



**Waterloo Region
District School Board**

REQUEST FOR TENDER

25-7630-RFT

Laurentian Public School HVAC and Building Controls Upgrade

ISSUE DATE: JAN 28, 2025

ELECTRONIC SUBMISSIONS will be received by the Bidding System no later than 2:00 p.m. local time, on February 18, 2025.

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00 01 00 Consultant/Professional Seals

- 1.1 The following professional seals and signatures are provided as required by Paragraph 1.21.1 (4) Division C of the Ontario Building Code and apply to the areas of expertise for which each consultant was commissioned.

1.1.1 Architect



1.1.2 Mechanical



1.1.3 Electrical



END OF SECTION

DIVISION 00 – BIDDING AND CONTRACT DOCUMENTS

00 21 13 Instructions to Bidders

1. Designated Representative

To contact the Board or ask questions in relation to this Procurement, bidders must initiate the communication electronically through the Bidding System. The Board will not accept any respondent's communications by any other means, except as specifically stated in the Procurement. Bidders must not communicate in any manner with anyone other than the Designated Representative.

For the purposes of this procurement process, the Designated Representative will be:

Procurement Lead: Ardith Inapan
Title: Buyer
Waterloo Region District School Board
Email: ardith_inapan@wrdsb.ca

2. Consultant

The Board has hired the following architect/consultant to assist in the preparation of this Tender: WalterFedy

The architect/consultant and any sub consultants are not to be contacted by any interested parties from the bid issue date to the bid award notification. The architect/consultant or any sub consultants will not respond to any direct communication.

The Board will be responsible for the contract administration of the project after the purchase order has been issued or the contract has been signed by the Board.

3. Blackout Period

A black out period shall exist between the deadline for questions and the date of award. During this period, there shall be no communication between the Bidders, the Board, or any Board consultants or employees, unless initiated by the Board's Designated Representative, noted above.

4. Communication and Question Protocol

Bidders and their representatives are NOT permitted to contact WRDSB Project Managers/Leads, agents of the Board; any member of the Board's governing body (such as Board of Trustees, or advisors); any employee, consultant, or agent of the Board's Clients, other than the Designated Representative listed above. Any attempt by a Bidder to bypass or influence the procurement process may result in disqualification of the Bidder and the rejection of the Bidder's submission.

The Board will not be responsible for any verbal statement, instruction, or representations. In case of difference between any verbal information and written document, the written document shall govern. Information obtained from any source, other than the Designated Representative, noted above in writing, shall not be relied upon.

The Board shall not be bound by any verbal instruction or information provided by any Board employee or consultant of the Board. Only responses provided in an Addendum shall form part of this Procurement Document.

All requests for information, instructions, or clarifications shall be through the Bidding System by clicking on the “Submit a Question” button found within the bid detail of the specified Procurement. Addenda will be issued accordingly.

It is the responsibility of the Bidder to seek clarification of any matter that they consider unclear before submitting their application. The Board is not responsible for any misunderstanding of the Procurement documents on the part of the Bidder.

5. Doing Business with the Waterloo Region District School Board

Bid opportunities above \$10,001 CAD will be solicited through the electronic bidding system [bids&tenders](#) or the Board may also utilize Supplier roster lists awarded through a competitive process, participate in cooperative procurements with various public entities, or buying groups. These may include, but are not limited to, Ontario Education Collaborative Marketspace, Supply Ontario, and other Cooperate Group(s).

WRDSB competitive opportunities are posted on the Electronic Bidding System, [bids&tenders/wrdsb](#).

The WRDSB only accept electronic Bid Submissions submitted through the Electronic Bidding System, [bids&tenders/wrdsb](#)

Bid opportunities may be posted as Public or by Invitation and are based on dollar thresholds outlined in Administration Procedure 4570 PROCUREMENT. Click [here](#) to access the Board’s Administrative Procedures, Section 4000 – Business Services.

6. Anticipated Project Schedule

The following table represents the anticipated project timelines. This timeline is an estimate only and may be subject to change by the Board at any time.

DESCRIPTION	DATE
Issue Date of Tender	JAN 28, 2025
Non-Mandatory Pre-Bid Site Examination	Date: Monday, February 3, 2025 Time: 3:00 pm Address 777 Westmount Rd E, Kitchener, ON N2E 1J2 Main Office
Deadline for Questions	FEB 11, 2025
Closing Date and Time	FEB 18, 2025, 2:00 pm local time
Anticipated Contract Start / Work begins	JUL 02, 2025
Substantial Completion Date	AUG 22, 2025
Ready for Takeover	AUG 29, 2025
Deemed Complete Date	SEPT 26, 2025

7. Pre-Bid Site Examination

Bidders are strongly encouraged to attend the non-mandatory pre-bid site examination and sign the attendance sheet. Date, time and location are provided above in the Anticipated Project Schedule. The Board may not provide another opportunity to visit the site. However, absence from this site meeting will not disqualify any Bidder.

Bidders shall attend the site meeting at their own risk and hold the Board harmless for any issues or damages arising out of their attendance of the site meeting.

The Owner will not consider any claims for additional payments during the execution of the Work for extra work or difficulties encountered resulting from conditions which were either visible or could be reasonably inferred from an examination of the Place of the Work and the available project information prior to the submission of Bids.

Bidders are encouraged to bring their own measuring tape, camera, or other portable tools as required to the site meeting. Bidders are solely responsible for making their own assessment of the site.

8. Secondary Site Examinations

Bidder may request a secondary site examination visit through the Bidding System by

clicking on the “Submit a Question” button found within the bid details page of that Procurement. Include the contact’s name and email of the person who will visit the site.

Bidders shall attend the secondary site examination visit at their own risk and hold the Board harmless for any issues or damages arising out of their attendance of the site meeting.

Bidders not in attendance of a Mandatory Pre-Bid Site Examination meeting will not be provided an opportunity to a secondary site examination visit.

Bidders must adhere to all communication protocols, as describe in Section 1.0, Sub Section 4. Communication Protocol.

The Owner will not consider any claims for additional payments during the execution of the Work for extra work or difficulties encountered resulting from conditions which were either visible or could be reasonably inferred from an examination of the Place of the Work and the available project information prior to the submission of Bids.

Bidders are encouraged to bring their own measuring tape, camera, or other portable tools as required to the site meeting. Bidders are solely responsible for making their own assessment of the site.

9. Examination of Bid Documents and Work and Submitting Questions

- i. Bidders are required to fully acquaint themselves with the Procurement documents; fully inform themselves of all conditions, limitations and requirements involved in the Procurement; and obtain all information that may be necessary to complete those requirements before submitting a Bid.
- ii. Submission of a Bid shall be considered conclusive evidence that the Bidder has satisfied itself as to the requirements of this Procurement.
- iii. In the event a Bidder discovers any errors, discrepancies, inconsistencies, or omissions or requires clarification within this Procurement, they are to submit their observations and/or questions through bids&tenders by clicking on the “Submit a Question” button found within the bid detail of the specified Procurement by the Deadline for Questions specified in this paragraph.
- iv. Bidders are strongly encouraged to ask clear and concise question(s) or statements citing the relevant section of the Bid Solicitation Document. The Board cannot guarantee a response to questions received by the Board after the Deadline for Questions.
- v. The Board has endeavored to provide complete, correct information and estimates to enable Bidders to properly assess and determine the scope and complexity of the Work prior to submitting a Bid.
- vi. Bidders are solely responsible for determining if they require additional information or if anything appears incorrect or incomplete. The onus is on the Bidder to contact the Designated Representative prior to the Deadline for

Responses indicated in this document, if they have any questions or queries whatsoever or find omissions from or discrepancies in this Bid Solicitation document, unnecessary restrictions in the terms of reference, or should they be in doubt as to the meaning of any part of this document.

- vii. Written responses or clarifications to issues of substance will be shared with all Bidders in the form of an Addendum.

10. Electronic Bid Submission Only / Electronic Bidding System

Competitive opportunities including Requests of Prequalification (RFPQ) are posted on the Electronic Bidding System, [bids&tenders/wrdsb](#).

The Bidder must submit their bid through the Bidding System only. Any other form of submittal will not be considered. It is the Bidder's responsibility to read the Procurement documents thoroughly including all attachments and addenda, if any, as these contain information that is highly pertinent to this Procurement and to clarify any details with the Designated Representative prior to their submission. To be considered, Bidders must respond to this Procurement.

- i. In order to submit a bid, bidders must be registered with [bids&tenders](#). The sole onus is on the bidder to have the most current correct information set-up in Bids and Tenders including but not limited to plan taker contact information, categories, and agency.
- ii. All Bids shall be submitted through [bids&tenders](#) only. The onus is on the Bidder to ensure all requirements of the Bid Solicitations are submitted.
- iii. If the bidder encounters technical issues, the onus is on the bidder to have this resolved prior to the closing date and time by contacting support@bidsandtenders.ca
- iv. Bidder shall have a "Vendor account" in the Bidding System and shall ensure the account is created with the Bidders full legal company name and be registered as a "plan taker" for this bid solicitation. Only the plan takers will have access to download bid documents, receive addenda email notifications, download addenda and to submit their bid electronically through the Bidding System.
- v. The onus is on the Bidder to ensure that the Bid is received in the Bidding System on or before the Closing Time. The Closing Time shall be determined by the Bidding System's web clock. The timing of the Bid submission shall be based on when the Bid is received by the Bidding System, not when a Bid is submitted by a Bidder.
- vi. Bidders shall allow sufficient time to upload their Bid submission including all requirements as stated in this Procurement and to resolve any issues that may arise as Bid transmission can be delayed in an "internet traffic jam" due to file transfer size, transmission speed, and other electronic considerations

- vii. All prices including provisional/supplementary pricing, if requested, shall be submitted in the Schedule of Prices forms available through the Bidding System.
- viii. The Owner reserves the right to accept or reject any or all provisional bid prices submitted, and such prices shall remain in effect for the duration of the Contract. Failure to submit provisional prices where required may result in the Bid being declared non-compliant.
- ix. Bids submitted by fax or paper copy, or any other format will not be accepted.
- x. The Bidding System will not accept Bids after the Closing Time as determined by the Bidding System's web clock.
- xi. The Board hereby consent to the use of an Electronic Signature for the signing of all documents requested hereunder. Acceptable forms of signatures include, but are not limited to, the typing of the Bidder's authorized signing officer's name or the inclusion of an image of the Bidder's authorized signing officer's signature, so long as the electronic signature is sufficient to identify the Bidder's authorized signing officer. The Bidder's authorized signing officer agrees that whatever form of electronic signature is provided constitutes a signature for the purpose of executing all documents requested hereunder.
- xii. Upon submitting a Bid, the Bidding System will send a confirmation email to the Bidder advising that the Bid was submitted successfully. If a Bidder does not receive a confirmation email despite submitting a Bid, the Bidder should contact technical support of the service provider hosting the Bidding System via email: support@bidsandtenders.ca
- xiii. There will be no public opening for this Bid.
- xiv. If a Bid is a joint submission of two (2) or more firms, a single Bid is to be coordinated and submitted by the lead Bidder with the required information. If two or more parties submitted a joint response to this Bid Solicitation, they shall decide between them who is to be the Bidder, without any involvement of the Board.
- xv. Your online Bid submission shall be taken as your statement that you understand the requirements and agree to comply with the requirements as well as terms and conditions stated in this Bid Solicitation document, including Board's Standard Terms and Conditions. Your Bid submission through the Bidding System confirms that you have checked and confirmed your pricing and by submitting the Bid online, you agree that you have not omitted any items from your Bid.
- xvi. For construction projects with Bids above \$200,000 the Successful Bidder will be required to execute a "Canadian Standard Form of Construction Contract to a Stipulated Sum" (CCDC 2 - 2020 including amendments thereto as set out in this Procurement.

11. Bid Prices

- i. The amounts stipulated on the Schedule of Prices are intended to cover the cost of the complete Work as described in this Bid Solicitation Document.
- ii. All prices shall be in Canadian Funds, Free On Board (FOB) Destination, Freight Prepaid (Board locations).
- iii. Exclusive of the HST, or other similar taxes.
- iv. Unit pricing shall be exclusive of Harmonized Sales Tax (HST), but shall include all applicable costs including but not limited to overhead, material, labour, travel, fuel, fuel surcharge, equipment, disbursements, expenses, customs, charges, freight, shipping and handling costs, and all other charges of every kind attributable to the services, equipment or goods provided.
- v. The person submitting the Bid on behalf of the Bidder must have authority to bind the Bidder.
- vi. Quantities may be estimated and subject to change, and therefore the Board, at its discretion, may purchase more or less of the commodity based on the unit price bid.
- vii. All information required on the forms shall be completed in full including references and Sub-contractors that it proposes to use for Work described. Changes made to the list of nominated Sub-contractors after the closing of the Bid, must have prior written approval of the Board's Single Point of Contact.
- viii. All price(s) submitted shall be a reasonable price for each particular item as determined by the Board and under no condition will an unbalanced Bid be considered. Submissions containing prices which appear to be so unbalanced as to likely affect the interests of the Board adversely will be clarified and may be rejected.
- ix. Unit prices and/or optional pricing, if any will set the foundation for any approved increases or decreases in Work. The unit prices must remain fixed and firm for the term of the Contract, unless otherwise specified in this Bid Solicitation document.
- x. Provisional or Optional Pricing may or may not be required for completion of the Work called for under the Contract. The Board will decide necessity of these items and quantities thereon based on the unit prices(s) included in their Bid. If Optional items are not purchased, or quantities are less than estimated, no adjustment or compensation will be awarded to the Bidder by the Board. Optional pricing is not used for comparison of Bids for award purpose.

12. References - Not Applicable

Bidders must provide a minimum of three (3) references for work of comparable size and scope that has been successfully completed within the last five (5) years. One (1) reference must be from the WRDSB, if you've done previous work, otherwise one (1) reference must be of a government entity of similar size, scope, and complexity.

References must contain information about your clients including a complete

organization name, contact person's names, title, telephone number and/or email address, details of the work provided, start and end dates of the work, and total cost of the work. Bidders cannot use references that pertain to another Vendor/Contractors' work.

The Board reserves the right to contact the clients noted to verify information provided and assess overall client experience. Bidders should ensure that their references are prepared to provide a response if contacted by the Board. If the Board is unable to obtain a satisfactory reference, or if the reference does not respond to the reference call (after Board's best efforts), or if the reference chooses not to comment, the reference will be deemed unsatisfactory, and the Board may ask the Bidder for additional references. Unsatisfactory references may result in the Bidder's submission being rejected.

13. Addenda

All Addenda issued through the Bidding System shall form part of the Bid Solicitation Document.

The Board shall not be bound by any verbal instruction or information provided by any Board employee or consultant of the Board. Only responses provided in an Addendum shall form part of this Bid Solicitation Document.

Prior to bid closing any discrepancies, omissions, questions, or clarifications regarding the procurement documents must be sent immediately through the Bidding System by clicking on the "Submit a Question" button found within the bid details page of that opportunity, no later than the deadline noted in the Anticipated Project Schedule. Those that are deemed pertinent to the Bid Solicitation Document will be addressed in the form of an Addendum.

It is understood and acknowledged that while the Bid Solicitation document includes specific requirements, a complete review and recommendation is required. Minor items or details not herein specified, but obviously required for the Work shall be provided as if specified in conformance with modern practices. Any omissions or errors or misrepresentation of these requirements and specifications within the Bid Solicitation document shall not relieve the Bidder of the responsibility of providing the services or products as aforesaid.

Bidders shall acknowledge the receipt of all Addenda in the Bidding System prior to the submission of a Bid. Where Addenda has been issued, the system will not allow the Bidder to submit a Bid prior to acknowledging said Addenda.

Where an Addendum is issued after a Bid has been submitted, the Bidding System will automatically withdraw the submitted Bid. The Bid status will change to incomplete and will not be accepted by the Board as a submitted Bid. It is the responsibility of the Bidder to make any required adjustments to their submission, acknowledge all Addenda and ensure the Bid has been received by the Bidding System. Bidders should check the Bidding System for Addenda up until the Bid Closing Date and Time.

Addenda cannot be acknowledged after the Closing Date and Time.

14. Edit and Withdrawal of Bid Submission

- i. A Bidder who has submitted a bid may edit or withdraw its bid at any point up to the Closing Date and Time.
- ii. Any edits to a bid submission will cause the submission to automatically be withdrawn. The bid submission must be re-submitted to be accepted.
- iii. The Bidder is solely responsible for ensuring that its re-submission is received prior to Closing Date and Time. The closing time shall be determined by the web clock within the Bidding System. After such time, requests to withdraw Bid will not be considered.

15. Irrevocable Period

Bids will be irrevocable by the Bidder, and open for acceptance by the Board, for **60 (sixty) days** following the Closing Date.

16. Tie Bids

Where two (2) or more Bids have been received reflecting the same, lowest Bid price, the time stamp for date and time submission in the Bidding System will dictate the award (earliest submission shall prevail).

17. Bid Irregularities

Bids with one or more of the following may be declared informal and/or disqualified and/or non-compliant:

- i. Bids that do not comply strictly with all terms and conditions of the Bid Solicitation Document.
- ii. Bids that are incomplete, conditional, qualified, or obscure.
- iii. Bids that are based upon an unreasonable period of time for completion of the Work.
- iv. Bids received from Bidders involved in Claims with either of the Board or banned or on probation with the Board.
- v. Bids received from any Bidder deemed to be unskilled or experienced in the work contemplated, or those who have defaulted on, or failed to satisfactorily complete other similar work in the past.
- vi. Bids submitted by Bidders that are not prequalified, where applicable.

18. Bid Review

- i. All Bids received on or before the Closing Time will be reviewed for compliance based on this Bid Solicitation document. Non-compliant Bids will be rejected. Bids not meeting any of the mandatory requirements included in this Bid Solicitation document will be disqualified. Bidders may be contacted to clarify their submissions.

- ii. Should there be any error in extensions, additions or computations, the Board shall be entitled to correct such errors based upon the unit prices supplied, and the corrected total shall be considered as representing the intention of the Bidder and shall be used as the basis for comparison of Bids.
- iii. It is the Bidder's responsibility to satisfy the Board that they can comply with the requirements contained within this Bid Solicitation document and that they possess the necessary inventory, equipment, facilities, resources, and staff to perform the work specified in this Bid Solicitation document. Bidders may be required to submit evidence of above in a form acceptable to the Board. Substitution of materials, equipment, or methods different from that outlined in the terms of reference will not be accepted unless provided for within this Bid Solicitation document or with the written approval of the Board.
- iv. The Board also reserves the right to examine Bidder's facilities, equipment and visit the subcontractors or sub-consultants proposed and/or Bidder's existing and past clients. The award decision may be revised based on the above.
- v. The Board will not be responsible for travel costs if travel is required. No additional charges will be accepted by the Board for any cost incurred by the Bidder or any other party in participating in the Bid evaluations.
- vi. The Board may, in its sole discretion, check references, conduct credit checks, review the litigation history and history of professional liability or other insurance claims, and obtain any other type of information that might aid the Board in its selection. The Board reserves the right to consider all, or any information received from all available sources, whether internally or externally obtained. The Board may disqualify any Bid from further consideration based on results of reference or credit checks or review of litigation or claim history. The foregoing may include the Board's own experiences with the respective Bidder(s) or any of the subcontractors and sub-consultants proposed in their Bid.
- vii. The Board may request a meeting with Bidders.

19. Post-Award Meeting

A post-award meeting may be held consisting of the successful Contractor, and their key personnel assigned to the contract, the Board's Project Manager/Lead and if applicable the Architect/Consultant, to discuss the program and exchange information before the contract commences. This meeting will be at the sole expense of the Bidder and shall be considered part of the contract. If applicable, the meeting date will be scheduled after the Award.

20. Intent to Award

Bidders are advised not to make any business decisions, assignments, or any sub-contract for the execution of the Work, before receiving a Purchase Order from the Board.

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- i. Subject to the reserved rights of the Board and availability of funds, the lowest compliant Bid will be recommended for award.
 - ii. There shall be no obligation on the Board as a result of seeking Bids or conducting the procurement process and the Board reserves the right to pursue other Bidders, cancel the Bid Solicitation, issue a revised request, or to pursue any other course of action which would aid in meeting their needs.
 - iii. If instructed, within twenty-four (24) hours, excluding hours occurring during a Saturday, Sunday, or a legal holiday, of receiving a request or intent to award from the Board, the Bidder (the "Recommended Bidder") shall provide a list of all Subcontractors/Subconsultants that it proposes to use for all Work described in this Procurement including the Company Name, Sub Trade Category and if applicable, related Divisions.
 - iv. Within **seven (7) calendar days** of receiving a request or intent to award from the Board, the Bidder (the "Recommended Bidder") shall provide the following mandatory requirements:
 - a. Insurance certificate with coverage specified in the Bid Solicitation Document.
 - b. WSIB clearance certificate valid on the date of award or an exemption letter (if applicable and requested).
 - c. Non-Disclosure Agreement (NDA) duly signed by the authorized signatory (to be renewed annually). The Board will provide this form.
 - d. Bonding Requirements, if applicable, as specified in the Bid Solicitation Document.
 - e. An executed Board issued Form of Agreement, if applicable, and duly signed by the authorized signatory.
 - f. Any other submittal specified in the Bid Solicitation Document or in the intent to award, as a requirement of award.
 - g. For construction projects above \$200,000 the Successful Bidder will be required to execute a "Canadian Standard Form of Construction Contract to a Stipulated Sum" (CCDC 2 – 2020) including amendments thereto as set out in this Procurement.
 - v. The documents listed below will be incorporated as deemed necessary by the Board, into the Contract with the Bidder. If there is a discrepancy between the wording of one document and the wording of any other document that appears on the list, the wording of the document that first appears on the list shall take precedence:
 - a. Board approved change order(s) or Contract / Agreement / CCDC 2 -2020 amendment(s)

- b. Purchase Order(s), Contract(s) Agreement(s) / CCDC 2 -2020 executed with the Bidder including exhibits
- c. Bid Solicitation document issued by the Board, including addenda, if applicable
- d. Bid submitted by the Bidder

21. Post Award

In addition to all of the Board's other remedies, if a recommended Bidder fails to satisfy the requirements and/or execute the Form of Agreement or any other applicable conditions within seven (7) calendar days of notice of selection, the Board may, in their sole and absolute discretion and without incurring any liability, rescind the selection of that Bidder.

The Bidder may protest within the five (5) day Notice of Intent to Award, after that, the protest will not be reviewed or accepted.

22. Award Posting Notification

For procurements valued at \$121,200 or more, and in accordance with the Broader Public Sector Procurement Directive, once the Board is satisfied that all requirements are met, the project award notification will be posted in the same manner as the procurement documents were posted. The notification will be posted after the purchase order and/or agreement between the successful bidder and the Board has been issued/executed. The award notification will list the name of the successful bidder, agreement start and end dates, and any extension options.

END OF SECTION

00 21 14 – General Contractors and Subcontractors

1.0 General Contractors

- 1.1 Only invited prequalified General Contractors, as a result of the award of a competitive prequalification process, #23-7430-RFPQ, may submit a bid for this opportunity. Invitations are based on awarded Project Size Categories. Roster approved GCs can only bid on the project size categories based on the award.
- 1.2 A Site Supervisor and Project Manager, assigned to manage and supervise the Work, must be named in the Bidder's Contact Information Specification section through the electronic Bidding System only and include resumes. Personnel will be subject to approval by the Board and cannot be changed without prior written approval from the Board.

2.0 Subcontractors/Subconsultants

- 2.1. Refer to specification sections for products, suppliers and installers that will be required.
- 2.2. The Subcontractor/Subconsultant list is not required at time of bid submission.
- 2.3. The Subcontractor/Subconsultant list is mandatory after the bid closing date from the Recommended Bidder within twenty-four (24) hours of receiving a request or intent to award from the Board.
- 2.4. The Bidder (the "Recommended Bidder") shall provide a listing in a Board approved formatted list of Subcontractor/Subconsultant that it proposes to use for all Work described in this Procurement including the specification sections, as per the following:
 - 2.5.1 Bidders shall select experienced and qualified Subcontractor/Subconsultant or Suppliers in their field to perform or supply an item of Work indicated in this Procurement.
 - 2.5.2 The Bidder shall be fully aware of the capability of each Subcontractor/Subconsultant and/or Supplier included in its bid, including but not limited to technical ability, financial stability and ability to maintain the proposed construction schedule.
 - 2.5.3 The Owner reserves the right to reject any nominated Subcontractor/Subconsultant or supplier, based on the following but not limited to unsatisfactory past performance, suspended/removed from doing business with the Board and/or outstanding/unresolved corrective action notice issued by the Owner to the Subcontractor/Subconsultant within the last three (3) years.
 - 2.5.4 The Owner reserves the right to obtain information from the Bidder and from third parties respecting the qualifications and experience of the Bidder's nominated list of Subcontractor/Subconsultant for such item of the Work.
 - 2.5.5 The Board reserves the right to examine Bidder's facilities, equipment and visit the Subcontractor/Subconsultant's proposed.

- 2.5.6 The substitution of any Subcontractor/Subconsultant and/or Suppliers after the list is submitted will not be accepted unless a valid reason is given in writing to and approved by the Owner, whose approval may be arbitrarily withheld.
- 2.5.7 Where a bidder lists “own forces” in place of a Subcontractor/Subconsultant, the bidder shall carry out such item of the Work with its own forces.
- 2.5.8 Where “own forces” have been listed by a bidder, the Owner reserves the right to obtain information from the bidder and from third parties respecting the qualifications and experience of the bidder’s “own forces” for such item of the Work.

END OF SECTION

00 21 15 – Scope of Work

HVAC upgrade providing cooling to 10 classrooms and multi-purpose room. Scope includes multiple horizontal unit ventilators and the installation of condensing units on the roof along with one rooftop unit, to serve the multi-purpose room. Renovation also includes millwork and flooring replacement. Upgrade from pneumatic to DDC controls is also included as part of this renovation (refer to drawings for detailed scope).

END OF SECTION

00 31 34 – Subsurface Investigation Report – Not Applicable

1.0 General

1.1. Related Sections

- .1 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.2. SUBSURFACE INVESTIGATION REPORT

- .1 An investigation report with respect to the applicable building site and important immediate affected surroundings, is titled as follows:
 - .1 Title:
 - .2 Dated:
 - .3 Prepared By:
- .2 A copy of this detailed investigation report is included as an appendix to this section.
- .3 The subsurface investigation report records properties of the soils, subgrade conditions, and offers recommendations for the design of foundations.
- .4 The report as prepared primarily for the use of the Consultants.
- .5 The recommendations given shall not be construed as a requirement of this Contract unless also contained in the Contract Documents.
- .6 The report, by its nature, cannot reveal all conditions that exist or can or might occur on the subject site. Should subsurface conditions be found or be a concern thereto, or to vary substantially from the investigation report, changes in the design and construction of foundations will be made, with resulting credits or expenditures to the Contract Price accruing to the Owner.

END OF SECTION

Appendix 00 31 34A – Soil Report- Not Applicable

Sample:

[illegible]

Project Name: _____

School / Location: _____

Date: _____

[illegible]

00 56 13 – Definitions Stipulated Price

1.1. Definitions Declaration

- .1 CCDC 2-2020 Edition, Stipulated Price Contract as may be amended, forms the basis of Definitions between the Owner and Contractor.
- .2 These Definitions are bound to the CCDC 2 Definitions and CCDC 2 General Conditions.

1.2. Supplementary Words and Terms to CCDC 2-2020

- .1 The following words and terms are additional to the CCDC 2 Definitions.
- .2 Addendum: A document that amends the Bid Documents during the Bidding Period and becomes part of the Contract Documents when a Contract is executed. (Plural: Addenda).
- .3 Agreement: The signed and sealed legal instrument binding parties in a Contract, describing in strict terms their mutual arrangement, roles and responsibilities, commencement, and completion responsibilities.
- .4 Alternative Price: The amount stipulated by a Bidder for an Alternative and stated as an addition, a deduction, or no change to the Bid Price.
- .5 Authorities: Those having jurisdiction under law over Work or Parts thereof.
- .6 Bid: To offer as a Bid stating for what price a Contractor will assume a Contract.
- .7 Bid Documents: A set of documents consisting of the Instructions to Bidders, Bid Form, Contract Documents, and other information issued for the benefit of Bidders to prepare and submit a Bid.
- .8 Bid Form: The specific and detailed form used to collect information about a Bid.
- .9 Bidding: The process of preparing and submitting a Bid.
- .10 Construction Documents: The Drawings and Project Manual. When combined with a Contract and Contract conditions, these documents form the Contract Documents.
- .11 Contingency Allowance: An additional monetary amount added to a Project cost estimate and designated to cover unpredictable or unforeseen items of Work. The amount is usually based on some percentage of the estimated cost and expended and adjusted by Change Order. It is not intended to cover additions to the scope of Work.
- .12 General Conditions: That part of the Contract Documents which sets forth many of the rights, responsibilities and relationships of the parties involved in a Contract.
- .13 Exposed: Visible at completion of Work, in usable areas as well as interior of closets, cabinets, drawers, storage and service rooms, stairwells and exterior surfaces.

