices is at least 99 % during test period.

1.4 SYSTEM DESCRIPTION

.1 Work includes:

- .1 Start-up testing and verification of all systems supplied under this section.
- .2 Check out demonstration of proper operation of all components.
- .3 On-site operational tests.

.2 Following submission of report by contractor Consultant will review testing and verification as required.

.3 Provide test equipment including two-way radios.

.4 Independent testing laboratory to certify test equipment as accurate to within approved tolerances no later than 2 months prior to tests.

.5 Inform and obtain approval from Consultant in writing at least 14 days prior to each test.

Indicate:
- .1 Location and part of system to be tested.
- .2 Testing procedures, anticipated results.
- .3 Names of testing personnel.

.6 Co-ordinate with other trades.

.7 Correct deficiencies; re-test in presence of Consultant until satisfactory performance is obtained.

.8 Acceptance of tests will not relieve Contractor from responsibility for ensuring that complete systems meet every requirement of Contract.

.9 Load system with project software.

1.4 QUALITY ASSURANCE

.1 Test after installation of each part of system and after completion of mechanical and electrical hook-ups, to verify correct installation and functioning.
- .1 Test and calibrate field hardware including stand-alone capability of each controller.
- .2 Verify each A-to-D convertor.
- .3 Test and calibrate each AI using calibrated Binary instruments.
- .4 Test each BI to ensure proper settings and switching contacts.
- .5 Test each BO to ensure proper operation and lag time.
- .6 Test each AO to ensure proper operation of controlled devices. Verify tight closure and signals.
- .7 Test operating software.
- .8 Test application software. Provide samples of logs and commands.
- .9 Debug software.

.2 Final Startup Testing
- .1 Upon satisfactory completion of tests, perform point-by-point test of entire system under direction of Consultant.
- .2 Provide:
  - .1 Two technical personnel capable of re-calibrating field hardware and modifying software.
  - .2 Detailed daily schedule showing items to be tested and personnel available.
  - .3 Key document for recording procedures to be listing of system database, including key name, English description, point type and address, engineering units, low and high limits. Include space on listing for remarks and signatures of commissioning technician

.3 Final Operational Testing
- .1 Purpose: to demonstrate that BAS functions in accordance with contract

requirements.

.1 Prior to the commencement of 30 day test Contractor must demonstrate that operating parameters (setpoints, alarm limits and CDL's) have been implemented so as to ensure proper operation and operator notification in event of off-normal operation. Repetitive alarm conditions to be resolved so as to minimize reporting of nuisance conditions.

.2 Test to last at least 30 consecutive 24 hour days.

.3 Tests to include:

.1 Demonstration of correct operation of monitored and controlled points.

.2 Operation and capabilities of sequences, reports, special control algorithms, diagnostics, software.

.4 System will be accepted when:

.1 BAS equipment operates to meet overall performance requirements. Downtime must not exceed allowable time calculated for this site.

.2 Requirements of Contract have been met.

.5 In event of failure to attain specified AEL during test period, extend test period on day-to-day basis until specified AEL is attained for test period.

.6 Correct defects when they occur and before resuming tests.

1.5 VERIFICATION

.1 After installation of the system and completion of mechanical and electrical hook-up, perform point by point verification to confirm correct installation and functioning of equipment.

.2 Submit a point by point Equipment Inspection and Verification Report with each point results initialed by BAS Technician to the consultant.

.3 Following submission of the above point by point Equipment Inspection and Verification Report, notify the consultant in writing at least seven days prior to the Owner/Consultant point by point verification:

.1 Provide all necessary testing equipment, communication equipment and personnel.

.2 Perform Owner/Consultant verification in the presence of the Owner/Consultant.

.3 Demonstrate the proper operation of each component.

.4 Verify all Binary input alarm points by physically simulating an alarm condition.

.5 Calibrate all temperature, humidity, and pressure sensors using accurate electronic testing, equipment as a reference.

.6 Verify all control loops and programmed sequences of operation by simulating conditions for each mode of operation.

.4 Correct any deficiencies and re-test in the presence of the consultant, until designated part of the system performs satisfactorily.

2 Products Not Applicable

3 Execution

3.1 GENERAL

.1 Install in accordance with manufacturer's instructions.

.2 Cooperate with other sections of Mechanical Contract and Electrical Contract to start-up equipment and provide documentation included but not limited to the following:
- .1 Boilers
- .2 Humidifier.
- .3 Testing, Adjusting & Balancing.

3.2 FIELD SERVICES

.1 Prepare and start logic control system under provisions of this section.

.2 Start-up, Check-out and Verification of systems: Allow sufficient time for start-up and verification prior to placing control systems in permanent operation. Provide the capability for off-site monitoring at control contractor's local or main office. At a minimum, off-site facility shall be capable of system diagnostics and software download.

.3 Provide Owner's Representative with spare parts list. Identify equipment critical to maintaining the integrity of the operating system.

3.3 BAS BUILDING CONTROLLER VERIFICATION

.1 The following checkout and start-up procedure must be performed on each BAS panel prior to software installation and prior to commencement of point to point check-out.

.2 BAS Panel Checkout:
- .1 Verify that the enclosure is not mounted to a vibrating surface.
- .2 Verify that line voltage wiring enters the enclosure separate from all low voltage wiring. Line and low voltage wiring is required to be separated within field panels.
- .3 Verify that wiring is not routed from the bottom of the enclosure up through the center.
- .4 Check all point and trunk wiring for shorts, grounds, and induced/stray voltages. Also, verify all terminations are neat and dressed.
- .5 Verify that all points are properly terminated according to as-built drawings.
- .6 Verify that the correct point modules have been inserted to the proper termination blocks and the address keys have been placed in proper slots. Install corresponding module labels.
- .7 Verify that required LAN trunk wires have been terminated correctly.
- .8 Verify that the BAS panel has been powered with the proper voltage.
- .9 Using either the terminal workstation or the system technicians laptop personal computer load the BAS panel database.

3.4 VERIFICATION OVERVIEW

.1 Verification and field start-up to be performed by Factory Trained Authorized Manufacturer Service Technician.

.2 Include the following services:
- .1 Provide the initial system software, programming, customizing and data entry.
- .2 Factory Trained Authorized Manufacturer Service Technician must visit the site to test and commission the equipment. Provide written verification report detailing this phase of the work.
- .3 Provide Demonstration, Operating and Maintenance Instructions.

.3 Verification
- .1 Start-up testing and verification of all parts of the systems supplied under this section.
- .2 Verification performed by Factory Trained Authorized Manufacturer Service Technician(s) on site capable of re-calibrating field hardware and modifying software on site.
- .3 On-site operational tests.
- .4 Verify the wiring to all equipment is complete.
- .5 After installation of the system and completion of mechanical, control and electrical hook-up, perform point by point verification to confirm correct installation and functioning of equipment.
- .6 Cooperate with other sections of Mechanical Contract to start-up equipment and provide documentation included but not limited to the following: Testing, Adjusting & Balancing.
- .7 Check out demonstration of proper operation of all components.
- .8 After installation of the system and completion of mechanical, control and electrical hook-up, perform point by point verification to confirm correct installation and functioning of equipment.
- .9 Provide a copy of inspecting technician's report to user. Identify each device by location and certify the test results.

.4 The following checkout procedures must be performed on all input/output points defined in any field panel or LAN Device. These procedures represent the minimum requirements for verification of inputs. More in-depth verification may be necessary.

.5 Verify the correct wiring terminations per the design documentation package, at the field panel. Verify that all wiring and terminations are neat and dressed.

.6 Analog Input Checkout
- .1 Verify the point address by checking that the analog input instrument is wired to the correct piece of field equipment. Do this by altering the environment at the sensing element or by disconnecting one of the wires at the sensor, and verifying that the reading at the field panel has reacted to this change.
- .2 Verify the point database to be correct, (i.e. alarm ability, alarm limits, slope/intercept, engineering units, etc.). Verify that the correct change of value (COV) limit has been defined.
- .3 Verify the sensor has the correct range and input signal. (i.e. 10-60° C, 4 - 20 mA). Verify that the device is mounted in the correct location and is wired and installed correctly per the design documentation package.
- .4 Set-up and/or calibrate any associated equipment (i.e. panel LCD meters, loop isolators, etc.). Verify that these auxiliary devices are mounted in the correct location and are wired and installed correctly per the design documentation package.

.7 Binary Input Checkout

.1 Verify the point address by verifying that the Binary input is correctly terminated at the controlled piece of equipment.

.2 Verify the point database is correct (i.e. point name, address, alarm ability, etc.).

.3 Set-up and/or calibrate the associated equipment, i.e. high/low temp detector, flow switch, end switch, current relay, pressure switch, etc. is mounted in the correct location, and is wired and installed correctly per the control system installation drawings.

.4 With the controlled equipment running or energized as described in the Binary output checkout procedures, verify the correct operation of the Binary input point and associated equipment by putting the Binary input monitored equipment into its two states. Verify that the proof or status point indicates the correct value at the operator's terminal and that the status led is giving the proper indication in each mode of operation (on/off).

.8 Analog Output Checkout

.1 Insure that the correct output device(s) are installed per the Control System Installation Drawings. (i.e. # modules, transformers, power supply, etc.). Verify that these devices are installed, wired and piped correctly. Verify that any configuration jumpers for PXP type devices are in the proper settings for the required application. Verify related transformers are fused in accordance with installation drawings.

.2 Verify the point database to be correct (i.e., slope/intercept, engineering units, etc.). Verify that the correct COV limit has been defined. Refer to Manufacturer's Instructions for establishing correct COV values.

.3 Verify the point address by checking that the analog output is wired and/or piped to the correct output transducer and/or equipment.

.4 Verify that the controlled device is calibrated (i.e. 4-20 mA variable frequency drive, etc.) and is in the correct location, and is wired or piped and installed correctly per the design documentation package. If the controlled device is not calibrated, then a three point (high, low and mid-point) calibration procedure must take place. Verify proper operation of the end device. When calibration has been verified, ensure that installation drawings and point database have been updated.

.5 Set-up and or calibrate any associated equipment, (i.e. panel LCD meters, loop isolators, pneumatic gauges, etc.). Also verify that these auxiliary devices are mounted in the correct location, and are wired or piped and installed correctly per the design documentation package.

4

.1 After verifying the set-up and operation of any associated equipment check for the correct operation of the logical point and associated equipment by commanding the analog output to the top and bottom of its range. Verify that the control device(s) responded appropriately as indicated by the design documentation package. Check to insure that all network terminals, etc. can also command these outputs.

.2 Binary Output Verification

.1 Verify that the correct voltage is utilized in the circuit.

.2 Verify the point database to be correct (i.e. point name, address, etc.).

.3 Check and verify that the end device responds appropriately to the Binary output(s).

.4 After verifying the set-up and operation of any associated Binary input/proof points, check and verify correct operation of the logical point and associated equipment by commanding the point to all possible states (i.e. off, on, fast, slow, auto, etc.). Verify that the defined proof delay is adequate for all modes of operation.

.5 If any interlocked equipment exists that has independent hand-off-auto or auxiliary control wiring, verify correct operation of same. Also check that any interlocked equipment such as end switches for damper operation or exhaust and return fans are wired correctly and operate correctly.

.6 Verify that the controlled piece or pieces of equipment cannot be caused to change state via the Binary output if an associated hand-off-auto switch is in the hand /on or hand/off mode of operation, unless specified as a fireman's override point etc.

4.3 SEQUENCE OF OPERATION TEST

.1 The following are sample sequence of operations tests. The intent of these procedures is to provide a plan of action to verify system operations via block checks of the project specific sequence of operations. It also provides a basis for determining the number of tests and the time required to conduct them for a given project. The procedures may be used in this format, or one procedure to a page should more detail be required. Additional tests can and should be added to form a test library. The procedures outlined below should be verified for accuracy, and may be modified to meet your specific requirements.

.2 DESCRIPTION OF TEST: Room Control Checkout. Verify operation of heating valve (Winter Mode of Operation).
INPUT TO TRIGGER TEST: Change room air setpoint from current value to a lower value (setpoint - 5° C). Observe valve operation. After 10 minutes, change room air temperature setpoint from current value to a higher value (setpoint + 10° C). Observe valve operation.
EXPECTED OUTCOME: In both cases, the heating valve will open and close to achieve and maintain setpoint.

PASS:	FAIL:	DATE:	INITIALS:

.3 DESCRIPTION OF TEST: AH Alarm Checkout. Verify AH-1 discharge air temperature alarming is operational and is received at the designated terminal.
INPUT TO TRIGGER TEST: Change discharge temperature high alarm limit through software to a value below the current discharge temperature (discharge temperature - 5° C).
EXPECTED OUTCOME: A high temperature alarm will be received per the Alarm Definition Report at its designated terminal.

PASS:	FAIL:	DATE:	INITIALS:

.4 DESCRIPTION OF TEST: AH Temperature and Humidity Control Checkout. Verify modulation of heating valve (Winter Mode of Operation) AH-1 / VHC-1G.
INPUT TO TRIGGER TEST: Place the summer/winter trigger point in the winter mode. Change discharge air setpoint from current value to a lower value (setpoint - 5° C). Observe valve operation. After 10 minutes, change discharge air temperature setpoint from current value to a higher value (setpoint + 10° C). Observe valve operation.
EXPECTED OUTCOME: In both cases, the heating valve will modulate to achieve and maintain setpoint.

PASS:	FAIL:	DATE:	INITIALS:

.5 DESCRIPTION OF TEST: AH Temperature and Humidity Control Checkout. Verify modulation of humidity valve with supply humidity as high limit.
INPUT TO TRIGGER TEST: Change return air humidity setpoint to a lower setpoint value (setpoint - 20 % RH). Observe valve operation. Supply humidity high limit control loop should have an observable upper limit (i.e. virtual point). Change supply humidity high limit setpoint to a lower value (setpoint - 20% RH). Observe supply humidity high limit control loop upper limit value.
EXPECTED OUTCOME: After changing return air humidity setpoint, humidifier will modulate to achieve and maintain the new setpoint. After changing the supply humidity high limit setpoint, the virtual point storing the humidity value upper operating limit should decrease, preventing the humidifier from opening to achieve the new high limit setpoint.