- .14 Instructions To Bidders: Instructions contained in the Bid Documents to convey an Owner's expectations and criteria associated with submitting a Bid.
- .15 Ready for Takeover: *Ready-for-Takeover* shall have been attained when the conditions set out in GC12.1, SC 55.1 , 12.1.1
- .16 Section: A portion of a Project Specification covering one or more segments of the total Work or requirements. Sections are included in a Project manual as required to meet Project requirements.
- .17 Standard: A document describing a grade or a level of quality, which has been established by a recognized agency or organization, utilizing an internal voting process.
- .18 Separate Price: A separate price for work to be added to the base price if selected by the Owner. This price type is not a part of the base bid price.
- .19 Stipulated Price: An amount set forth in a Stipulated Price Contract as the total payment for the performance of the Work. Sometimes referred to as a stipulated sum or a lump sum stipulated price.
- .20 Tender: Refer to definition of Bid.
- .21 Unit Price: The amount payable for a single unit of Work as stated in a Schedule of Prices.
- .22 Install: To remove from site storage, move or transport to intended location, install in position, connect to utilities, repair site caused damage, and make ready for use.
- .23 Supply: To acquire or purchase, ship or transport to the site, unload, remove packaging to permit inspection for damage, re-package, replace damaged items, and safely store on-site.
- .24 Provide: To Supply and Install
- .25 Wherever words 'approved', 'selected', 'satisfactory', 'directed', 'permitted', 'inspected', 'instructed', 'required', 'submit', 'ordered', 'reviewed', 'reported to', or similar words or phrases are used in Contract Documents, it shall be understood, unless context provides otherwise, that words 'by Consultant' or 'to Consultants' follow.
- .26 Words 'by others' when used in Specifications or on Drawings shall not mean by someone other than Contractor. Only means by which something shown or specified shall be indicated as not being in Contract is by initials 'NIC' or words 'not in Contract', 'by Owner', or 'by Other Contractor'.

END OF SECTION

00 72 13 – Standard Terms and Conditions

1. **Applicable Terms and Conditions (Supplier)**

None of the standard or other terms, conditions, or policies of the Bidder, whether published or otherwise shall be of any effect unless accepted by the Board in writing. This includes, without limitations, terms in publications, web-site, sales invoice, delivery document as well as those commonly applied by the Bidder. Board's acceptance of goods, equipment or service, acknowledgement thereon or paying invoices shall not imply acceptance of such terms, conditions, or provisions.

2. **Bankruptcy**

If, during the term of the Contract, the Supplier makes an assignment for the benefit of creditors, or becomes bankrupt or insolvent, or makes a proposal to its creditors, the Contract with the Supplier shall immediately be terminated, and the Board shall be entitled to enter into an agreement with another party without the consent of the Supplier.

3. **Basis of Award (Price factor)**

Bidders shall be deemed to have included all costs related to the Work in the Total Price as provided in their Bid, except for items clearly identified as provisional in the Bid Solicitation document. In no case shall the invoicing for the entire Work performed exceed the Total Price, unless additional Work is ordered by the Board in writing. The unit prices as well as provisional pricing shall be used to invoice the additional or provisional work, as required by the Board. For the purpose of award, the Total Price will be considered as representing the intention of the Bidders and will be used as the basis for comparison of Bids for the price factor.

4. **Bonding Requirements**

Bonding is only required if the project is equal to or greater than \$200,000.00.

Note: The Bidding System has flagged these fields as mandatory. If your bid is less than \$200,000.00, you may upload a pdf document stating: Not Applicable.

i. **Bid Amount**

Bonding requirements are based on the total base bid amount INCLUSIVE of ALL applicable taxes.

ii. **Bid Deposit Bond & Agreement to Bond**

Bid submissions must be accompanied by a bid deposit in the form of a digital Bid Bond in an electronically verifiable and enforceable (e-Bond) format in the amount of 10% of the total base bid (inclusive of HST) made payable to the Waterloo Region District School Board (the 'Board') as surety that, if the Bid is accepted, a Contract will be entered into for the proper performance of the work. For more information, contact your surety company or visit the Surety Association of Canada website.

Bid Submissions must be accompanied by an Agreement to Bond in the form of a digital Bond in an electronically verifiable and enforceable (e-Bond), completed and executed by the Bidder's Surety, assuring the successful Supplier shall provide for a Performance Bond for 50% of the total Contract Price, and a Labour and Material Payment Bond for 50% of the total Contract Price.

Bidders shall upload their digital Bid Deposit Bond and Agreement to Bond separately to the Bidding System, in the bid submission files labeled "Bid Deposit Bond" & "Agreement to Bond". If both Bonds are within one (1) document, upload it in both files. All instructions and details for accessing authentication shall be included with the digital Bonds uploaded in the Bidding System. Do not include and/or upload Performance Bond and Labour and Materials Bond in this section.

Bids that do not contain the bid deposit(s) in the required amount will be declared non-compliant and will be rejected. A scanned PDF copy of bonds or original certified cheque, bank draft, money order, etc. are not acceptable as Bid deposit and will result in your Bid being rejected.

The bid deposit of the Bidder whose submission is accepted shall be forfeited by the Bidder should the Bidder fail to execute a Contract or provide the necessary documents as required within this Bid Solicitation document (including but not necessarily limited to: signed agreement, satisfactory security, insurance certificate, appropriate Workplace Safety and Insurance Board letter of clearance certificate) within the time stipulated as a written notice from the Board.

For bid amounts where Bonding is not requested, the Awarded Bidder agrees to pay to the Board the difference in costs between the bid submitted and the final contract should the Awarded Bidder fail to either execute or deliver the contract documents in accordance with the Bid Solicitation within seven (7) calendar days of written notification of the award of the contract.

iii. Performance and Labour & Materials Bonds

For bid amounts where bonding is required, inclusive of all taxes, the Supplier shall provide a digital Bid Performance and Labour and Materials Bond in an electronically verifiable and enforceable (e-Bond) format in the amount(s) of not less than 50% Performance Bond and a 50% Labour and Materials Bond of the total Contract Price made payable to the Waterloo Region District School Board (the 'Board') as surety that, if the Bid is accepted, a Contract will be entered into for the proper performance of the work and extends protection to Sub-contractors, Suppliers, and any other persons supplying labour or materials to the Project. For more information, contact your surety company or visit the Surety Association of Canada website.

If the Supplier fails to provide a performance bond and/or labour and materials bond when requested, the Board may declare the bid deposit forfeited and the Bidder will be held responsible for any increased costs or damages incurred by the Board. Any Bidder who fails to provide all required documents within the timelines provided, or otherwise fails to enter into an agreement with the Board upon notice of being the Supplier may be subject to future bidding constraints by the Board.

Performance bond shall guarantee all conditions as set out in the contract, including proper execution of the work and for all matters for which the Supplier is responsible for throughout the two (2) year period of maintenance and warranty.

Any costs associated with performance bond are the responsibility and cost of the Bidder.

Bonds must be submitted through the Bidding System within seven (7) calendar days of receiving the Intent to Award.

5. Business Code of Conduct for Board Employees

The Board will not knowingly purchase goods and/or services from Suppliers who operate in contravention of local and international laws. If a product and/or service supplied to the Board is discovered to be in contravention, the Board reserves the right to rectify the issue with the Supplier, including the cancellation of the contract.

The Board expects that all employees and Suppliers act within the parameters of the in Administration Procedure 4360 PRINCIPLES OF BUSINESS CONDUCT FOR BOARD EMPLOYEES. Click [here](#) to access the Board's Administrative Procedures, Section 4000 – Business Services.

6. Code of Conduct for Suppliers

These Guidelines cover any contractor, supplier, consultant, business, firm, company or individual doing work, providing a service or delivering goods on any Waterloo Region District School Board property, as well as the Supplier's employees, sub-contractors, agents, consultants, and others on site in connection with the Supplier's work or at the Supplier's express or implied invitation.

- i. **Courtesy and Respect:** all Suppliers and their employees must conduct themselves in a manner that is lawful, courteous, respectful, businesslike, and free of bias to the Board, its officer, employees, students, guests, or visitors.
- ii. **Language and Behavior:** Suppliers and their employees cannot engage in behavior that is rude, threatening, or offensive. Use of profane or insulting language is prohibited. Harassment of any type, including sexual harassment is strictly prohibited. Abusive, derogatory, obscene or improper language, gestures, remarks, whistling, cat calls or other disrespectful behavior cannot be tolerated.

- Rough housing, fighting, fisticuffs, physical threats, destruction of property, vandalism, littering, or physical abuse of anyone on WRDSB property are not permitted under any circumstance.
- iii. **No Weapons, Alcohol, or Drugs:** The use, possession, distribution, or sale of any weapon, alcohol, illegal drug, or controlled dangerous substance by any Supplier or Supplier's employee is prohibited. Offenders will be removed from WRDSB property and/or reported to the local Police Department.
 - iv. **Smoking:** Suppliers and their employees are not permitted to smoke on WRDSB property, in or near any buildings.
 - v. **Fraternization:** Suppliers and their employees may not fraternize or socialize with WRDSB students or employees.
 - vi. **Appearance:** Suppliers and their employees are required to wear appropriate work wear, hard hats and safety footwear, as the case may be, while on WRDSB property. Articles of clothing must be neat and tidy in appearance, and cannot display offensive or inappropriate language, symbols or graphics. WRDSB has the right to decide if such clothing is inappropriate.
 - vii. **Vehicles and Driving on Board Property:** Vehicles must clearly indicate the Supplier's company name, identifier number and telephone number. It must be readable from 8 meters (25 feet) away. Vehicles including movable Equipment/Machinery must not enter, leave or drive on Board premises during nutritional breaks, before and after school hours, or anytime there are students or staff outside of the building.
 - viii. **Reporting:** The Supplier is required to report any matter involving a violation of these rules of conduct, any matter involving health or safety, including any altercations, to WRDSB Facilities staff.

The Supplier is responsible for its employees, agents, consultants and guests. If prohibited conduct does occur, the Supplier will take all necessary steps to stop and prevent any future occurrence. Any breach of these conditions will result in the removal of the person responsible from the school premises and prohibited actions could result in the termination of any contract or agreement with WRDSB.

7. Compliance with Laws, Acts and Regulations

Suppliers shall abide by all applicable provincial and federal laws, as well as Board Policies. Some of the applicable laws are highlighted below for information purposes only. In case of any discrepancy between this Bid Solicitation Document and the provision of applicable laws, the latter shall prevail. This list is not intended to be a comprehensive summary of relevant laws or be a complete list of applicable regulations or interpretation of the provisions of any laws

- Accessibility for Ontarians with Disabilities Act (AODA)

- Architect Act
- [Bill S-211 Fighting Against Forced Labour and Child Labour in Supply Chains Act](#)
- Broader Public Sector Accountability Act, 2010
- Building Ontario Businesses Initiative (BOBI) Act, 2022
- Canada Revenue Agency (CRA) regulations
- Confidentiality Acts (MFIPPA, PIPEDA etc.)
- Construction Act
- Education Act
- Occupational Health and Safety Act
- Trade Agreements (CETA/CFTA etc.)
- Workplace Safety and Insurance Act (WSIB)
- [WRDBS Procurement Services Policies website](#)
- [WRDSB Policies and Procedures](#)

Non-compliance to provincial and/or federal laws, or Board Policies may result in rejection of the Bidder's Bid submission and/or termination of Contract.

Bidders shall make themselves aware of provisions in all applicable provincial and federal laws as well as Board policies and ensure full compliance. Non-compliance may result in rejection of Bid and/or termination of Contract.

The Supplier(s) will be required to comply with all applicable federal, provincial laws as well as Board policies in performing its obligations under the Contract including, without limitation, the Occupational Health and Safety Act, as amended, and the Workplace Safety and Insurance Act, 1997, as amended, and Accessibility for Ontarians With Disabilities Act, 2005, S.O. 2005, c.11, Accessibility Standards for Customer Services O. Reg. 429/07 requirements, under the Accessibility for Ontarians With Disabilities Act, 2005, as amended, or any successor legislation applicable, and to provide to the Board, upon request, periodic reports and evidences confirming such compliance.

By supplying the goods or equipment and/or providing services, the Supplier warrants that the goods or equipment supplied, and services provided to the Board conforms in all respects to the standards and codes set forth by federal and provincial agencies. Failure to comply with this condition will be considered a breach of this Contract.

The obligations of the parties and resolutions of any disputes shall be governed by and construed in accordance with the laws of the Province of Ontario and the federal laws of Canada, including the Construction Act, as to interpretation and performance, and shall be treated, in all respects, as an Ontario contract. The parties shall attorn to the exclusive jurisdiction of the courts of the Province of Ontario.

8. Confidential Information, MFIPPA, and PIPEDA

All information and documentation provided by the Board or to the Board in connection with this Procurement, before or after the issuance of this Procurement is the sole property of the Board and shall be treated as confidential, subject to the provisions of the Municipal Freedom of Information and Protection of Privacy Act (MFIPPA).

Bidders shall identify any confidential information in their Bid Submission. The Board will make reasonable efforts to safeguard confidential information, subject to its disclosure requirements under MFIPPA or any other disclosure requirements imposed by law or by order of a court or competent tribunal. Bidders are advised that their Bid submissions may be disclosed, on a confidential basis, to advisers retained by the Board to advise or assist with the Bid process, including the evaluation of Bid submissions.

Bidders should be advised that when submitting a Bid, the name, title, and contact information will be made public upon request. Under MFIPPA, and as a record of the Board, the Bid prices submitted and agreed to under contract with the Board can also be made available through a Freedom of Information request. Bidders will be notified regarding requests for any other information submitted in a Bid; information may be disclosed to a requester in whole or part unless otherwise considered exempt from disclosure under MFIPPA.

The Supplier represents and warrants that if it is or becomes subject to any private sector privacy legislation during the Term it will be solely responsible for compliance with such legislation. Without limitation, the Supplier represents and warrants that if it is subject to the *Personal Information Protection and Electronic Documents Act*, S.C. 2000, c.5, including any further amendments thereto (PIPEDA):

(a) it and all of the Supplier's Sub-contractors shall ensure the PIPEDA compliance of all PIPEDA Protected Information it collects directly from individuals or indirectly from the Board, uses or discloses in the course of performing their obligations under this Agreement; and,

(b) without limitation, it shall ensure the PIPEDA compliance of all PIPEDA Protected Information it transfers or discloses to the Board.

9. Confirmation to Proceed

No work shall commence until the Board has issued a purchase order and/or contract, if applicable to the Supplier. Goods/Service or Work as described shall not commence until all the required documents have been submitted to Procurement Services and the Form of Agreement and/or the CCDC 2 - 2020 if applicable, are executed by the Supplier and the Board. For payment purposes, a Purchase Order shall be generated and issued to the Supplier. The Purchase Order number must appear on all invoices in order to ensure prompt payment.

10. Conflict of Interest

By submitting a Bid, the Bidder confirms that they have no conflict of interest with respect to other work and/or other clients. The Bidder shall ensure that all Sub-contractors, sub-consultants and suppliers also have no conflict with respect to other work and/or other clients.

The Supplier, Sub-contractors and Sub-suppliers and any of their respective advisors, partners, directors, officers, employees, agents, and volunteers shall not engage in any activity or provide any services where such activity or the provision of such services creates a conflict of interest (actually or potentially, in the sole opinion of the Owner) with the provision of the Work pursuant to the Contract. The Supplier acknowledges and agrees that a conflict of interest, as described in this section includes, but is not limited to, the use of Confidential Information where the Owner has not specifically authorized such use.

The Supplier shall disclose to the Owner, in writing, without delay, any actual or potential situation that may be reasonably interpreted as either a conflict of interest or a potential conflict of interest, including the retention of any Sub-contractor or Supplier that is directly or indirectly affiliated with or related to the Supplier.

The Supplier covenants and agrees that it will not hire or retain the services of any employee or previous employee of the Owner where to do so constitutes a breach by such employee or previous employee of the Owner's conflict of interest policy, as it may be amended from time to time, until after completion of the Work/Services under the Contract.

It is of the essence of the Contract that the Owner shall not have direct or indirect liability to any Sub-contractor or Supplier, and that the Owner relies on the maintenance of an arm's-length relationship between the Supplier and its Sub-contractors and Sub-suppliers. Consistent with this fundamental term of the Contract, the Supplier will not enter into any agreement or understanding with any Sub-contractor or Supplier, whether as part of any contract or any written or oral collateral agreement, pursuant to which the parties thereto agree to cooperate in the presentation of a claim for payment against the Owner, directly or through the Supplier, where such claim is, in whole or in part, in respect of a disputed claim by the Sub-contractor or Supplier against the Supplier, where the payment to the Sub-contractor or Supplier by the Supplier is agreed to be conditional or contingent on the ability to recover those amounts or a portion thereof from the Owner, failing which the Supplier shall be saved harmless from all or a portion of those claims. The Supplier acknowledges that any such agreement would undermine the required arm's-length relationship and constitute a conflict of interest. For greater certainty, the Supplier shall only be entitled to advance claims against the Owner for amounts pertaining to Sub-contractor or Supplier claims where the Supplier has actually paid or unconditionally acknowledged liability for those claims or where those claims are the

subject of litigation or binding arbitration between the Sub-contractor or Supplier and the Supplier has been found liable for those claims.

A breach by the Supplier, any of the Sub-contractors, Sub-suppliers or any of their respective advisors, partners, directors, officers, employees, agents, and volunteers shall entitle the Owner to terminate the Contract, in addition to any other rights and remedies that the Owner has in the Contract, in law, or in equity.”

11. Construction Act Guidelines

For Work that is governed by the provisions of the Construction Act, the Construction Act shall apply where applicable including in respect to release of 10% holdback, 2% deficiency holdback, adjudication, and the provision of security.

12. Criminal Background Checks and Collection of Personal Information

The Board must comply with Ontario Regulation 521/01 (Collection of Personal Information) of the Education Act with respect to criminal background checks and offence declarations.

If required by the Board, the Supplier will provide to the Board, or designate, a Criminal Background check for pertinent individuals covering offences under the Criminal Code, the Controlled Drugs and Substances Act, and any other offences which would be revealed by a search of the automated Criminal Records Retrieval System.

An Offence Declaration on a Board-approved form for every employee of the Supplier who may come in direct contact with Board staff and/or students on a regular basis at any Board site prior to the occurrence and on or before September 1 each year thereafter may be required. Updated Offence Declarations may be required annually. The Board will determine in its sole discretion whether this is a requirement.

Termination of contracts may be the result of non-compliance to this requirement.

13. Damage Responsibility of Supplier

The Supplier, their agents and all workers and persons employed by them or under their control, shall use due care that no person or property is injured and that no rights are infringed in the prosecution of the work, and the Supplier shall be solely responsible for all damages by whomsoever claimable in respect of any injury to persons or to lands, buildings, structures, utilities, survey markers, fences, livestock, trees, crops, roads, ways, ditches, drains and in watercourses, whether natural or artificial, or property or whatever description and in respect of any infringement of any right, privilege or easement whatever occasioned in the carrying on of the work or any part thereof, or by any neglect, misfeasance or nonfeasance on the Supplier’s part or on the part of any of his agents, workers and persons employed by them or under their control shall bear the full cost thereof and shall at his own expense make such temporary provisions as may be necessary to ensure the avoidance of any such damage, injury or infringement.

The Supplier shall indemnify and save harmless the Board from and against all claims, demands, loss, costs, damages, actions suits or other proceedings by whomsoever made, brought, or prosecuted in any manner based upon, occasioned by, or attributed to any such damage, injury, or infringement.

Notwithstanding the indemnity provisions contained in this section, where in the opinion of the Board Representative the Supplier has failed to rectify any damage, injury or infringement or has failed to adequately compensate any person for any damage, injury or infringement for which the Supplier is responsible under the Contract, the Board, following notice in writing to the Supplier of his intention so to do, may withhold payment of any monies due to the Supplier under this or any other Contract until the Supplier has rectified such damage, injury or infringement or has paid adequate compensation for such damage, injury or infringement.

14. Damage Reporting

If a utility structure or device, utility cable/conduit, or utility related infrastructure is damaged, the Supplier shall notify the Board representative the same working day of any service disruption or damage and the Supplier will immediately notify the utility company to initiate repair. The Supplier will additionally make every reasonable effort to advise impacted resident(s) of a service disruption.

It is understood that all damage caused by workers engaged in the work under these specifications will be repaired by the Supplier and at the Supplier's sole expense. Damaged turf areas will be levelled and seeded, all horticultural planting damaged beyond repair will be replaced and any damage to structures, utilities, signs, light fixtures, landscape furniture, irrigation systems etc. will be repaired or replaced. Repair work will be carried out by skilled workers acceptable to the Board representative. All repairs and replacements will be approved by a Board representative prior to final payment.

15. Debriefing Requests

For procurements valued at \$121,200 or more, and in accordance with the Broader Public Sector Procurement Directive, unsuccessful Bidders are entitled to a debriefing to receive feedback with respect to their Bid submission. To obtain a debriefing, Bidders shall contact the Single Point of Contact listed in this Bid Solicitation Document in writing with their request within sixty (60) calendar days of the award notification.

16. Default

If the Supplier fails to properly, promptly, and fully carry out the Work required by these documents, the Board reserves the right to notify the Supplier to discontinue all Work under this Contract, to advertise for new Bids or carry out the Work in any way as the Board may, in their sole discretion, deem best.

The Supplier further agrees to indemnify and save harmless the Indemnified Parties from all loss, damage, liability, cost, charge, or expense whatsoever which it, they or any of them may suffer, incur or be put to by reason of such default or failure.

17. Delay Claims

The Supplier shall be responsible for all deliverables including lead times. The bidder shall include in their bid price any costs associated with an extended schedule beyond the stated substantial completion date due to delayed deliveries of items. Costing is to be inclusive of any afterhours work required due to the school being occupied by staff and students during the school year until completion.

The board will not accept or consider any "delay claim" requests for delayed deliverables outlined in the tender documents.

18. Delivery and Transportation Charges

Unless otherwise specified under the Special Provisions and/or Scope of Work and Deliverables sections of this document, prices documented shall be net prices including transportation and delivery charges fully paid by the Supplier and Free On Board (FOB) Destination, Freight Prepaid (any/all Board locations).

19. Designated Substances

The Occupational Health and Safety Act of Ontario (OHSA) allows for certain toxic substances to be especially designated. The OHSA defines a designated substance as “a biological, chemical, or physical agent or combination thereof prescribed as a designated substance to which the exposure of a worker is prohibited, regulated, restricted, limited, or controlled”. Ontario Regulation 490/09 - Designated Substances (O.Reg. 490/09), made under the Occupational Health and Safety Act outlines required steps to control exposure of workers to designated substances. Under O. Reg. 490/09 there are eleven (11) designated substances: acrylonitrile, arsenic, asbestos, benzene, coke oven emissions, ethylene oxide, isocyanates, lead, mercury, silica and vinyl chloride. This regulation applies to every employer and worker at a workplace where the designated substances are present, produced, processed, used, handled or stored and at which a worker is likely to be exposed to the designated substance.

I. Asbestos

Asbestos-containing material (ACMs) were identified during the completion of the Asbestos Audit Update Report (AAU), prepared by MTE Consultants Inc. Each facility was surveyed, and if applicable, an AAU Report is available, refer to attached, Appendix 01 35 34A. If these materials, including those deemed or suspected, will be disturbed, or will likely be disturbed, during building maintenance, renovations, construction, or demolition activities, they must be handled and disposed of in accordance with the procedures prescribed by O. Reg. 278/05.

Should the Supplier encounter asbestos, not noted in the above AAU Report, which would be disturbed during the course of the Work they should stop the work in that immediate area and report the same to the Board Contact.

All asbestos work must be conducted by Suppliers approved by the Board, who are trained in the type of asbestos operations required and should be overseen by a qualified third-party Health, Safety and Environmental professional. To conduct Type 3 asbestos operations, Suppliers must be certified as Asbestos Abatement Workers AAW (Trade code 253W) and Asbestos Abatement Supervisors AAS (Trade code 253S) by The Ministry of Training, Colleges and Universities as prescribed by Section 20 of O. Reg. 278/05.

Unless otherwise specifically covered by Cash Allowance or Contingency Allowance for known asbestos materials, include in this contract for the removal under abatement, in compliance with O. Reg. 278/05, of all known asbestos containing materials, as identified in the audit, within 0.6 meter (2'-0") of all new services, materials, and equipment, and/or as required to complete the work. No claims for extra cost will be accepted for areas known to contain asbestos containing materials.

II. Lead

Lead was historically used in mortar pigments, ceramic glazing; plumbing solder, electrical equipment and electronics solder, in pipe gaskets as packing in cast iron bell and spigot joints of sanitary drains, flexible plumbing connections, flashing panels, acoustical dampeners, phone cable casing and some architectural applications. The assessment of lead for this assignment was limited to paint on interior and exterior surfaces which may be disturbed during the Work.

Preliminary paint, coatings or materials were collected within the work area to determine if lead-containing paints, including lead-based paints, are present. The analytical results, if applicable, including the location marked on the floor plans are available, refer to attached, Appendix 01 35 34B.

Should the Supplier encounter paint and coatings, not sampled, that would be disturbed during the course of the Work, they should stop the work in that immediate area and report the same to the Board Contact.

Unless otherwise specifically covered by Cash Allowance or Contingency Allowance for known lead-containing paint and coatings, include in this contract for the removal or disturbance of lead-containing materials, must be completed in compliance with "Lead on Construction Projects" guideline (April 2011). No claims for extra cost will be accepted for lead-containing paint or coatings in identified areas.

The classification of typical lead-containing construction tasks is based on presumed airborne concentrations obtained from the U.S. Occupational Safety and Health Administration (OSHA), the Ontario Ministry of Labour, and published research

studies. The classification of Type 1, Type 2, or Type 3 operations are grouped based on the following concentrations of airborne lead

Supplier shall inform all workers of the presence of paint finishes that are lead containing. Disturbance of lead-containing materials, paints or surface coatings shall be conducted in accordance with the procedures outlined in the Environmental Abatement Council of Canada (EACC) "Lead Guideline" (October 2014) and/or the Ministry of Labour (MOL) "Lead on Construction Projects" guideline (April 2011). The extent of procedures required depends on the type of work to be conducted. Waste to be handled and disposed of in accordance with O.Reg. 347.

III. Mercury

Mercury is typically used in building service applications such as thermometers, barometers, thermostats, gauges, electrical switches, and lighting products including fluorescent light bulbs and a variety of High Intensity Discharge (HID) lamps as mercury vapour, metal halide and high pressure sodium lamps. Lamps and other devices that require demolition are to be handled with care and kept intact to avoid potential exposure. Any mercury-containing lamps or other equipment that are demolished are to be recycled. Waste to be handled and disposed of in accordance with O.Reg. 347.

IV. Silica

Silica is present in rock, stone, soil, and sand. Masonry products such as concrete block, brick, and mortar, as well as concrete and associated products contain silica. Due to its ubiquitous nature, silica was historically used in a wide variety of building materials and is still used today in new construction.

All work involving the demolition silica-containing materials shall follow the procedures outlined in the MOL "Silica on Construction Projects" guideline. Type 1 operations may be necessary based on the type of work conducted and the Supplier shall implement dust suppression methods and protect workers.

V. Other Designated Substance

In addition to asbestos and/or lead, silica, and mercury are present in all WRDSB facilities. New construction, renovation or alterations require compliance by the Supplier with the applicable legislation. Other designated substances (i.e., acrylonitrile, arsenic, benzene, coke oven emissions, isocyanates, ethyl oxide, and vinyl chloride) are not encountered in WRDSB facilities as significant constituents or in a form that would represent an exposure concern. responsible for obtaining its own independent financial, legal, accounting, and technical advice with respect to any information included in the Bid Solicitation Document or in any data, materials, or documents provided or required by the Board.

20. Dispute Resolution

All disputes arising out of or in connection with this Contract, or in respect of any legal relationship associated with or derived from this Contract, other than with respect to the Board's right to terminate this Contract, shall first be mediated pursuant to the [National Mediation Rules of the ADR Institute of Canada, Inc.](#) Despite this agreement to mediate, the Supplier or the Board may apply to a court of competent jurisdiction or other competent authority for interim measures of protection at any time. All disputes remaining unsettled after mediation shall be arbitrated and finally resolved before a single arbitrator pursuant to the National Arbitration Rules of the ADR Institute of Canada, Inc. The place of mediation and arbitration shall be Toronto, Ontario, Canada. The language of the mediation shall be English.

21. Electrical Safety Requirements

All electrical equipment and components must be C.S.A. or Electrical Safety Association (E.S.A.) certified. A certification sticker must be affixed to the equipment in a visible location.

22. Emergency and Maintenance

The care of the Works until completed, delivered to and accepted by the Board rests solely with the Supplier who shall assume all risk of damage to the work.

For the purpose of emergency and maintenance measures, the name, address, and telephone number of a responsible official of the contracting firm shall be given to the Board's contact person in charge of the project, if requested. This official shall always be available and have the necessary authority to mobilize workers and machinery and to take any action as directed by the Board in the event emergency or maintenance measures are required, regardless of the fact that the emergency or requirement of maintenance may have been caused by the Supplier's negligence, Act of God, or any cause whatsoever.

Should the Supplier be unable to carry out the required immediate remedial measures, the Board may carry out the necessary repairs and the costs for this work shall be deducted from payments due to the Supplier.

23. Equivalent or Brand Name

Any reference to a brand name or a particular manufacturer shall be understood to have been made solely for the purpose of establishing and describing required performance and quality levels of the product to be supplied, unless specified otherwise.

No reference to the brand name of a particular manufacturer shall be construed to restrict Bidders to that manufacturer. Bidders are invited to Bid equivalent and comparable equipment or items of any manufacturer, pending approval from the Board in the form of an Addendum. It is the Bidder's responsibility to demonstrate that the item meets the specifications.

Bidders shall request through the Bidding System by clicking on the "Submit a Question" button found within the bid details page of that Procurement that a proposed product be

considered an approved equivalent prior to the Deadline for Questions in the Anticipated Project Schedule.

The request must include enough detail to determine equivalency by comparing the Board's specifications to the alternate product. It will not be the Board's responsibility to perform this comparison.

The Board/ Consultant may, depending on the nature of the product request site visits within a reasonable distance (preferable within 100 km of the Board) showing product and installation based on a certain age, minimum 18 months in use, room use, room size, etc. based on same or similar purpose as described in this Procurement.

The Board/Consultant will endeavor to complete a review and make a decision prior to the Closing Date, and, if required, the Board reserves the right to extend the Closing Date to complete its review. However, in the event additional time is required beyond a suitable extension to the Closing Date, the request will be pending until the product is thoroughly vetted, therefore, it may not be approved for this particular Procurement.

If the Board is willing to consider the product with its differences, it will be communicated in the form of an Addendum prior to the Closing Date.

The cost of any testing requirements to establish acceptable equivalent or comparable products will be borne by the Bidder, unless otherwise stated by the Board.

24. Evidence of Quality

It is the Bidder's responsibility to prove their product/service quality meets the Board's requirements and Bidders may be required to submit evidence in a form acceptable to the Board. Substitution of materials equipment or methods different from that outlined in the specifications / terms of reference will not be accepted unless provided for within the Bid Solicitation document or without the written approval of the Board.

25. Force Majeure

If either party is delayed in the performance of their obligations under this Contract by Force Majeure, then the Contract Time shall be extended for such reasonable time as the Owner and the Supplier shall agree. The extension of time shall not be less than the time lost as a result of the event causing the delay, unless the parties agree to a shorter extension. Neither party shall be entitled to payment for costs incurred by such delays. Upon reaching agreement on the extension of the Contract Time attributable to the Force Majeure event, the Owner and the Supplier shall execute a Change Order indicating the length of the extension to the Contract Time and confirming that there are no costs payable by the either party for the extension of Contract Time. However, if at the time an event of Force Majeure arises a party is in default of its obligations under the Contract and has received a notice of default shall not excuse a party from its obligation to cure the default(s). For greater certainty, the defaulting party, to the extent possible, must continue to address and cure the default notwithstanding an event of Force Majeure."

Any cause, unknown at the effective date of the Contract and beyond either party's

control, other than financial difficulties, bankruptcy or insolvency, which prevents the performance by a party, or both, of any of their respective obligations under the Contract and the event of Force Majeure did not arise from a party's default and could not be avoided or mitigated by the exercise of reasonable effort or foresight. Force Majeure includes Labour Disputes; fire; unusual delay by common carriers or unavoidable casualties; delays in obtaining third-party licenses, permits, agreements, or approvals (excluding approvals of any Sub-contractors or Suppliers of any tier); civil disturbance; emergency acts, orders, legislation, regulations or directives or revoking of funding from any government or other public authority; acts of a public enemy; war; riot; sabotage; blockage; embargo; lightning; earthquake; adverse weather conditions but only if substantially beyond the weather norms of the Place of the Work; acts of God; or declared epidemic or pandemic outbreak or other public health emergency (e.g. SARS, COVID-19)

If in the reasonable opinion of either party to this Contract that performance of the Contract is made impossible by force majeure, then either party shall notify the other in writing and the Board shall either terminate the Contract forthwith without any future payments being made or authorize the Bidder to continue performance of the Contract with such adjustments as may be required by the existence of the force majeure and agreed upon by both parties.

26. Hold Back or Set Off

The Board may hold back payment or set off against payment if, in the opinion of the Board, the Supplier has failed to comply with any requirements of the Contract.

27. Hot Work Procedure

Take all precautions to Work safely and to provide the necessary protection to persons and property from Hot Work. This includes, but is not limited to Brazing, Cutting, Grinding, Soldering, Thawing Pipe, Torch Applied Roofing and Welding. With all such activity these steps are to be followed:

- i. Whenever possible, complete Hot Work in a welding shop or out of doors at the school.
- ii. Flammable liquids, dust lint and oily deposits to be removed from within 50-ft (15m) of Work. Remove other combustibles where possible. Otherwise protect with fire-resistive tarpaulins or metal shields.
- iii. Explosive atmosphere in area eliminated. Floors swept clean. Combustible floors wet down, covered with damp sand or fire-resistive tarpaulins.
- iv. All wall and floor openings covered. Fire-resistive tarpaulins suspended beneath Work.
- v. For on-site Work (indoor and out of doors), advise the Head Custodian, Principal, Consultant (if assigned) and Project Coordinator/Lead prior to Work being performed, and of related dangers.

- vi. Where the Fire Alarm system is required to be set to stand-by to discourage false alarms from smoke detectors provide a firewatch throughout the building or structure being worked on. NEVER put the fire alarm system in stand-by mode when the building is occupied by staff or students.
- vii. In the event of a fire as a result of the Hot Work, notify the fire department immediately. Report incident to the head custodian, the Consultant, if assigned, and Project Coordinator immediately, whether extinguished or not. Provide a fire incident report to the Board.
- viii. Barriers must be set up to protect staff and students (i.e. pylons, shields, and caution tape) from exposure to arc flash and smoke migration.
- ix. Have all necessary doors, windows and/or drapes closed. Confer with the Head Custodian to shut down all fan systems in the area to reduce or eliminate smoke distribution.
- x. Provide and keep fire extinguishers handy and in good Working condition. Temporarily cover all smoke detectors in the area during time of Work.
- xi. Provide a fire watch/spot check for several hours after Work is completed. Uncover smoke detectors.
- xii. On new construction, the requirements of the Hot Wok permit may be waived, until such time as either Substantial Completion or Occupancy is granted, whichever comes first.
- xiii. On additions to existing buildings, the requirements for Hot Work permits shall remain in place.

27.1 Hot Work Permit

- i. Each permit is valid for seven (7) days only and must be renewed prior to its expiration date
- ii. The contractor must obtain Hot Work Permits from the School Board's representative prior to the start of work.
- iii. The contractor must complete the form as required and must keep the form on site.
- iv. Return each completed form to the School Board's representative on the date of expiration.
- v. The most current version of the Permit and its requirements shall be used for the purposes of the Work.

28. Incurred Costs

The Board will not be liable, nor reimburse any Bidder for costs incurred in the preparation of the Bid, or any other services that may be requested as part of the procurement process.

29. Indemnification

The Bidder will indemnify and save harmless and defend the Board, and their respective elected officials, officers, employees, agents and their respective successors and assigns, from and against all actions claims and demands whatsoever which may be brought against or made upon any of the Indemnified Parties and against all losses, liability, judgments, claims, costs, demands or expenses which the Indemnified Parties may sustain, suffer, or be put to resulting from or arising out of the Bidder's failure to exercise reasonable care, skill or diligence in the performance or rendering of any Work or service required hereunder to be performed or rendered by the Bidder, its agents, servants, employees or Sub-contractors, or any of them as well as for the infringement of or use of any intellectual property rights including any copyright or patent arising out of the reproduction or use in any manner of any plans, designs, drawings, specifications, information, negatives, data, material, sketches, notes, documents, memoranda, or computer software furnished by the Bidder in the performance of this Contract.

30. Inspection of Supplier's Work.

The Board reserves the right to have all work including maintenance and repair work reviewed by a third-party Contractor, Agency or Consultant to confirm that work within this Contract is being completed satisfactorily.

31. Insurance Requirements

If selected, it is the responsibility of the Supplier and its Insurance Broker to review all potential operations and exposures to determine if the coverage and limits noted below are sufficient to address all insurance related exposures presented by the specification of the Project, Work, or Supply. The Supplier shall insure its undertaking, business, and equipment under the following coverage to protect and indemnify and save harmless the Board.

Throughout the term of this Contract (including any renewal thereof), the Supplier shall obtain, upload through bids&tenders and maintain at its own expense, including the cost of any applicable deductible or self-insured retention, the following policies of insurance:

- i. **Commercial General Liability Insurance** shall be in the name of the Supplier, and shall name the **Waterloo Region District School Board** and any other person or party identified in the contract documents, as an **additional insured**, with limits of not less than \$5,000,000.00 inclusive per occurrence for bodily injury, death, and damage to property, including loss of use thereof, for itself and each of its employees, *Subcontractors* and/or agents. To achieve the desired limit, umbrella, or excess liability insurance may be used. The policy shall be endorsed to provide the *Owner* with not less than 30 days' notice, in writing, in advance of any cancellation and of change or amendment restricting coverage.
- ii. **Automobile Liability Insurance** in respect of licensed vehicles with limits of not less than \$2,000,000.00 inclusive per occurrence for bodily injury, death and damage to

- property, covering all licensed vehicles owned or leased by the Supplier, and endorsed to provide the Owner with not less than 30 days' notice, in writing, in advance of any cancellation, change or amendment restricting coverage. Where the policy has been issued pursuant to a government-operated automobile insurance system, the Supplier shall provide the Owner with confirmation of automobile insurance coverage for all automobiles registered in the name of the Contractor
- iii. **If applicable, Broad Form Contractor's Equipment Insurance:** The General Contractor shall provide and maintain during the term of the Agreement, coverage for construction machinery and equipment used by the Contractor for the performance of the work. Such insurance shall be in a form acceptable to the Board and shall not allow subrogation claims by the Insurer against the Board.
 - iv. **If applicable,** the General Contractor shall provide and maintain during the term of the Agreement an **All Risk Installation Floater Insurance** policy covering the installation of any machinery and equipment associated with the construction project. Coverage shall be in an amount equal to the value of the machinery and/or equipment and shall include coverage while it is in transit to, while stored at a temporary location, and awaiting installation at the work site.
 - v. **If applicable,** the General Contractor shall **ensure** its professional consultants, architects, landscape architects, planners, and engineers providing a professional service in connection with the contract, maintain until three (3) years after the Agreement, **Professional Liability Insurance** to a limit not less than \$1,000,000 per claim providing coverage for acts, errors and omissions arising from their professional services performed under this Agreement. The policy SIR/deductible shall not exceed \$100,000 per claim and if the policy has an aggregate limit, the amount of the aggregate shall be double the required per claim limit. Certificates evidencing such coverage shall be supplied to the Board prior to the completion of the project and in accordance with the provisions stated above.
 - vi. **If applicable, (i.e., for projects with environmental liability concerns)** the General Contractor shall take out and keep in force **Contractor's Pollution Liability (CPL)** coverage to ensure that its work does not exacerbate any pre-existing environmental condition during construction. Coverage shall be in an amount of not less than \$5,000,000 per claim or per occurrence, or such greater amount as the Board may from time to time require, naming the Board as an additional insured, whose coverage shall be maintained in force for 1 year following the termination of the Contract. The policy SIR/deductible shall not exceed \$100,000 per claim and if the policy has an aggregate limit, the amount of the aggregate shall be double the required per occurrence limit.
 - vii. **Provisions:** Prior to the commencement of work, the Supplier shall forward a Certificate of Insurance evidencing this insurance with the executed Agreement. The

Certificate shall state that coverage will not be suspended, voided, canceled, reduced in coverage or in limits except after thirty (30) days (ten (10) days if cancellation is due to non-payment of premium) prior written notice by certified mail to the Board.

It is also understood and agreed that in the event of a claim any deductible or self-insured retention under these policies of insurance shall be the sole responsibility of the General Contractor and that this coverage shall preclude subrogation claims against the Board and any other person insured under the policy and be primary insurance in response to claims. Any insurance or self-insurance maintained by the Board and any other person insured under the policy shall be considered excess of the Contractor's insurance and shall not contribute with it. The minimum amount of insurance required herein shall not modify, waive or otherwise alter the Contractor's obligation to fully indemnify the Board under this Agreement.

The Board reserves the right to modify the insurance requirements as deemed suitable.

viii. Third Party Claims Process:

- a. The Board's claims process for Third Party claims is to refer the claimant directly to the Supplier and to leave the resolution of the claim with the Supplier. This applies regardless of whether or not it is an insured loss.
- b. As the Board has a responsibility to the taxpayers, we must ensure that claimants are dealt with in a fair and efficient manner. Claims reported to the Supplier, either directly by a third party or through the Board shall be promptly investigated by the Supplier. The Supplier shall contact the third party claimant within 48 hours of receipt of notice of a claim. The Supplier shall initiate an investigation of the claim immediately upon notice, and advise the third party claimant in writing, with a copy to the Board, of its position regarding the claim within 21 calendar days of the notice. The Supplier shall include in its response the reasons for its position.
- c. Should this position not resolve the claim and be accepted by the third party claimant, the Supplier shall immediately report the claim to its Insurer for further review. (Insurer for this purpose is defined as either the Claims Department of the Supplier's Insurance Company or the Claims Administrator at the Supplier's Insurance Broker.) The Supplier's Insurer upon receipt of this claim shall advise the third party claimant by letter, with a copy to the Board, that it is now investigating the claim. When a final position on the claim has been determined, the Supplier's Insurer shall advise the third party claimant by letter, with a copy to the Board. Failure to follow this procedure shall permit the Board to investigate and resolve any such claims.
- d. Nothing herein shall limit the right of the Board to investigate and resolve any such claims notwithstanding the response of the Supplier and/or its Insurer

and to seek indemnification from the Supplier or to exercise any other rights under the Contract.

- e. The Board may, without breaching this contract, retain from the funds owing to the Supplier an amount that, as between the Board and the Supplier, is equal to the balance in the Board's favour of all outstanding debts, claims or damages, whether or not related to this contract.

32. Invoicing and Payment Terms

- a) **Submit all invoices** to finance-ap@wrdsb.ca for payment at the completion of the Work or after receipt of goods, unless otherwise stated. Not Applicable for Credit Card orders.
- b) **Fiscal Year End:** All work scheduled within a single school year (Sept 1-Aug 31) must be completed and invoiced received by the Board no later than August 31 of that same school year, unless budgets dictate that work must extend into the following school year and/or mutually agreed upon both parties.
- c) **New Account**, in advance of invoicing, upon request, Suppliers will provide:
 - i. necessary company information to set up a WRDSB account and
 - ii. banking information to receive payment by Electronic Funds Transfer (EFT).
- d) **Requests to change company information** must be submitted in writing accompanied with a legal document/letter signed by a lawyer on the law firm's letterhead.
- e) **Invoices must contain** the following information, where applicable, in order to be deemed complete:
 - i. Purchase Order Number
 - ii. Invoice Date
 - iii. Unique Invoice Number
 - iv. Supplier name and address
 - v. Quantity, Unit Price, Unit of Measure and Extended Price
 - vi. Description for each line item
 - vii. Date of Service Call, if applicable
 - viii. HST
 - ix. Payment Terms
 - x. Work Order Number, if applicable
 - xi. WRDSB Project Lead, if available, and
- f) **Payment terms** shall be net twenty-eight days (28) days after receipt of proper invoice where the Construction Act is applicable, unless otherwise agreed by the Board in writing. All other payment terms will reflect Net 30. An early payment discount, if offered, may be considered on a mutual agreement basis. Payment may be delayed if the invoice is incorrect or the goods, equipment and/or services are not acceptable to the Board. The Board will not pay any interest, penalty, or late fee for delayed payments. The Board preferred payment method is Credit Card or EFT, however alternate payment methods may be approved. Suppliers are required to invoice promptly, without delay.

32.1 Construction Act – Proper Invoice

The Board will pay such invoice within twenty-eight (28) calendar days of the Board's receipt of such proper invoice if the work has been performed to the satisfaction of the Board For Work that is governed by the provisions of the Construction Act and the Regulations thereto, the Supplier shall submit its invoices in the form of a Proper Invoice. For the purposes of this section, a "Proper Invoice" shall include the following:

- i. the Supplier's name, address, telephone number and mailing address.
- ii. the date of the Proper Invoice and the period during which the services or materials for which payment is being applied for were supplied.
- iii. information identifying the authority, whether in the contract or otherwise, under which the services or materials were supplied.
- iv. a description, including quantity where appropriate, of the services or materials that were supplied during the payment period.
- v. the amount payable for the services or materials that were supplied during the payment period, with a clear identification of the portions of the amount that are holdbacks, and HST.
- vi. the name, title, telephone number and mailing address of the person to whom payment is to be sent.
- vii. the payment terms as specified by the Board in the Contract.
- viii. the invoice number and if applicable, the revision number.
- ix. the Supplier's HST number.
- x. invoices and time sheets from all subtrades whose work is included in the Proper Invoice, if required in the Contract.
- xi. backup documentation to support any cash allowances and extra work claimed in the Proper Invoice.
- xii. a schedule of values indicating:
 - a. for lump sum contracts, the percentage of work completed per division with each division further subdivided to show the percentage of work completed for each subtrade,
 - b. for unit price contracts, the tender quantity, unit of measure, previous quantity, current quantity, to-date quantity,
 - c. an updated list of change orders, showing the percentage of work completed under each change order, and
 - d. an updated cash allowance list, showing the percentage of work completed in respect of each cash allowance, if required by the Contract.
- xiii. a Statutory Declaration where required by the Contract attesting to the truth of the statements made therein.

33. Licenses and Permits

The Supplier will be responsible for applications and fees associated with any and all licenses and permits required by any and all governing bodies. The Supplier will attach a

copy of all permits, and any other required documentation to the applicable assigned work order for Board records.

34. Locates, if applicable

All required utility locates must be obtained before any on-site work commences, be available for Supplier operator/employee review, and are the sole responsibility of the Supplier. Any damage to any utility installation arising from work performed by the Supplier or their employees shall be the Supplier's responsibility.

The Supplier will obtain all utility locates in advance of work and all cost(s) associated with obtaining the utility locates will be the Supplier's responsibility.

The Supplier shall possess the ability to supply and or share with the Board Representative utility locates for the sole purpose of Quality Control inspections. This is to be done at no additional cost to the Board.

35. Log Reports

If required, the Supplier must submit a completed Log Report with invoices. The Board may request more frequent log submissions if deems necessary.

36. Materials - Specifications

Only new materials in perfect condition will be accepted. Demonstrators, seconds or defective materials are unacceptable. Any materials found not to be in a new condition or as specified will be returned to the Supplier at the Supplier's expense.

37. Material Safety Data Sheets (M.S.D.S.)

Where applicable, a materials safety data sheet (M.S.D.S.), must accompany all purchased goods, that fall under the requirements of the Occupational Health and Safety Act. The Board will not accept any additional charges or surcharges related to the supplying of M.S.D.S.

38. Mathematical Errors (Unit Prices Prevail)

Should there be any error in extensions, additions or computations, the Board shall be entitled to correct such errors based upon the unit prices supplied, and the corrected total shall be considered as representing the intention of the Bidder and shall be used as the basis for comparison of bid submissions.

39. No Branding

The Supplier shall not place any sign at the site, public meetings, any public or private property or along curbside prior, during or after the Work without prior written permission of the Board.

40. No Collusion

Bidders including any of their agents are prohibited from engaging in any comparison of figures or arrangement with any other individual, corporation or person submitting a Bid for the same Work and shall be fair in all respects and shall be without collusion or fraud.

41. No Lobbying

Any attempt by the Bidder or its agents to contact any of the following persons, directly or indirectly, with respect to this procurement may lead to disqualification:

- i. any elected or appointed officer.
- ii. any staff of the Board except the Single Point of Contact as identified in the Bid Solicitation Document; or
- iii. any other person connected in any way with the procurement.

42. No Smoking and Scent-Free Environment

The Province of Ontario has legislated under the Smoke Free Ontario Act that smoking is not permitted on any Board owned properties. Furthermore, most Board properties are “scent free”. Smoking will not be permitted on-site. Offenders will be asked to leave the site, and infractions could result in corrective action and or fine.

43. Non-Assignment

No assignment by the Supplier shall relieve the Supplier of any responsibility for the full performance of all its’ obligations under this contract.

The Supplier shall not change its corporate name without the prior written approval of the Board.

44. Non-Disclosure Agreement (NDA)

The Board requires all service providers to sign off on a non-disclosure agreement and for the service provider to complete the Software Privacy and Security Standards Document (if necessary) in accordance with Board procedure AP4790. Prior to any sharing of Board personal, sensitive, or confidential information, the Supplier will be subject to further privacy and security reviews as required. This agreement will be renewed on an annual basis.

45. Ownership of Work

For the purposes of this paragraph:

“ **Deliverables** ” means all material prepared by the Bidder forming the Work under this Contract including, without limitation, all electronic media, reports, documents and instruments of service.

“ **Intellectual Property Rights** ” means any and all rights provided under: (a) patent law; (b) copyright law; (c) trade-mark law; (d) industrial design law; (e) any other statutory provision or common law principle applicable to this Contract, including trade secret law; and (f) any and all registrations and licenses in relation to the foregoing; and

“ **Personnel** ” means employees, representatives, agents and Sub-contractors.

The Bidder and the Board acknowledge and agree that the development of the Deliverables and the provision of the Work may result in the creation or development of new intellectual property and may contain or utilize the existing intellectual property of

the Bidder or of third parties. Accordingly, the Bidder and the Board agree as follows.

- i. Except as set out in paragraph (b) below, the Bidder hereby assigns and agrees to assign to the Board all right, title and interest, including all Intellectual Property Rights, in and to each Deliverable from the moment of creation, and will cause its Personnel to assign the same. The Bidder will cause its Personnel to waive all moral rights they may have in each Deliverable.
- ii. To the extent that a Deliverable contains or utilizes the intellectual property of the Bidder or a third party ("Retained Materials"), and the Bidder expressly identifies such Retained Materials, the Bidder and the applicable third party will, subject to the following sentence, retain all their respective right, title and interest, including all Intellectual Property Rights, which each may have in such Retained Materials. To the extent that a Deliverable contains or utilizes Retained Materials, the Bidder hereby grants to each of the Board a royalty-free, irrevocable, perpetual, world-wide, non-exclusive license to make, use, sell, modify, prepare derivative works, disclose, publish, sublicense, copy and communicate by electronic means such Retained Materials.
- iii. The Supplier agrees to always cooperate fully, and will cause its Personnel to cooperate fully at all times, with respect to signing such documents and doing such acts and other things reasonably requested by the Board to confirm the transfer of ownership rights in the Deliverables.

46. Patent, Copyright and Other Proprietary Rights

The Bidder (by responding) agrees that the Bid on acceptance by the Designated Representative, become the property of the Board. The copyright for respective purchased concepts and/or materials will become the property of the Board unless otherwise mutually agreed upon by the Bidder and the Board.

All Bids, other documents as well as correspondence are subject to the provisions of the Municipal Freedom of Information and Protection of Privacy Act (MFIPPA).

47. Performance

- i. Where the Supplier is in default in carrying out any of its obligations under the contract, the Board may issue a verbal warning outlining the deficiency in supply or other aspects of performance and requiring the Supplier to correct those deficiencies within such period of time as stated.
- ii. If the deficiency is not corrected within the time specified, or there is a further instance of deficient performance, the Board may issue a written notice to the Supplier, identifying the deficiency in performance and setting a final date or time period for its correction.
- iii. If corrective steps are not taken by the final date or within that time, the Board may terminate the Contract and take corrective action.

- iv. Termination of any Contract can be immediate depending on the severity of the default.
- v. The Supplier shall have no right to perform the services contemplated under this agreement beyond the time when such services become unsatisfactory to the Board; and in the event that Supplier shall be discharged before all the services contemplated hereunder have been completed, or the services are for any reason terminated, stopped or discontinued because of the inability of the Supplier to serve under this agreement they shall be paid only for that portion of the Work which shall have been satisfactorily completed at the time of termination.
- vi. Where deemed appropriate, a performance evaluation shall be completed by the Board. The evaluation report shall be reviewed with Procurement Services, and a copy of the completed evaluation forwarded to the Supplier for their records. Dependent on the evaluation scoring, the Board may request a corrective action plan and/or project size/value may be affected on future bid opportunities for your company.

48. Permits and Licenses

Unless stated otherwise, the Supplier shall apply for all required permits and licenses, supply all necessary notices required for the Work and pay all required fees. These costs shall be included in the Total Price. A copy of all permits, and any other required documentation shall be provided the Board upon request.

49. Proceedings Against the Board

The Bidder represents and warrants that the Bidder is not a party to any legal suits, actions, litigation proceedings, arbitrations, alternative dispute resolutions, investigations, or claims (Hereinafter collectively referred to as "Claims") by or against or otherwise involving the Board and the Bidder. The Board may reject any Bid in the event of potential, current, pending, or threatened litigation, arbitration, alternative dispute resolution or disputes involving the Board and the Bidder.

50. Protection of Board Assets

The Supplier (the Supplier / Sub-contractor) shall be informed of and protect all Board assets including existing structures and vehicles, to the satisfaction of the Board. Any damage shall be reported to the Board and subsequently repaired and/or replaced by the Supplier, at their expense, to the satisfaction of the Board. The Supplier shall not cause any inconvenience to Board operations, staff, public or users of the Board facilities, within reason. Communication between the successful Supplier and the school (or Board representative if school contact is not available) must be timely and effective to ensure all stakeholders are considered / aware of work to be completed.

51. Public Health Safety Protocol

Best practices include but not limited to wearing a medical grade mask and maintaining physical distancing (2m/6.5ft).

Recommended practices are subject to change at any time. For information and updates, refer to the following resources and website: [Waterloo Region District School Board](#) and [Regional of Waterloo Public Health Services](#)

52. Records, Inspection, Audits

The Board will have the right, upon reasonable notice, to full access to the accounts and records of the Supplier in respect of the goods, services and equipment provided by it under the Contract, for the purposes of inspection and/or audit. The Supplier shall make and retain such records during the term of the Contract and for a minimum of seven (7) years following its termination, cancellation, or expiry.

53. Reserved Rights of the Board

The Board reserve the right, in their respective sole and unfettered discretion, to:

- i. Reject any Bid received from a Bidder which is party to any potential, current, past or existing suits, actions, and litigation proceedings, arbitrations, alternative dispute resolutions, investigations, Bidder performance evaluations that are below expectations, significant or persistent deficiencies in performance of any substantive requirement or obligation under a prior agreement or agreements or claims by or against or otherwise involving either of the Board and the Bidder.
- ii. waive formalities and accept Bids which substantially comply with the requirements of this tender.
- iii. accept any Bid in whole or in part.
- iv. accept, reject, or cancel any or all Optional pricing.
- v. discuss with any Bidders different or additional terms to those contemplated in this Bid Solicitation Document or in any Bid submission.
- vi. make public the names of any or all Bidders.
- vii. accept or reject equivalent or alternative brand names.
- viii. check references other than those provided by any Bidder.
- ix. Verify with any Bidder or with a third party any information set out in a Bid.
- x. reject any, or any part of, any or all Bids, or cancel the bidding process at any stage and/or issue a new Bid call for the same or similar deliverables.
- xi. disqualify any Bidder:
 - a. whose Bid contains misrepresentations or any other, inaccurate, or misleading information, or any qualifications within its Bid,
 - b. who has engaged in conduct prohibited by the Bid Solicitation Document,
 - c. with inadequate credentials or due to unsatisfactory past performance,
- xii. reject Bid(s) from Bidder who has engaged in lobbying or has contravened any of the terms of the Bid Solicitation Document.
- xiii. reject a Bid based on:
 - a. information provided by references or credit check or other due diligence

- efforts,
- b. the information provided by a Bidder pursuant to the Board exercising its clarification rights under the procurement process, or
- c. other relevant information that arises during the procurement process.
- xiv. choose to reject a Bid if only a single Bid is received and cancel the bidding process or enter into direct negotiations with the sole Bidder.
- xv. accept a Bid other than the lowest or highest scoring and/or to not accept any Bid for any reason whatsoever.
- xvi. award the contract as split-order, lump sum or individual-item basis, or such combination as shall best serve the interests of the Board.
- xvii. negotiate in circumstances permitted for in the Bid document or by relevant policies, or directives, and include additional terms and conditions during the process of negotiations.
- xviii. no longer consider a Bidder if a satisfactory outcome is not reached as part of negotiation, as determined by the Board in their sole discretion and move to the next highest ranked Bid in such event.
- xix. select a Bidder other than the Bidder whose Bid reflects the lowest cost to the Board and/or award the Contract to any Bidder.
- xx. award any business/Work described in this Bid Solicitation to more than one (1) Bidder.
- xxi. not award the Contract if the costs of completing the Work exceed budget funding; or do not respond to all requirements or do not represent fair market value or where necessary internal approvals are not obtained, and
- xxii. If the Board receives a bid from a Supplier with Rates that are abnormally lower than the Rates in other Bids, the Board may verify with the Bidder that the Bidder satisfies the conditions for participation and is capable of fulfilling the Agreement.

These reserved rights are in addition to any other expressed rights or any other rights which may be implied in the circumstances. The Board shall not be liable for any expenses, costs or losses suffered by any Bidder or any third party resulting from the Board exercising any of its express or implied rights under this bidding process.

54. Responsibilities of the Supplier

Acceptance of a purchase order issued by the Board and/or a signed agreement shall constitute a contract (the "Contract") between the Board and the Supplier, which shall bind the Supplier on their part to furnish and deliver the goods, equipment and services at the prices given and in accordance with the conditions of the Bid solicitation document.