PASS:	FAIL:	DATE:	INITIALS:

.6 DESCRIPTION OF TEST: AHU Safety Checkout. Verify Low Temperature Detector Operation.
INPUT TO TRIGGER TEST: Manually depress low temperature detector to simulate a freeze or low temperature condition.
EXPECTED OUTCOME: Supply and return fans will shut down. Heating valve will return (to its fail safe position), humidifier will shut down , mixing dampers will close to the full return air position.

PASS:	FAIL:	DATE:	INITIALS:

.7 DESCRIPTION OF TEST: AH Temperature and Humidity Control Checkout. Verify modulation of mixing dampers (OA/RA/EA).
INPUT TO TRIGGER TEST: Change mixed air temperature setpoint to a lower setpoint value, (setpoint - 5° C). Observe damper operation.
After a time period of 10 minutes, change mixed air temperature setpoint from the original setpoint to a higher setpoint value (setpoint +10° C). Observe damper operation.
EXPECTED OUTCOME: In both cases, the mixed air dampers will modulate to achieve and maintain setpoint.

PASS:	FAIL:	DATE:	INITIALS:

3.6 EQUIPMENT INSPECTION AND VERIFICATION REPORT - APPENDIX A

.1 Installation: Initialing this column verifies the proper location and mounting per the Manufacturer's installation instructions and control drawings.

.2 Point To Point Complete: This column indicates that the point checkout procedure is successfully completed.

.3 Procedure # Used: This column indicates the Procedure # used to check out the points and equipment.

.4 Date: This column is dated when the point checkout procedure is successfully completed.

.5 Contractor's Initials: This column is initialized by a Contractor's representative, verifying the completion of the checkout procedure.

.6 Comment Number: This column indicates a number referencing a comment on the Point Verification Comment Sheet. The comments are used to indicate any additional information or problems.

.7 Displayed Value: The displayed value column is the value displayed on the i.e. PC, Laptop, Terminal.

.8 Actual Value: This column is for recording the measured value at the sensor, i.e. with an approved test instrument.

APPENDIX 'A'
EQUIPMENT INSPECTION AND VERIFICATION REPORT
Note: Points added by change order to be included.
BAS Technician: _____

Point Information									
	Name								
	Number								
	Type								
	Address								
	Fail Mode								
Start-Up	Installation								
	Point to Point								
	Procedure #								

	Date								
	BAS Technician								
	Comment #								
	Display Value								
	Actual Value								
	Calibration Needed								
	Notes								

APPENDIX 'B' PROJECT PUNCH LIST
BAS Technician: _____

Item	Description of Problem	Date	Int.	Action Taken	Date	Int.

APPENDIX 'C' POINT VERIFICATION COMMENT SHEET
BAS Technician: _____

The purpose of this form is to document such things as devices which have been mounted in a manner which deviates from the contract documents. Such deviations may occur due to customer requests or architectural requirements or constraints.
Entering such deviations on this form provides a permanent record for reference by the customer and/or service personnel at a later date.

Date:_____ BAS#: or LAN Device #_____

Comment #	Comment from Point Verification Sheet for Bas # or Lan Device

APPENDIX 'D' SYSTEM PERFORMANCE TEST FORM

PPCL Program Number_____ PPCL Revision Number_____
Date of Test_____ Equipment_____
Test Number_____

BAS Technician: _____

DESCRIPTION OF TEST: INPUT TO TRIGGER TEST: EXPECTED OUTCOME:

RESULT	PASS/FAIL	DATE	INITIAL

IF TEST FAILS SEE RETEST NUMBER_____

Page_____

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

1.3 RELATED SECTIONS

.1 Section 25 30 02 BAS: Field Control Devices.

.2 Section 25 30 03 BAS Field Installation

1.4 BAS IDENTIFICATION

.1 Conform to requirements of Section 23 05 53 Mechanical Identification and Section 26 05 03 Electrical Identification supplemented and modified by requirements specified in this section.

1.5 WORK INCLUDED

.1 Except as otherwise indicated the system supplier shall secure and pay for all permits, inspections and certifications required for his work and arrange for necessary approvals by the governing authorities.

.2 Work covered by sections referred to above consists of fully operational BAS, including, but not limited to, following:

- .1 Expansion of existing BACnet® based Building Automation System.
- .2 Design and provide all new networking equipment, building controllers, field control devices, cabling and any other accessories or devices required to make new controls function as designed.
- .3 Modify existing BAS programming and graphics to suit new sensors and controlled devices. New graphics to the standard of the existing BAS Graphic User Interface.
- .4 Provide all necessary power required for BAS from local 120V/208V branch circuit panelboards including low voltage transformers.
- .5 Related work performed by other Sections.
  - .1 This section to mount control damper actuators on the control dampers supplied by Section 24 33 15 Dampers Operating
  - .2 This section to wire control damper actuators supplied by this section.

1.6 COORDINATION

.1 Coordinate location of exposed control sensors with plans and room details before installation.

.2 Coordinate controlled/monitored equipment from other divisions to achieve compatibility with BAS.

.3 Coordinate with the Owner's IT department for Ethernet communication cabling and TCP/IP address.

1.7 WARRANTY

.1 Control system failures during warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to Owner. Respond during normal business hours within 24 hours of Owner's warranty service request 24 hours Monday through Friday and 48 hours on Saturday and Sunday.

.2 Provide updates to operator workstation or web server software, project-specific software, graphic software, database software, and firmware that resolve Contractor-identified software deficiencies at no charge during warranty period. Coordinate updates or upgrades with Owner's representative.

.3 Provide for 16 hours of customized programming after verification by the original programmer

1.8 OWNERSHIP OF PROPRIETARY MATERIAL

.1 Project-specific software and documentation shall become Owner's property. This includes, but is not limited to:
- .1 Graphics
- .2 As Built drawings
- .3 Database
- .4 Application programming code
- .5 Documentation

1.9 PERMITS, FEES AND INSPECTIONS

.1 Line and low voltage Control Wiring permit.
- .1 Wiring shall be installed by an Electrician
- .2 Submit to Electrical Inspection Department and Supply Authority necessary quantity of Control Drawings and Control Specifications for examination and approval prior to commencement of work
- .3 Pay associated fees.
- .4 Furnish Certificates of Acceptance from Inspection Department and authorities having jurisdiction on completion of work.

1.10 MAINTENANCE CONTRACT DURING WARRANTY PERIOD

.1 Provide services, materials and equipment to maintain BAS for the building warranty period.

.2 Perform as minimum (4) equally distributed visits including during warranty period. Notify Consultant and Owner 24 hours in advance of each visit and Provide written report.

.3 Check, setup and calibrate a minimum of 33% of all devices and all dampers during each visit.

.4 Perform inspections during regular working hours

.5 Records and logs: maintain records and logs of each maintenance task

.6 System modifications: provide in writing. No system modification, including operating parameters and control settings, to be made without prior written approval of Consultant.

.7 Rectify deficiencies revealed by maintenance inspections and environmental checks.

1.11 SUBMITTALS

.1 In accordance with Section 20 05 02 Mechanical Submittals.
- .1 Submit control diagrams
  - .1 Sequences of operation for each system,
  - .2 All input/output object listings and an alarm point summary listing.
  - .3 Complete bill of materials
  - .4 Provide BACnet® Conformance
  - .5 Provide complete description and documentation of any proprietary (non-BACnet®) services and/or objects used in the system.
  - .6 Specification sheets for each item to include manufacturer's descriptive literature, specification, drawings, diagrams, performance and characteristic curves, catalogue cuts, manufacturer's name, trade name, catalogue or model number, nameplate data, size, layout, dimensions, capacity, other data to establish compliance.
  - .7 Sketch of site-specific system architecture.
  - .8 Specification sheets for each item including memory provided, programming language, speed, type of data transmission.
  - .9 Controller locations.
  - .10 Sensing element type and location.

.2 As Built Drawings
- .1 Conform to requirements of Division 1 and Section 20 05 01 Common Work Results for Mechanical - General, supplemented and modified by requirements specified in this section.
- .2 Final Control Diagrams
- .3 Changes to contract documents as well as addenda and contract extras.
- .4 Changes to interface wiring.
- .5 Major routing of conduit and control air lines.
- .6 Signal levels, setpoints, reset curves, schedules.

2 Products

2.1 GENERAL

.1 Control system installed to be "fail-safe".

.2 Provide all required adapters between "metric" and "Imperial" components.

2.2 PRODUCT

.1 Use new products the manufacturer is currently manufacturing and selling for use in new installations. Do not use this installation as a product test site unless explicitly approved in writing by Owner. Spare parts shall be available for at least seven years after completion of this contract.

.2 Each major component of equipment shall have the manufacturer's name and address and the model and serial number on a nameplate.

.3 Maintainability: Maintenance of any satellite panel or any peripheral device shall not affect the remainder of the system.

2.3 BUILDING CONTROLLERS

.1 Listed as a certified B-BC in the BACnet® Testing Laboratories (BTL) Product Listing.

.2 Fully programmable BACnet® Building Controllers that communicate on BACnet® Local Area Network (LAN) and BACnet® MS/TP Network (MS/TP)

.3 Controllers equal to or better than most recent expanded building controllers. Compatible with existing BACnet® BAS

.4 Provide UPS for each Building Controller

.5 Provide quantity as required to create a functional system.

2.4 LOCKABLE CONTROL ENCLOSURES

.1 Enclosures to bear the appropriate CSA designation i.e. CSA Enclosure 1 - General Purpose, CSA Enclosure 3 - Weatherproof.

.2 To have hinged doors equipped with standard keyed-alike cabinet locks, keyed to same key.

.3 Either free-standing or wall mounted enameled steel cabinets with hinged and key-locked front door.

.4 Modular multiple panels as required to handle requirements with additional space to accommodate future capacity without adding additional cabinets.

.5 Cabinets: 12 gauge furniture steel (12 gauge) with baked enamel finish on exterior and rust inhibitive paint on interior, for surface mounting, with hinged door, latch lock, 2 keys, complete with perforated metal mounting backboard.

.6 Factory installed bonding and neutral termination strips.

.7 Provide for conduit entrance from top, bottom or sides of panel.

.8 Cabinets to provide protection from water dripping from above, while allowing sufficient airflow to prevent internal overheating.

2.5 ACCEPTABLE MATERIAL AND INSTALLER

.1 Native BACnet® Building Automation System (BAS) throughout project. Building Controllers (B-BC) to be currently listed by BACnet® Testing Laboratories (BTL)

.2 Acceptable Installer and Material:
- .1 Advanced Energy Management with Alerton, Inc. BTL Listed BACnet® Building Controllers (B-BC)

3 Execution

3.1 ELECTRICAL ENCLOSURES

.1 House all electrical equipment associated with the control system in separate dedicated enclosures provided by this section.

.2 House all controllers associated with the control system in lockable enclosures provided by this section.

.3 Top of lockable enclosure to be 1980 mm AFF.

3.2 BAS OBJECT TYPE SUMMARY

.1 Displays: System displays shall show all analog and binary object types within the system. They shall be logically laid out for easy use by the owner. Provide outside air temperature indication on all system displays associated

.2 Run Time Totalization: At a minimum, run time totalization shall be incorporated for each monitored piece of equipment (i.e. Fans, Pumps, Boilers but not including valves, dampers etc.). Warning limits for each point shall be entered for alarm and or maintenance purposes.

.3 Trend log: All binary and analog object types (including zones) shall have the capability to be automatically trended.

.4 Alarm: All analog inputs (High/Low Limits) and selected binary input alarm points shall be routed (locally or remotely) with alarm message per owner's requirements.

.5 Database Save: Provide back-up database for all stand-alone application controllers on disk.

3.3 BAS POINT DESCRIPTORS & NOMENCLATURE

.1 Conform to existing naming conventions for buildings, zones, controllers and devices in use at building.

.2 Typical control device identification tag:

Point: XYZ _AH1_SAT Address: 1000300.AI2 Description: Supply Air Temperature Part No. XXX – XXXX	Point: XYZ _HX1_VLV Address: 1000100.AO9 Description: Heating Water Exchanger: Steam Valve Part No. XXX – XXXX
Point: XYZ _AH2_FSS Address: 1000500.BO1 Description: Fan Start/Stop Relay Part No. XXX – XXXX	Point: XYZ _ DHWR_PST Address: 1000200.BI4 Description: Domestic Hot Water Return: Pump Current Sensor Part No XXX - XXXX

END OF SECTION

1 General

1.1 GENERAL

The General Conditions of the contract as well as provisions of Division 1 and Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

2 Products

2.1 GENERAL

.1 External trim materials to be corrosion resistant. Internal parts to be assembled in vibration-proof, assembly.

.2 Terminations: use standard conduit box with slot screwdriver compression connector block unless otherwise specified.

.3 Transmitters to be unaffected by external transmitters (e.g. walkie talkies).

.4 Account for hysteresis, relaxation time, maximum and minimum limits in applications of sensors and controls.

.5 Devices to be installed in user occupied space must not exceed Noise Criteria (NC) of 35. Noise generated by any device must not be detectable above space ambient conditions.

2.2 ETHERNET SWITCHES

.1 Conform to IEEE Standard 802.3 and UL508 Listed, Industrial Control Equipment.

.2 RoHS Compliant

.3 Data rate: 10/100Mbps using RJ-45 Connectors.

2.3 TEMPERATURE SENSORS

.1 General: except for Terminal unit box control to be resistance or thermocouple type to following requirements:

- .1 Thermocouples: to be limited to temperature range of 200° C and over. RTD's: 100 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.
- .2 Sensing element: hermetically sealed.
- .3 Stem and tip construction: copper or type 304 stainless steel. Time constant response: less than 3 seconds to temperature change of 10° C.

.2 Thermistor:
.1 Monitoring Range.
.1 -40° C to 55° C where exposed to outside air.
.2 -5° C to 55° C elsewhere.
.2 Factory Calibration Point 25° C with accuracy of Calibration Point +/- 0.3° C.
.3 Stainless steel probe.

.3 Resistance Temperature Detectors (RTD's):
.1 Monitoring Range.
.1 -1° C to 49° C for ducts.
.2 21° C to 104° C for hot water and glycol systems.
.2 Factory Calibration Point 21° C.
.3 Accuracy Calibration Point.
.1 For -7° C to 49° C type +/- 0.7° C.
.2 For 21° C to 104° C type +/- 1.1° C.
.3 Platinum or Nickel Wire Sensor.

.4 Immersion wells: NPS 3/4, stainless steel spring loaded construction, with heat transfer compound compatible with sensor. Insertion length 100 mm or as indicated.