The Supplier shall:

- i. perform the Contract in accordance with the specifications, terms and conditions under which it is awarded.

- ii. act in a professional manner at all times when dealing with Board staff, with the public, and while working on site.
- iii. not, except with the consent of the Board in writing, release information relating to any subsequent order for advertising, promotional or technical purposes or otherwise give it publicly in any fashion, nor shall the name of either of the Board be used for, or in connection with, any advertising or promotional purpose of the Supplier.
- iv. treat information gained while working with the Board confidentially and not use it for any other project and return it to the Board if requested.
- v. submit to Finance – Accounts Payable, an invoice for payment at the completion of the Work, unless otherwise stated. All applicable taxes including HST are to be itemized separately on invoices. Include the purchase order number on each invoice; and
- vi. provide necessary information if they wish to receive payment by Electronic Funds Transfer (EFT).

55. Site and Work Examination

- i. Bidders will accept the site conditions, and the requirements of the Work, as is. No modifications to the Bid will be accepted after the Closing Time.
- ii. No claim for extras will be allowed for Work or difficulties encountered due to conditions of the site which were visible, knowable, or reasonably inferable, prior to the time of submission of Bid. Bidders shall accept sole responsibility for any error or neglect on their part in this regard.
- iii. Before submitting a Bid, each Bidder shall:
 - a. carefully examine this entire Bid Solicitation Document to determine the extent of the Work, and various provisions including the maps, drawings, reports and specifications.
 - b. immediately report all discrepancies between the various documents and site conditions.
 - c. provide Sub-contractors, sub-consultants, and suppliers to whom the Bidder intends to sublet a portion or portions of the Work with complete information as to the requirements of the Work. This is to include maps, drawings, reports, specifications, and all requirements of the Bid Solicitation Document including any addenda.
- iv. In the event of discrepancies between the maps, drawings, reports, and the specifications with regard to quantity or quantities of materials or items, and in the absence of Addenda in clarification of said discrepancies, the Bidder is to include for the larger quantity or quantities.
- v. No additional payments will be made for any costs incurred through failure of the Bidder to abide by provisions stipulated in all of the articles and sub-articles of this

item.

- vi. Any soils investigation, environmental, geotechnical or other reports prepared or obtained with respect to the Place of the Work (collectively the "Reports") are available from the Consultant. Where the Work involves existing buildings, structures, facilities, plant or equipment, any reports, data or as-built drawings concerning such buildings, structures, facilities, plant or equipment (collectively the "Data") are available from the Consultant. The Reports should not be considered a representation of the site conditions of the entire Place of the Work, and the Reports and Data are provided for general information and guidance purposes only. Neither the Owner nor the Consultant guarantees the accuracy or completeness of the Reports or the Data, nor does either assume any responsibility for any interpretations or conclusions that bidders may make or draw from the Reports or the Data.
- vii. Each Bidder is solely responsible, at its own cost and expense, to carry out its own independent research and due diligence, or to perform any other investigations considered necessary by the Bidder to satisfy itself as to all existing conditions. The Bidders' obligations set out in this paragraph apply irrespective of any Reports, Data or any information contained in the Bid Documents.
- viii. No allowances will be made for additional costs and no claims will be entertained in connection with conditions which could reasonably have been ascertained by investigation or other due diligence undertaken prior to the Submission Deadline, and/or in connection with Work which is required and which is reasonably inferable from the Bid Documents, the Reports and/or Data as being necessary.

56. Site Existing Services, if applicable

The position of utility pole lines, underground conduits and services, watermains, sewers and other underground and over ground utilities and structures are not necessarily known, and the accuracy of the position of such utilities and structures on any reference documents is not guaranteed. The Board will not be responsible for damages or extra work caused or occasioned by the Supplier relying on this or any other information or records.

Before starting work, the Supplier shall familiarize themselves of the exact location of all such utilities and structures and shall assume all liability for damage to them. Where extra measures are required to support utility poles during construction either by the utility involved or the Supplier themselves, the costs involved shall be borne by the Supplier. The Supplier will be responsible for any fees that may be associated with these services.

57. Site Inspection and Control

A representative of the Board (appointed by the Board) reserves the right to enter the site at any time for the review & inspection. The presence of a said representative does not indicate satisfaction or compliance unless these comments are made by the representative and submitted to the Supplier in written form

58. Site Investigation

Bidders shall not rely solely upon information furnished by the Board but shall do their own investigation of the locations, and quantity of the work to be completed under this contract.

The Bidder assumes all risk of conditions, existing or arising, in the course of the work, which might or could make the work or any items therefore more expensive in character, or more onerous to fulfill, than was contemplated or known when the Bid was made, or the Contract signed.

59. Site Safety and Clean Up

For safety of students, staff, and community members alike, it is expected that cleanup operations will progress with the job.

Repair work will be carried out by skilled workers acceptable to the Board Representative, under the liability of the Supplier.

The Board Authorized Representative must approve all repairs and replacements prior to final payment.

60. Suspension of Bidders

At the sole discretion of the Manager of Procurement Services, any Bidder may be suspended from consideration for default of delivery, unsatisfactory performance, safety concerns, lobbying or contravention of the Bid Solicitation Document.

61. Sustainable Purchasing

The procurement needs of the Board represent a significant level of responsibility to demonstrate leadership and support for greener business practices. Integrating environmental performance and impact into supply chain decisions is a commitment to improvement of the environment and the quality of life.

Green procurement shall be viewed in the context of achieving value for money for the total life-cycle costs. It requires the inclusion of environmental impact considerations into the procurement process, including planning, acquisition, use and disposal. Value for money shall include the consideration of many environmental tangible and intangible factors when determining the total life-cycle costs and environmental impact.

62. Termination

If the Supplier fails to comply with any provision of this agreement or otherwise fails to perform its obligations hereunder in a competent manner satisfactory to the Board, the Board may give the Supplier notice in writing of such failure. If the Supplier has not remedied its failure within ten (10) working days of the said notice, the Board shall be entitled to exercise any one or more of the following remedies:

- i. The Board may terminate the contract without further notice, and exercise its rights to the Contract security provided by the Supplier.

- ii. The Board may withhold any payment due to the Supplier hereunder until the Supplier has remedied its failure.
- iii. The Board may engage the services of another Bidder to remedy the Supplier's failure, and obtain reimbursement therefore from the Supplier. The said reimbursement may be obtained either through deduction from any amounts owing to the Supplier hereunder, or through any other legal means available to the Board; or
- iv. The Board may assert any other remedy available to it in law or equity.

Unless the Board expressly agrees to the contrary, any failure of the Board to exercise any of the foregoing remedies, or the granting of any extension or indulgences, shall not be prejudicial to any right of the Board to subsequently obtain such remedies.

63. Termination for Convenience

The Board may terminate the Contract, in whole or in part, whenever the Board determine that such termination is in the best interests of the Board without showing cause, upon providing written notice to the Supplier. The Board shall pay all reasonable costs incurred by the Supplier/Contract up to the date of termination considering the Work performed and/or services were provided in accordance with the Contract and to the complete satisfaction of the Board. Payment shall be in accordance with prices as per Contract. However, in no event shall the Supplier be paid an amount, which exceeds the Total Bid Price. The Supplier will not be reimbursed for any profits which may have been anticipated but which have not been earned up to the date of termination.

64. Termination for Lack of Funding

Should the Board fail to appropriate funds to enable payments including multi-year agreements, the Board may cancel the contract without termination charges, provided the Supplier receives thirty (30) days written notice of such termination from the Board.

65. Tools and Equipment

All equipment and methods used to carry out this Contract shall be in accordance with best practices, guidelines, regulations, and standards with respect to safety and quality.

No equipment, tools or materials are to be stored or left overnight within Board property.

At the time of bid, if requested, the bidders will indicate the type of equipment that will be used to fulfill the terms and conditions of this contract. Prior to the Board entering into an agreement with the Supplier, or at any time during the Contract, the Board may, at their discretion, request an inspection of the equipment proposed for use.

It is the responsibility of the Supplier, in the event of a major mechanical equipment breakdown, to have available substitute equipment of similar capability. It shall be supplied and put into service to fulfill the timeline terms of this tender. Failure to provide alternative equipment within timeline expectations specified within this tender, may result in termination of the contract. It is the responsibility of the Supplier to ensure work

continues and deadlines are met, despite any unforeseen interruption as a result of equipment failure.

It is the Supplier's responsibility to ensure that the equipment and the operator, are licensed in accordance with the Ministry of Transportation. The Board may, at their discretion, require the Supplier to provide proof that the equipment has passed a recent (within the last 12 months) government safety inspection and that the operators are suitably licensed prior to commencement of the contract. All vehicles, tools, equipment, and voltage rated gloves requiring dielectric testing shall have current certification and all applicable documentation.

The equipment must be in good working order and the Supplier is responsible for all general and preventative maintenance, fuel, and repair and those costs shall be included in the bid. All preventative maintenance and repairs are to be conducted off peak hours. No other charges to the Board shall apply.

66. Traffic/Pedestrian Safety

Vehicles, including Couriers and movable Equipment/Machinery must take all precautions to avoid entering or driving on Board premises during nutritional breaks, before and after school hours, or anytime there are students or staff outside of the building.

67. Traffic Control and Site use

Supplier's activities shall be limited to areas for work and storage as directed by the Board. Except where expressly permitted by the Board, materials and/or equipment must not be stored within four metres of the travelled portion of any roadway. Notwithstanding the foregoing, the Supplier shall, at their own expense, remove any equipment or material, which, in the Board's opinion, constitutes a traffic hazard.

The Supplier shall plan and schedule the routes of vehicles transporting all materials to, from or within the job, so that vehicular movements are accomplished with minimum interference and interruption to traffic. This will necessitate vehicles to "slip off" or "slip on" in the direction of traffic lanes.

The Supplier shall maintain the adjacent side streets in a condition free from debris resulting from their operations, such as materials spilling from trucks. It is expected that the Supplier shall regularly inspect the surface condition of these streets and promptly dispose of all the debris.

Should the Supplier be unable to carry out the required remedial measures, the Board may carry out the necessary maintenance and the costs for the work shall be deducted from payments due to the Supplier.

The Supplier shall, at his own expense and to the satisfaction of the Board, provide all vehicular traffic control equipment, material, and labor required to perform the work in a safe manner in accordance with the "Occupational Health and Safety Act" and the "Ontario Traffic Manual" (Book 7). The Supplier shall assure that all required

forms are completed and on-site for inspection. In the event a traffic control company is contracted for the purpose of signage, information regarding the Supplier must be included in the quotation and included with the bid price.

The Supplier shall be responsible for the supply of traffic flag person(s) where required under the "Ontario Traffic Manual" (Book 7), with all costs included in the base unit price.

68. Usage Reports

The Board, at no additional cost, may request detailed usage reports or activity log reports in Excel (unprotected) to be provided annually or upon request. Reports may include but not limited to descriptions, codes, quantities, extended quantity, price.

69. Variation of Bid Prices

No variation in the Total Price, unit prices and/or provisional pricing will be permitted after Closing Time, except in the instance of variation solely due to an increase or decrease in the rate of eligible taxes, beyond the control of the Bidder, occurring after the time of submission of their Bid. An increase or a decrease in the rate of eligible taxes, under these circumstances, shall alter the price of the Bid, but only to the extent of the tax increase or decrease.

70. Volume and Exclusivity

Quantities and/or Board sites may be added, deleted or adjusted at the discretion of the Board due to but not limited to unintentional omissions, inventory adjustments, new schools/school closures and/or budget restraints.

The Board makes no guarantee of value or volume of work to be assigned to the Supplier. Any agreement executed with the Supplier may not be an exclusive contract for the provision of the described goods/services. The Board reserves the right to contract with other Supplier for good(s) and/or service(s) of the same as or similar to the deliverables or may obtain such good(s) and service(s) internally.

71. Waiver

No term or provision of the Bid Solicitation Document shall be deemed waived, and no breach consented to, unless such waiver or consent is in writing and signed by an authorized representative of the party claimed to have waived or consented to the breach. No consent by a party to, or waiver of, a breach under the procurement process shall constitute consent to, waiver of, or excuse for any other, different, or subsequent breach.

The Board does not accept responsibility for any information or any errors or omissions which may be contained in the Bid Solicitation Document, or the data, materials or documents disclosed or as provided to the Bidders pursuant to the procurement. The Board make no representation or warranty, either expressed or implied, in fact or in law with respect to the accuracy or completeness of the Bid Solicitation Document or such data, materials or documents and the Board shall not be responsible for any actions, costs, losses or liability whatsoever arising from any Bidder's reliance or use of the Bid

Solicitation Document or any other technical or historical data, materials or documents provided by the Board. The Bidder is responsible for obtaining its own independent financial, legal, accounting, and technical advice with respect to any information included in the Bid Solicitation Document or in any data, materials, or documents provided or required by the Board.

72. Warranty and Maintenance

The Supplier, at the time of substantial completion, shall furnish a written warranty covering material, maintenance, and work performed under the contract for a minimum period of two (2) years from the date of completion, unless otherwise stated. Individual sections may extend warranties beyond the two (2) year time frame. The Supplier is responsible for all required maintenance complete with materials and labour during the warranty period.

73. Work Continuity

The Supplier shall take adequate care to protect the Work, the Board's property, adjacent properties and shall be fully responsible for any damage or injury due to their act or neglect or is attributable to the acts or omissions of the Supplier, its Sub-contractors, sub-suppliers, agents, employees, officers, directors, and all other persons and other entities for whose acts the Supplier may be liable or for whom it is responsible in law and their respective officers, directors, agents and employees.

The Supplier shall ensure minimal to no disturbance to the user(s) of the surrounding facilities. Replacement and repairs due to any damage caused to any existing structure, Board equipment, public assets or private property during the Work shall be the responsibility of the Supplier.

74. Work Requirements

The Supplier shall perform entire work with minimal to no disturbance to the routine operations of the respective facility. Further, the Supplier shall ensure safety of WRDSB assets, students, staff as well as public at all times.

75. Workplace Safety Insurance Board (WSIB) Certificate

The Board requires all Suppliers and service providers be in full compliance with all requirements imposed upon them by the Workplace Safety Insurance Board. All certificates of training and Safety Policies and Manuals must be available for presentation upon request.

Prior to a formal award and commencing the services covered by this Bid Solicitation, the recommended Bidder(s) make available to the Board a copy of certificates of good standing with the Workplace Safety and Insurance Board ("WSIB Certificates") listing appropriate NAICS Code and Code Description stating that the Supplier/consultant and all of its sub-contractors/consultants have complied with the requirements of the Workplace Safety and Insurance Act and in particular, that all requisite premiums under such Act

have been paid. Where the Bidder is exempt from registration with the WSIB, the Bidder must provide evidence of such by way of written confirmation from WSIB.

WSIB Certificate evidencing renewal or replacement of Certificates listing appropriate NAICS Code and Code Description shall be uploaded through the Bidding System within 72 hours of the expiration or replacement of the current certificate, without demand by the Board.

END OF SECTION

00 73 00 “The Supplementary Conditions”

**SUPPLEMENTARY CONDITIONS & AMENDMENTS TO STANDARD CONSTRUCTION
DOCUMENT CCDC2 -2020 STIPULATED PRICE SUBCONTRACT**

(the “Supplementary Conditions”)

**AGREEMENT, DEFINITIONS, AND
GENERAL CONDITIONS**

The Standard Construction Document CCDC 2 2020 for a Stipulated Price Contract, English version, consisting of the Agreement Between *Owner* and Contractor, Definitions and General Conditions of the Stipulated Price Contract, Parts 1 to 13 inclusive, governing same, together with the changes with the new *Construction Act* is hereby made part of these *Contract Documents*, with the following amendments, additions and modifications:

AGREEMENT BETWEEN OWNER AND CONTRACTOR

ARTICLE A-1 – THE WORK

SC17.1	A-1.3	<u>Amend</u> Article A-1.3 by <u>deleting</u> all of the words after “<i>Contract Documents</i>” and <u>replace</u> them with the following” “attain .1 <i>Substantial Performance of the Work</i> by the 22 day of August in the year 2025. .2 (if applicable) <i>Occupancy</i> by the 27 day of August in the year 2025, and .3 <i>Ready-for-Takeover</i> by the 29 day of August in the year 2025.”
SC1.1		

ARTICLE A-3 – CONTRACT DOCUMENTS

SC2.1	A-3.1	<u>Add</u> the following documents to the list of <i>Contract Documents</i> in Article A-3.1: • Waterloo Region District School Board’s Supplementary Conditions & Amendments to Standard Construction Document CCDC 2-2020 Stipulated Price Subcontract, May 2022 Version, including any Special Supplementary Conditions listed in Appendix 2 thereto • <i>Drawings</i> • <i>Specifications</i> • Performance Bond (Form 32 -Performance Bond under Section 85.1 of the Act) if applicable • Labour and Material Payment Bond (Form 31 – Labour and Material Payment Bond under Section 85.1 of the Act), if applicable

ARTICLE A-4 – CONTRACT PRICE

SC3.1	A-4.4	<u>Delete</u> Article A-4.4 and <u>replace</u> it with the following: “4.4 The <i>Contract Price</i> shall remain fixed for the duration of the <i>Contract Time</i>, subject only to adjustments as provided for in the <i>Contract Documents</i>. For certainty, and without limiting the general application of the preceding sentence, the <i>Contractor</i> assumes all risks in connection with cost increases for overhead, <i>Products</i>, <i>Labour</i>, and <i>Construction Equipment</i> prescribed by the <i>Contract Documents</i> for the performance of the <i>Work</i>, and the <i>Contractor</i> assumes all responsibility for liabilities and additional costs that may arise as a result of the <i>Contractor’s</i> inclusion of any <i>Product</i>, <i>Construction Equipment</i>, <i>Supplier</i>, or <i>Subcontractor</i> in its calculation of the <i>Contract Price</i>.”

ARTICLE A-5 – PAYMENT

SC4.1	A-5.1	<u>Delete</u> Article A- 5.1 in its entirety including all subparagraphs and <u>replace</u> it with the following: “5.1 Subject to the provisions of the <i>Contract Documents</i> and the <i>Construction Act</i>, the <i>Owner</i> shall:

		.1 make progress payments to the <i>Contractor</i> on account of the <i>Contract Price</i> when due together with such <i>Value Added Taxes</i> as may be applicable to such payments, .2 upon <i>Substantial Performance of the Work</i> as certified by the <i>Consultant</i>, and on the 61st day after the publication of the certificate of <i>Substantial Performance of the Work</i>, in accordance with the <i>Construction Act</i>, there being no claims for lien registered against the title to the <i>Place of the Work</i> and no written notices of lien delivered to the <i>Owner</i>, pay the <i>Contractor</i> the unpaid balance of the 10% holdback, together with such <i>Value Added Taxes</i> as may be applicable to such payment, less any amount stated in the <i>Owner's Notice of Non-Payment</i>. .3 after <i>Ready-for-Takeover</i> has been achieved in accordance with the <i>Contract Documents</i> and the <i>Work</i> is complete, there being no claims for lien registered against the title to the <i>Place of the Work</i> and no written notices of lien delivered to the <i>Owner</i>, pay the <i>Contractor</i> any unpaid balance of the <i>Contract Price</i> in accordance with GC 5.5 – FINAL PAYMENT, excluding <i>Deficiency Holdback</i>, together with such <i>Value Added Taxes</i> as may be applicable to such payment.”
SC 4.2	A-5.2.1	Delete subparagraph 5.2.1 in its entirety and <u>replace</u> it with the following: “.1 Should either party fail to make payments as they become due under the terms of the <i>Contract</i> or in an award by arbitration or court, interest shall also become due and payable on such unpaid amounts at the prejudgment interest rate prescribed by the <i>Courts of Justice Act</i> (Ontario), as it may change from time to time.”

***NEW* ARTICLE A-9 – CONFLICT OF INTEREST**

SC3.1	A-9	<u>Add</u> new ARTICLE A-9 CONFLICT OF INTEREST as follows: “ARTICLE A-9 CONFLICT OF INTEREST 9.1 The <i>Contractor</i>, <i>Subcontractors</i> and <i>Suppliers</i> and any of their respective advisors, partners, directors, officers, employees, agents, and volunteers shall not engage in any activity or provide any services where such activity or the provision of such services creates a conflict of interest (actually or potentially, in the sole opinion of the <i>Owner</i>) with the provision of the <i>Work</i> pursuant to the <i>Contract</i>. The <i>Contractor</i> acknowledges and agrees that a conflict of interest, as described in this Article A-9, includes, but is not limited to, the use of <i>Confidential Information</i> where the <i>Owner</i> has not specifically authorized such use. 9.2 The <i>Contractor</i> shall disclose to the <i>Owner</i>, in writing, without delay, any actual or potential situation that may be reasonably interpreted as either a conflict of interest or a potential conflict of interest, including the retention of any <i>Subcontractor</i> or <i>Supplier</i> that is directly or indirectly affiliated with or related to the <i>Contractor</i>. 9.3 The <i>Contractor</i> covenants and agrees that it will not hire or retain the services of any employee or previous employee of the <i>Owner</i> where to do so constitutes a breach by such employee or previous employee of the <i>Owner's</i> conflict of interest policy, as it may be amended from time to time, until after completion of the <i>Work</i> under the <i>Contract</i>. 9.4 It is of the essence of the <i>Contract</i> that the <i>Owner</i> shall not have direct or indirect liability to any <i>Subcontractor</i> or <i>Supplier</i>, and that the <i>Owner</i> relies on the maintenance of an arm's-length relationship between the <i>Contractor</i> and its <i>Subcontractors</i> and <i>Suppliers</i>. Consistent with this fundamental term of the <i>Contract</i>, the <i>Contractor</i> will not enter into any agreement or understanding with any <i>Subcontractor</i> or <i>Supplier</i>, whether as part of any contract or any written or oral collateral agreement, pursuant to which the parties thereto agree to

		cooperate in the presentation of a claim for payment against the <i>Owner</i>, directly or through the <i>Contractor</i>, where such claim is, in whole or in part, in respect of a disputed claim by the <i>Subcontractor or Supplier</i> against the <i>Contractor</i>, where the payment to the <i>Subcontractor or Supplier</i> by the <i>Contractor</i> is agreed to be conditional or contingent on the ability to recover those amounts or a portion thereof from the <i>Owner</i>, failing which the <i>Contractor</i> shall be saved harmless from all or a portion of those claims. The <i>Contractor</i> acknowledges that any such agreement would undermine the required arm's-length relationship and constitute a conflict of interest. For greater certainty, the <i>Contractor</i> shall only be entitled to advance claims against the <i>Owner</i> for amounts pertaining to <i>Subcontractor or Supplier</i> claims where the <i>Contractor</i> has actually paid or unconditionally acknowledged liability for those claims or where those claims are the subject of litigation or binding arbitration between the <i>Subcontractor or Supplier</i> and the <i>Contractor</i> has been found liable for those claims.
	9.5	Notwithstanding paragraph 7.1.2 of GC 7.1 - OWNER'S RIGHT TO PERFORM THE WORK, TERMINATE THE CONTRACTOR'S RIGHT TO CONTINUE WITH THE WORK, OR TERMINATE THE CONTRACT, a breach of this Article A-9 by the <i>Contractor</i>, any of the <i>Subcontractors</i>, or any of their respective advisors, partners, directors, officers, employees, agents, and volunteers shall entitle the <i>Owner</i> to terminate the <i>Contract</i>, in addition to any other rights and remedies that the <i>Owner</i> has in the <i>Contract</i>, in law, or in equity."

***NEW* ARTICLE A-10 TIME OF THE ESSENCE**

SC6.1	Article A-10	<u>Add</u> the following new Article A-10 as follows: "ARTICLE A-10 TIME OF THE ESSENCE 10.1 It is agreed that one of the reasons the <i>Contractor</i> was selected by the <i>Owner</i> for this <i>Contract</i> is the <i>Contractor's</i> representation and covenant that it will attain <i>Substantial Performance, Occupancy</i> (if applicable), and <i>Ready-for-Takeover</i> within the <i>Contract Time</i> stated in Article A-1 of this <i>Contract</i>. 10.2 The <i>Contractor</i> acknowledges and agrees that it is responsible to marshal its resources and those of its <i>Subcontractors and Suppliers</i> in a manner which will permit timely attainment of <i>Substantial Performance, Occupancy</i> (if applicable), and <i>Ready-for-Takeover</i>. The <i>Contractor</i> agrees that time is of the essence of this <i>Contract</i>." 10.3 The Contractor shall pay to the Owner compensation for all additional costs and damages borne by the Board to cover costs incurred due to delay beyond contract timelines, until Ready-for-Takeover is achieved and certified pursuant to the terms of the Contract. Liquidated damages will be assessed as incurred and amounts will be payable directly to the Board. Additional costs may include, but are not limited to: temporary classrooms, temporary washrooms, additional staff, etc.
SC6.2		

DEFINITIONS

Revisions to Existing Definitions		
SC5.1	Consultant	<u>Amend</u> the definition of “Consultant” by <u>adding</u> the following to the end of the definition: “For the purposes of the <i>Contract</i>, the terms “<i>Consultant</i>”, “<i>Architect</i>” and “<i>Engineer</i>” shall be considered synonymous.”
SC5.2	Payment Legislation/Construction Act	<u>Delete</u> the Definition of <i>Payment Legislation</i> and replace it with “Construction Act” as follows: “Construction Act <i>Construction Act</i> means the <i>Construction Act</i>, R.S.O. 1990, c. C.30, as amended, including all regulations passed under it that are enforceable as of the date of execution of this <i>Contract</i>. For certainty, the first procurement process for the <i>Project</i> (i.e., the “improvement” as that term is defined in the <i>Construction Act</i>) commenced on or after October 1, 2019.”
SC5.3	Ready-for-Takeover	<u>Amend</u> the Definition of <i>Ready-for-Takeover</i> by deleting all the words after “as verified” and replacing them with “and approved by the <i>Owner</i>.”
New Definitions		
	Adjudication	<u>Add</u> the following definition: “Adjudication <i>Adjudication</i> means construction dispute interim adjudication as defined under the <i>Construction Act</i>.”
	Close-Out Documentation	<u>Add</u> the following new definition: “Close-Out Documentation <i>Close-Out Documentation</i> has the meaning given to it under GC 5.4.2.”
	Confidential Information	<u>Add</u> the following definition: “Confidential Information <i>Confidential Information</i> means all the information or material of the <i>Owner</i> that is of a proprietary or confidential nature, whether it is identified as proprietary or confidential or not, including but not limited to information and material of every kind and description (such as drawings and move-lists) which is communicated to or comes into the possession or control of the <i>Contractor</i> at any time, but <i>Confidential Information</i> shall not include information that: .1 is or becomes generally available to the public without fault or breach on the part of the <i>Contractor</i>, including without limitation breach of any duty of confidentiality owed by the <i>Contractor</i> to the <i>Owner</i> or to any third party, but only after that information becomes generally available to the public; .2 the <i>Contractor</i> can demonstrate to have been rightfully obtained by the <i>Contractor</i> from a third party who had the right to transfer or disclose it to the <i>Contractor</i> free of any obligation of confidence;

		.3 the <i>Contractor</i> can demonstrate to have been rightfully known to or in the possession of the <i>Contractor</i> at the time of disclosure, free of any obligation of confidence; or .4 is independently developed by the <i>Contractor</i> without use of any <i>Confidential Information</i>."
	Construction Schedule	<u>Add</u> the following definition: "Construction Schedule <i>Construction Schedule</i> means the schedule for the performance of the <i>Work</i> provided by the <i>Contractor</i>, and approved by the <i>Owner</i>, pursuant to GC 3.4.1, including any amendments to the <i>Construction Schedule</i> made pursuant to the <i>Contract Documents</i>."
	Construction Schedule Update	<u>Add</u> the following definition: "Construction Schedule Update <i>Construction Schedule Update</i> means an update to the <i>Construction Schedule</i> by the <i>Contractor</i> using Microsoft Project (or other approved scheduling software) that accurately depicts the progress of the <i>Work</i> relative to the critical path established in the <i>Construction Schedule</i> approved in GC 3.5.1 (or any approved successor <i>Construction Schedule</i>), aligns with the currently approved date for <i>Substantial Performance of the Work</i>, shows up-to-date projected major activity sequences and durations, and shows any changes or delays in anticipated completion dates of major activities in the <i>Work</i> relative to the last <i>Construction Schedule Update</i>, and includes the following minimum deliverables: (a) a record version of the updated <i>Construction Schedule</i> in .pdf format; (b) an editable copy of the updated original digital file of the <i>Construction Schedule</i> (e.g., .mpp format files for Microsoft Project)."
	Deficiency Holdback	<u>Add</u> the following definition: Deficiency Holdback - a value applied to the total contract value to cover the cost of completing deficiencies in, or correcting defects in The Work.
	Direct Costs	<u>Add</u> the following definition: "Direct Costs <i>Direct Costs</i> are the reasonable costs of performing the contract or subcontract including costs related to the additional supply of services or materials (including equipment rentals), insurance and surety bond premiums, and costs resulting from seasonal conditions, that would not have been incurred, but do not include indirect damages suffered, such as loss of profit, productivity or opportunity, or any head office overhead costs."
	EFT	<u>Add</u> the following definition: "EFT <i>EFT</i> has the definition given to it under GC 5.3.2."