.5 Room Temperature Sensors-Type T-RM
.1 Room type: wall mounting flush mounted with stainless steel blank cover and vandal resistant screws.
.1 Standard of Acceptance:
.1 Greystone TE200 AS7 10,000 Ohm Thermistor

2.4 TEMPERATURE TRANSMITTERS

.1 Input circuit: to accept 3-lead, 100 ohm at 0° C, platinum resistance detectors type sensors.

.2 Power supply: 575 ohms at 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, hysteresis effects: not to exceed plus or minus 0.5 % of full scale output.

.7 Maximum current to 100 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 - 50° C to +50° C, plus or minus 0.5° C.
- .2 0 to 100° C, plus or minus 0.5° C.
- .3 0 to 5° 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.

2.8 ELECTRICAL RELAYS

.1 Double voltage, DPDT, plug-in type with termination base

.2 Coils: rated for 120 VAC or 12 V DC. Other voltage: provide transformer

.3 Contacts: rated at 6 amps at 120 VAC

.4 Relay to have visual status indication

.5 Acceptable material: Eaton Model # XRR2D12 and plug-in base.

2.9 ANALOG CURRENT SENSORS

.1 Purpose: measure line current and produce proportional signal in one of following ranges:
- .1 4-20 mA DC
- .2 0-5 volt DC
- .3 2-10 volts DC

.2 Solid core AC current sensors.

.3 Frequency insensitive from 10 - 80 Hz.

.4 Accuracy to 0.5% full scale

.5 Zero and span adjustments. Field adjustable range to suit motor applications.

.6 Adjustable mounting bracket.

.7 Acceptable material: Greystone Model CS-450-1.

2.10 AIRFLOW PRESSURE SWITCHES

.1 Pressure sensing elements Bourbon tube, bellows or diaphragm type.

.2 Adjustable setpoint and differential.

.3 SPDT contacts.

.4 Operate automatically and reset automatically when condition returns to normal.

.5 Setpoint: 17 to 250 Pa (0.07” to 1" w.g.)

.6 Differential: 10 to 25 Pa (0.04” to 0.1" w.g.)

.7 CSA approved.

.8 Mount with diaphragms in a vertical plane.

2.11 ELECTRONIC CONTROL DAMPER OPERATORS

.1 Spring return for "fail-safe" in Normally Open or Normally Closed position as indicated.

.2 Refer to Section 24 33 15 Dampers - Operating for damper size limits. Provide separate actuators per section for multiple section dampers.

.3 Operator: size so as to control dampers against maximum pressure or dynamic closing pressure (whichever is greater).

.4 Power requirements: 5 VA maximum at 24 VAC.

.5 Operating range: 0 - 20 VDC

.6 Provide adjustable external stops to limit stroke in either direction.

.7 For electric damper operators, use only 75% of the manufacturer's rated motor torque in calculating damper operator requirements.

.8 Provide multiple operators wired to operate in unison where required.

2.12 DAMPER END SWITCHES

.1 Activated by damper blade movement and mounted securely on damper frame.

.2 Rotary action steel slotted lever with plastic roller.

.3 Two electrically isolated SPST changeover micro switches. One circuit to fan interlock and other circuit to BAS system.

.4 Contact rating of 10 amperes at 120 V AC.

.5 CSA approved and bear a ULC label.

2.13 CONTROL VALVES

.1 NPS 2 and under.
- .1 Class 250.
- .2 Bronze body and trim.
- .3 Screwed ends.

.2 NPS 2 1/2 and over.
- .1 Class 125.
- .2 Cast iron body.
- .3 Bronze trim.
- .4 Flanged or roll grooved ends.
- .5

.3 Two-Way Radiator Control Valves:
- .1 Spring return for "fail safe" in normally open position unless otherwise noted.
- .2 Line size
- .3 NPS ½ to NPS 3.
- .4 Acceptable Material
  - .1 Belimo B2 + LF Two way ball valves

2.14 ELECTRONIC/ELECTRIC VALVE ACTUATORS

.1 Construction: steel, cast iron, aluminum.
- .1 Control voltage: 0-20V DC or 24V AC.
- .2 Positioning time: to suit application. 90 sec maximum
- .3 Spring return to normal position as indicated

.2 Size operators to ensure tight shut off when subjected to maximum system differential pressure

.3 Minimum close off rating shall be 200 kPa (30 psi).

3 Execution

3.1 GENERAL

.1 Temperature transmitters, humidity transmitters, controllers, relays: install in NEMA I enclosure or as required for specific applications. Provide for electrolytic isolation in all cases when dissimilar metals make contact.

.2 Support field-mounted transmitters, sensors on pipe stands or channel brackets.

.3 Duct and AH unit mounted devices: Seal duct and AH unit to prevent air leakage.

.4 Wall mounted devices: Install on plywood panel properly attached to wall.

.5 Duct mounted devices: On insulated ducts, mount devices and associated wiring on standoffs.

3.2 FAN AND PUMP STATUS

.1 Fan status: determined via AI points connected to current-operated sensors.

.2 Pump status: determined via AI points connected to current operated sensors.

.3 Auxiliary contacts on motor starters will not be acceptable for this function.

3.3 BAS CONTROL COMPONENTS AND MOTOR STARTERS

.1 AC Current sensors
- .1 For motor control centers and for individual magnetic starters, AC Current sensors are supplied and installed by Electrical Contractor. Refer to Section 26 29 10 Motor Starters to 600 V and Section 26 24 19 Motor Control Devices. Provide necessary adapters to utilize these devices.

.2 For thermal overload switches, AC Current sensors are supplied and installed by Section 25 30 02 BAS Field Control Devices.

.2 Relays and Relay Bases

.1 For motor control centers and for individual magnetic starters, relays and relay bases are supplied and installed by Electrical Contractor. Refer to Section 26 29 10 Motor Starters to 600 V and Section 26 24 19 Motor Control Devices. Provide necessary adapters to utilize these devices.

.2 For thermal overload switches, relays and relay bases are supplied and installed by Section 25 30 02 BAS Field Control Devices.

.3 The AC Current sensors, Relays and Relay Bases that are provided by Electrical Contractor are for use by the BAS. Provide necessary hardware, adapters and devices as required for the BAS to utilize this equipment. Should modifications be required to the supplied devices to facilitate interfacing with the BAS, all necessary modifications, equipment, programming, etc. shall be carried out by the BAS contractor, at no additional cost to the Owner. Further, if the BAS Contractor modifies the control components located in the starter enclosures, the services of CSA will be required to visit the site and perform a field certification of each modified starter. Include all costs for the field certification in the BAS Contract.

3.4 TEMPERATURE SENSORS

.1 Mount room temperature sensors on electrical box as per detail on the drawings.

.2 Stabilized to such a level as to permit on-the-job installations that will require minimum field adjustments or calibration.

.3 Assemblies readily accessible and adaptable to each type of application in such a manner as to allow for quick, easy replacement and servicing without special tools or skills.

.4 Install wells in the piping at elbows where piping is smaller than the length of the well to affect proper flow across the entire area of the well. Well shall not restrict flow area to less than 70 percent of line-size-pipe normal flow area.

3.5 TEMPERATURE AND HUMIDITY SENSORS

.1 Stabilize to ensure minimum field adjustments or calibrations

.2 To be readily accessible and adaptable to each type of application so as to allow for quick easy replacement and servicing without special tools or skills.

.3 Thermowell: install for piping installations. Where pipe diameter is less than well insertion length, locate well in elbow. Thermowell to restrict flow by less than 30%.

3.6 FIELD MOUNTED TRANSMITTERS AND SENSORS

.1 Support properly on pipe stands or channel brackets.

.2 Install wall mounted devices on plywood panel attached properly to wall.

3.7 PRESSURE AND DIFFERENTIAL PRESSURE SWITCHES

.1 Install isolation valve and snubber on sensors between sensor and pressure source. In addition, protect sensing elements on steam and high temperature hot water service with pigtail syphon between valve and sensor.

END OF SECTION

1 General

1.1 GENERAL

.1 NOTE: Section 20 05 01 Mechanical General Requirements, Section 20 05 02 Mechanical Submittals and Section 20 05 03 Mechanical Contract Closeout are part of and to be read in conjunction with this Section.

1.2 REFERENCE STANDARDS

.1 In accordance with Section 20 05 01 Mechanical General Requirements.

1.3 WIRING

.1 If departures from the contract drawings are deemed necessary, details of such departures, including changes in related portions of the project and the reasons therefore, shall be submitted to the Consultant with drawings for approval.

.2 Incorporate surge transient protection in the design of the system to protect all electrical components in all control equipment.

1.4 SYSTEM DESCRIPTION

.1 Electrical: Hard wiring between field control devices and BAS field panels.

.2 Terminal Units: Air flow probe for Terminal Units are provided by Section 24 37 13 Air Terminal. Air flow dp sensor, actuator and associated controls are provided by BAS 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 BAS contractor. Coordinate air flow adjustments with balancing trade.

2 Products

2.1 CONTROL SYSTEM WIRE AND CABLE

.1 Cable jacket:
- .1 FT6 jacket rated and bear the following labels: CSA 300 volts and FT6.
- .2 FT4 jacket rated and bear the following labels: CSA 600 volts and FT4.
- .3 Labeled with the following information, as a minimum:
  - .1 Cable type.
  - .2 FT rating.
  - .3 Temperature rating.
  - .4 CSA number.
  - .5 Rated voltage.
  - .6 Gauge and number of conductors.
- .4 Application:
  - .1 Control wiring to 600 volt starters to be FT4 in conduit.
  - .2 All control wiring in conduit may be FT4.
  - .3 All other control wiring to be FT6.
  - .4 Colored as follows:

System Description	Jacket Colour
BAS	Yellow

.2 Below 50V control wiring:
- .1 Minimum No. 14 stranded.
- .2 Minimum two conductor No. 18 AWG solid copper or No. 20 AWG, stranded twisted pair for field wiring of each digital device.
- .3 Minimum No. 22 AWG solid copper for multi-conductor wiring having four or more conductors.
- .4 Minimum two conductor No. 18 AWG, solid copper, or No. 20 AWG, stranded twisted pair, shielded for field wiring of each analog input.

2.3 BAS CONTROL WIRING MATERIALS AND INSTALLATION METHODS

.1 Installation methods as per Canadian Electrical Code.

.2 All wiring to be run surface mounted in EMT conduit.

.3 Fittings: Steel

.4 Final connection to mechanical equipment to be with liquid tight metal flexible conduit.

.5 Reference the Electrical specifications for wiring methods.

3 Execution

3.1 GENERAL

.1 Install all work in accordance with authorities having jurisdiction and manufacturer's requirements. In case of conflicting requirements, the more stringent shall apply.

.2 Install in a neat and ordered manner.

.2 Fully enclose or properly guard electrical wiring, terminal blocks, high voltage above 70 V contacts and mark to prevent accidental injury.

.3 Check factory connections and joints. Tighten where necessary to ensure continuity.

.4 Holes through exterior wall and roofs: flash and make weatherproof.

.5 Where equipment, ducts or pipes are insulated, install control wiring on stand-offs.

.6 Do not cover with mechanical insulation.

.7 Secure approval for damper motor locations and supports.

.8 Run parallel or perpendicular to building lines. When installed in a wall cavity, conduit is to be installed vertically from outlet box to ceiling space, not run in an angled manner through the studs.

.9 Run conduits in flanged portion of structural steel, where possible.

.10 Group conduits wherever possible.

.11 Do not pass conduits through structural members except as indicated.

.12 Do not locate conduits closer than 75 mm (3 inch) parallel to hot water lines with a minimum of 25 mm (1 inch) at crossovers.

.13 Support electrical systems raceway independent of any type of suspended ceiling support rods, wires, etc. Toggle bolts shall not be used in Gypsum board construction.

.14 Do not install horizontal conduits runs in masonry walls.

.15 Do not install conduits in terrazzo or concrete toppings.

END OF SECTION

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DRAWING LIST

ARCHITECTURAL

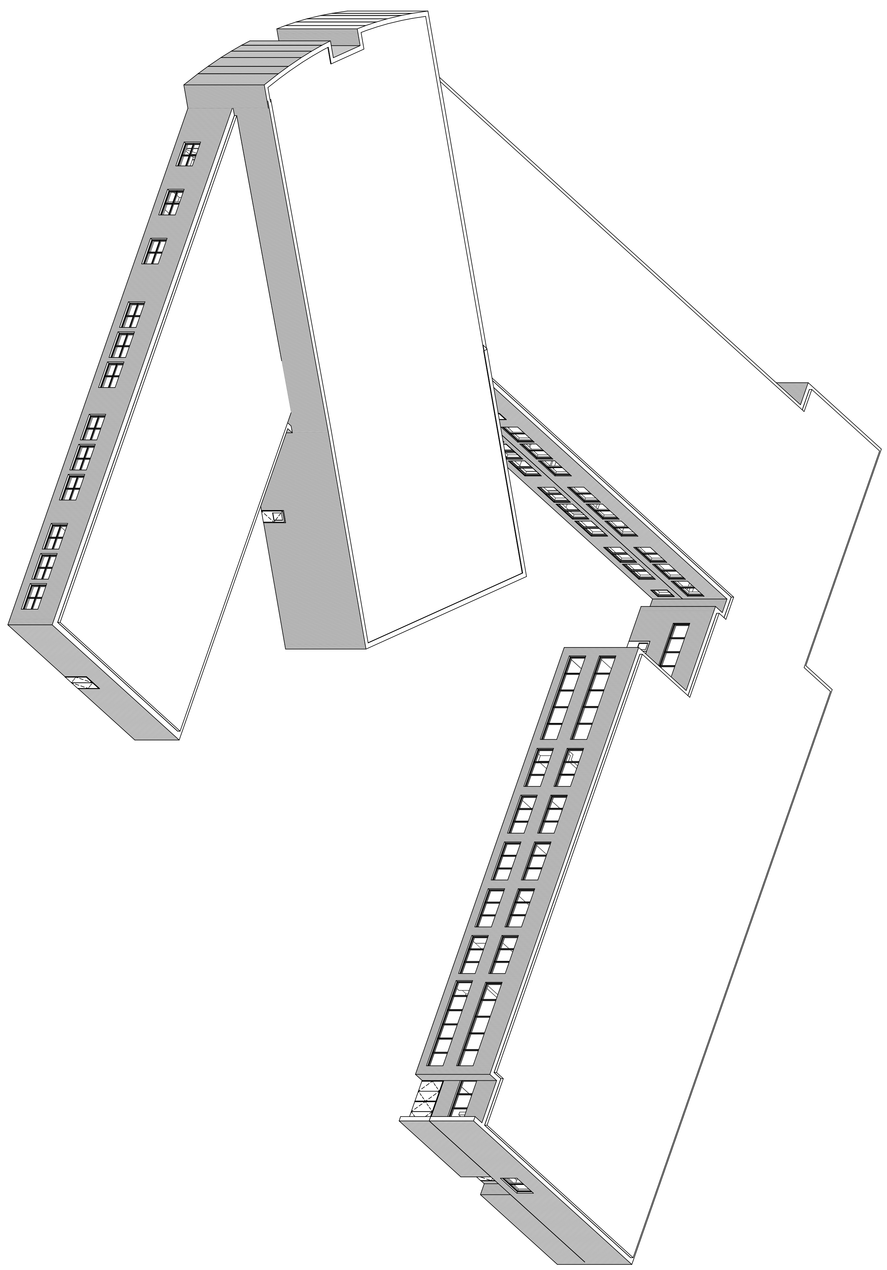
A-111	FLOOR PLANS
A-121	FLOOR PLAN - BOILER ROOM

MECHANICAL

M#-101	HEATING FLOOR PLANS, SCHEMATICS, AND LEGEND
M#-501	VENTING FLOOR PLAN AND ELEVATION
M#-601	MECHANICAL SCHEDULES AND DETAILS

ELECTRICAL

EM-101	BASEMENT FLOOR PLAN ELECTRICAL
EM-201	BOILER ROOM PLANS, SCHEDULE AND DETAIL ELECTRICAL



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DUMAC
DUMAC ENERGY LIMITED CONSULTING ENGINEERS

CLIENT:
Halifax Regional Centre for Education

FBM PROJECT NO.: 2024-016-2 | DATE: 10 MAY 2024

PROJECT NAME:

BICENTENNIAL SCHOOL - BOILER REPLACEMENT

85 VICTORIA ROAD, DARTMOUTH, NS B3A 1T9
ISSUED FOR TENDER

SCOPE OF WORK

NOT IN CONTRACT

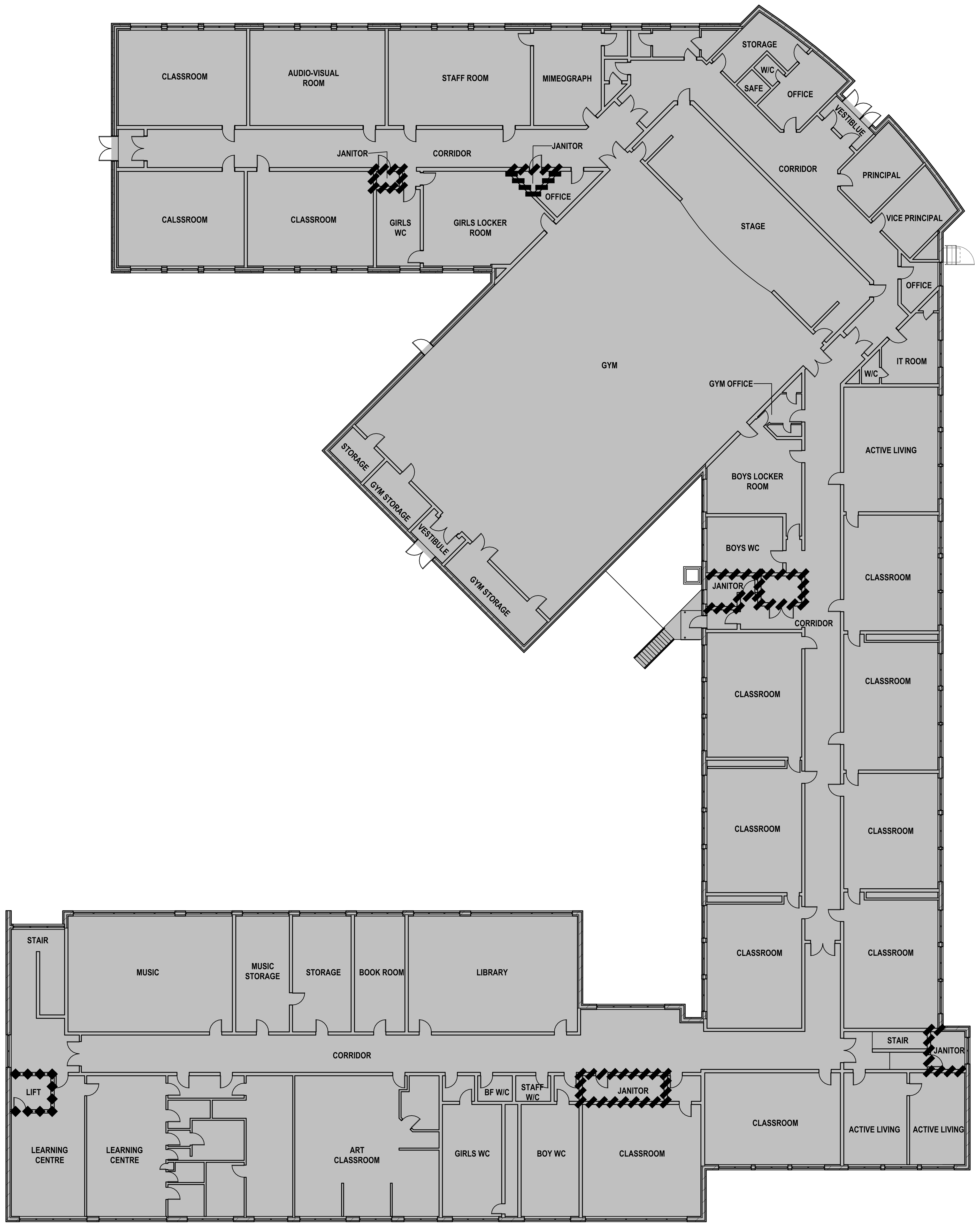
FIRE SEPARATION LEGEND

FIRE SEPARATION WITHOUT A RATING

1 HOUR

PROJECT NORTH

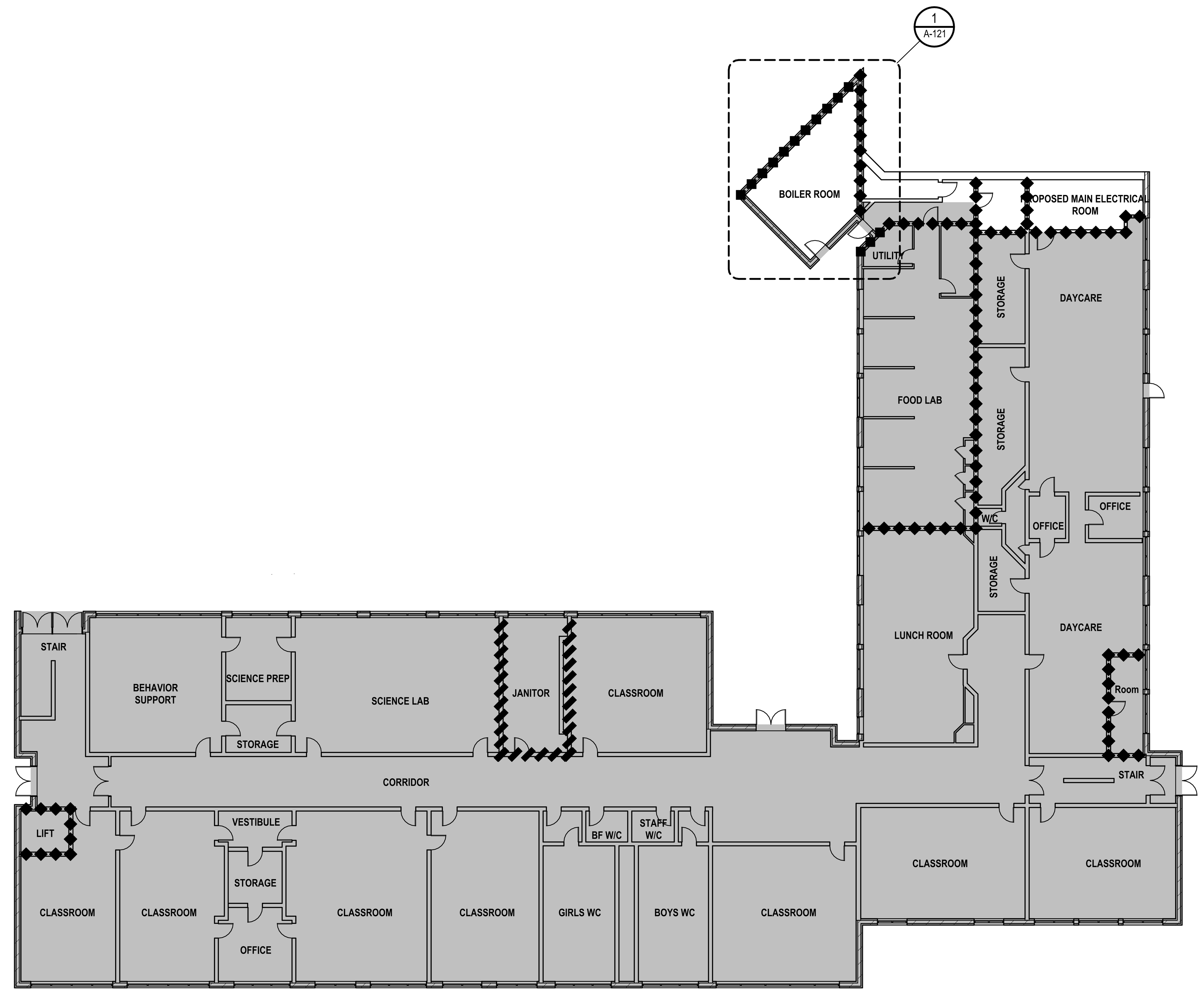
N



1
A-111
MAIN LEVEL
SCALE: 1/16" = 1'-0"

PROJECT NORTH

N



2
A-111
BASEMENT
SCALE: 1/16" = 1'-0"

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SCALE	As indicated
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CHECKED	GW
DATE	10 MAY 2024

PROJECT

BICENTENNIAL SCHOOL - BOILER REPLACEMENT

CLIENT

Halifax Regional Centre for Education

PROJECT No. 2024-016-2

SHEET TITLE

FLOOR PLANS

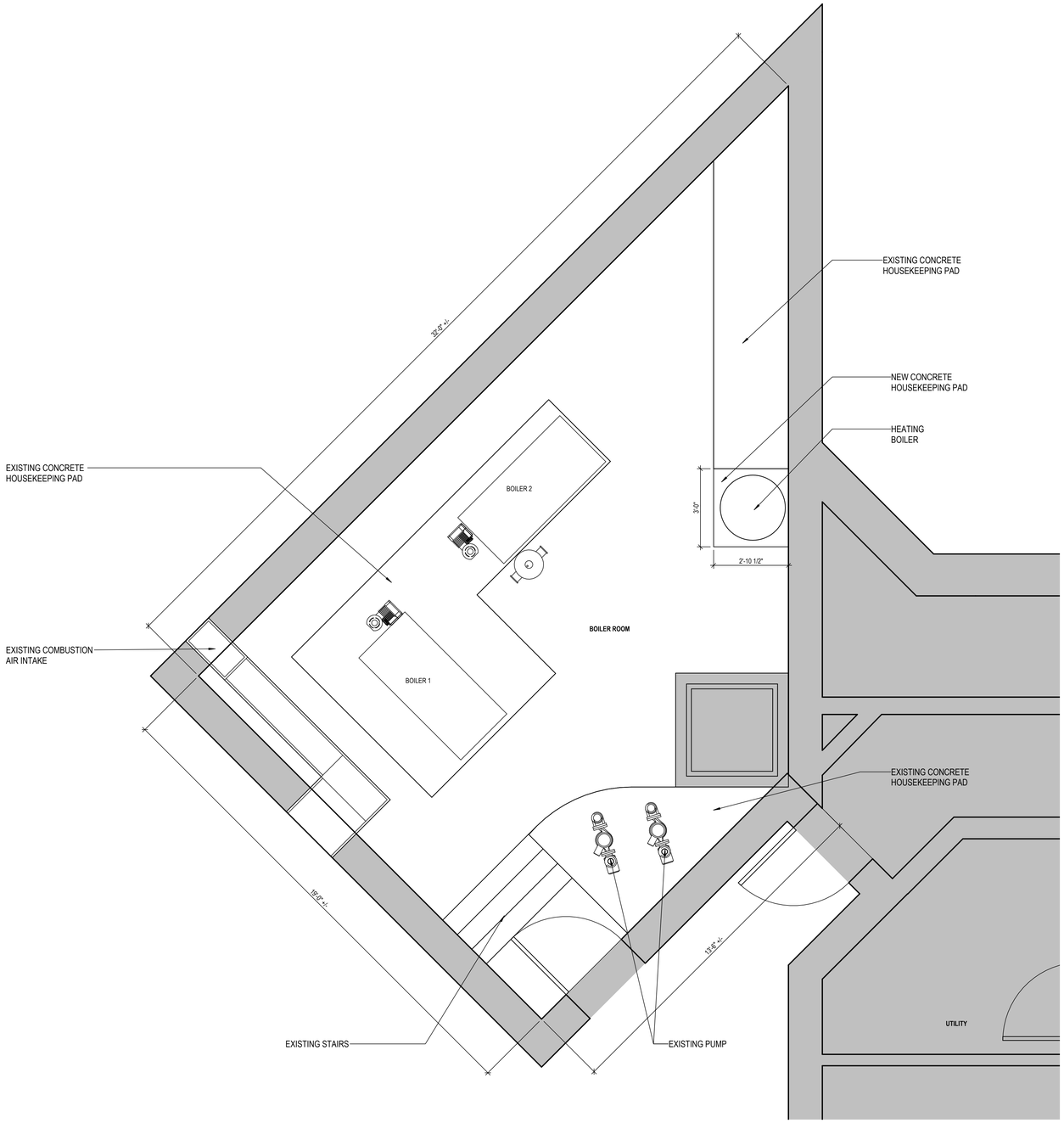
A-111

GENERAL NOTES

1. FOR EQUIPEMENT INFORMATION, REFER TO MECH. & ELEC. DRAWINGS.

2. PROVIDE APPROVED FIRESTOPPING AROUND ALL NEW PENETRATIONS IN FIRE RATED ASSEMBLIES.

3. PROVIDE 3/4" FIRE RATED BACKING BOARD AS REQUIRED FOR MOUNTING OF MECHANICAL AND ELECTRICAL EQUIPMENT



1 / A-121 BOILER ROOM

SCALE: 1/2" = 1'-0"