	Excess Soil	<u>Add</u> the following definition: “Excess Soil <i>Excess Soil</i> means “excess soil” as that term is defined under section 3 of the <i>Excess Soil Regulation</i>.”
	Excess Soil Regulation	<u>Add</u> the following Definition: “Excess Soil Regulation <i>Excess Soil Regulation</i> means O. Reg. 406/19: On-Site and Excess Soil Management to the <i>Environmental Protection Act</i>, R.S.O. 1990, c. E.19.”
	Final Pre-Invoice Submission Meeting	<u>Add</u> the following ne definition: “Final Pre-Invoice Submission Meeting <i>Final Pre-Invoice Submission Meeting</i> has the meaning given to it in GC 5.5.1.”
	Force Majeure	<u>Add</u> the following definition: “Force Majeure <i>Force Majeure</i> means any cause, unknown at the effective date of the <i>Contract</i> and beyond either party’s control, other than financial difficulties, bankruptcy or insolvency, which prevents the performance by a party, or both, of any of their respective obligations under the <i>Contract</i> and the event of <i>Force Majeure</i> did not arise from a party’s default and could not be avoided or mitigated by the exercise of reasonable effort or foresight. <i>Force Majeure</i> includes <i>Labour Disputes</i>; fire; unusual delay by common carriers or unavoidable casualties; delays in obtaining third-party licences, permits, agreements, or approvals (excluding approvals of any <i>Subcontractors</i> or <i>Suppliers</i> of any tier); civil disturbance; emergency acts, orders, legislation, regulations or directives or revoking of funding from any government or other public authority; acts of a public enemy; war; riot; sabotage; blockage; embargo; lightning; earthquake; adverse weather conditions but only if substantially beyond the weather norms of the <i>Place of the Work</i>; acts of God; or declared epidemic or pandemic outbreak or other public health emergency (e.g. SARS, COVID-19).”
	Install	<u>Add</u> the following definition: “Install <i>Install</i> means install and connect. <i>Install</i> has this meaning whether or not the first letter is capitalized.”
	Labour Dispute	<u>Add</u> the following definition: “Labour Dispute <i>Labour Dispute</i> means any lawful or unlawful labour problems, work stoppage, labour disruption, strike, job action, slow down, lock-outs, picketing, refusal to work or continue to work, refusal to supply materials, cessation or work or other labour controversy which does, or might, affect the <i>Work</i>.”
	Notice of Non-Payment	<u>Add</u> the following definition:

		“Notice of Non-Payment <i>Notice of Non-Payment</i> means a notice of non-payment of holdback (Form 6) or a notice of non-payment (Form 1.1) under the <i>Act</i>, as applicable to the circumstances.”
	OHSA	<u>Add</u> the following definition: “OHSA <i>OHSA</i> means the <i>Occupational Health and Safety Act</i>, R.S.O. 1990, c. O.1, as amended, including all regulations thereto.”
	Overhead	<u>Add</u> the following definition: “Overhead <i>Overhead</i> means all site and head office operations and facilities, all site and head office administration and supervision; all duties and taxes for permits and licenses required by the authorities having jurisdiction at the <i>Place of the Work</i>; all requirements of Division 1, including but not limited to submittals, warranty, quality control, calculations, testing and inspections; meals and accommodations; and, tools, expendables and clean-up costs.”
	Payment Period	<u>Add</u> the following definition: “Payment Period <i>Payment Period</i> has the definition given to it under GC 5.2.1.”
	Pre-Invoice Submission Meeting	<u>Add</u> the following definition: “Pre-Invoice Submission Meeting <i>Pre-Invoice Submission Meeting</i> has the definition given to it under GC 5.2.1.”
	Proper Invoice	<u>Add</u> the following definition: “Proper Invoice <i>Proper Invoice</i> means a “proper invoice” as that term is defined in Section 6.1 of the <i>Act</i>, including the minimum requirements set out in Appendix “1” of the Supplementary Conditions.”
	Proper Invoice Submission Date	<u>Add</u> the following definition: “Proper Invoice Submission Date <i>Proper Invoice Submission Date</i> has the definition given to it under GC 5.2.2.1.”
	Request for Information (RFI)	<u>Add</u> the following definition: “Request for Information (RFI) <i>Request for Information</i> or <i>RFI</i> means written documentation sent by the <i>Contractor</i> to the <i>Owner</i> or to the <i>Owner’s</i> representative or the <i>Consultant</i> requesting written clarification(s) and/or interpretation(s) of the <i>Drawings</i> and/or <i>Specifications</i>, <i>Contract</i> requirements and/or other pertinent information required to complete the <i>Work</i> of the <i>Contract</i> without applying for a change or changes to the <i>Work</i>.”

	Restricted Period	Add the following definition: “Restricted Period <i>Restricted Period</i> means the (inclusive) period of time between December 1 to January 8 and August 15 to September 15 of any given year throughout the duration of the <i>Contract</i>.”

GENERAL CONDITIONS OF THE STIPULATED PRICE CONTRACT

Where a General Condition or paragraph of the General Conditions of the *Contract* is deleted by these amendments, the numbering of the remaining General Conditions or paragraphs shall remain unchanged, unless stated otherwise herein, and the numbering of the deleted item will be retained, unused.

PART 1 GENERAL PROVISIONS

GC 1.1 CONTRACT DOCUMENTS

SC5.1	1.1.3	<u>Delete</u> GC 1.1.3 in its entirety and <u>replace</u> it with the following: “1.1.3 The <i>Contractor</i> shall review the <i>Contract Documents</i> and shall report promptly to the <i>Consultant</i> any error, inconsistency, or omission the <i>Contractor</i> may discover. Such review by the <i>Contractor</i> shall be undertaken with the standard of care described in GC 3.13.1. Except for its obligation to make such a review and report the result, the <i>Contractor</i> does not assume any responsibility to the <i>Owner</i> or to the <i>Consultant</i> for the accuracy of the <i>Contract Documents</i>. Provided it has exercised the degree of care and skill described in this GC 1.1.3, the <i>Contractor</i> shall not be liable for damage or costs resulting from such errors, inconsistencies, or omissions in the <i>Contract Documents</i>, which the <i>Contractor</i> could not reasonably have discovered through the exercise of the required standard of care.”
SC5.2	1.1.4	<u>Delete</u> GC 1.1.4 in its entirety and <u>replace</u> it with the following: “1.1.4 Except for the obligation to complete the review prescribed in GC 1.1.3, and report the results as set out in this GC 1.1.4, the <i>Contractor</i> is not responsible for errors, omissions or inconsistencies in the <i>Contract Documents</i>. If there are errors, omissions or inconsistencies discovered by or made known to the <i>Contractor</i> as part of its review under GC 1.1.3 or at any time during the performance of the <i>Work</i>, the <i>Contractor</i> shall immediately notify the <i>Consultant</i>, and request instructions, a <i>Supplemental Instruction</i>, <i>Change Order</i>, or <i>Change Directive</i>, as the case may require, and shall not proceed with the <i>Work</i> affected until the <i>Contractor</i> has received corrected or additional information from the <i>Consultant</i>. The <i>Contractor</i> shall not be liable for damage or costs resulting from such errors, inconsistencies, or omissions in the <i>Contract Documents</i>, which the <i>Contractor</i> could not reasonably have discovered through the exercise of care and skill described in GC 3.13.”
	1.1.5.1	<u>Delete</u> GC 1.1.5.1 and <u>replace</u> with the following: “.1 the order of priority of documents, from highest to lowest, shall be: .1 Supplementary Conditions; .2 the Agreement between the Owner and the Contractor; .3 the Definitions; .4 the General Conditions; .5 Division 01 of the <i>Specifications</i>

		.6 technical <i>Specifications</i>; .7 material and finishing schedules; and .8 the <i>Drawings</i>.
	1.1.5.5	<u>Delete</u> GC 1.1.5.5 and <u>replace</u> with the following: “.5 Noted materials and annotations on the <i>Drawings</i> shall govern over the graphic representation of the <i>Drawings</i>.”
	1.1.5.6 to 1.1.5.8	<u>Add</u> the following new GC 1.1.5.6 to 1.1.5.8 as follows: “.6 Finishes in the room finish schedules shall govern over those shown on the <i>Drawings</i>. .7 Architectural drawings shall have precedence over structural, plumbing, mechanical, electrical and landscape drawings insofar as outlining, determining and interpreting conflicts over the required design intent of all architectural layouts and architectural elements of construction, it being understood that the integrity and installation of the systems designed by the <i>Consultant</i> or its sub-<i>Consultants</i> are to remain with each of the applicable drawing disciplines. .8 Should reference standards contained in the <i>Specifications</i> conflict with the <i>Specifications</i>, the <i>Specifications</i> shall govern. Should reference standards and <i>Specifications</i> conflict with each other or if certain requirements of the <i>Specifications</i> conflict with other requirements of the <i>Specifications</i>, the more stringent requirements shall govern.”
	1.1.9	<u>Add</u> the following to the end of GC 1.1.9: “The <i>Specifications</i> are divided into divisions and sections for convenience but shall be read as a whole and neither such division nor anything else contained in the <i>Contract Documents</i> will be construed to place responsibility on the <i>Owner</i> or the <i>Consultant</i> to settle disputes among the <i>Subcontractors</i> and <i>Suppliers</i> with respect to such divisions. The <i>Drawings</i> are, in part, diagrammatic and are intended to convey the scope of the <i>Work</i> and indicate general and appropriate locations, arrangements and sizes of fixtures, equipment, outlets and other elements. The <i>Contractor</i> shall obtain more accurate information about the locations, arrangements and sizes from study and coordination of the <i>Drawings</i>, including <i>Shop Drawings</i> and shall become familiar with conditions and spaces affecting those matters before proceeding with the <i>Work</i>. Where site conditions require reasonable minor changes where the change requires only the additional labour two hours or less, the <i>Contractor</i> shall make such changes at no additional cost to the <i>Owner</i>. Similarly, where known conditions or existing conditions interfere with new installation and require relocation, the <i>Contractor</i> shall include such relocation in the <i>Work</i>. The <i>Contractor</i> shall arrange and install fixtures and equipment in such a way as to conserve as much headroom and space as possible. The schedules are those portions of the <i>Contract Documents</i>, wherever located and whenever issued, which compile information of similar content and may consist of drawings, tables and/or lists.”
	1.1.13	<u>Add</u> new paragraphs 1.1.13 as follows: 1.1.13 The <i>Contractor</i> shall keep one copy of the current <i>Contract Documents</i>, <i>Supplemental Instructions</i>, contemplated <i>Change Orders</i>, <i>Change Orders</i>, <i>Change Directives</i>, cash allowance disbursement authorizations, reviewed <i>Shop Drawings</i>, submittals, reports and records of meeting at the <i>Place of the Work</i>, in good order and available to the <i>Owner</i> and <i>Consultant</i>.”

GC 1.3 RIGHTS AND REMEDIES

SC6.1	1.3.2	In paragraph 1.3.2 <u>delete</u> the word "No" from the beginning of the paragraph and <u>replace</u> it with the words: "Except with respect to the requirements set out in paragraphs 6.4.1, 6.5.4, 6.6.1 and 8.3.2, no..."

***NEW* GC 1.5 EXAMINATION OF DOCUMENTS AND SITE**

SC8.1	1.5	<u>Add</u> new GC 1.5 – EXAMINATION OF DOCUMENTS AND SITE as follows: "GC 1.5 EXAMINATION OF DOCUMENTS AND SITE 1.5.1 The <i>Contractor</i> declares and represents that in tendering for the <i>Work</i>, and in entering into a Contract with the <i>Owner</i> for the performance of the <i>Work</i>, it has investigated for itself the character of the <i>Work</i> to be done, based on information generally available from a visit to the <i>Place of the Work</i> and to the standard set out under GC 3.14.1 and further represents and warrants and acknowledges that it considered and took into account in the <i>Contract Price</i> all reasonably known impacts and restrictions arising from the COVID-19 pandemic, including without limitation corresponding legislative changes that may impact performance of the <i>Project</i>, various weather conditions that may affect the <i>Work</i>, the availability of supplies and labour or other conditions or risks that the <i>Contractor</i> knew about or reasonably ought to have known about prior to the date of the <i>Contract</i>. The <i>Contractor</i> has assumed and does hereby assume all risk of known conditions now existing or arising in the course of the <i>Work</i> which might or could make the <i>Work</i>, or any items thereof more expensive in character, more onerous to fulfill than was contemplated or known when the tender was made or the <i>Contract</i> signed. 1.5.2 The <i>Contractor</i> also declares that prior to commencement of the <i>Work</i>, where in tendering for the <i>Work</i> and in entering into this <i>Contract</i>, the <i>Contractor</i> relied upon information furnished by the <i>Owner</i> or any of its agents or servants respecting the nature or confirmation of the ground at the site of the <i>Work</i>, the <i>Contractor</i> shall review to the standard specified in GC 3.14.1, the accuracy of the information furnished by the <i>Owner</i>. If a condition is materially different than what is stated in the information furnished by the <i>Owner</i>, the <i>Contractor</i> shall, no later than five (5) <i>Working Days</i> after the first observation of such condition(s), deliver to the <i>Owner</i> and to the <i>Consultant</i> a <i>Notice in Writing</i> specifying the materially different condition and the <i>Contractor</i> shall not proceed with the affected part of the <i>Work</i> until receiving written direction from the <i>Owner</i> or the <i>Consultant</i>. Where the <i>Contractor</i> fails to provide prompt <i>Notice in Writing</i> in accordance with this GC 1.5.2, the <i>Contractor</i> expressly waives and releases the <i>Owner</i> from all claims with respect to the said information with respect to the <i>Work</i>.

PART 2 ADMINISTRATION OF THE CONTRACT

GC 2.2 ROLE OF THE CONSULTANT

SC11.1	2.2.5	<u>Delete</u> paragraph 2.2.4 and <u>replace</u> it with the following: "2.2.4 Upon receipt of an application for payment that satisfies the requirement of a <i>Proper Invoice</i>, based on the <i>Consultant's</i> observations and evaluation of the <i>Contractor's</i> application for payment, the <i>Consultant</i> will determine the amounts owing to the <i>Contractor</i> under the <i>Contract</i> and will issue certificates for payment as provided in Article A-5 - PAYMENT, GC 5.3 - PAYMENT, GC 5.4 SUBSTANTIAL PERFORMANCE OF THE WORK AND PAYMENT OF HOLDBACK, and GC 5.5 - FINAL PAYMENT. If the <i>Consultant</i> determines that the amount payable to the <i>Contractor</i> differs from the amount stated in a <i>Proper</i>

		<i>Invoice</i> , the <i>Consultant</i> shall notify the <i>Owner</i> as provided in GC 5.3.1.2 and prepare a draft of the applicable <i>Notice of Non-Payment</i> for the amount in dispute."
	2.2.6	In the first sentence of paragraph 2.2.6, <u>delete</u> the words "Except with respect to GC 5.1 – FINANCING INFORMATION REQUIRED OF THE OWNER".
	2.2.12	At paragraph 2.2.12, <u>insert</u> the following at end of that paragraph: "If, in the opinion of the <i>Contractor</i> , the <i>Supplemental Instruction</i> involves an adjustment in the <i>Contract Price</i> or in the <i>Contract Time</i> , it shall, within ten (10) <i>Working Days</i> of receipt of a <i>Supplemental Instruction</i> , provide the <i>Consultant</i> with a notice in writing to that effect. Failure to provide written notification within the time stipulated in this paragraph 2.2.12 shall be deemed an acceptance of the <i>Supplemental Instruction</i> by the <i>Contractor</i> , without any adjustment in the <i>Contract Price</i> or <i>Contract Time</i> ."

GC 2.3 REVIEW AND INSPECTION OF THE WORK

SC10.1	2.3.2	<u>Amend</u> paragraph 2.3.2 by <u>adding</u> the words "and <i>Owner</i> " after the words " <i>Consultant</i> " in the second and third lines.
	2.3.3	<u>Delete</u> paragraph 2.3.3 in its entirety and <u>replace</u> it with the following: "2.3.3 The <i>Contractor</i> shall furnish promptly two copies to the <i>Consultant</i> and one copy to the <i>Owner</i> of all certificates and inspection reports relating to the <i>Work</i> ."
	2.3.4	In paragraph 2.3.4 <u>add</u> the word "review" after the word "inspections" in the first and second lines of paragraph 2.3.4.
	2.3.5	In paragraph 2.3.5 in the first line after the word " <i>Consultant</i> ", <u>add</u> "or the <i>Owner</i> ".
	2.3.8	<u>Add</u> a new paragraph 2.3.8 as follows: "2.3.8 The <i>Consultant</i> will conduct periodic reviews of the <i>Work</i> in progress, to determine general conformance with the requirements of the <i>Contract Documents</i> . Such reviews, or lack thereof, shall not give rise to any claims by the <i>Contractor</i> in connection with construction means, methods, techniques, sequences and procedures, nor in connection with construction safety at the <i>Place of Work</i> , responsibility for which belongs exclusively to the <i>Contractor</i> ."

GC 2.4 DEFECTIVE WORK

SC11.1	2.4.1	<u>Amend</u> GC 2.4.1 by inserting ", the <i>Owner</i> and/or its agent" in the first sentence following "rejected by the <i>Consultant</i> ".
	2.4.1.1 to 2.4.1.2	<u>Add</u> new paragraphs 2.4.1.1 and 2.4.1.2 as follows: "2.4.1.1 The <i>Contractor</i> shall rectify, in a manner acceptable to the <i>Consultant</i> and to the <i>Owner through the Consultant</i> all defective work and deficiencies throughout the <i>Work</i> , whether or not they are specifically identified by the <i>Consultant</i> . 2.4.1.2 The <i>Contractor</i> shall prioritize the correction of any defective work, which, in the sole discretion of the <i>Owner through the Consultant</i> , adversely affects the day to day operations of the <i>Owner</i> or which, in the sole discretion of the <i>Consultant</i> , adversely affects the progress of the <i>Work</i> ."

	2.4.2	<u>Delete</u> paragraph 2.4.2 in its entirety and <u>replace</u> it with the following: "2.4.2 The <i>Contractor</i> shall promptly pay the <i>Owner</i> for costs incurred by the <i>Owner</i> , the <i>Owner's</i> own forces or the <i>Owner's</i> other contractors, for work destroyed or damaged or any alterations necessitated by the <i>Contractor's</i> removal, replacement or re-execution of defective work."
	2.4.4	<u>Add</u> new paragraph 2.4.4 as follows: "2.4.4 Neither acceptance of the <i>Work</i> by the <i>Consultant</i> or the <i>Owner</i> , nor any failure by the <i>Consultant</i> or the <i>Owner</i> to identify, observe or warn of defective <i>Work</i> or any deficiency in the <i>Work</i> shall relieve the <i>Contractor</i> from the sole responsibility for rectifying such defect or deficiency at the <i>Contractor's</i> sole cost, even where such failure to identify, observe or warn is negligent."

PART 3 EXECUTION OF THE WORK

GC 3.1 CONTROL OF THE WORK

SC12.1	3.1.2	Amend paragraph 3.1.2 by <u>inserting</u> the words "Construction Schedule" after the word "sequences".
SC12.2	3.1.3 & 3.1.4	<u>Add</u> new paragraphs 3.1.3 and 3.1.4 as follows: "3.1.3 Prior to commencing individual procurement, fabrication and construction activities, the <i>Contractor</i> shall verify at the <i>Place of the Work</i> , all relevant measurements and levels necessary for proper and complete fabrication, assembly and installation of the <i>Work</i> and shall further carefully compare such field measurements and conditions with the requirements of the <i>Contract Documents</i> . Where dimensions are not included or exact locations are not apparent, the <i>Contractor</i> shall immediately notify the <i>Consultant</i> in writing and obtain written instructions from the <i>Consultant</i> before proceedings with any part of the affected <i>Work</i> . 3.1.4 Notwithstanding the provisions of paragraphs 3.1.1 and 3.1.2, the <i>Owner</i> shall have access to the site at all times to monitor all aspects of construction. Such access shall in no circumstances affect the obligations of the <i>Contractor</i> to fulfill its contractual obligations."

GC 3.2 CONSTRUCTION BY OWNER OR OTHER CONTRACTORS

SC13.1	3.2.2.1	<u>Delete</u> subparagraph 3.2.2.1 and <u>replace</u> it with "[Intentionally left blank]".
	3.2.3.2	<u>Delete</u> subparagraph 3.2.3.2 and <u>replace</u> it with the following: ".2 co-ordinate and schedule the activities and work of other contractors and the <i>Owner's</i> own forces, including where other contractors or the <i>Owner's</i> own forces are used after the <i>Owner</i> and the <i>Contractor</i> cannot reach agreement on the value of a change, with the <i>Work</i> of the <i>Contractor</i> and connect as specified or shown in the <i>Contract Documents</i> ."
	3.2.3.4	<u>Delete</u> the period at the end of subparagraph 3.2.3.4 and <u>replace</u> it with a semicolon.
	3.2.3.5	<u>Add</u> new subparagraph 3.2.3.5 as follows: ".5 Subject to GC 9.4 CONSTRUCTION SAFETY, for the <i>Owner's</i> own forces and for other contractors, assume overall responsibility for compliance with all aspects of the applicable health and safety legislation in force at the <i>Place of the Work</i> , including all of the responsibilities of the "constructor", pursuant to the <i>OHSA</i> ."

GC 3.3 TEMPORARY WORK

SC14.1	3.3.2	In paragraph 3.3.2, in the second line after the words “where required by law”, insert “or by the <i>Consultant</i> ”.

GC 3.4 CONSTRUCTION SCHEDULE

SC17.1	3.4.1	<u>Delete</u> GC 3.4.1 in its entirety and <u>replace</u> it with the following: “3.4.1 The <i>Contractor</i> shall: 1 within five (5) calendar days of receiving written confirmation of the award of the <i>Contract</i>, prepare and submit to the <i>Owner</i> and the <i>Consultant</i> for their review and approval, a construction schedule in the format indicated below that indicates the timing of the activities of the <i>Work</i> and provides sufficient detail of the critical events and their inter-relationship to demonstrate the <i>Work</i> will be performed in conformity with the <i>Contract Time</i> and in accordance with the <i>Contract Documents</i>. Such schedule is to include a delivery schedule for <i>Products</i> whose delivery is critical to the schedule for the <i>Work</i> or are required by the <i>Contract</i> to be included in a <i>Products</i> delivery schedule. The <i>Contractor</i> shall employ construction scheduling software, being the latest version of “Microsoft Project”, that permits the progress of the <i>Work</i> to be monitored in relation to the critical path established in the schedule. The <i>Contractor</i> shall provide such schedule and any successor or revised schedules in both original digital file format (e.g., .mpp format for Microsoft Project), portable data file (PDF) format, and hard copy. Once accepted by the <i>Owner</i> and the <i>Consultant</i>, the construction schedule submitted by the <i>Contractor</i> shall become the baseline “Construction Schedule”; .2 provide the expertise and resources, such resources including manpower equipment and tools, as are necessary on a best efforts basis to maintain progress under the accepted baseline <i>Construction Schedule</i> or revised construction schedule accepted by the <i>Owner</i> pursuant to GC 3.4 CONSTRUCTION SCHEDULE, which includes without limitation, the <i>Contractor’s</i> use of all possible and, if necessary, extraordinary measures, to bring the progress of the <i>Work</i> into compliance with the <i>Construction Schedule</i>, such as (i) increasing the presence of its own forces at the <i>Place of the Work</i>; (ii) directing any <i>Subcontractors</i> or <i>Suppliers</i> to increase their labour forces and equipment; (iii) working overtime and extra shifts; and (iv) providing any additional supervision and coordination of the <i>Project</i>, all at the <i>Contractor’s</i> own cost and expense save and except where GC 6.5.1, 6.5.2, or 6.5.3 apply; and, .3 monitor the progress of the <i>Work</i> on a weekly basis relative to the baseline <i>Construction Schedule</i>, or any revised <i>Construction Schedule</i> accepted by the <i>Owner</i> pursuant to GC 3.4 CONSTRUCTION SCHEDULE, deliver a <i>Construction Schedule Update</i> to the <i>Consultant</i> and <i>Owner</i> with each application for payment, at a minimum, or as may be reasonably required by the <i>Consultant</i> and advise the <i>Consultant</i> and the <i>Owner</i> weekly in writing of any variation from the baseline or slippage in the schedule; and, .4 if after applying the expertise and resources required under paragraph 3.4.1.2, the <i>Contractor</i> forms the opinion that the slippage in schedule reported in paragraph 3.4.1.3

		cannot be recovered by the <i>Contractor</i>, it shall, in the same notice provided under paragraph 3.4.1.3, indicate to the <i>Consultant</i> if the <i>Contractor</i> intends to apply for an extension of <i>Contract Time</i> as provided in PART 6 —CHANGES IN THE WORK; and, .5 ensure that the <i>Contract Price</i> shall include all costs required to phase or stage the <i>Work</i>.”
	3.4.2	<u>Add</u> new GC 3.4.2 and GC 3.4.3 as follows: “3.4.2 If, at any time, it should appear to the <i>Owner</i> or the <i>Consultant</i> that the actual progress of the <i>Work</i> is behind schedule or is likely to become behind schedule, or if the <i>Contractor</i> has given notice of such to the <i>Owner</i> or the <i>Consultant</i> pursuant to GC 3.4.1.3, the <i>Contractor</i> shall, either at the request of the <i>Owner</i> or the <i>Consultant</i>, or following giving notice pursuant to GC 3.4.1.3, take appropriate steps to cause the actual progress of the <i>Work</i> to conform to the schedule or minimize the resulting delay. Within 5 calendar days of the request by the <i>Owner</i> or the <i>Consultant</i> or the notice being given pursuant to GC 3.4.1.3, the <i>Contractor</i> shall produce and present to the <i>Owner</i> and the <i>Consultant</i> a plan demonstrating how the <i>Contractor</i> will recover the performance of the <i>Work</i> to align with the currently approved <i>Construction Schedule</i>. 3.4.3 The <i>Contractor</i> shall not amend the <i>Construction Schedule</i> without the prior written consent of the <i>Owner</i>.. Any revisions to the <i>Construction Schedule</i> approved by the <i>Owner</i> shall not be deemed to be an extension of the <i>Contract Time</i>. All requests by the <i>Contractor</i> for a revision to the <i>Construction Schedule</i> that include an extension to the <i>Contract Time</i> must be approved by the <i>Owner</i> through an executed <i>Change Order</i>.”

GC 3.5 SUPERVISION

SC17.1	3.5.1	<u>Delete</u> GC 3.5.1 and <u>replace</u> it with the following: “3.5.1 The <i>Contractor</i> shall employ a competent full-time superintendent, acceptable to the <i>Owner</i> and <i>Consultant</i>, who shall be in full time attendance at the <i>Place of the Work</i> while the <i>Work</i> is being performed. The superintendent shall not be changed by the <i>Contractor</i> without valid reason which shall be provided in writing and shall not be changed without prior consultation with and agreement by the <i>Owner</i> and the <i>Consultant</i>. The <i>Contractor</i> shall replace the superintendent within 7 <i>Working Days</i> of the <i>Owner’s</i> written notification, if the superintendent’s performance is not acceptable to the <i>Owner</i>. The <i>Contractor</i> shall provide the <i>Owner</i> and the <i>Consultant</i> with the names, addresses and telephone numbers of the superintendent referred to in this GC 3.5.1 and other responsible persons who may be contacted for emergency and other reasons during non-working hours. .”
	3.5.2	<u>Delete</u> GC 3.5.2 and <u>replace</u> it with the following: “3.5.2 The superintendent, and any project manager appointed by the <i>Contractor</i>, shall represent the <i>Contractor</i> at the <i>Place of the Work</i> and shall have full authority to act on written instructions given by the <i>Consultant</i> and/or the <i>Owner</i>. Instructions given to the

		superintendent or the project manager shall be deemed to have been given to the <i>Contractor</i> and both the superintendent and any project manager shall have full authority to act on behalf of the <i>Contractor</i> and bind the <i>Contractor</i> in matters related to the <i>Contract</i> ."
	3.5.3 to 3.5.6	<u>Add</u> new GC 3.5.3, 3.5.4, 3.5.5 and 3.5.6 as follows: "3.5.3 The <i>Owner</i> may, at any time during the course of the <i>Work</i>, request the replacement of the appointed representative(s). Immediately upon receipt of the request, the <i>Contractor</i> shall make arrangements to appoint an acceptable replacement, which is approved by the <i>Owner</i>. 3.5.4 The supervisory staff assigned to the <i>Project</i> shall also be fully competent to implement efficiently all requirements for scheduling, coordination, field engineering, reviews, inspections and submittals defined in the <i>Specifications</i>, and have a minimum 5 years documented "Superintendent/Project Management" experience. 3.5.5 The <i>Consultant and Owner</i> shall reserve the right to review the record of experience and credentials of supervisory staff assigned to the <i>Project</i> prior to commencement of the <i>Work</i>. 3.5.6 A superintendent assigned to the <i>Work</i> shall be "Gold Seal Certified" as per the Canadian Construction Association; or a superintendent that can demonstrate the requisite experience and success related to the <i>Project</i> to the sole satisfaction of the <i>Owner</i>."