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CLIENT

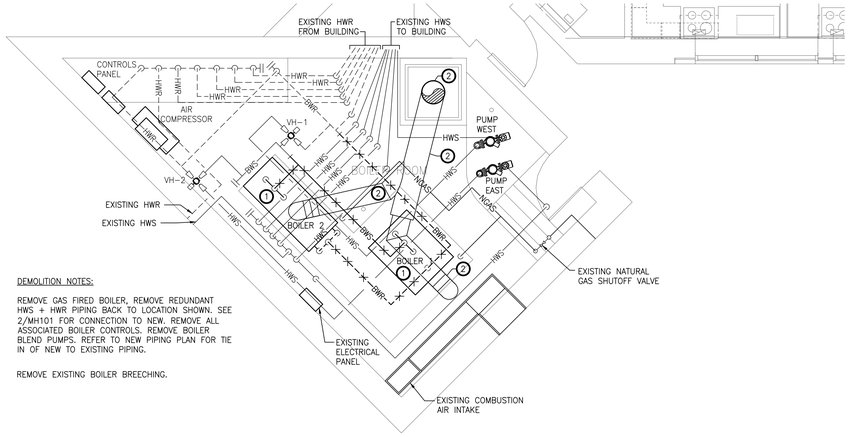
Halifax Regional Centre for Education

PROJECT No: 2024-016-2

SHEET TITLE

FLOOR PLAN - BOILER ROOM

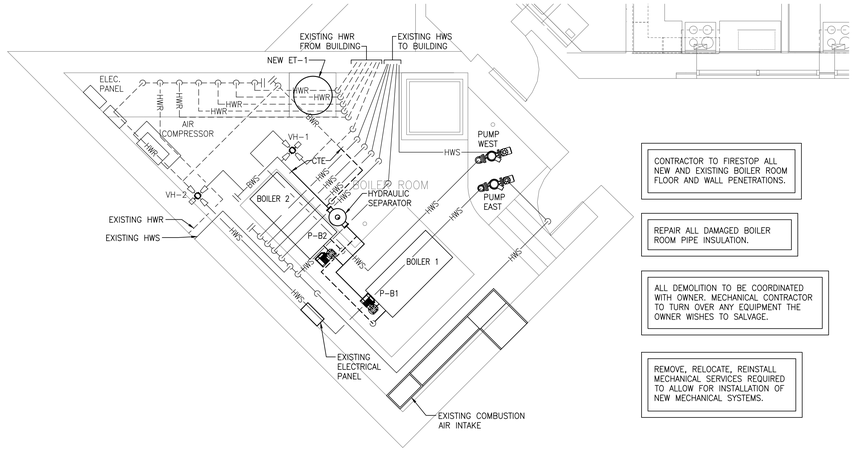
A-121



DEMOLITION NOTES:

1. REMOVE GAS FIRED BOILER, REMOVE REDUNDANT HWS + HWR PIPING BACK TO LOCATION SHOWN. SEE 2/MH101 FOR CONNECTION TO NEW. REMOVE ALL ASSOCIATED BOILER CONTROLS. REMOVE BOILER BLEND PUMPS. REFER TO NEW PIPING PLAN FOR TIE IN OF NEW TO EXISTING PIPING.
2. REMOVE EXISTING BOILER BREECHING.

1 / MH101 BOILER ROOM FLOOR PLAN – DEMO
1/4" = 1'-0"



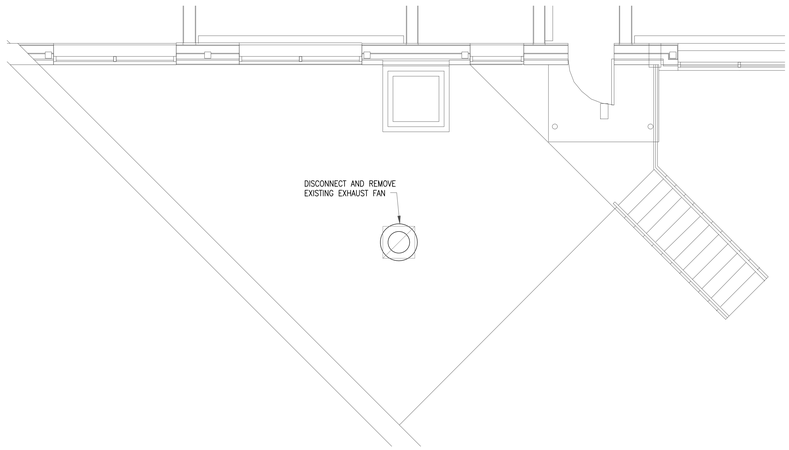
CONTRACTOR TO FIRESTOP ALL NEW AND EXISTING BOILER ROOM FLOOR AND WALL PENETRATIONS.

REPAIR ALL DAMAGED BOILER ROOM PIPE INSULATION.

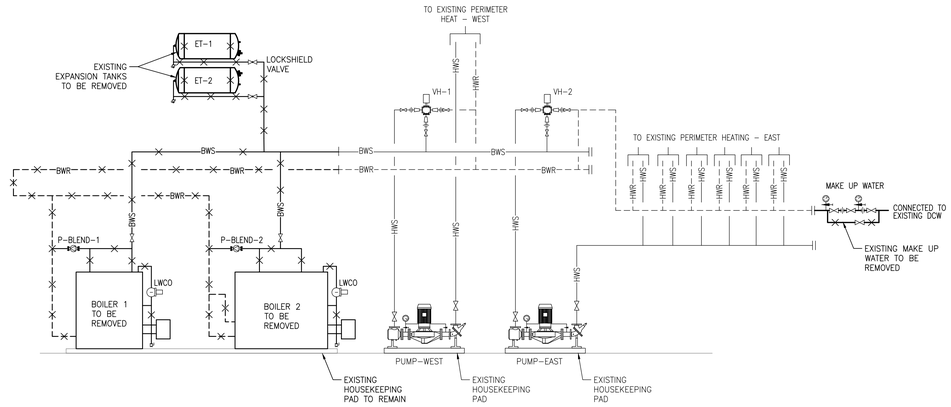
ALL DEMOLITION TO BE COORDINATED WITH OWNER. MECHANICAL CONTRACTOR TO TURN OVER ANY EQUIPMENT THE OWNER WISHES TO SALVAGE.

REMOVE, RELOCATE, REINSTALL MECHANICAL SERVICES REQUIRED TO ALLOW FOR INSTALLATION OF NEW MECHANICAL SYSTEMS.

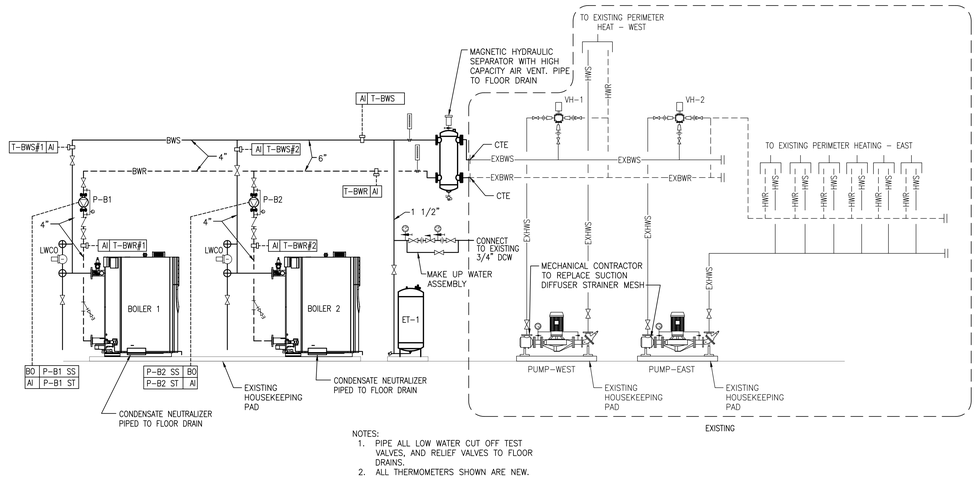
4 / MH101 BOILER ROOM FLOOR PLAN – NEW
1/4" = 1'-0"



2 / MH101 BOILER ROOM ROOF PLAN – DEMO
1/4" = 1'-0"



3 / MH101 HYDRONIC PIPING SCHEMATIC – DEMO
NTS



NOTES:
1. PIPE ALL LOW WATER CUT OFF TEST VALVES, AND RELIEF VALVES TO FLOOR DRAINS.
2. ALL THERMOMETERS SHOWN ARE NEW.

5 / MH101 HYDRONIC PIPING SCHEMATIC – NEW
NTS

MECHANICAL LEGEND

- HWS — NEW HOT WATER HEATING SUPPLY
- HWR — NEW HOT WATER HEATING RETURN
- EXHWS — EXISTING HOT WATER HEATING SUPPLY
- EXHWR — EXISTING HOT WATER HEATING RETURN
- EXISTING PIPING TO BE REMOVED. REFER TO NEW FLOOR PLANS FOR CONNECTION OF NEW TO EXISTING
- ELBOW TURNED UP
- ELBOW TURNED DOWN
- DIRECTION OF FLOW
- VALVE (SEE SPEC FOR TYPE)
- RELIEF VALVE PIPED TO DRAIN
- HOSE END DRAIN VALVE
- CIRCUIT BALANCING VALVE
- TEMPERATURE SENSING BULB WELL WITH THERMOMETER
- "Y" STRAINER
- PG — PRESSURE GAUGE WITH GAUGE COCK
- CIRCUIT BALANCING VALVE
- AO — ANALOG OUTPUT
- AI — ANALOG INPUT
- BO — BINARY OUTPUT
- BI — BINARY INPUT
- WIRING BY ELECTRICAL CONTRACTOR
- WIRING BY CONTROLS CONTRACTOR
- T — EXISTING TEMPERATURE SENSOR
- T1 — NEW THERMOSTAT
- RECTANGULAR AND ROUND SUPPLY AIR DUCT SECTION UP
- RECTANGULAR AND ROUND SUPPLY AIR DUCT SECTION DOWN
- RECTANGULAR AND ROUND RETURN AIR DUCT SECTION UP
- RECTANGULAR AND ROUND RETURN AIR DUCT SECTION DOWN

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PROJECT
BICENTENNIAL SCHOOL - BOILER REPLACEMENT

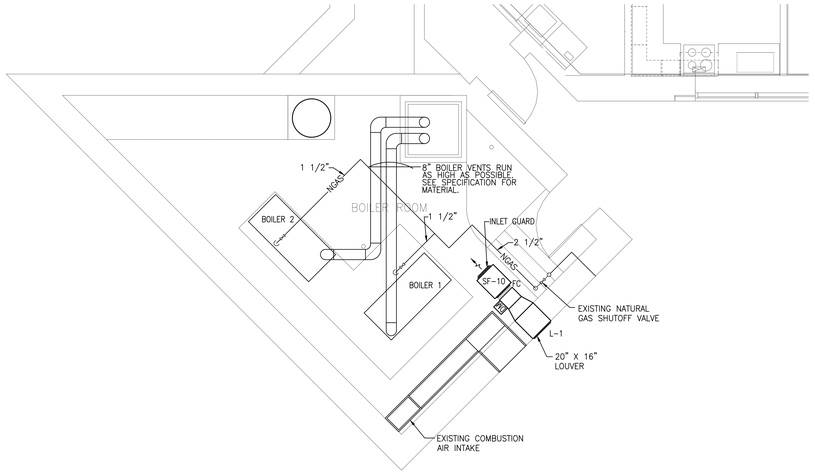
CLIENT
Halifax Regional Centre for Education

PROJECT No. 2024-016

SHEET TITLE
HEATING FLOOR PLANS SCHEMATICS, AND LEGEND

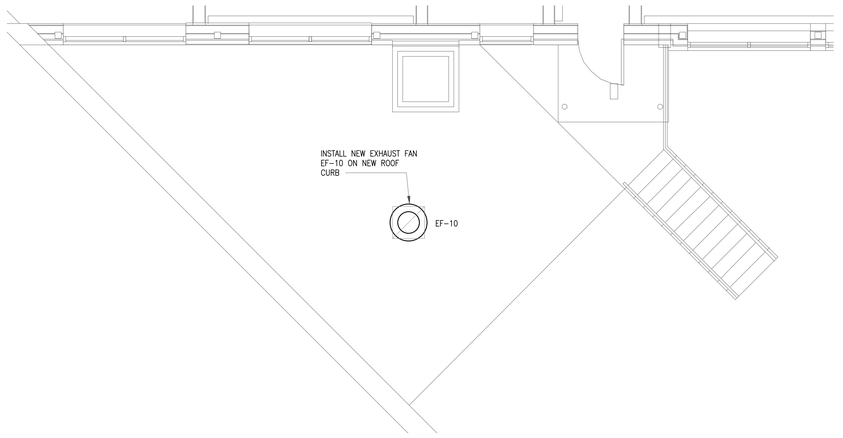
MH101

DUMAC#23-045



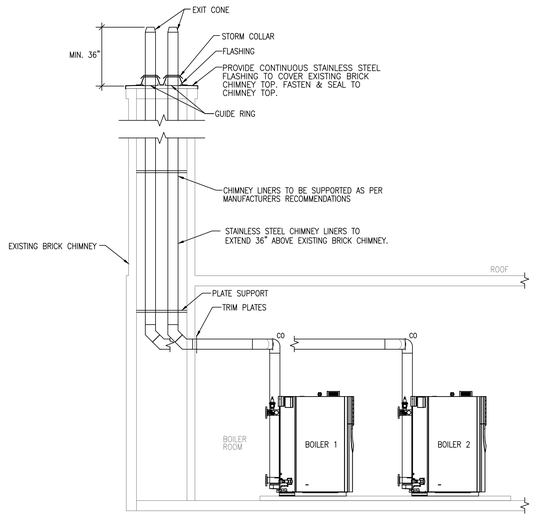
1 / MH501 NEW BOILER ROOM FLOOR PLAN – VENTING AND NATURAL GAS

1/4" = 1'-0"



2 / MH501 NEW BOILER ROOM ROOF PLAN – VENTING AND NATURAL GAS

1/4" = 1'-0"