GC 3.6 SUBCONTRACTORS AND SUPPLIERS

SC18.1	3.6.1.1	In paragraph 3.6.1.1 <u>add</u> to the end of the second line the words "including any warranties and service agreements which extend beyond the term of the <i>Contract</i> ."
	3.6.1.2	In subparagraph 3.6.1.2 after the words "the <i>Contract Documents</i> " <u>add</u> the words "including any required surety bonding".
	3.6.2	<u>Delete</u> paragraph 3.6.2. in its entirety and <u>replace</u> it with the following: "3.6.2 The substitution of any <i>Subcontractor</i> and/or <i>Suppliers</i> after submission of the <i>Contractor's</i> bid will not be accepted unless a valid reason is given in writing to and approved by the <i>Owner</i>, whose approval may be arbitrarily withheld. The reason for substitution must be provided to the <i>Owner</i> and to the original <i>Subcontractor</i> and/or <i>Supplier</i> and the <i>Subcontractor</i> and/or <i>Supplier</i> shall be given the opportunity to reply to the <i>Contractor</i> and <i>Owner</i>. The <i>Contractor</i> shall be fully aware of the capability of each <i>Subcontractor</i> and/or <i>Supplier</i> included in its bid, including but not limited to technical ability, financial stability and ability to maintain the proposed construction schedule."
	3.6.7, 3.6.8, 3.6.9 & 3.6.10	<u>Add</u> new paragraphs 3.6.7, 3.6.8, 3.6.9, and 3.6.10 as follows: "3.6.7 The <i>Contractor</i> represents and warrants that it has confirmed the availability of its <i>Subcontractors</i> for the <i>Project</i> and, in particular, for the performance of their respective portions of the <i>Work</i> to ensure completion of the <i>Project</i> within the <i>Contract Price</i> and the <i>Contract Time</i>.

		3.6.8 The <i>Consultant</i> or the <i>Owner</i>, acting reasonably, may from time to time require the <i>Contractor</i> to remove from the <i>Project</i> any personnel of the <i>Contractor</i>, including project managers, superintendents or <i>Subcontractors</i>. Such persons shall be replaced by the <i>Contractor</i> in a timely fashion to the satisfaction of the <i>Consultant</i> or the <i>Owner</i>, as the case may be, at no cost to the <i>Owner</i>. 3.6.9 Where provided in the <i>Contract</i>, the <i>Owner</i> may assign to the <i>Contractor</i>, and the <i>Contractor</i> agrees to accept, any contract procured by the <i>Owner</i> for <i>Work</i> or services required on the <i>Project</i> that has been pre-tendered or pre-negotiated by the <i>Owner</i>, and upon such assignment, the <i>Owner</i> shall have no further liability to any party for such contract. 3.6.10 The <i>Contractor</i> covenants that each subcontract or supply contract which the <i>Contractor</i> enters into for the purpose of performing the <i>Work</i> shall expressly provide for the assignment thereof to the <i>Owner</i> (at the option of the <i>Owner</i>) and the assumption by the <i>Owner</i> of the obligations of the <i>Contractor</i> thereunder, upon the termination of the <i>Contract</i> and upon written notice by the <i>Owner</i> to the other parties to such subcontracts or supply contracts, without the imposition of further terms or conditions; provided, however, that until the <i>Owner</i> has given such notice, nothing herein contained shall be deemed to create any contractual or other liability upon the <i>Owner</i> for the performance of obligations under such subcontracts or supply contracts and the <i>Contractor</i> shall be fully responsible for all of its obligations and liabilities (if any) under such subcontracts and supply contracts."

GC 3.7 LABOUR AND PRODUCTS

SC19.1	3.7.1	<u>Amend</u> paragraph 3.7.1 by <u>adding</u> the words, "..., agents, <i>Subcontractors</i> and <i>Suppliers</i> ..." after the word "employees" in the first line.
SC19.2	3.7.2	<u>Delete</u> paragraph 3.7.2 and <u>substitute</u> with the following: "3.7.2 <i>Products</i> provided shall be new and shall conform to all current applicable specifications of the Canadian Standards Association, Canadian Standards Board or General Standards Board, ASTM, National Building Code, provincial and municipal building codes, fire safety standards, and all governmental authorities and regulatory agencies having jurisdiction at the <i>Place of the Work</i>, unless otherwise specified. <i>Products</i> which are not specified shall be of a quality consistent with those specified and their use acceptable to the <i>Consultant</i>. <i>Products</i> brought on to the <i>Place of the Work</i> by the <i>Contractor</i> shall be deemed to be the property of the <i>Owner</i>, but the <i>Owner</i> shall be under no liability for loss thereof or damage thereto arising from any cause whatsoever. The said <i>Products</i> shall be at the sole risk of the <i>Contractor</i>. Workmanship shall be, in every respect, first class and the <i>Work</i> shall be performed in accordance with the best modern industry practice."
	3.7.4 to 3.7.8	<u>Add</u> new paragraphs 3.7.4, 3.7.5, 3.7.6, 3.7.7, and 3.7.8 as follows: "3.7.4 Upon receipt of a <i>Notice in Writing</i> from the <i>Owner</i>, the <i>Contractor</i> shall immediately remove from the <i>Place of the Work</i>, tradesmen and labourers or anyone whose conduct jeopardizes the safety of the <i>Owner's</i> operations or who are considered by the <i>Owner</i> or the <i>Consultant</i> to be unskilled or otherwise objectionable. Immediately upon receipt of the request, the <i>Contractor</i> shall make arrangements to appoint an acceptable replacement.

		3.7.5 The <i>Contractor</i> shall cooperate with the <i>Owner</i> and its representatives and shall take all reasonable and necessary actions to maintain stable and harmonious labour relations with respect to the <i>Work</i> at the <i>Place of the Work</i>, including cooperation to attempt to avoid <i>Work</i> stoppages, trade union jurisdictional disputes and other <i>Labour Disputes</i>. Any costs arising from labour disputes shall be at the sole expense of the <i>Contractor</i>. 3.7.6 The cost for overtime required beyond the normal <i>Working Day</i> to complete individual construction operations of a continuous nature, such as pouring or finishing of concrete or similar work, or <i>Work</i> that the <i>Contractor</i> elects to perform at overtime rates without the <i>Owner</i> requesting it, shall not be chargeable to the <i>Owner</i>. 3.7.7 All manufactured <i>Products</i> which are identified by their proprietary names or by part or catalogue number in the <i>Specifications</i> shall be used by the <i>Contractor</i>. No substitutes for such specified <i>Products</i> shall be used without the written approval of the <i>Owner</i> and the <i>Consultant</i>. Substitutes will only be considered by the <i>Consultant</i> when submitted in sufficient time to permit proper review and investigation. When requesting approval for the use of substitutes, the <i>Contractor</i> shall include in its submission any proposed change in the <i>Contract Price</i>. The <i>Contractor</i> shall use all proprietary <i>Products</i> in strict accordance with the manufacturer's directions. Where there is a choice of proprietary <i>Products</i> specified for one use, the <i>Contractor</i> may select any one of the <i>Products</i> so specified for this use. 3.7.8 Materials, appliances, equipment and other <i>Products</i> are sometimes specified by reference to brand names, proprietary names, trademarks or symbols. In such cases, the name of a manufacturer, distributor, <i>Supplier</i> or dealer is sometimes given to assist the <i>Contractor</i> to find a source <i>Supplier</i>. This shall not relieve the <i>Contractor</i> from its responsibility from finding its own source of supply even if the source names no longer supplies the <i>Product</i> specified. If the <i>Contractor</i> is unable to obtain the specified <i>Product</i>, the <i>Contractor</i> shall supply a substitute product equal to or better than the specified <i>Product</i>, as approved by the <i>Consultant</i> with no extra compensation. Should the <i>Contractor</i> be unable to obtain a substitute <i>Product</i> equal to or superior to the specified <i>Product</i> and the <i>Owner</i> accepts a different <i>Product</i>, the <i>Contract Price</i> shall be adjusted accordingly, as approved by the <i>Consultant</i>."

GC 3.8 SHOP DRAWINGS

SC21.1	3.8.1	<u>Delete</u> paragraph 3.8.1 in its entirety and <u>replace</u> with the following: "3.8.1 The <i>Contractor</i> shall provide shop drawings as described in the <i>Contract Documents</i> and as the <i>Consultant</i> may reasonably request."
	3.8.3	<u>Delete</u> paragraph 3.8.3 and <u>replace</u> it with the following: "3.8.3 The <i>Contractor</i> shall prepare a <i>Shop Drawings</i> schedule acceptable to the <i>Owner</i> and the <i>Consultant</i> prior to the first application for payment. A draft of the proposed <i>Shop Drawings</i> schedule shall be submitted by the <i>Contractor</i> to the <i>Consultant</i> and the <i>Owner</i> for approval. The draft <i>Shop Drawings</i> schedule shall clearly indicate the phasing of <i>Shop</i>

		<i>Drawings</i> submissions. The <i>Contractor</i> shall periodically re-submit the <i>Shop Drawings</i> schedule to correspond to changes in the <i>Construction Schedule</i> ."
	3.8.5	<u>Delete</u> paragraph 3.8.5 in its entirety and <u>substitute</u> the following: "3.8.5 At the time of providing <i>Shop Drawings</i> , the <i>Contractor</i> shall advise the <i>Consultant</i> in writing of any deviations in <i>Shop Drawings</i> from the requirements of the <i>Contract Documents</i> . The <i>Consultant</i> shall indicate the acceptance of such deviation expressly in writing. Where manufacturers' literature is submitted in lieu of scaled drawings, it shall be clearly marked in ink, to indicate the specific items for which review is requested."
	3.8.8 to 3.8.12	<u>Add</u> new paragraphs 3.8.8, 3.8.9, 3.8.10, 3.8.11, and 3.8.12 as follows: "3.8.8 Reviewed <i>Shop Drawings</i> shall not authorize a change in the <i>Contract Price</i> and/or the <i>Contract Time</i> . 3.8.9 Except where the parties have agreed to a different <i>Shop Drawings</i> schedule pursuant to paragraph 3.10.3, the <i>Contractor</i> shall comply with the requirements for <i>Shop Drawings</i> submissions stated in the <i>Specifications</i> . 3.8.10 The <i>Contractor</i> shall not use the term "by others" on <i>Shop Drawings</i> or other submittals. The related trade, <i>Subcontractor</i> or <i>Supplier</i> shall be stated. 3.8.11 Certain <i>Specifications</i> sections require the <i>Shop Drawings</i> to bear the seal and signature of a professional engineer. Such professional engineer must be registered in the jurisdiction of the <i>Place of the Work</i> and shall have expertise in the area of practice reflected in the <i>Shop Drawings</i> . 3.8.12 The <i>Consultant</i> will review and return <i>Shop Drawings</i> and submittals in accordance with the schedule agreed upon in paragraph 3.10.3, The <i>Contractor</i> shall allow the <i>Consultant</i> a minimum of 10 <i>Working Days</i> to review <i>Shop Drawings</i> from the date of receipt. If resubmission of <i>Shop Drawings</i> is required, a further 10 <i>Working Day</i> period is required for the <i>Consultant's</i> review."

***NEW* GC 3.9 USE OF THE WORK**

SC22.1	GC 3.9	<u>Add</u> new GC 3.9 – USE OF THE WORK as follows: "GC 3.9 USE OF THE WORK 3.9.1 The <i>Contractor</i> shall confine <i>Construction Equipment</i> , <i>Temporary Work</i> , storage of <i>Products</i> , waste products and debris, and operations of employees and <i>Subcontractors</i> to limits indicated by laws, ordinances, permits, by the direction of the <i>Owner</i> or the <i>Consultant</i> , or the <i>Contract Documents</i> and shall not unreasonably encumber the <i>Place of the Work</i> . 3.9.2 The <i>Contractor</i> shall not load or permit to be loaded any part of the <i>Work</i> with a weight or force that will endanger the safety of the <i>Work</i> .

		3.9.3 The <i>Owner</i> shall have the right to enter or occupy the <i>Place of the Work</i> in whole or in part for the purpose of placing fittings and equipment, or for other use before <i>Substantial Performance of the Work</i>, if, in the opinion of the <i>Consultant</i>, such entry and occupation does not prevent or substantially interfere with the <i>Contractor</i> in the performance of the <i>Contract</i> within the <i>Contract Time</i>. Such entry or occupation shall neither be considered as acceptance of the <i>Work</i> or in any way relieves the <i>Contractor</i> from its responsibility to complete the <i>Contract</i>."

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***NEW* GC 3.10 CUTTING AND REMEDIAL WORK**

SC23.1	GC 3.10	Add new GC 3.10 – CUTTING AND REMEDIAL WORK as follows: "GC 3.10 CUTTING AND REMEDIAL WORK 3.10.1 The <i>Contractor</i> shall perform the cutting and remedial work required to make the affected parts of the <i>Work</i> come together properly. Such cutting and remedial work shall be performed by specialists familiar with the <i>Products</i> affected and shall be performed in a manner to neither damage nor endanger the <i>Work</i>. 3.10.2 The <i>Contractor</i> shall coordinate the <i>Work</i> to ensure all cutting and remedial work required is kept to a minimum. 3.10.3 Unless specifically stated otherwise in the <i>Specifications</i>, the <i>Contractor</i> shall do all cutting and making good necessary for the proper installation and performance of the <i>Work</i>. 3.10.4 To avoid unnecessary cutting, the <i>Contractor</i> shall lay out its work and advise the <i>Subcontractors</i>, when necessary, where to leave holes for installation of pipes and other work."

***NEW* GC 3.11 CLEAN UP**

SC24.1	3.11.1, 3.11.2, 3.11.3, 3.11.4, 3.11.5 & 3.11.6	Add new paragraphs 3.11.1, 3.11.2, 3.11.3, 3.11.4, 3.11.5, and 3.11.6 as follows: "3.11.1 The <i>Contractor</i> shall maintain the <i>Work</i> in a safe and tidy condition and free from the accumulation of waste products and debris, other than that caused by the <i>Owner</i>, other contractors or their employees. The <i>Contractor</i> shall remove accumulated waste and debris at least once a week as a minimum or as required by the nature of the <i>Work</i>. 3.11.2 Before applying for <i>Substantial Performance of the Work</i>, the <i>Contractor</i> shall remove waste products and debris, other than that resulting from the work of the <i>Owner</i>, other contractors or their employees, and shall leave the <i>Place of the Work</i> clean and suitable for use or occupancy by the <i>Owner</i>. The <i>Contractor</i> shall remove products, tools, materials, <i>Construction Equipment</i>, and <i>Temporary Work</i> not required for the performance of the remaining work.

		3.11.3 As a condition precedent to submitting its application for final payment, the <i>Contractor</i> shall remove any remaining products, tools, materials, <i>Construction Equipment</i>, <i>Temporary Work</i>, and waste products and debris, other than those resulting from the work of the <i>Owner</i>, other contractors or their employees. 3.11.4 The <i>Contractor</i> shall clean up garbage during and after construction and maintain the <i>Place of the Work</i> in a neat and orderly condition on a daily basis. Prior to leaving the <i>Place of the Work</i> and following completion of the <i>Work</i>, the <i>Contractor</i> shall make good all damage to the building and its components caused by the performance of the <i>Work</i> or by any <i>Subcontractor</i> or <i>Supplier</i>. The <i>Contractor</i> shall leave the <i>Place of the Work</i> in a clean and finished state; remove all <i>Construction Equipment</i> and materials; remove all paint, stains, labels, dirt, etc. from the <i>Place of the Work</i>; and touch up all damaged painted areas (if applicable). The <i>Contractor</i> shall be responsible for restoring those areas of the <i>Place of the Work</i>, impacted by the <i>Work</i>, to their original condition." 3.11.5 Without limitation to or waiver of the <i>Owner's</i> other rights and remedies, the <i>Owner</i> shall have the right to back charge to the <i>Contractor</i> the cost of damage to the site caused by transportation in and out of the <i>Place of the Work</i> by the <i>Contractor</i>, <i>Subcontractors</i> or <i>Suppliers</i>, if not repaired before final payment. 3.11.6 The <i>Contractor</i> shall dispose of debris at a location and in a manner acceptable to the <i>Owner</i> (and to the authorities having jurisdiction at the <i>Place of the Work</i> and at the disposal area) and the <i>Contractor</i> shall cover containers with tarpaulins."

***NEW* GC 3.12 EXCESS SOIL MANAGEMENT**

SC25.1	GC 3.12	<u>Add</u> new GC 3.12 – EXCESS SOIL MANAGEMENT as follows: "GC 3.12 EXCESS SOIL MANAGEMENT 3.12.1 The <i>Contractor</i> shall be solely responsible for the proper management of all <i>Excess Soil</i> at the <i>Place of the Work</i> and for performance of the <i>Work</i> in compliance with the rules, regulations and practices required by the <i>Excess Soil Regulation</i> until such time as <i>Ready-for-Takeover</i> is achieved. Without restricting the generality of the previous sentence, the <i>Contractor's</i> responsibility under this GC 3.12 includes the designation, transportation, tracking, temporary and/or final placement, record keeping, and reporting of all <i>Excess Soil</i> in connection with the <i>Work</i> all in compliance with the <i>Excess Soil Regulation</i>. 3.12.3 The <i>Contractor</i> shall indemnify and save harmless the <i>Owner</i>, their agents, officers, directors, administrators, employees, consultants, successors and assigns from and against the consequences of any and all health and safety infractions committed directly by the <i>Contractor</i>, or those for whom it is responsible at law, under the <i>Excess Soil Regulation</i>, or any environmental protection legislation, including the payment of legal fees and disbursements on a substantial indemnity basis. Such indemnity shall apply to the extent to which the <i>Owner</i> is not covered by insurance."

***NEW* GC 3.13 CONTRACTOR STANDARD OF CARE**

SC25.1	3.13	<u>Add</u> a new GC 3.13 – CONTRACTOR STANDARD OF CARE as follows: “GC 3.13 CONTRACTOR STANDARD OF CARE “3.13.1 In performing its services and obligations under the <i>Contract</i>, the <i>Contractor</i> shall exercise the standard of care, skill and diligence that would normally be provided by an experienced and prudent contractor supplying similar services for similar projects. The <i>Contractor</i> acknowledges and agrees that throughout the <i>Contract</i>, the performance of the <i>Contractor’s</i> obligations, duties and responsibilities shall be interpreted in accordance with this standard. The <i>Contractor</i> shall exercise the same standard of care, skill and diligence in respect of any <i>Products</i>, personnel or procedures which it may recommend to the <i>Owner</i> or employ on the <i>Project</i>. 3.13.2 The <i>Contractor</i> further represents, covenants and warrants to the <i>Owner</i> that: .1 the personnel it assigns to the <i>Project</i> are appropriately experienced; .2 it has a sufficient staff of qualified and competent personnel to replace any of its appointed representatives, subject to the <i>Owner’s</i> approval, in the event of death, incapacity, removal or resignation; and .3 there are no pending, threatened or anticipated claims, liabilities or contingent liabilities that would have a material effect on the financial ability of the <i>Contractor</i> to perform its work under the <i>Contract</i>.”

PART 4 ALLOWANCES

GC 4.1 CASH ALLOWANCES

SC27.1	4.1.3	In GC 4.1.3 <u>delete</u> the words “through the <i>Consultant</i> ” and <u>replace</u> them with “in writing.”
	4.1.4	<u>Delete</u> GC 4.1.4 in its entirety and <u>replace</u> it with the following: “4.1.4 Where the actual cost of the <i>Work</i> under any cash allowance exceeds the amount of the allowance, any unexpended amounts from other cash allowances shall be reallocated, by the <i>Consultant</i> at the <i>Owner’s</i> direction, to cover the shortfall, and, in that case, there shall be no additional amount added to the <i>Contract Price</i> for overhead and profit. Only where the actual cost of the <i>Work</i> under all cash allowances exceeds the total amount of all cash allowances shall the <i>Contractor</i> be compensated for the excess incurred and substantiated, plus an amount for overhead and profit on the excess only, as set out in the <i>Contract Documents</i>.”
	4.1.7	<u>Delete</u> GC 4.1.7 in its entirety and <u>replace</u> it with the following:

		"4.1.7 The net amount of any unexpended cash allowances, after providing for any reallocations as contemplated in paragraph 4.1.4, shall be deducted from the <i>Contract Price</i> by <i>Change Order</i> without any adjustment for the <i>Contractor's</i> overhead and profit on such amount."
	4.1.8 and 4.1.9	<u>Add</u> new GC 4.1.8 and 4.1.9 as follows: "4.1.8 The <i>Owner</i> reserves the right to call, or to have the <i>Contractor</i> call, for competitive bids for portions of the <i>Work</i> to be paid for from cash allowances. 4.1.9 Cash allowances cover the net cost to the <i>Contractor</i> of services, <i>Products</i>, <i>Construction Equipment</i>, freight, unloading, handling, storage, installation, provincial sales tax, and other authorized expenses incurred in performing any <i>Work</i> stipulated under the cash allowances but does not include any <i>Value Added Taxes</i> payable by the <i>Owner</i> and the <i>Contractor</i>."

PART 5 PAYMENT

GC 5.1 FINANCING INFORMATION REQUIRED OF THE OWNER

SC28.1	5.1	<u>Delete</u> GC 5.1 – FINANCING INFORMATION REQUIRED OF THE OWNER and all paragraphs thereunder, including any reference to GC 5.1 throughout the <i>Contract</i>.

GC 5.2 APPLICATIONS FOR PAYMENT

SC29.1	5.2.1	<u>Delete</u> GC 5.2.1 and <u>replace</u> it with the following: "5.2.1 Upon execution of the <i>Contract</i>, and in any event prior to the <i>Contractor</i> submitting its first application for payment, the <i>Owner</i> shall issue a purchase order to the <i>Contractor</i> for the performance of the <i>Contract</i>. The number indicated on such purchase order must be clearly identifiable on all applications for payment. Applications for payment shall be dated the last day of each month or an alternative day of each month agreed to in writing by the parties, with each month representing one payment period under the <i>Contract</i> (each a "Payment Period"). Within 3 calendar days of the end of each <i>Payment Period</i>, the <i>Contractor</i> will submit a draft application for payment to the <i>Owner</i> and the <i>Consultant</i>. Upon receipt of the draft application for payment, and within 7 calendar days, a representative of each of the <i>Contractor</i>, <i>Owner</i>, and the <i>Consultant</i> shall attend a meeting to discuss and review the work completed during the <i>Payment Period</i>, including quantities, if applicable (the "Pre-Invoice Submission Meeting"). In the event that the scheduled date for the <i>Pre-Invoice Submission Meeting</i> is not a <i>Working Day</i>, the <i>Pre-Invoice Submission Meeting</i> shall occur on the next <i>Working Day</i>. The <i>Contractor</i> shall bring with it to the <i>Pre-Invoice Submission Meeting</i> the following: .1 a copy of the draft application for payment; .2 any documents the <i>Contractor</i> is required to bring to the <i>Pre-Invoice Submission Meeting</i> as stipulated in the <i>Contract Documents</i> or as reasonably requested by the <i>Owner</i>; and

		.3 any other documents reasonably requested, in advance, by the <i>Owner</i> or the <i>Consultant</i> ."
SC29.2	5.2.2	<u>Delete</u> GC 5.2.2 in its entirety and <u>replace</u> it with the following: "5.2.2 Applications for payment shall be given in accordance with the following requirements: .1 Within 5 calendar days following the <i>Pre-Invoice Submission Meeting</i>, the <i>Contractor</i> shall deliver its application for payment to the <i>Owner</i> and to the <i>Consultant</i> for <i>Work</i> performed during the <i>Payment Period</i> ("Proper Invoice Submission Date") subject to the following: .1 If the fifth calendar day following the <i>Pre-Invoice Submission Meeting</i>, to which an invoice relates falls on a day that is not a <i>Working Day</i>, the <i>Proper Invoice Submission Date</i> shall be deemed to fall on the next <i>Working Day</i>. .2 The application for payment must be delivered to the <i>Owner</i> and to the <i>Consultant</i> in the same manner as a <i>Notice in Writing</i> during the hours of 9:00 am to 4:00pm (EST) on the <i>Proper Invoice Submission Date</i>. Delivery to the <i>Owner</i> shall be to the following email address: facilities_cap@wrdsb.ca .3 If an application for payment is received after 4:00 p.m. (EST) on the applicable <i>Proper Invoice Submission Date</i>, the application for payment will not be considered or reviewed by the <i>Owner</i> and <i>Consultant</i> until the next <i>Proper Invoice Submission Date</i>. Notwithstanding the foregoing, the <i>Owner</i> in its sole and absolute discretion may elect to accept an application for payment submitted after 4:00 p.m. on the applicable <i>Proper Invoice Submission Date</i>; however, such acceptance shall not be construed as a waiver of any of its rights or waive or release the <i>Contractor's</i> obligations to strictly comply with the requirements prescribed in this subparagraph 5.2.2.3. .4 No applications for payment shall be accepted by the <i>Owner</i> prior to the <i>Proper Invoice Submission Date</i>. .5 All applications for payment shall include all of the requirements for a <i>Proper Invoice</i> prescribed by the <i>Construction Act</i> and this <i>Contract</i> and be dated the last day of the applicable <i>Payment Period</i>;"
SC29.3	5.2.3	<u>Delete</u> GC 5.2.3 and <u>replace</u> it with the following: "5.2.3 The amount claimed shall be for the value, proportionate to the amount of the <i>Contract</i>, of <i>Work</i> performed and <i>Products</i> delivered and incorporated into the <i>Work</i> as of the last date of the applicable <i>Payment Period</i>. Materials may also be deemed to be supplied to an improvement, for payment purposes, when, in the <i>Owner's</i> opinion, they are placed and properly secured on the land on which the improvement is made, or placed upon land designated by the <i>Owner</i> or agent of the <i>Owner</i>, but placing the materials on the land so designated does not, of itself, make that land subject to a lien. No amount claimed shall include products delivered and incorporated into the work, unless the products are free

		and clear of all security interests, liens and other claims of third parties. No amount claimed shall include <i>Products</i> delivered to the <i>Place of the Work</i> unless the <i>Products</i> are free and clear of all security interests, liens, and other claims of third parties."
SC29.4	5.2.4	After the word " <i>Consultant</i> " in GC 5.2.4 <u>add</u> the words "and the <i>Owner</i> "
SC29.5	5.2.5	After the word " <i>Consultant</i> " in GC 5.2.5 <u>add</u> the words "or the <i>Owner</i> ".
SC29.6	5.2.9	<u>Add</u> new 5.2.9 as follows: "5.2.9 The <i>Contractor</i> shall prepare and maintain current as-built drawings which shall consist of the <i>Drawings</i> and <i>Specifications</i> revised by the <i>Contractor</i> during the <i>Work</i> , showing changes to the <i>Drawings</i> and <i>Specifications</i> , which current as-built drawings shall be maintained by the <i>Contractor</i> and made available to the <i>Consultant</i> for review with each application for progress payment. The <i>Consultant</i> shall recommend to the <i>Owner</i> that the <i>Owner</i> retain a reasonable amount for the value of the as-built drawings not presented for review."

GC 5.3 PAYMENT

SC30.1	5.3.1	<u>Delete</u> GC 5.3.1 in its entirety, including all subparagraphs thereunder, and <u>replace</u> it with the following: "5.3.1 After receipt by the <i>Owner</i> and the <i>Consultant</i> of an application for payment submitted by the <i>Contractor</i> in accordance with GC 5.2 - APPLICATIONS FOR PAYMENT: .1 the <i>Consultant</i> will either: (a) issue to the <i>Owner</i> with a copy to the <i>Contractor</i>, a progress payment certificate in the amount applied for by the <i>Contractor</i> in the <i>Proper Invoice</i>, or (b) issue to the <i>Owner</i>, with a copy to the <i>Contractor</i>, a certificate for payment for an amount determined by the <i>Consultant</i> to be properly due to the <i>Contractor</i> after applying any credits, withheld amounts, or other set-offs which the <i>Consultant</i> has determined that the <i>Owner</i> is entitled to notwithstanding any notice of dispute or disagreement that the <i>Contractor</i> may have served, along with the <i>Consultant's</i> reasons why an amount other than what is claimed in the <i>Proper Invoice</i> is properly due to the <i>Contractor</i>, which finding the <i>Owner</i> may accept or amend prior to the <i>Owner</i> issuing a <i>Notice of Non-Payment</i>, if any, in accordance with GC 5.3.2; .2 the <i>Owner</i> shall make payment to the <i>Contractor</i> on account as provided in Article A-5 PAYMENT, (a) in the amount stated in the certificate for payment, or (b) in the amount stated in the certificate for payment less such amount stated in the <i>Owner's Notice of Non-Payment</i> issued pursuant to GC 5.3.3,

		on the 28th calendar day after receipt of a <i>Proper Invoice</i>, unless such 28th calendar day lands on a day that is other than a <i>Working Day</i>, in which case payment shall be made on the next <i>Working Day</i> after such 28th day."
	5.3.2 to 5.3.7	<u>Add</u> new paragraphs 5.3.2, 5.3.3, 5.3.4, 5.3.4, 5.3.5, 5.3.6, and 5.3.7 as follows: 5.3.2 All payments to the <i>Contractor</i> shall be processed using electronic funds transfer ("EFT") and deposited directly to the <i>Contractor's</i> bank account unless agreed to otherwise by the <i>Contractor</i> and the <i>Owner</i> in writing. Prior to the <i>Contractor</i> submitting its first application for payment, the <i>Owner</i> and the <i>Contractor</i> shall exchange such information as is necessary to facilitate <i>EFT</i> payments. 5.3.3 In the event that the application for payment delivered by the <i>Contractor</i> pursuant to GC 5.2 - APPLICATIONS FOR PAYMENT does not include the requirements for a <i>Proper Invoice</i> or where the <i>Owner</i> disputes the amount claimed as payable in the <i>Proper Invoice</i>, then the <i>Owner</i> shall within 14 calendar days of receipt of the application for payment, issue a <i>Notice of Non-Payment</i> (Form 1.1). 5.3.4 Where the <i>Owner</i> has delivered a <i>Notice of Non-Payment</i>, the <i>Owner</i> and the <i>Contractor</i> shall first engage in good faith negotiations to resolve the dispute. If within 5 calendar days following the issuance of a <i>Notice of Non-Payment</i>, despite good faith efforts by both parties and the assistance of the <i>Consultant</i>, the <i>Owner</i> and the <i>Contractor</i> cannot resolve the dispute, either party may commence an <i>Adjudication</i> in accordance with the procedures set out in the <i>Construction Act</i>. Any portion of the <i>Proper Invoice</i> which is not the subject of the <i>Notice of Non-Payment</i> shall be payable within the time period set out in GC 5.3.1.2. 5.3.5 Provided that the <i>Owner</i> complies with its obligations under the <i>Construction Act</i>, and subject to any interim determination of an adjudicator in accordance with any <i>Adjudication</i>, and where applicable, a final determination made in accordance with the dispute resolution processes prescribed by this <i>Contract</i>, the <i>Owner</i> shall be entitled to claim in a <i>Notice of Non-Payment</i> a right to deduct from or, set off against, any payment of the <i>Contract Price</i>: .1 any amount expended by the <i>Owner</i> in exercising the <i>Owner's</i> rights under this <i>Contract</i> to perform any of the <i>Contractor's</i> obligations that the <i>Contractor</i> has failed to perform; .2 any damages, costs or expenses (including, without limitation, reasonable legal fees and expenses) incurred by the <i>Owner</i> as a result of the failure of the <i>Contractor</i> to perform any of its obligations under the <i>Contract</i>; .3 any other amount owing from the <i>Contractor</i> to the <i>Owner</i> under this <i>Contract</i>. 5.3.6 The amounts disputed and described under the <i>Notice of Non-Payment</i> shall be held by the <i>Owner</i> until all disputed amounts of the <i>Proper Invoice</i> have been resolved pursuant to PART 8 – DISPUTE RESOLUTION.

		5.3.7 The <i>Contractor</i> represents, warrants, and covenants to the <i>Owner</i> that it is familiar with its prompt payment and trust obligations under the <i>Construction Act</i> and will take all required steps and measures to ensure that it complies with the applicable prompt payment and trust provisions under the <i>Construction Act</i> including, without limitation, section 8.1 of the <i>Construction Act</i>. Evidence of the <i>Contractor's</i> compliance under this GC 5.3.7, including evidence demonstrating that all <i>EFTs</i> by the <i>Owner</i> to the <i>Contractor</i> are kept in a bank account in the <i>Contractor's</i> name will be made available to the <i>Owner</i> within 5 <i>Working Days</i> following receipt by the <i>Contractor</i> of a <i>Notice in Writing</i> making such request."

GC 5.4

SUBSTANTIAL PERFORMANCE OF THE WORK- AND PAYMENT OF HOLDBACK

SC32.1	GC 5.4	<u>Delete</u> GC 5.4 – SUBSTANTIAL PERFORMANCE OF THE WORK AND PAYMENT OF HOLDBACK in its entirety and <u>replace</u> it with the following: "GC 5.4 SUBSTANTIAL PERFORMANCE OF THE WORK AND PAYMENT OF HOLDBACK 5.4.1 When the <i>Contractor</i> considers that <i>Substantial Performance of the Work</i> has been achieved, the <i>Contractor</i> shall prepare and submit to the <i>Consultant</i> and the <i>Owner</i> a comprehensive deficiency list of items to be completed or corrected, including any incomplete <i>Close-Out Documentation</i>, and apply for a review by the <i>Consultant</i> and the <i>Owner</i> to establish <i>Substantial Performance of the Work</i>. Failure to include an item on the list does not alter the responsibility of the <i>Contractor</i> to complete the <i>Contract</i>. 5.4.2 Prior to, or as part of its written application for <i>Substantial Performance of the Work</i> the <i>Contractor</i> shall submit to the <i>Consultant</i> submit to the <i>Consultant</i> all closeout documentation required by the <i>Contract Documents</i>, including but not limited to, warranties, manuals, guarantees, as-built drawings, warranty cards and all other relevant literature from suppliers and manufacturers including, but not limited to, where applicable (the "Close-Out Documentation"): .1 equipment, maintenance, and operations manuals; .2 equipment specifications, data sheets and brochures, parts lists and assembly drawings, performance curves and other related data; .3 line drawings, value charts and control sheets sequences with description of the sequence of operations; .4 warranty documents; .5 guarantees; .6 certificates; .7 service and maintenance reports; .8 <i>Specifications</i>; .9 <i>Shop Drawings</i>; .10 coordination drawings; .11 testing and balancing results and reports; .12 <i>Commissioning</i> and quality assurance documentation; .13 distribution system diagrams;

		.14 spare parts; .15 samples; .16 existing reports and correspondence from authorities having jurisdiction in the <i>Place of the Work</i>; .17 inspection certificates; .18 red-lined record drawings from the construction trailer in two copies and .19 other materials or documentation required to be submitted under the <i>Contract</i>. 5.4.3 The <i>Consultant</i> will review the <i>Work</i> to verify the validity of the application and shall promptly, and in any event, no later than 30 calendar days after receipt of the <i>Contractor's</i> complete deficiency list and application: .1 prepare a final deficiency list incorporating all items to be completed or corrected, including any incomplete or unsubmitted <i>Close-Out Documentation</i>. Each item shall have an indicated value for correction or completion and the determination of the total value of such items shall be determined pursuant to GC 5.8 – DEFICIENCY HOLDBACK. The final deficiency list complete with values is to be included with the <i>Consultant's</i> draft verification and shall be reviewed with the <i>Owner</i> prior to the <i>Consultant</i> rendering a determination in accordance with GC 5.4.3.2 .2 having completed the requirements set out in GC 5.4.3.1, (a) the <i>Consultant</i> shall advise the <i>Contractor</i> in writing that the <i>Work</i> or the designated portion of the <i>Work</i> is not substantially performed and give reasons why, or (b) the <i>Consultant</i> shall state the date of <i>Substantial Performance of the Work</i> in a certificate and issue a copy of that certificate to each the <i>Owner</i> and the <i>Contractor</i>. 5.4.4 Following the issuance of the certificate of <i>Substantial Performance of the Work</i> referenced in subparagraph 5.4.3.2(b): .1 The <i>Contractor</i> shall publish, in a construction trade newspaper in the area of the location of the <i>Work</i>, a copy of the certificate of <i>Substantial Performance of the Work</i> referred to in GC 5.4.2.2(b) within seven (7) calendar days of receiving a copy of the certificate signed by the <i>Consultant</i>, and the <i>Contractor</i> shall provide suitable evidence of the publication to the <i>Consultant</i> and the <i>Owner</i>. If the <i>Contractor</i> fails to publish such notice, the <i>Owner</i> shall be at liberty to publish said certificate and back-charge the <i>Contractor</i> its reasonable costs for doing so; .2 The <i>Contractor</i> shall complete the <i>Work</i> within forty (40) calendar days of the date certified as the date of <i>Substantial Performance of the Work</i>; .3 Notwithstanding any other provisions of the <i>Contract</i>, no payments will be processed between <i>Substantial Performance of the Work</i> and <i>Ready-for-Takeover</i>; .4 The <i>Owner</i> reserves the right to contract out any or all unfinished <i>Work</i> if it has not been completed within forty (40) days of <i>Substantial Performance of the Work</i> using, without limitation, the funds retained in accordance with GC 5.8 - DEFICIENCY HOLDBACK, without prejudice to any other right or remedy and without affecting

		the warranty period. The cost to the <i>Owner</i> of completing the <i>Work</i> including <i>Owner</i> and <i>Consultant</i> wages and materials shall be deducted from the <i>Contract Price</i>. 5.4.5 After publication of the certificate of the <i>Substantial Performance of the Work</i>, and provided that the <i>Contractor</i> has completed performance of the <i>Work</i> within the 40 calendar days following certification of <i>Substantial Performance of the Work</i>, the <i>Contractor</i> may submit an application for payment of the outstanding <i>Construction Act</i> holdback amount, which application for payment shall: .1 include all of the requirements listed in EXHIBIT "1" - PROJECT SPECIFIC REQUIREMENTS FOR A PROPER INVOICE, as applicable to the application for payment of the holdback amount; and .2 include a statement that the <i>Contractor</i> has not received any written notices of lien or any claims for liens from any <i>Subcontractor</i> or <i>Supplier</i>. 5.4.6 The <i>Construction Act</i> holdback amount shall become due and payable the day immediately following the expiration of the holdback period prescribed by the <i>Construction Act</i> (in most cases being the 61st calendar day following the publication of the certificate of <i>Substantial Performance of the Work</i> referred to in GC 5.4.4.1), subject to the occurrence of any of the following: .1 the preservation of a lien in respect of the <i>Project</i> that has not been satisfied, discharged or otherwise provided for in accordance with the <i>Construction Act</i>; .2 receipt by the <i>Owner</i> of a written notice of lien that has not been satisfied, discharged or otherwise provided for in accordance with the <i>Construction Act</i>; or .3 prior to the expiry of 40 calendar days following the publication of the certificate of <i>Substantial Performance of the Work</i>, the <i>Owner</i> publishes a <i>Notice of Non-Payment</i> of holdback in accordance with the <i>Construction Act</i> (Form 6), setting out the amount of holdback that will not be paid, which may include non-payment to secure the correction of deficiencies and/or the completion of the <i>Work</i>. 5.4.7 Notwithstanding the <i>Owner's</i> obligation to make payment of the holdback amount in accordance with GC 5.4.6, the processing of such payment remains subject to the <i>Owner's</i> internal <i>EFT</i> timing limitations. The <i>Owner</i> covenants, and the <i>Contractor</i> agrees, that payment of the holdback shall be made by <i>EFT</i> at the first opportunity during the <i>Owner's</i> normal processing of <i>EFTs</i> upon the holdback becoming due in accordance with GC 5.4.6..

GC 5.5 FINAL PAYMENT

SC35.1	GC 5.5	<u>Delete</u> GC 5.5 in its entirety, including all subparagraphs thereunder and <u>replace</u> it with the following: "5.5.1 When <i>Ready-for-Takeover</i> has been achieved in accordance with GC 12.1 – READY-FOR-TAKEOVER and the <i>Contractor</i> considers the <i>Work</i> is complete, and after the <i>Contractor</i>, the <i>Owner</i>, and the <i>Consultant</i> have attended a <i>Pre-Invoice Submission Meeting</i> analogous

		to the requirement in GC 5.2.1 (the "<i>Final Pre-Invoice Submission Meeting</i>"), the <i>Contractor</i> may submit an application for final payment to the <i>Owner</i> and to the <i>Consultant</i>, which application for payment shall: .1 include all of the requirements set out in GC 5.2.2, including without limitation those requirements listed in APPENDIX "1" - PROJECT SPECIFIC REQUIREMENTS FOR A PROPER INVOICE that are specific to an application for final payment; and .2 if applicable, (a) a certificate from the <i>Consultant</i> or written confirmation from the <i>Owner</i> that the deficiencies or incomplete <i>Work</i> waived by the <i>Owner</i> pursuant to GC 12.1.2 have been fully rectified as of the date of the <i>Contractor's</i> application for final payment, and/or (b) written confirmation, signed by the <i>Owner</i> and the <i>Contractor</i>, that the <i>Contract Price</i> has been reduced by a specified amount in exchange for the <i>Owner</i> releasing the <i>Contractor</i> of its obligation to rectify the certain outstanding deficiencies and/or incomplete <i>Work</i> waived by the <i>Owner</i> pursuant to GC 12.1.2, as detailed in such written confirmation. 5.5.2 No later than 5 calendar days prior to the <i>Final Pre-Invoice Submission Meeting</i>, the <i>Contractor</i> will, if not already provided, submit to the <i>Consultant</i> all <i>Close-Out Documentation</i>. 5.5.3 Delivery of all <i>Close-Out Documentation</i> is a requirement for the <i>Proper Invoice</i> for final payment. 5.5.4 After receipt by the <i>Owner</i> and the <i>Consultant</i> of an application for payment submitted by the <i>Contractor</i> that is a <i>Proper Invoice</i> and by no later than 10 calendar days after the receipt of the <i>Proper Invoice</i>: .1 the <i>Consultant</i> will either: (a) issue to the <i>Owner</i> with a copy to the <i>Contractor</i>, a progress payment certificate in the amount applied for by the <i>Contractor</i> in the <i>Proper Invoice</i>, or (b) deliver a finding to the <i>Owner</i> with reasons why an amount other than what is claimed in the <i>Proper Invoice</i> is properly due to the <i>Contractor</i>, which finding the <i>Owner</i> may accept or amend prior to issuing a <i>Notice of Non-Payment</i> (Form 1.1), if any, in accordance with GC 5.5.2; .2 the <i>Owner</i> shall make payment to the <i>Contractor</i> on account as provided in Article A-5 PAYMENT, (a) in the amount stated in the certificate for payment, or (b) in the amount stated in the certificate for payment less such amount stated in the <i>Owner's Notice of Non-Payment</i> issued pursuant to GC 5.5.5, on the 28th calendar day after receipt of a <i>Proper Invoice</i>, unless such 28th calendar day lands on a day that is other than a <i>Working Day</i>, in which case payment shall be made on the next <i>Working Day</i> after such 28th day.

		5.5.5 In the event that the application for final payment delivered by the <i>Contractor</i> does not include the requirements of GC 5.5.1 (including the requirements for a <i>Proper Invoice</i>) and GC 5.5.2 or where the <i>Owner</i> disputes the amount claimed as payable in the <i>Proper Invoice</i>, then the <i>Owner</i> shall within 14 calendar days of receipt of the application for payment, issue a <i>Notice of Non-Payment</i>. Where the <i>Owner</i> has delivered a <i>Notice of Non-Payment</i>, as specified under this GC 5.5.5, the <i>Owner</i> and the <i>Contractor</i> shall first engage in good faith negotiations to resolve the dispute. If within 5 calendar days following the issuance of a <i>Notice of Non-Payment</i>, despite good faith efforts by both parties with the assistance of the <i>Consultant</i>, the <i>Owner</i> and the <i>Contractor</i> cannot resolve the dispute, either party may commence an <i>Adjudication</i> in accordance with the procedures set out in the <i>Construction Act</i>. Any portion of the <i>Proper Invoice</i> which is not the subject of the <i>Notice of Non-Payment</i> shall be payable within the time period set out in GC 5.5.4.2. 5.5.6 Subject to the provisions of the <i>Construction Act</i> and any other rights conferred on the <i>Owner</i> at law or under this <i>Contract</i> to withhold payment or back charge or set-off against payment, the <i>Owner</i> shall pay the amount payable under a <i>Proper Invoice</i> for final payment in accordance with the <i>Construction Act</i>. 5.5.7 When the <i>Consultant</i> issues a certificate of completion in accordance with GC 5.5.4.1, the <i>Consultant</i> shall also issue a certificate for release of any holdback for finishing work amount. In accordance with the <i>Construction Act</i>, the <i>Owner</i> may retain any amounts which are required by law to satisfy any liens against the <i>Work</i>, in respect of any third party claims made to the <i>Owner</i> in respect of the <i>Contract</i> or the <i>Work</i>, and in respect of any claims the <i>Owner</i> may have against the <i>Contractor</i>. Subject to the foregoing, the <i>Owner</i> shall release the holdback in accordance with the <i>Construction Act</i>."

GC 5.6 DEFERRED WORK

SC33.1	5.6.1	<u>Delete</u> paragraph 5.6.1 and <u>replace</u> with the following: "5.6.1 If because of conditions reasonably beyond the control of the <i>Contractor</i>, there are items of work that cannot be performed, payment in full for that portion of the <i>Work</i> which has been performed as certified by the <i>Consultant</i> shall not be withheld or delayed by the <i>Owner</i> on account thereof, but the <i>Owner</i> may withhold, subject to its requirement to issue a <i>Notice of Non-Payment</i> under the <i>Construction Act</i>, until the remaining portion of the <i>Work</i> is finished, only such an amount that the <i>Consultant</i> determines is sufficient and reasonable to cover the cost of performing such remaining work. The remaining work shall be valued as deficient work as defined in GC 5.8.1."

NEW GC 5.8

DEFICIENCY HOLDBACK

SC34.1	5.8.1	<u>Add</u> new GC 5.8 – DEFICIENCY HOLDBACK as follows: "GC 5.8 DEFICIENCY HOLDBACK 5.8.1 Notwithstanding any provisions contained in the <i>Contract Documents</i> concerning certification and release of monies to the <i>Contractor</i>, the <i>Owner</i> reserves the right to retain a <i>Deficiency Holdback</i>, In addition to the <i>Construction Act</i> holdback. The <i>Deficiency</i>

		<i>Holdback</i> in the value of 2% shall be applied against the total Contract value and shall be applied to each progress payment. The <i>Deficiency Holdback</i> shall be payable to the Contractor upon the confirmation of completion of all deficiencies and defects in work by the Consultant and the Owner. 5.8.2 In performing the calculation under GC 5.8.1, .1 no individual deficiency will be valued at less than five hundred dollars (\$500.00); and .2 for any <i>Close-Out Documentation</i> not submitted in advance of or as part of the Contractor's application for <i>Substantial Performance of the Work</i>, an amount shall be retained by the Owner as part of the deficiency holdback that is equal to the estimated time and material costs to retain a third-party to re-create the applicable <i>Close-Out Documentation</i>, as determined by the Consultant, until such time as the applicable <i>Close-Out Documentation</i> is submitted and approved. 5.8.3 The deficiency holdback shall be due and payable to the Contractor on the 61st day following completion of all of the deficiencies listed by the Consultant and confirmed to be corrected, there being no claims for lien registered against the title to the <i>Place of the Work</i> issued in accordance with the <i>Construction Act</i>, and less any amounts disputed under an Owner's <i>Notice of Non-Payment</i> (Form 1.1)."

PART 6 CHANGES IN THE WORK

GC 6.1 OWNER'S RIGHT TO MAKE CHANGES

SC37.1	6.1.2	<u>Add</u> the following to the end of GC 6.1.2: "This requirement is of the essence and it is the express intention of the parties that any claims by the Contractor for a change in the <i>Contract Price</i> and/or <i>Contract Time</i> shall be barred unless there has been strict compliance with PART 6 - CHANGES IN THE WORK. No verbal dealings between the parties and no implied acceptance of alterations or additions to the <i>Work</i> and no claims that the Owner has been unjustly enriched by any alteration or addition to the <i>Work</i>, whether in fact there is any such unjust enrichment or not, shall be the basis of a claim for additional payment under this <i>Contract</i>, an increase to the <i>Contract Price</i>, or a claim for any extension of the <i>Contract Time</i>."
	6.1.3 to 6.1.8	<u>Add</u> new paragraphs 6.1.3, 6.1.4, 6.1.5, 6.1.6, 6.1.7 and 6.1.8 as follows: "6.1.3 The Contractor agrees that changes resulting from construction coordination, including but not limited to, scheduling, site surface conditions, site coordination, and <i>Subcontractor and Supplier</i> coordination are included in the <i>Contract Price</i> and the Contractor shall be precluded from making any claim for a change in the <i>Contract Price</i> as a result of such changes. 6.1.4 Labour costs shall be actual, prevailing rates at the <i>Place of the Work</i> paid to workers, plus statutory charges on labour including WSIB, unemployment insurance, Canada pension,

		vacation pay, hospitalization and medical insurance. The <i>Contractor</i> shall provide these rates, when requested by the <i>Consultant</i>, for review and/or agreement. 6.1.5 Quotations for changes to the <i>Work</i> shall only include <i>Direct Costs</i> and be accompanied by itemized breakdowns together with detailed, substantiating quotations or cost vouchers from <i>Subcontractors</i> and <i>Suppliers</i>, submitted in a format acceptable to the <i>Consultant</i> and shall include any <i>Direct Costs</i> associated with extensions in <i>Contract Time</i>. 6.1.6 When both additions and deletions covering related <i>Work</i> or substitutions are involved in a change to the <i>Work</i>, payment, including <i>Overhead</i> and profit, shall be calculated on the basis of the net difference, if any, with respect to that change in the <i>Work</i>. 6.1.7 Changes to the contract shall be quoted to permit the work to be executed within the <i>Contract Time</i> unless approved by the <i>Consultant</i> and the <i>Owner</i>. 6.1.8 No extension to the <i>Contract Time</i> shall be granted for changes in the <i>Work</i> unless the <i>Contractor</i> can clearly demonstrate that such changes significantly alter the overall construction schedule submitted at the commencement of the <i>Work</i>. Extensions of <i>Contract Time</i> and all associated costs, if approved, shall be included in the relevant <i>Change Order</i>. 6.1.9 When a change in the <i>Work</i> is proposed or required, the <i>Contractor</i> shall within 10 calendar days submit to the <i>Consultant</i> for review a claim for a change in <i>Contract Price</i> and/or <i>Contract Time</i>. Should 10 calendar days be insufficient to prepare the submission, the <i>Contractor</i> shall within 5 calendar days, advise the <i>Consultant</i> in writing of the proposed date of submission of the claim. Claims submitted after the dates prescribed herein will not be considered."

GC 6.2 CHANGE ORDER

SC38.1	6.2.1	In paragraph 6.2.1 after the last sentence in the paragraph <u>add</u> the following: "The adjustment in the <i>Contract Time</i> and the <i>Contract Price</i> shall include an adjustment, if any, for delay or for the impact that the change in the <i>Work</i> has on the <i>Work</i> of the <i>Contractor</i>, and once such adjustment is made, the <i>Contractor</i> shall be precluded from making any further claims for delay or impact with respect to the change in the <i>Work</i>."
	6.2.3 to 6.2.5	<u>Add</u> new paragraphs 6.2.3, 6.2.4, and 6.2.5 as follows: "6.2.3 The value of a change shall be determined in one or more of the following methods as directed by the <i>Consultant</i>: .1 by estimate and acceptance of a lump sum; .2 by negotiated unit prices which include the <i>Contractor's</i> overhead and profit, or;

		.3 by the actual <i>Direct Cost</i> to the <i>Owner</i>, such costs to be the actual cost after all credits included in the change have been deducted, plus the following ranges of mark-up on such costs: .1 Contractor on work of their own forces, 5% overhead, 5% profit. .2 Subcontractor on work of their own forces, 5% overhead, 5 % profit .3 Contractor on work of Subcontractor, 5% overhead only. 6.2.4 All quotations shall include <i>Direct Costs</i> and be submitted in a complete manner listing: .1 quantity of each material, .2 unit cost of each material, .3 man hours involved, .4 cost per hour, .5 <i>Subcontractor</i> quotations submitted listing items 1 to 4 above and item 6 below. .6 mark-up. 6.2.5 The <i>Owner</i> and the <i>Consultant</i> will not be responsible for delays to the <i>Work</i> resulting from late, incomplete or inadequately broken-down valuations submitted by the <i>Contractor</i>."

GC 6.3 CHANGE DIRECTIVE

SC39.1	6.3.6.1	<u>Amend</u> paragraph 6.3.6.1 by deleting the final period and adding the following: “.1 Contractors work by their own forces - 5% overhead and 5% profit, Subcontractor work by their own forces – 5% overhead and 5% profit, Contractors on Subcontractors work – 5% overhead only.
	6.3.6.2	<u>Delete</u> paragraph 6.3.6.2 and <u>replace</u> it with the following: “.2 If a change in the <i>Work</i> results in a net decrease in the <i>Contract Price</i>, the amount of the credit shall be the net cost, without deduction for <i>Overhead</i> or profit.”
	6.3.7.1(4)	<u>Delete</u> GC 6.3.7.1(4).
	6.3.7.7	Amend GC 6.3.7.7 by <u>deleting</u> the words “described in paragraph 6.3.7.1” and <u>replacing</u> them with “approved by the <i>Owner</i> in writing and in advance of any such expenses being incurred;”
	6.3.7.9	Amend GC 6.3.7.9 by <u>adding</u> the following to the end of the paragraph: “...when specifically requested by the <i>Owner</i> or as directed by the <i>Consultant</i>.”.

	6.3.7.10	Amend GC 6.3.7.10 by <u>adding</u> the following to the end of the paragraph: “, provided that such amounts are not caused by negligent acts, omissions, or default of the <i>Contractor</i> or <i>Subcontractor</i> ;”.
	6.3.7.13	<u>Delete</u> GC 6.3.7.13.
	6.3.7.15	<u>Delete</u> GC 6.3.7.15.
	6.3.7.17	<u>Delete</u> GC 6.3.7.17 in its entirety including all subparagraphs.
	6.3.11	<u>Delete</u> GC 6.3.11 and <u>replace</u> it with the following: “6.3.11 The value of the <i>Work</i> performed as a result of a <i>Change Directive</i> shall not be eligible to be included in progress payments until the amount, including the method for determining the amount, of such <i>Change Directive</i> has been determined.”

GC 6.4 CONCEALED OR UNKNOWN CONDITIONS

SC40.1	6.4.1	<u>Delete</u> paragraph 6.4.1 in its entirety and <u>replace</u> with the following: “6.4.1.1 Prior to the submission of the bid on which the Contract was awarded, the Contractor confirms that it carefully investigated the Place of the Work insofar as the Place of Work was available for investigation and, in doing so, applied to that investigation the degree of care and skill required by paragraph 3.14.1 6.4.1.2 No claim by the <i>Contractor</i> will be considered by the <i>Owner</i> or the <i>Consultant</i> in connection with conditions which could reasonably have been ascertained by such investigation or other due diligence undertaken prior to the execution of the <i>Contract</i> .”
	6.4.2	<u>Amend</u> paragraph 6.4.2 by <u>adding</u> a new first sentence as follows: “Having regard to paragraph 6.4.1, if the <i>Contractor</i> believes that the conditions of the <i>Place of the Work</i> differ materially from those reasonably anticipated, differ materially from those indicated in the <i>Contract Documents</i> and were concealed from discovery notwithstanding the conduct of the investigation described in paragraph 6.4.1, it shall provide the <i>Owner</i> and the <i>Consultant</i> with <i>Notice in Writing</i> no later than five (5) <i>Working Days</i> after the first observation of such conditions.” -and- <u>amend</u> the existing second sentence of paragraph 6.4.2 in the second line, following the word “materially” by <u>adding</u> the words “or were concealed from discovery notwithstanding the conduct of the investigation described in paragraph 6.4.1,”.
	6.4.3	<u>Delete</u> paragraph 6.4.3 in its entirety and <u>substitute</u> the following:

		"6.4.3 If the <i>Consultant</i> makes a finding pursuant to paragraph 6.4.2 that no change in the <i>Contract Price</i> or the <i>Contract Time</i> is justified, the <i>Consultant</i> shall report in writing the reasons for this finding to the <i>Owner</i> and the <i>Contractor</i>."
	6.4.5	<u>Add</u> new paragraph 6.4.5 as follows: "6.4.5 No claims for additional compensation or for an extension of <i>Contract Time</i> shall be allowed if the <i>Contractor</i> fails to give <i>Notice in Writing</i> to the <i>Owner</i> or <i>Consultant</i>, as required by paragraph 6.4.2."

GC 6.5 DELAYS

SC41.1	6.5.1	In paragraph 6.5.1 <u>delete</u> the words after the word "for" in the fourth line and <u>replace</u> them with the words "...reasonable <i>Direct Costs</i> directly flowing from the delay, but excluding any consequential, indirect or special damages (including, without limitation, loss of profits, loss of opportunity or loss of productivity)."
	6.5.2	<u>Delete</u> GC 6.5.2 in its entirety and <u>replace</u> it with the following: "6.5.2 If the <i>Contractor</i> is delayed in the performance of the <i>Work</i> by a stop work order issued by a court or other public authority and providing that such order was issued on account of a direct breach, violation, contravention, or a failure to abide by any laws, ordinances, rules, regulations, or codes by the <i>Owner</i>, <i>Other Contractor(s)</i>, or the <i>Consultant</i>, and relating to the <i>Work</i> or the <i>Place of the Work</i>, then the <i>Contract Time</i> shall be extended for such reasonable time as the <i>Consultant</i> may determine. The <i>Contractor</i> shall be reimbursed by the <i>Owner</i> for reasonable <i>Direct Costs</i> directly flowing from the delay, but excluding any consequential, indirect or special damages (including, without limitation, loss of profits, loss of opportunity or loss of productivity)."
	6.5.3	<u>Delete</u> paragraph 6.5.3 in its entirety and <u>replace</u> with the following: "6.5.3 If either party is delayed in the performance of their obligations under this <i>Contract</i> by <i>Force Majeure</i>, then the <i>Contract Time</i> shall be extended for such reasonable time as the <i>Owner</i> and the <i>Contractor</i> shall agree. The extension of time shall not be less than the time lost as a result of the event causing the delay, unless the parties agree to a shorter extension. Neither party shall be entitled to payment for costs incurred by such delays. Upon reaching agreement on the extension of the <i>Contract Time</i> attributable to the <i>Force Majeure</i> event, the <i>Owner</i> and the <i>Contractor</i> shall execute a <i>Change Order</i> indicating the length of the extension to the <i>Contract Time</i> and confirming that there are no costs payable by the either party for the extension of <i>Contract Time</i>. However, if at the time an event of <i>Force Majeure</i> arises a party is in default of its obligations under the <i>Contract</i> and has received a notice of default pursuant to PART 7 – DEFAULT NOTICE, this paragraph 6.5.3 shall not excuse a party from its obligation to cure the default(s). For greater certainty, the defaulting party, to the extent possible, must continue to address and cure the default notwithstanding an event of <i>Force Majeure</i>."