3 / MH501 CHIMNEY AND BREECHING ELEVATION

NTS

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BICENTENNIAL SCHOOL - BOILER REPLACEMENT

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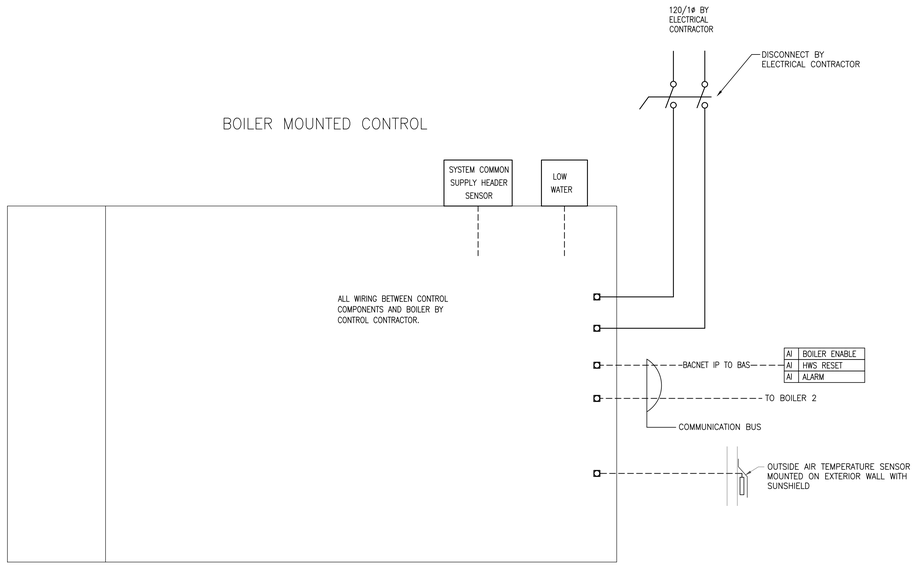
PROJECT No. 2024-016

SHEET TITLE

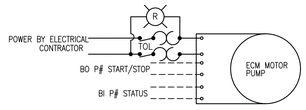
VENTING FLOOR PLAN AND ELEVATION

MH501

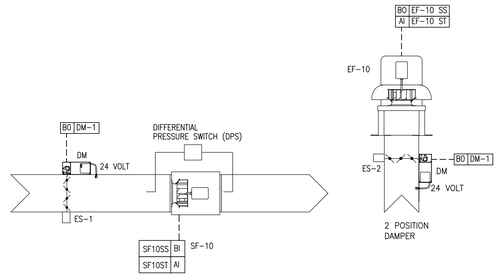


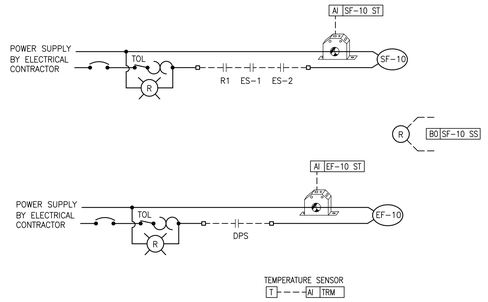
1 MH601 — BOILER 1 CONTROL PANEL SCHEMATIC
SIMILAR FOR BOILER 2

3 MH601 — TYPICAL PIPE IDENTIFICATION
NTS



4 MH601 — ECM PUMP WIRING SCHEMATIC
NTS, P-B1, P-B2





DM LINE VOLTAGE DAMPER MOTOR C/W END SWITCH BY CONTROLS CONTRACTOR

OUTSIDE AIR TEMPERATURE BELOW 2°C:

FANS OFF.

OUTSIDE AIR TEMPERATURE ABOVE 4°C:

UPON A RISE IN SPACE TEMPERATURE ABOVE 25°C, SUPPLY AIR DAMPER AND EXHAUST AIR DAMPER OPEN AND WHEN END SWITCHES MAKE SUPPLY FAN STARTS. WHEN SUPPLY FAN DIFFERENTIAL PRESSURE SWITCH MAKES EXHAUST FAN STARTS. ALARM IF FAN CURRENT FALLS BELOW NORMAL.

2 MH601 — SF-10 & EF-10 WIRING AND CONTROL
NTS

NATURAL GAS FIRED BOILER SCHEDULE

SYMBOL	SERVICE	LOCATION	STANDARD OF ACCEPTANCE		FUEL	INPUT RATING MBH		ACCESSORIES AND/OR REMARKS
			MANUFACTURER	MODEL			VOLTAGE	
BOILER-1	HYDRONIC HEATING	BOILER ROOM	LOCHINVAR	FBN2001	N.G.	1999	120/1	MUST FIT THROUGH 36" DOOR OPENING
BOILER-2	HYDRONIC HEATING	BOILER ROOM	LOCHINVAR	FBN2001	N.G.	1999	120/1	MUST FIT THROUGH 36" DOOR OPENING

EXPANSION TANK SCHEDULE

SYMBOL	SERVICE	LOCATION	STANDARD OF ACCEPTANCE		TOTAL VOL. GALLONS	ACCEPTANCE GALLONS	ACCESSORIES AND/OR REMARKS
			MANUFACTURER	MODEL			
ET-1	HEATING BOILER	BOILER ROOM	EXPANFLEX	AL-600	158	158	

PUMP SCHEDULE

SYMBOL	SERVICE	LOCATION	STANDARD OF ACCEPTANCE		FLUID	FLOW at P.D. GPM at FT.HD	MOTOR		REMARKS
			MANUFACTURER	MODEL			WATTS	VOLTAGE	
P-B1	BOILER 1	BOILER ROOM	GRUNDFOS	MAGNA3 100-120	WATER	192 @ 18	1564	208/1	-
P-B2	BOILER 2	BOILER ROOM	GRUNDFOS	MAGNA3 100-120	WATER	192 @ 18	1564	208/1	-

LOUVER SCHEDULE

SYMBOL	STANDARD OF ACCEPTANCE		NECK SIZE	ACCESSORIES AND / OR REMARKS
	MANUFACTURER	MODEL		
L-1	RUSKIN	ELF6375DX	20" X 16"	
-	-	-	-	

FAN AND DAMPER SCHEDULE

CONTROL DAMPER MOTORS BY CONTROLS CONTRACTOR. CONTROL DAMPERS (FOR ROOF EF, SIZE DAMPERS TO MATCH FAN REC. ROOF OPENING) BY MECHANICAL CONTRACTOR (M.C.). ROOF CURBS WHERE NOTED BY GENERAL CONTRACTOR (G.C.)

SYMBOL	SERVES	LOCATION	STANDARD OF ACCEPTANCE		AIRFLOW		DRIVE	RPM	POWER W	MOTOR			CONTROL DAMPER	DAMPER MOTOR	DISC	SONES	ACCESSORIES AND/OR REMARKS	SYMBOL
			MANUFACTURER	MODEL#	CFM	"WG				HP	VOLTAGE	ROOF CURB						
SF-10	BOILER ROOM	BOILER ROOM	LOREN COOK	100SQN12D	375	0.3	DIRECT	1117	103	0.167	120/1	-	Y	Y	Y	3.1/3.7	FSC SPEED CONTROLLER, INLET GUARD	SF-10
EF-10	BOILER ROOM	ROOF	LOREN COOK	101C150	375	0.3	DIRECT	1085	0.038 HP	1/8	120/1	Y	Y	Y	Y	4.7	FSC SPEED CONTROLLER	EF-10

WIRING BY MECHANICAL

WIRING BY ELECTRICAL

DUMAC#23-045

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No	REVISION	BY	DATE
0	ISSUED FOR TENDER	-	10 MAY 2024

STAMP

REGISTERED PROFESSIONAL ENGINEER — APPLIANCE OF NOVA SCOTIA — C. J. Landry — 9858

SCALE	AS INDICATED
DRAWN	JC
CHECKED	CL
DATE	

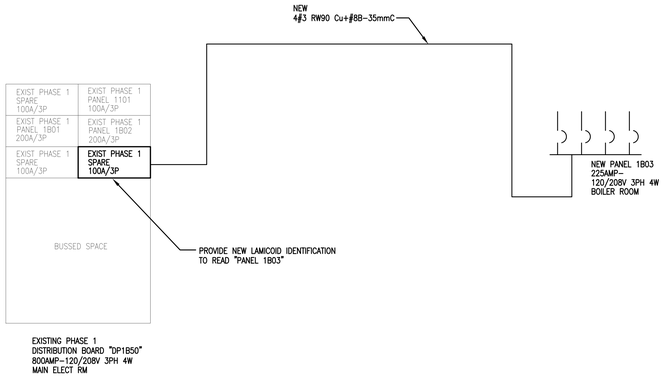
PROJECT
BICENTENNIAL SCHOOL - BOILER REPLACEMENT

CLIENT
Halifax Regional Centre for Education

PROJECT No. 2024-016

SHEET TITLE
MECHANICAL SCHEDULES

MH601



EXISTING PHASE 1
DISTRIBUTION BOARD "DP1B50"
800AMP-120/208V 3PH 4W
MAIN ELECT RM

1 EM101 PARTIAL POWER RISER DIAGRAM
3/32" = 1'-0"

VOLTS 120/208 PANEL NEW 1B03 TYPE PBL-1
PHASE 3 LOCATION BOILER RM MAINS 225 AMPS
WIRE 4 FED FROM DP1150 ENTER AT MTG. S

DESIGNATION	WATTS A	WATTS B	WATTS C	CIR. No.	BKR NO	A B C	BKR NO	CIR. No.	WATTS A	WATTS B	WATTS C	DESIGNATION
LIGHTING-BOILER RM	300			1	15A			2				
BOILER B1		500		3	15A			4				
BOILER B2			500	5	15A			6				
BOILER P-B1	500			7	2P			8				
		500		9	15A			10				
BOILER P-B2			500	11	2P			12				
	500			13	15A			14				
EXH FAN EF-10		300		15	15A			16				
SUPPLY FAN SF-10			300	17	15A			18				
				19				20				
				21				22				
				23				24				
				25				26				
				27				28				
				29				30				
				31				32				
SPARE				33	20A		15A	34				SPARE
SPARE				35	20A		15A	36				SPARE
SPARE				37	20A		15A	38				SPARE
SPARE				39	20A		15A	40				SPARE
SPARE				41	20A		15A	42				SPARE

EXISTING BRANCH CIRCUITS TO BE TRANSFERED OVER FROM EXISTING BOILER ROOM SQUARE D PANEL AS INDICATED ON NOTE-1, DRAWING EP201.
PROVIDE BREAKERS SIZED TO MATCH EXISTING. EXTEND EXISTING BRANCH CIRCUITRY AS REQUIRED.

EXISTING BRANCH CIRCUITS TO BE TRANSFERED OVER FROM EXISTING BOILER ROOM SQUARE D PANEL AS INDICATED ON NOTE-1, DRAWING EP201.
PROVIDE BREAKERS SIZED TO MATCH EXISTING. EXTEND EXISTING BRANCH CIRCUITRY AS REQUIRED.

ΦA TOTAL
ΦB TOTAL
ΦC TOTAL

TOTAL LOAD ____ KW ____ AMP

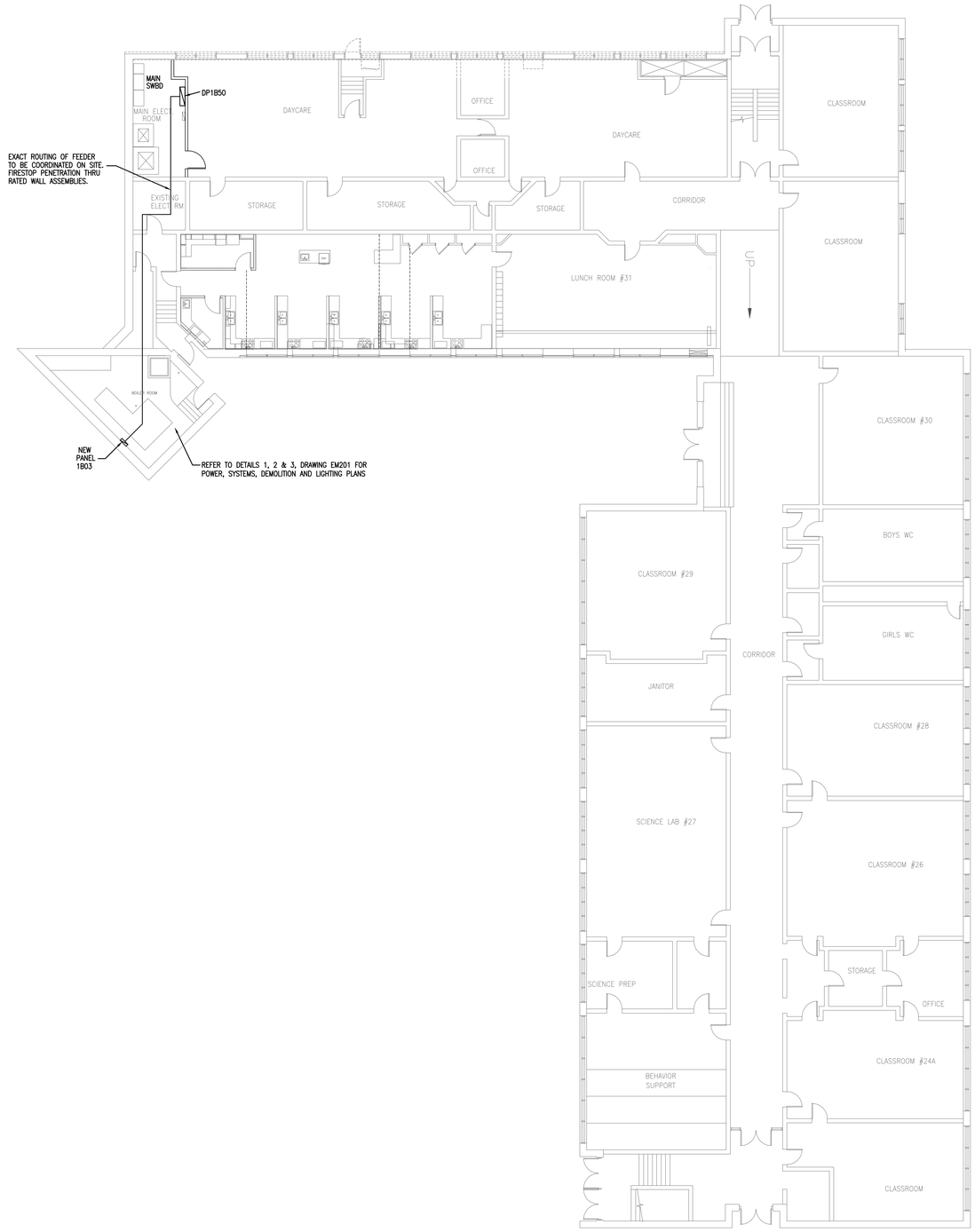
● GROUND FAULT CIRCUIT INTERUPTER BREAKER
✱ LOCKABLE BREAKER

PANEL BOARD TO BE 20" WIDE X 5.75" DEEP, COPPER MAINS

1. PROVIDE SEPARATE NEUTRALS FOR ALL NEW CIRCUITS
2. TRACE AND IDENTIFY EACH EXISTING BRANCH CIRCUIT AND PROVIDE TYPED PANEL DIRECTORY

ELECTRICAL LEGEND

$	125V, 20AMP SINGLE POLE TOGGLE SWITCH
'1'	TYPE '1' LIGHTING FIXTURE-1220mm LINEAR LENSED LED STRIP FIXTURE 120VAC, 4000K, 4000 LUMENS. SURFACE MOUNTED. MANUFACTURER: SIGNIFY SDS-4-2448L-8CST-UN3-DIM30 OR EQUAL
	125V, 15/20A, 5-20R DUPLEX RECEPTACLE MOUNTED 18" (450mm) AFF.
	PANEL BOARD
$TOL	MANUAL MOTOR STARTER C/W RED ON PILOT AND LOCKING TAB
NF	NON-FUSED DISCONNECT SWITCH
CO	FIRE ALARM SYSTEM CARBON MONOXIDE DETECTOR C/W SOUNDER BASE
(2)	INDICATES MECHANICAL EQUIPMENT NUMBER. REFER TO MOTOR STARTER AND CONTROL LIST.



1 EM101 BASEMENT FLOOR PLAN – ELECTRICAL
3/32" = 1'-0"

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No	REVISION	BY	DATE
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STAMP

REGISTERED PROFESSIONAL ENGINEER
D.M. DUMARESQ
3369
PROVINCE OF NOVA SCOTIA

SCALE AS INDICATED
DRAWN
CHECKED
DATE

PROJECT
BICENTENNIAL SCHOOL - BOILER REPLACEMENT

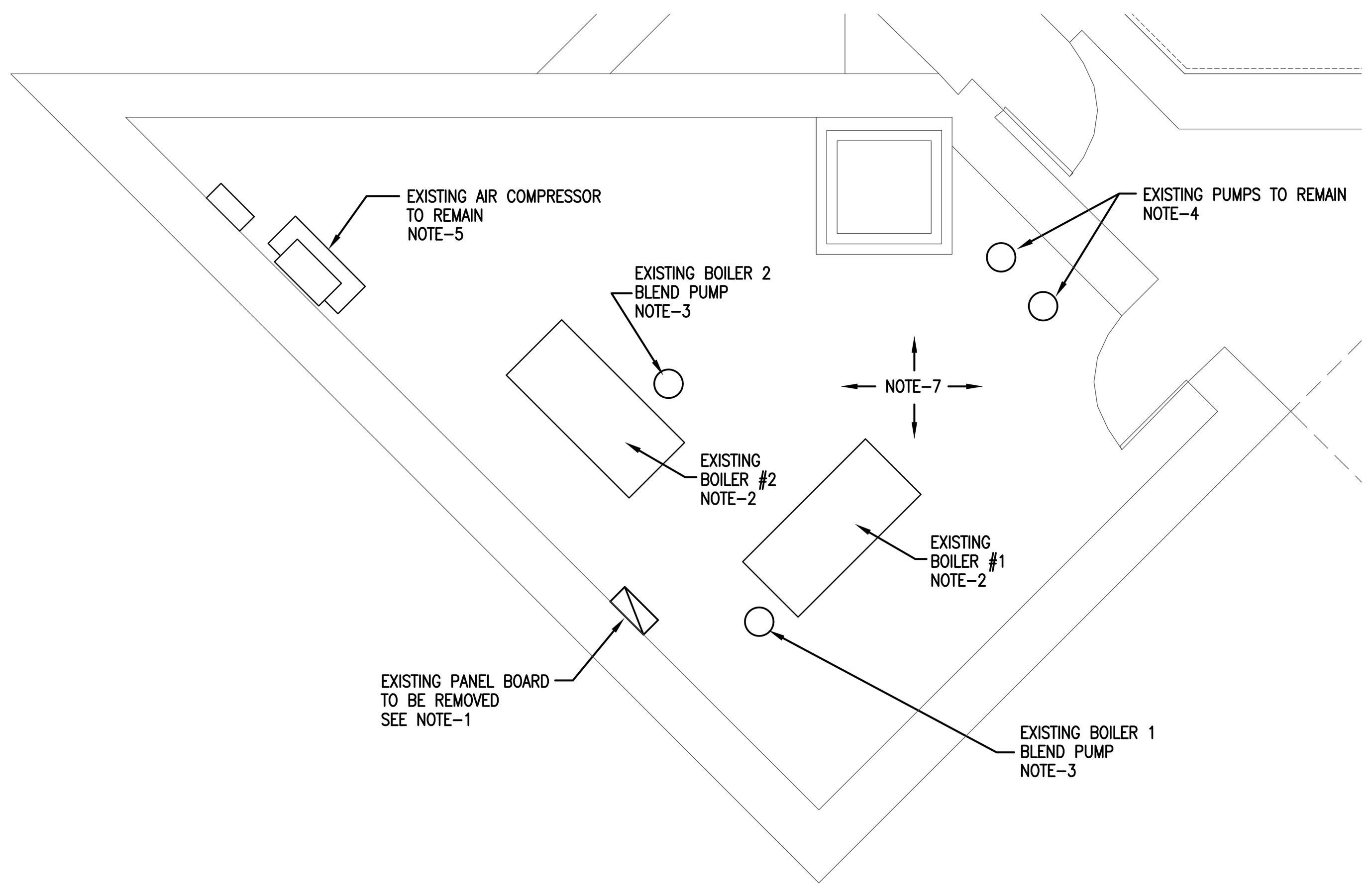
CLIENT
Halifax Regional Centre for Education

PROJECT No. 2024-016

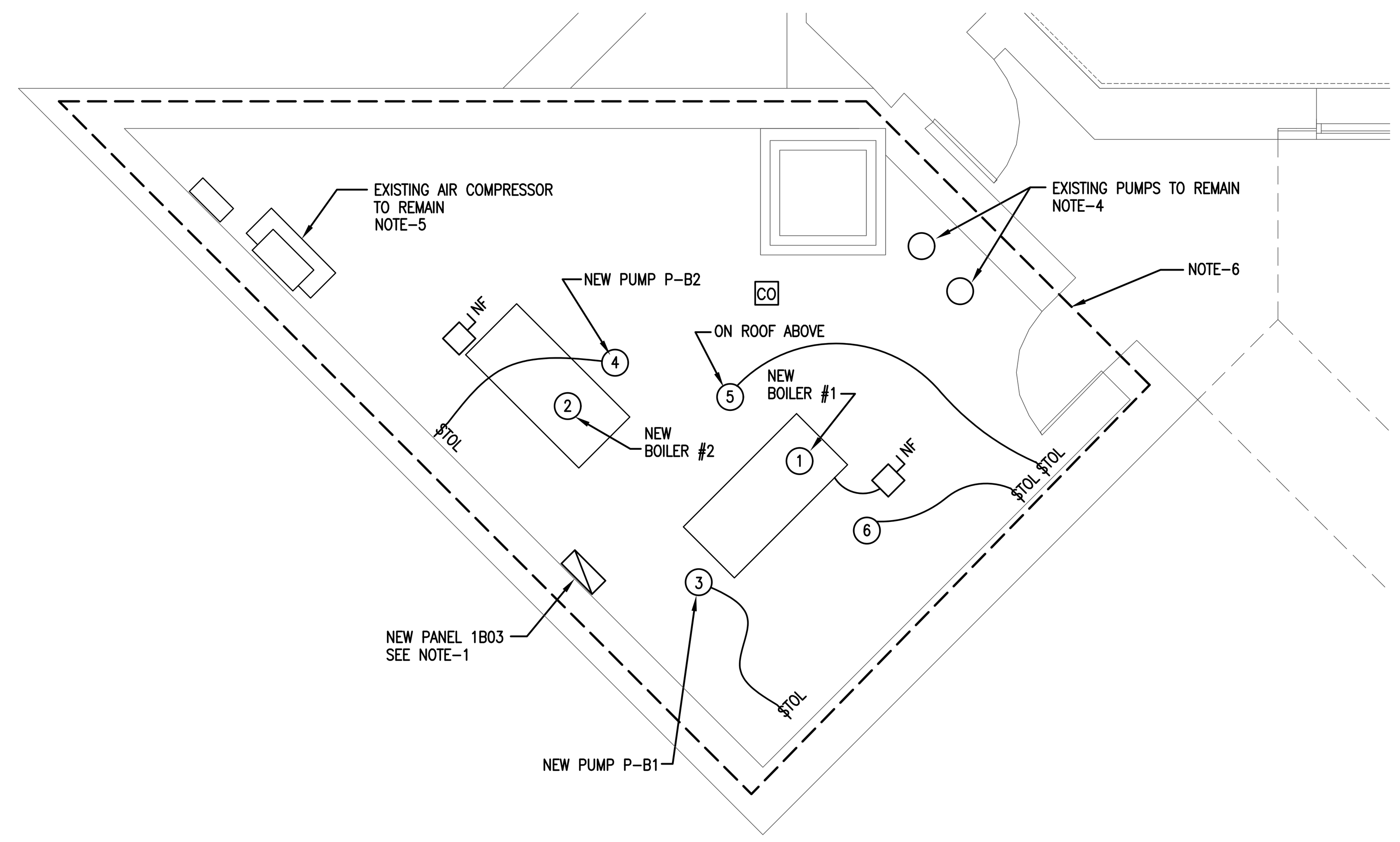
SHEET TITLE
BASEMENT FLOOR PLAN ELECTRICAL

EM101

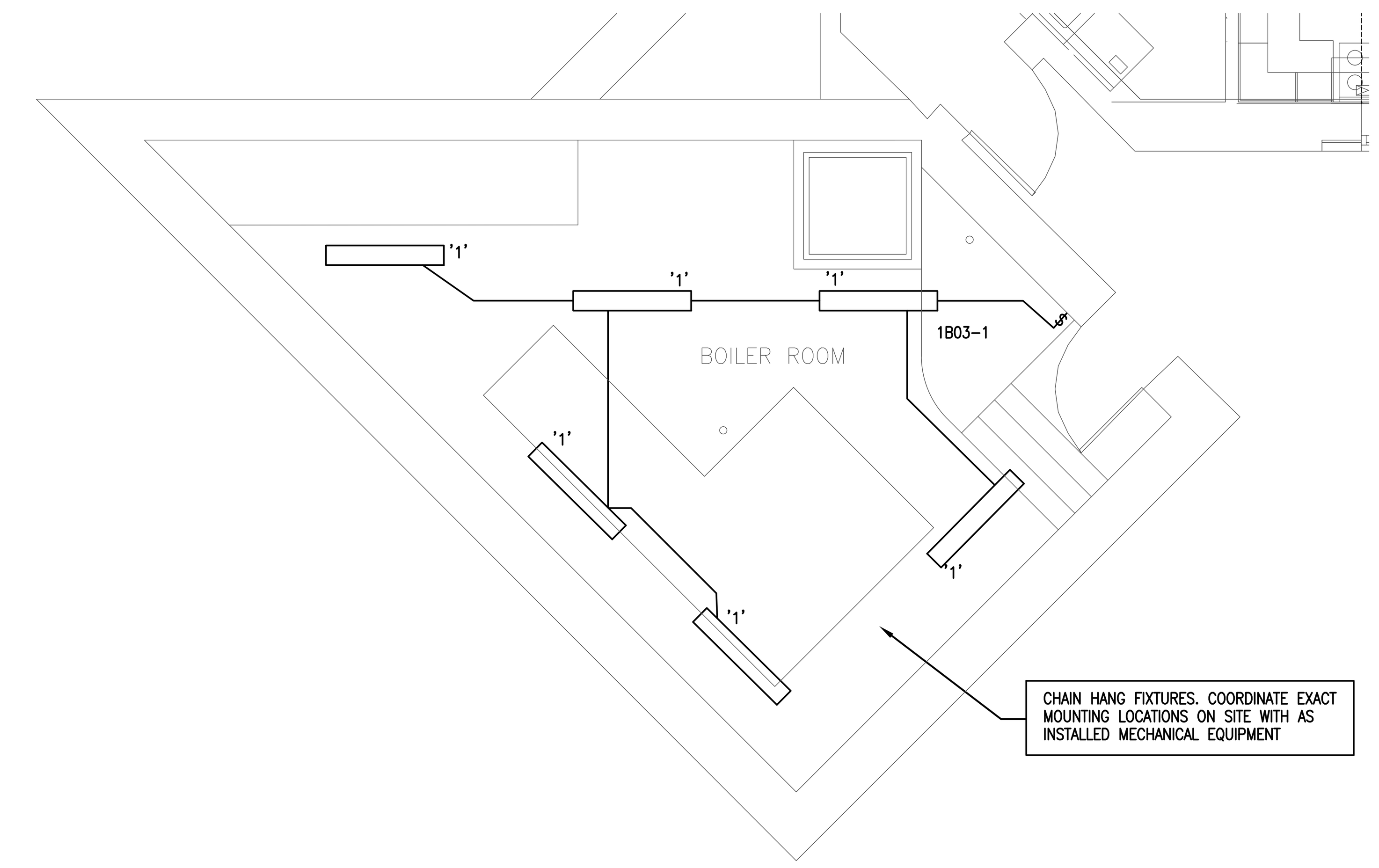
DUMAC#23-045



1 BOILER ROOM FLOOR PLAN – ELECTRICAL DEMOLITION
EM201
1/4" = 1'-0"



2 BOILER ROOM FLOOR PLAN – NEW ELECTRICAL
EM201
1/4" = 1'-0"



3 BOILER ROOM FLOOR PLAN – NEW LIGHTING
EM201
1/4" = 1'-0"

ELECTRICAL SPECIFICATIONS

1. PROVIDE ALL MATERIALS, LABOUR, SCAFFOLDS, TOOLS AND EQUIPMENT NECESSARY TO COMPLETE THE ELECTRICAL INSTALLATION AND HAVE ALL SYSTEMS READY FOR OPERATION.
2. DO THE ENTIRE WIRING IN ACCORDANCE WITH THE REQUIREMENTS OF THE LATEST EDITION OF THE CANADIAN ELECTRICAL CODE AND ALL LOCAL AND PROVINCIAL ORDINANCES.
3. OBTAIN AND PAY FOR ALL FEES AND PERMITS REQUIRED BY ANY AUTHORITY HAVING JURISDICTION.
4. ALL MATERIAL SHALL BE NEW AND CSA APPROVED, EXCEPT WHERE OTHERWISE NOTED.
5. PROVIDE GROUNDING TO ALL EQUIPMENT AS SHOWN ON THE DRAWINGS IN ACCORDANCE WITH THE CANADIAN ELECTRICAL CODE.
6. ALL BRANCH CIRCUIT WIRING TO BE COPPER #12 MINIMUM GAUGE IN EMT CONDUIT C/W STEEL FITTINGS UNLESS OTHERWISE NOTED.
7. THIS CONTRACTOR TO COORDINATE LOCATIONS OF ELECTRICAL EQUIPMENT WITH ALL OTHER TRADES.
8. THIS CONTRACTOR TO PROVIDE ALL MATERIALS AND LABOUR TO ENSURE A FULLY WORKABLE SYSTEM.
9. ANY DISCREPANCIES IN THE ELECTRICAL DESIGN TO BE REPORTED TO THE ENGINEER.
10. THIS CONTRACTOR TO NOTIFY ELECTRICAL INSPECTION AUTHORITIES TO ARRANGE FOR INSPECTIONS AT THE APPROPRIATE STAGES OF CONSTRUCTION.
11. THESE SPECIFICATIONS, TOGETHER WITH THE DRAWINGS, ARE INTENDED TO PROVIDE COMPLETE SUPPLY AND INSTALLATION OF THE COMPLETE ELECTRICAL SYSTEMS AS FURTHER DESCRIBED AND AS ITEMS NECESSARY OR REQUIRED TO MAKE A FINISHED, WORKMANLIKE, FIRST-CLASS INSTALLATION, EVEN THOUGH EACH AND EVERY ITEM OF LABOUR AND MATERIAL MAY NOT BE MENTIONED OR SHOWN ON PLANS AND SPECIFICATIONS.
12. ALL CUTTING AND PATCHING IS THE RESPONSIBILITY OF ELECTRICAL CONTRACTOR, UNLESS NOTED OTHERWISE.
13. PROVIDE APPROVED FIRE STOPPING AROUND ALL NEW ELECTRICAL PENETRATIONS MADE THROUGH RATED ASSEMBLIES.
14. PROVIDE LAMICOID IDENTIFICATION FOR ALL DEVICES, PANELBOARD
15. FINAL CONNECTIONS TO MECHANICAL EQUIPMENT SHALL BE MADE USING LIQUID TIGHT METAL FLEXIBLE CONDUIT.
16. DISCONNECT SWITCHES SHALL BE HEAVY DUTY, BLADE TYPE.

NOTE-1:
EXISTING 120/208V, SQUARE D, 42 CIRCUIT PANEL BOARD TO BE DISCONNECTED AND REMOVED, INCLUDING ASSOCIATED FEEDER CABLE BACK TO SOURCE. PROVIDE NEW PANEL 1B03 AS INDICATED ON PLAN. REFER TO RISER DIAGRAM, DRAWING EP601. REFEED ALL CIRCUITS TO REMAIN IN SERVICE FROM NEW PANEL 1B03. MATCH BREAKER, WIRE AND CONDUITS SIZES. PROVIDE NEW TYPED PANEL DIRECTORY.

NOTE-2:
MECHANICAL CONTRACTOR IS REMOVING BOILERS #1 AND #2. ELECTRICAL CONTRACTOR SHALL DISCONNECT AND REMOVE ALL ASSOCIATED WIRE, CONDUIT, SWITCHES, ETC BACK TO SOURCE.

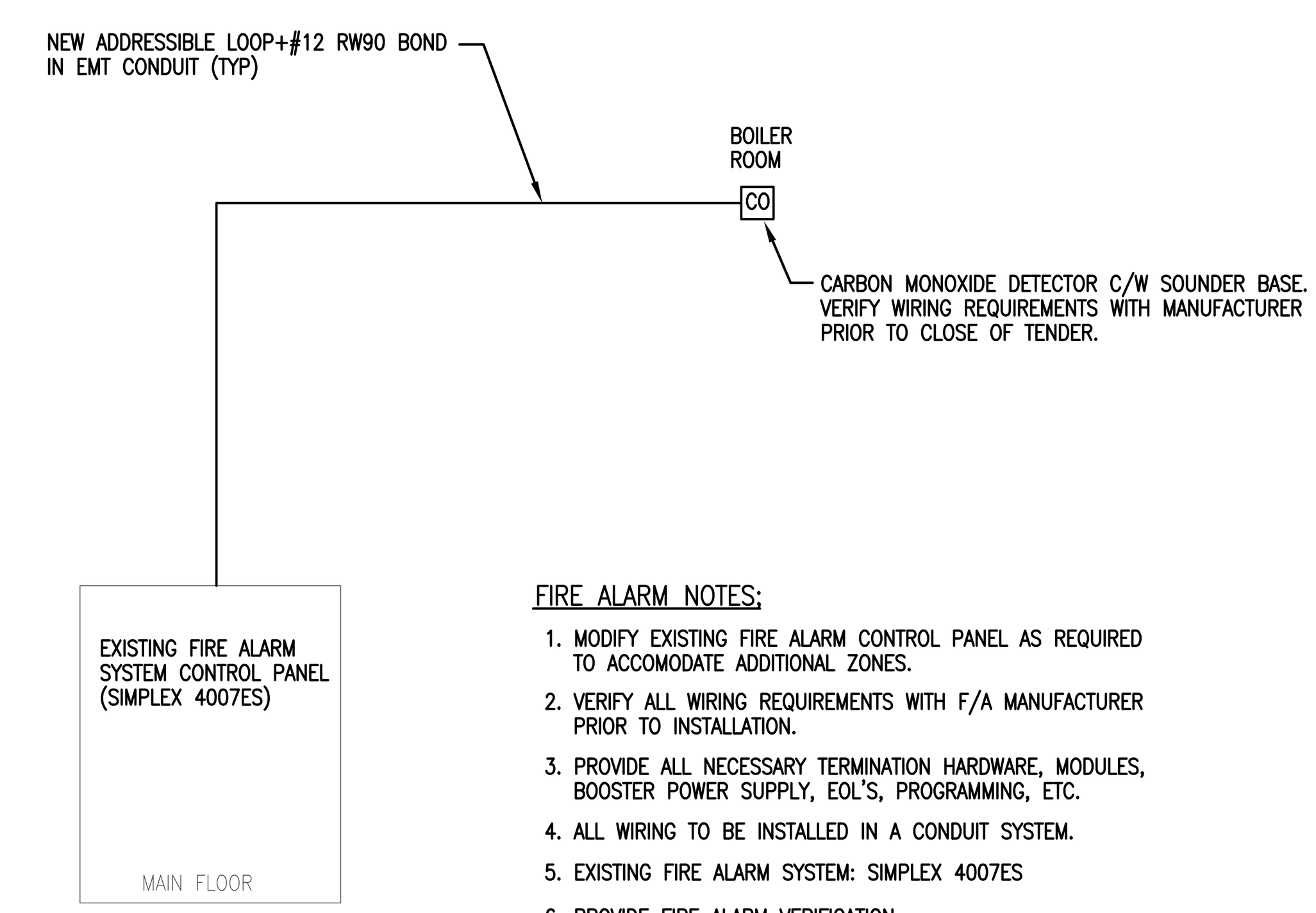
NOTE-3:
MECHANICAL CONTRACTOR IS REMOVING BLEND PUMPS. ELECTRICAL CONTRACTOR SHALL DISCONNECT AND REMOVE ALL ASSOCIATED WIRE, CONDUIT, SWITCHES, ETC BACK TO SOURCE.

NOTE-4:
EXISTING PUMPS TO REMAIN. REFEED FROM NEW PANEL 1B03. MATCH WIRE, CONDUIT AND CIRCUIT BREAKER SIZE.

NOTE-5:
EXISTING AIR COMPRESSOR TO REMAIN. REFEED FROM NEW PANEL 1B03. MATCH WIRE, CONDUIT AND CIRCUIT BREAKER SIZE.

NOTE-6:
SEAL AND FIRESTOP ALL OPENINGS IN BOILER ROOM PARTITIONS, (EXISTING AND NEW) MADE TO ACCOMODATE ELECTRICAL SERVICES.

NOTE-7:
DISCONNECT AND REMOVE EXISTING LIGHTING WITHIN BOILER ROOM. REMOVE ALL ASSOCIATED REDUNDANT CONDUIT, BOXES, WIRE, CONTROLS, ETC.



FIRE ALARM NOTES;
1. MODIFY EXISTING FIRE ALARM CONTROL PANEL AS REQUIRED TO ACCOMODATE ADDITIONAL ZONES.
2. VERIFY ALL WIRING REQUIREMENTS WITH F/A MANUFACTURER PRIOR TO INSTALLATION.
3. PROVIDE ALL NECESSARY TERMINATION HARDWARE, MODULES, BOOSTER POWER SUPPLY, EOL'S, PROGRAMMING, ETC.
4. ALL WIRING TO BE INSTALLED IN A CONDUIT SYSTEM.
5. EXISTING FIRE ALARM SYSTEM: SIMPLEX 4007ES
6. PROVIDE FIRE ALARM VERIFICATION.

4 PARTIAL FIRE ALARM SYSTEM RISER DIAGRAM
EM201
N.T.S.

MOTOR STARTER AND CONTROL LIST

E–ELECTRICAL CONTRACTOR
M–MECHANICAL CONTRACTOR
U–USERS EQUIPMENT
X–PROVIDE
S–SITE SERVICES CONTRACTOR

1–STOP–START
2–ON–OFF
3–HAND–OFF–AUTO
4–PILOT LIGHT
5–CONTROL RELAY
6–VARIABLE FREQUENCY DRIVE
7–DOUBLE VOLTAGE RELAY
8–AQUASTAT
9–END SWITCH
10–CONTROL VALVE
11–SOLENOID
12–MOTORIZED DAMPER
13–FLOAT SWITCH
14–PRESSURE SWITCH
15–INTEGRAL SWITCH
16–AIRFLOW SWITCH
17–CONTROL TRANSFORMER
18–THERMOSTAT
19–INTEGRAL CONTROL PANEL
20–FIRE ALARM SHUTDOWN
21–CURRENT SENSOR
22–LOW FLOW SWITCH
23–HIGH LIMIT
24–LOW LIMIT
25–BUILDING AUTOMATION SYSTEM
26–REVERSE ACTING THERMOSTAT
27–INTERVAL TIMER
28–RECEPTACLE SIZE 5–20R
29–CO/NO SENSOR
30–REMOTE PANEL
31–JUNCTION BOX
32–MOMENTARY CONNECTION STOP/START BUTTON
33–FAN SPEED CONTROL
34–MOTOR CIRCUIT PROTECTION
35–LEVEL CONTROL

EQUIPMENT NO.	LOCATION	EQUIPMENT	SUPPLIED UNDER	INSTALLED UNDER	WIRED UNDER	KW	HP	MCA	MOCP	VOLTAGE	PHASE	PANEL & CIRCUIT NO.	STARTER: MANUAL	TOGGLE	PILOT LIGHT	STARTER: SUPPLIED UNDER	INSTALLED UNDER	WIRED UNDER	LOCATE AT MOTOR: DISCONNECT SWITCH	SUPPLIED UNDER	INSTALLED UNDER	WIRED UNDER	REMOTE CONTROL: LEGEND ABOVE	SUPPLIED UNDER	INSTALLED UNDER	WIRED UNDER	LINE DIAGRAM	INTERLOCK WITH EQUIP. NO.	FEEDER DETAILS RW90	EQUIPMENT NO.
1	BOILER ROOM	BOILER B1	M	M	E					120	1	1B03–3							X	E	E	E	25	M	M	M			2#12+#12B–16mmC	1
2	BOILER ROOM	BOILER B2	M	M	E					120	1	1B03–5							X	E	E	E	25	M	M	M			2#12+#12B–16mmC	2
3	BOILER ROOM	BOILER P–B1	M	M	E					208	1	1B03–7,9	X	X	X	E	E	E					25	M	M	M			2#12+#12B–16mmC	3
4	BOILER ROOM	BOILER P–B2	M	M	E					208	1	1B03–11,13	X	X	X	E	E	E					25	M	M	M			2#12+#12B–16mmC	4
5	ROOF	EXH FAN EF–10	M	M	E					120	1	1B03–15	X	X	X	E	E	E					25	M	M	M			2#12+#12B–16mmC	5
6	BOILER ROOM	SUPPLY FAN SF–10	M	M	E					120	1	1B03–17	X	X	X	E	E	E					25	M	M	M			2#12+#12B–16mmC	6
7																														7
8																														8
9																														9
10																														10

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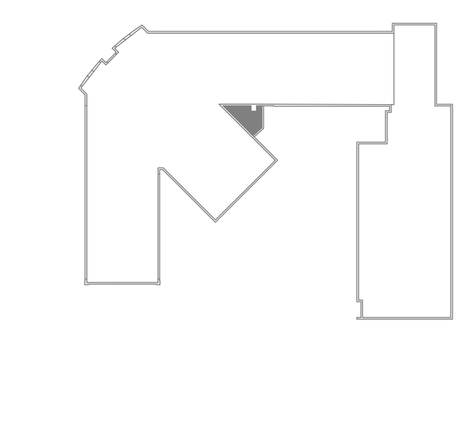

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BICENTENNIAL SCHOOL - BOILER REPLACEMENT

CLIENT
Halifax Regional Centre for Education

PROJECT No. 2024-016

SHEET TITLE
BOILER ROOM PLANS, SCHEDULE AND DETAIL ELECTRICAL

EM201

Halifax
Regional Centre for Education

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.of Transport.		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 493-5110 after 4:00 pm 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) _____

_____

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