	6.5.4	<u>Delete</u> paragraph 6.5.4 in its entirety and <u>replace</u> it with the following: “6.5.4 No extension or compensation shall be made for delay or impact on the <i>Work</i> unless notice in writing of a claim is given to the <i>Consultant</i> not later than ten (10) <i>Working Days</i> after the commencement of the delays or impact on the <i>Work</i>, provided however, that, in the case of a continuing cause of delay or impact on the <i>Work</i>, only one notice of claim shall be necessary.”
	6.5.6 to 6.5.8	<u>Add</u> new paragraphs 6.5.6, 6.5.7 and 6.5.8 as follows: “6.5.6 If the <i>Contractor</i> is delayed in the performance of the <i>Work</i> by an act or omission of the <i>Contractor</i> or anyone directly or indirectly employed or engaged by the <i>Contractor</i>, or by any cause within the <i>Contractor’s</i> control, then (i) firstly, at its expense, and to the extent possible, the <i>Contractor</i> shall accelerate the work and/or provide overtime work to recover time lost by a delay arising under this paragraph 6.5.6, and (ii) secondly, where it is not possible for the <i>Contractor</i> to recover the time lost by implementing acceleration measures and/or overtime work, the <i>Contract Time</i> may be extended for such reasonable time as the <i>Owner</i> may decide in consultation with the <i>Consultant</i> and the <i>Contractor</i>. The <i>Owner</i> shall be reimbursed by the <i>Contractor</i> for all reasonable costs incurred by the <i>Owner</i> as the result of such delay, including, but not limited to, <i>Owner’s</i> staff costs, the cost of all additional services required by the <i>Owner</i> from the <i>Consultant</i> or any sub-consultants, project managers, or others employed or engaged by the <i>Owner</i>, and in particular, the costs of the <i>Consultant’s</i> services during the period between the date of <i>Substantial Performance of the Work</i> stated in Article A-1 herein, as the same may be extended through the provision of these General Conditions, and any later or actual date of <i>Substantial Performance of the Work</i> achieved by the <i>Contractor</i>. 6.5.7 Without limiting the obligations of the <i>Contractor</i> described in GC 3.2 – CONSTRUCTION BY OWNER OR OTHER CONTRACTORS or GC 9.4 – CONSTRUCTION SAFETY, the <i>Owner</i> or <i>Consultant</i> may, by <i>Notice in Writing</i>, direct the <i>Contractor</i> to stop the <i>Work</i> where the <i>Owner</i> or <i>Consultant</i> determines that there is an imminent risk to the safety of persons or property at the <i>Place of the Work</i>. In the event that the <i>Contractor</i> receives such notice, it shall immediately stop the <i>Work</i> and secure the site. The <i>Contractor</i> shall not be entitled to an extension of the <i>Contract Time</i> or to an increase in the <i>Contract Price</i> unless the resulting delay, if any, would entitle the <i>Contractor</i> to an extension of the <i>Contact Time</i> or the reimbursement of the <i>Contractor’s</i> costs as provided in paragraphs 6.5.1, 6.5.2 or 6.5.3. 6.5.8 No claim for delay shall be made by the <i>Contractor</i> and the <i>Contract Time</i> shall not be extended due to climatic conditions or arising from the <i>Contractor’s</i> efforts to maintain the <i>Construction Schedule</i>.”

PART 7 DEFAULT NOTICE

GC 7.1

OWNER’S RIGHT TO PERFORM THE WORK, TERMINATE THE CONTRACTOR’S RIGHT TO CONTINUE WITH THE WORK OR TERMINATE THE CONTRACT

SC43.1	7.1.2	In GC 7.1.2, <u>delete</u> the words "and if the <i>Consultant</i> has given a written statement to the <i>Owner</i> and <i>Contractor</i> which provides the detail of such neglect to perform the <i>Work</i> properly or such failure to comply with the requirements of the <i>Contract</i> to a substantial degree".
SC43.2	7.1.3.4	<u>Add</u> a new subparagraph 7.1.3.4 as follows: ".4 an "acceptable schedule" as referred to in subparagraph 7.1.3.2. means a schedule approved by the <i>Consultant</i> and the <i>Owner</i> wherein the default can be corrected within the balance of the <i>Contract Time</i> and shall not cause delay to any other aspect of the <i>Work</i> or the work of other contractors, and in no event shall it be deemed to give a right to extend the <i>Contract Time</i> ."
	7.1.4.1	<u>Delete</u> subparagraph 7.1.4.1 and <u>replace</u> it with the following: ".1 correct such default and deduct the cost, including <i>Owner's</i> expenses, thereof from any payment then or thereafter due the <i>Contractor</i> ."
	7.1.4.2	<u>Delete</u> subparagraph 7.1.4.2 and <u>replace</u> it with the following: ".2 by providing <i>Notice in Writing</i> to the <i>Contractor</i> , terminate the <i>Contractor's</i> right to continue with the <i>Work</i> in whole or in part or terminate the <i>Contract</i> , and publish a notice of termination (Form 8) in accordance with the <i>Act</i> ."
	7.1.5.3	In subparagraph 7.1.5.3 <u>delete</u> the words: "however, if such cost of finishing the <i>Work</i> is less than the unpaid balance of the <i>Contract Price</i> , the <i>Owner</i> shall pay the <i>Contractor</i> the difference"
	7.1.6 to 7.1.10	<u>Delete</u> GC 7.1.6 and <u>replace</u> it with new paragraphs 7.1.6, 7.1.7, 7.1.8, 7.1.9 and 7.1.10 as follows: "7.1.6 In addition to its right to terminate the <i>Contract</i> set out herein, the <i>Owner</i> may terminate this <i>Contract</i> at any time for any other reason and without cause upon giving the <i>Contractor</i> fifteen (15) <i>Working Days Notice in Writing</i> to that effect. In such event, the <i>Contractor</i> shall be entitled to be paid for all <i>Work</i> performed including reasonable profit, for loss sustained upon <i>Products</i> and <i>Construction Equipment</i> , and such other damages as the <i>Contractor</i> may have sustained as a result of the termination of the <i>Contract</i> , but in no event shall the <i>Contractor</i> be entitled to be compensated for any loss of profit on unperformed portions of the <i>Work</i> , or indirect, special, or consequential damages incurred. 7.1.7 The <i>Owner</i> may suspend <i>Work</i> under this <i>Contract</i> at any time for any reason and without cause upon giving the <i>Contractor Notice in Writing</i> to that effect. In such event, the <i>Contractor</i> shall be entitled to be paid for all <i>Work</i> performed to the date of suspension and be compensated for all actual costs incurred arising from the suspension, including reasonable profit, for loss sustained upon <i>Products</i> and <i>Construction Equipment</i> , and such other damages as the <i>Contractor</i> may have sustained as a result of the suspension of the <i>Work</i> , but in no event shall the <i>Contractor</i> be entitled to be compensated for any indirect, special, or consequential damages incurred. In the event that the suspension continues for more than thirty (30) calendar days, the <i>Contract</i> shall be deemed to be terminated and the provisions of paragraph 7.1.6 shall apply. 7.1.8 In the case of either a termination of the <i>Contract</i> or a suspension of the <i>Work</i> under GC 7.1 - OWNER'S RIGHT TO PERFORM THE WORK, TERMINATE THE CONTRACTOR'S RIGHT TO CONTINUE WITH THE WORK, OR TERMINATE THE CONTRACT or GC 7.2 - CONTRACTOR'S RIGHT TO SUSPEND THE WORK OR TERMINATE THE CONTRACT, the <i>Contractor</i> shall use its best commercial efforts to mitigate the financial consequences to the <i>Owner</i> arising out of the termination or suspension, as the case may be.

		7.1.9 Upon the resumption of the <i>Work</i> following a suspension under GC 7.1 - OWNER'S RIGHT TO PERFORM THE WORK, TERMINATE THE CONTRACTOR'S RIGHT TO CONTINUE WITH THE WORK, OR TERMINATE THE CONTRACT or GC 7.2 - CONTRACTOR'S RIGHT TO SUSPEND THE WORK OR TERMINATE THE CONTRACT, the <i>Contractor</i> will endeavour to minimize the delay and financial consequences arising out of the suspension. 7.1.10 The <i>Contractor's</i> obligations under the <i>Contract</i> as to quality, correction, and warranty of the <i>Work</i> performed by the <i>Contractor</i> up to the time of termination or suspension shall continue after such termination of the <i>Contract</i> or suspension of the <i>Work</i>."

GC 7.2

CONTRACTOR'S RIGHT TO SUSPEND THE WORK OR TERMINATE THE CONTRACT

SC44.1	7.2.2	<u>Delete</u> paragraph 7.2.2 and <u>replace</u> it with the following: "7.2.2 If the <i>Work</i> is suspended or otherwise delayed for a period of 40 consecutive <i>Working Days</i> or more under a stop work order issued by a court or other public authority on account of a breach, violation, contravention, or a failure to abide by any laws, ordinances, rules, regulations, or codes directly by the <i>Owner</i>, the <i>Owner's</i> other contractor(s), or the <i>Consultant</i>, and relating to the <i>Work</i> or the <i>Place of the Work</i>, the <i>Contractor</i> may, without prejudice to any other right or remedy the <i>Contractor</i> may have, terminate the <i>Contract</i> by giving the <i>Owner</i> Notice in <i>Writing</i> to that effect."
SC44.2	7.2.3.1	<u>Delete</u> subparagraph 7.2.3.1 in its entirety.
	7.2.3.2	<u>Delete</u> subparagraph 7.2.3.2 in its entirety.
	7.2.3.4	In subparagraph 7.2.3.4, <u>delete</u> the words "except for GC 5.1 - FINANCING INFORMATION REQUIRED OF THE OWNER".
	7.2.5	<u>Delete</u> paragraph 7.2.5 and <u>replace</u> it with the following: "7.2.5 If the default cannot be corrected within the 5 <i>Working Days</i> specified in paragraph 7.2.4, the <i>Owner</i> shall be deemed to have cured the default if it: .1 commences correction of the default within the specified time; .2 provides the <i>Contractor</i> with an acceptable schedule for such correction; and, .3 completes the correction in accordance with such schedule."
	7.2.6 to 7.2.9	<u>Add</u> new paragraphs 7.2.6, 7.2.7, 7.2.8 and 7.2.9 as follows: "7.2.6 If the <i>Contractor</i> terminates the <i>Contract</i> under the conditions described in GC 7.2 – CONTRACTOR'S RIGHT TO SUSPEND THE WORK OR TERMINATE THE CONTRACT, the <i>Contractor</i> shall be entitled to be paid for all <i>Work</i> performed to the date of termination, as determined by the <i>Consultant</i>. The <i>Contractor</i> shall also be entitled to recover the direct costs associated with termination, including the costs of demobilization and losses sustained

		on <i>Products</i> and <i>Construction Equipment</i>. The <i>Contractor</i> shall not be entitled to any recovery for any special, indirect or consequential losses, including loss of profit. 7.2.7 The <i>Contractor</i> shall not be entitled to give notice of the <i>Owner's</i> default or terminate the <i>Contract</i> in the event the <i>Owner</i> withholds certificates or payment or both in accordance with the <i>Contract</i> because of: .1 the <i>Contractor's</i> failure to pay all legitimate claims promptly, or .2 the failure of the <i>Contractor</i> to discharge construction liens which are registered against the title to the <i>Place of the Work</i>. 7.2.8 The <i>Contractor's</i> obligations under the <i>Contract</i> as to quality, correction and warranty of the <i>Work</i> performed by the <i>Contractor</i> up to the effective date of termination shall continue in force and shall survive termination of this <i>Contract</i> by the <i>Contractor</i>. 7.2.9 If the <i>Contractor</i> suspends the <i>Work</i> or terminates the <i>Contract</i> as provided for in GC 7.2 – CONTRACTOR'S RIGHT TO SUSPEND THE WORK OR TERMINATE THE CONTRACT, the <i>Contractor</i> shall ensure the site and the <i>Work</i> are left in a safe, secure condition as required by authorities having jurisdiction at the <i>Place of the Work</i> and the <i>Contract Documents</i>."

PART 8 DISPUTE RESOLUTION

GC 8.1 AUTHORITY OF THE CONSULTANT

SC45.1	8.1.3	<u>Delete</u> paragraph 8.1.3 in its entirety and <u>substitute</u> as follows: "8.1.3 If a dispute is not resolved promptly, the <i>Consultant</i> will give such instruction as in the <i>Consultant's</i> opinion are necessary for the proper performance of the <i>Work</i> and to prevent delays pending settlement of the dispute. The parties shall act immediately according to such instructions, it being understood that by doing so neither party will jeopardize any claim the party may have."

GC 8.2 ADJUDICATION

SC45.2	8.2.2 to 8.2.7	<u>Add</u> new GC 8.2.2, 8.2.3, 8.2.4, 8.2.5, 8.2.6, and 8.2.7 as follows: "8.2.2 Save and except where the <i>Contractor</i> has given an undertaking, in accordance with the <i>Act</i>, to refer a dispute to <i>Adjudication</i>, prior to delivering a notice of <i>Adjudication</i> in a form prescribed by the <i>Act</i>, the parties agree to first address all disputes with at least one in-person meeting with the <i>Owner's</i> representative, the <i>Consultant's</i> representative, and the <i>Contractor's</i> representative. The parties agree that such steps will be taken to resolve any disputes in a timely and cost-effective manner. 8.2.3 Notwithstanding any other provisions in PART 8 DISPUTE RESOLUTION, the parties shall engage in <i>Adjudication</i> proceedings as required by, and in accordance with, the <i>Construction Act</i>. 8.2.4 The following procedures shall apply to any <i>Adjudication</i> the parties engage in under the <i>Construction Act</i>:

		.1 any hearings shall be held at a venue within the jurisdiction of the <i>Place of the Work</i> or such other venue as the parties may agree and which is acceptable to the adjudicator; .2 the <i>Adjudication</i> shall be conducted in English; .3 each party may be represented by counsel throughout an <i>Adjudication</i>; .4 there shall not be any oral communications with respect to issues in dispute that are the subject of an <i>Adjudication</i> between a party and the adjudicator unless it is made in the presence of both parties or their legal representatives; and .5 a copy of all written communications between the adjudicator and a party shall be given to the other party at the same time. 8.2.5 Any documents or information disclosed by the parties during an <i>Adjudication</i> are confidential and the parties shall not use such documents or information for any purpose other than the <i>Adjudication</i> in which they are disclosed and shall not disclose such documents and information to any third party, unless otherwise required by law, save and except the for the adjudicator. 8.2.6 If the <i>Contractor</i> fails to comply with any of the notice requirements set out in the <i>Contract</i>, including the time limits set out in any of the following: .1 GC 6.4 – CONCEALED OR UNKNOWN CONDITIONS; .2 GC 6.5 – DELAYS; .3 GC 6.6 – CLAIMS FOR A CHANGE IN CONTRACT PRICE; .4 PART 8 DISPUTE RESOLUTION .5 GC 9.2 – TOXIC AND HAZARDOUS SUBSTANCES .6 GC 9.3 – ARTIFACTS AND FOSSILS; or .7 GC 9.5 - MOULD in respect of any claim or dispute, the <i>Contractor</i> shall have no entitlement whatsoever (including to an increase in the <i>Contract Price</i>, or an extension of <i>Contract Time</i>) in the context of an <i>Adjudication</i> under the <i>Construction Act</i> and waives the right to make any such claims or disputes in an <i>Adjudication</i>. This GC 8.2.6 shall operate conclusively as an estoppel and bar in the event such claims or disputes are brought in an <i>Adjudication</i> and the <i>Owner</i> may rely on this GC 8.2.6 as a complete defence to any such claims or disputes. 8.2.7 The parties hereby acknowledge and agree, .1 that counterclaims, claims of set-off or the exercise or use of other contractual rights that permit the <i>Owner</i> to withhold, deduct or retain from monies otherwise owed to the <i>Contractor</i> under the <i>Contract</i> may be referred to, and included as part of, <i>Adjudications</i> under the <i>Construction Act</i>; .2 that disputes related to the termination or abandonment of the <i>Contract</i>, as well as any disputes that arise or are advanced following the termination or abandonment of the <i>Contract</i>, shall not be referred to <i>Adjudication</i> under the <i>Construction Act</i>; .3 that notice(s) of <i>Adjudication</i>, with respect to any dispute or claim relating to the <i>Project</i>, shall not be given, and no <i>Adjudication</i> shall be commenced following <i>Contract</i> completion, <i>Contract</i> abandonment, or termination of the <i>Contract</i>; .4 that any <i>Adjudication</i> between the <i>Contractor</i> and a <i>Subcontractor</i> or a supplier that relates to an <i>Adjudication</i> between the <i>Owner</i> and the <i>Contractor</i> shall be

		joined together to be adjudicated by a single adjudicator, provided that the adjudicator agrees to do so, and the <i>Contractor</i> shall include a provision in each of its contracts that contain an equivalent obligation to this GC 8.2.7.4; and .5 that, other than where the <i>Contractor</i> is obliged to commence an <i>Adjudication</i> pursuant to an undertaking under the <i>Construction Act</i>, neither the <i>Owner</i> nor the <i>Contractor</i> shall commence an <i>Adjudication</i> during the <i>Restricted Period</i>. 8.2.8 The parties acknowledge and agree that no <i>Adjudication</i>, arbitration, action, suit or other proceeding may be brought by the <i>Contractor</i> against the <i>Owner</i> in respect of a claim for an increase to the <i>Contract Price</i> as set out in GC 6.6, before the <i>Consultant</i> has issued its findings in respect of same, pursuant to GC 6.6.5. For greater clarity and without limiting the foregoing, the amount applied for in each <i>Proper Invoice</i> shall not include any amounts pertaining to the <i>Contractor's</i> claim for an increase in <i>Contract Price</i> unless and until the <i>Consultant</i> has issued a written notice to the <i>Contractor</i> regarding the validity of such claim, as provided for in GC 6.6.5. However, nothing in this GC 8.2.8 shall prevent a <i>Contractor</i> from commencing an <i>Adjudication</i> where, pursuant to the <i>Construction Act</i>, the <i>Contractor</i> is required to give an undertaking to a <i>Subcontractor</i> to commence an <i>Adjudication</i> following delivery of a <i>Notice of Non-Payment</i>."

GC 8.3 NEGOTIATION, MEDIATION AND ARBITRATION

SC46.1	8.3.1	<u>Amend</u> paragraph 8.3.1 by changing part of the second line from "shall appoint a <i>Project Mediator</i> " to "may appoint a <i>Project Mediator</i> , except that such an appointment shall only be made if both the <i>Owner</i> and the <i>Contractor</i> agree."
	8.3.4	<u>Amend</u> paragraph 8.3.4 by changing part of the second line from "the parties shall request the <i>Project Mediator</i> " to "and subject to paragraph 8.3.1 the parties may request the <i>Project Mediator</i> ".
	8.3.6 to 8.3.9	<u>Delete</u> paragraphs 8.3.6, 8.3.7 and 8.3.8 in their entirety and <u>replace</u> them with the following new GCs 8.3.6, 8.3.7, 8.3.8, and 8.3.9: "8.3.6 The dispute may be finally resolved by arbitration under the Rules for Arbitration of Construction Disputes as provided in CCDC 40 in effect at the time of bid closing, provided that both the <i>Contractor</i> and the <i>Owner</i> agree. If the <i>Contractor</i> and the <i>Owner</i> agree to resolve the dispute by arbitration, the arbitration shall be conducted in the jurisdiction of the <i>Place of the Work</i>. 8.3.7 Prior to delivering a notice of <i>Adjudication</i> in a form prescribed by the <i>Act</i>, the parties agree to first address all disputes by attending at least one meeting with the <i>Owner's</i> representative, the <i>Consultant's</i> representative, and the <i>Contractor's</i> representative, prior to commencing an <i>Adjudication</i>. The parties agree that such steps will be taken to resolve any disputes in a timely and cost effective manner. If a resolution to the dispute(s) is not made at such a meeting, any party who plans to commence an <i>Adjudication</i> shall provide the other party with 5 <i>Working Days' Notice in Writing</i> of its intention to issue a notice of <i>Adjudication</i>. 8.3.8 Other than where the <i>Contractor</i> is obliged to commence an <i>Adjudication</i> pursuant to an undertaking under the <i>Construction Act</i>, neither the <i>Owner</i> nor the <i>Contractor</i> shall commence an <i>Adjudication</i> during the <i>Restricted Period</i>. 8.3.9 Where either party has delivered a notice of <i>Adjudication</i> in a form prescribed by the <i>Act</i>, the procedures and rules set out under the <i>Construction Act</i> and the regulations thereto shall govern the <i>Adjudication</i>."

PART 9 PROTECTION OF PERSONS AND PROPERTY

GC 9.1 PROTECTION OF WORK AND PROPERTY

SC47.1	9.1.1.1	<u>Delete</u> subparagraph 9.1.1.1 in its entirety and <u>substitute</u> the following: “.1 errors in the <i>Contract Documents</i> which the <i>Contractor</i> could not have discovered applying the standard of care described in paragraph 3.14.1;”
	9.1.2	<u>Delete</u> paragraph 9.1.2 in its entirety and <u>substitute</u> as follows: “9.1.2 Before commencing any <i>Work</i> , the <i>Contractor</i> shall determine the locations of all underground or hidden utilities and structures indicated in or inferable from the <i>Contract Documents</i> , or that are inferable from an inspection of the <i>Place of the Work</i> exercising the degree of care and skill described in paragraph 3.14.1.”
	9.1.5	<u>Add</u> new paragraph 9.1.5 as follows: “9.1.5 With respect to any damage to which paragraphs 9.1.3 or 9.1.4 apply, the <i>Contractor</i> shall neither undertake to repair or replace any damage whatsoever to the work of other contractors, or to adjoining property, nor acknowledge that the same was caused or occasioned by the <i>Contractor</i> , without first consulting the <i>Owner</i> and receiving written instructions as to the course of action to be followed from either the <i>Owner</i> or the <i>Consultant</i> . Where, however, there is danger to life, the environment, or public safety, the <i>Contractor</i> shall take such emergency action as it deems necessary to remove the danger.”

GC 9.2 TOXIC AND HAZARDOUS SUBSTANCES

SC48.1	9.2.1	Amend GC 9.2.1 by <u>inserting</u> the following to the end of the paragraph: “For the purposes of GC 9.2 – TOXIC AND HAZARDOUS SUBSTANCES, <i>Excess Soil</i> shall not be considered a ‘toxic and hazardous substance’.”
SC48.2	9.2.5.5	Add a new subparagraph 9.2.5.5 as follows: “.5 in addition to the steps described in subparagraph 9.2.5.3, take any further steps it deems necessary to mitigate or stabilize any conditions resulting from encountering toxic or hazardous substances or materials.”
	9.2.6	<u>Amend</u> GC 9.2.6 by <u>adding</u> the following words after the word “responsible” in the second line: “or whether any toxic or hazardous substances or materials already at the <i>Place of the Work</i> (and which were then harmless or stored, contained or otherwise dealt with in accordance with legal and regulatory requirements) were dealt with by the <i>Contractor</i> or anyone for whom the <i>Contractor</i> 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 damages to the property of the <i>Owner</i> or others,”.

	9.2.8	<u>Amend</u> GC 9.2.8 by <u>adding</u> the following words after the word “responsible” in the second line: “or whether any toxic or hazardous substances or materials already at the <i>Place of the Work</i> (and which were then harmless or stored, contained or otherwise dealt with in accordance with legal and regulatory requirements) were dealt with by the <i>Contractor</i> or anyone for whom the <i>Contractor</i> 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 damages to the property of the <i>Owner</i> or others,”.
	9.2.10	<u>Add</u> new paragraph 9.2.10 as follows: “9.2.10 The <i>Contractor, Subcontractors and Suppliers</i> shall not bring on to the <i>Place of the Work</i> any toxic or hazardous substances and materials except as required in order to perform the <i>Work</i>. If such toxic or hazardous substances or materials are required, storage in quantities sufficient to allow work to proceed to the end of any current work week only shall be permitted. All such toxic and hazardous materials and substances shall be handled and disposed of only in accordance with all laws and regulations that are applicable at the <i>Place of the Work</i>.”

GC 9.4 CONSTRUCTION SAFETY

SC49.1	9.4.1	<u>Delete</u> GC 9.4.1 in its entirety and <u>replace</u> it with the following: “9.4.1 The <i>Contractor</i> shall be solely responsible for construction safety at the <i>Place of the Work</i> and for compliance with the rules, regulations, and practices required by the <i>OHSA</i>, including, but not limited to those of the “constructor”, and shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the <i>Work</i>. The <i>Contractor’s</i> health and safety program documentation shall be made available for review by the <i>Owner</i> or <i>Consultant</i> immediately upon request. Without limiting the foregoing, the <i>Contractor</i> shall be solely responsible for construction safety in respect of the <i>Consultant, Subcontractors and Suppliers</i>, the <i>Owner’s</i> own forces, <i>Other Contractors</i>, and all persons attending the <i>Place of the Work</i> during the course of the <i>Project</i>.”
	9.4.2	Amend GC 9.4.2 by <u>adding</u> the following words after “and the <i>Contractor</i>”: “, <i>Subcontractors and Suppliers</i>”.
	9.4.3	Amend GC 9.4.3 by <u>adding</u> the following words after “and the <i>Contractor</i>”: “, <i>Subcontractors and Suppliers</i>”.
	9.4.4	<u>Delete</u> GC 9.4.4 and replace it with the following:

		"9.4.4 The <i>Owner</i> undertakes to include in its contracts with other contractors and in its instructions to its own forces the requirement that the other contractor or its own forces, as the case may be, comply with the policies and procedures of and the directions and instructions from the <i>Contractor</i> with respect to occupational health and safety and related matters."
	9.4.5	<u>Delete</u> GC 9.4.5 in its entirety and <u>replace</u> it with the following: "9.4.5 Prior to the commencement of the <i>Work</i>, the <i>Contractor</i> shall submit to the <i>Owner</i>: .1 a current WSIB clearance certificate; .2 copies of the <i>Contractor's</i> insurance policies having application to the <i>Project</i> or certificates of insurance, at the option of the <i>Owner</i>; .3 documentation setting out the <i>Contractor's</i> in-house safety programs; .4 a copy of the Notice of Project filed with the Ministry of Labour naming itself as "constructor" under the <i>OHSA</i>; and .5 copies of any documentation or notices to be filed or delivered to the authorities having jurisdiction for the regulation of occupational health and safety at the <i>Place of the Work</i>;"
	9.4.6 to 9.4.12	<u>Add</u> new GC 9.4.6, 9.4.7, 9.4.8, 9.4.9, 9.4.10, 9.4.11, and 9.4.12 as follows: "9.4.6 The <i>Contractor</i> shall indemnify and save harmless the <i>Owner</i>, its agents, trustees, officers, directors, employees, consultants, successors, appointees, and assigns from and against the consequences of any and all safety infractions committed by the <i>Contractor</i> under <i>OHSA</i> and any other occupational health and safety legislation in force at the <i>Place of the Work</i> including the payment of legal fees and disbursements on a solicitor and client basis. Such indemnity shall apply to the extent to which the <i>Owner</i> is not covered by insurance. 9.4.7 If the <i>Owner</i> is of the reasonable opinion that the <i>Contractor</i> has not taken such precautions as are necessary to ensure compliance with the requirements of paragraph 9.4.1, the <i>Owner</i> may take any remedial measures which it deems necessary, including stopping the performance of all or any portion of the <i>Work</i>, and the <i>Owner</i> may use its employees, the <i>Contractor</i>, any <i>Subcontractor</i> or any other contractors to perform such remedial measures. 9.4.8 The <i>Contractor</i> shall file any notices or any similar document required pursuant to the <i>Contract</i> or the safety regulations in force at the <i>Place of the Work</i>. This duty of the <i>Contractor</i> will be considered to be included in the <i>Work</i> and no separate payment therefore will be made to the <i>Contractor</i>. 9.4.9 Unless otherwise provided in the <i>Contract Documents</i>, the <i>Contractor</i> shall develop, maintain and supervise for the duration of the <i>Work</i> a comprehensive safety program that will effectively incorporate and implement all required safety precautions. The program shall, at a minimum, respond fully to the applicable safety regulations and general construction practices for the safety of persons or property, including, without limitation, any general safety rules and regulations of the <i>Owner</i> and any workers' compensation or occupational health and safety statutes or regulations in force at the <i>Place of the Work</i>.

		9.4.10 The <i>Contractor</i> shall provide a copy of the safety program described in GC 9.4.9 hereof to the <i>Consultant</i> for delivery to the <i>Owner</i> prior to the commencement of the <i>Work</i>, and shall, ensure, as far as it is reasonably practical to do so, that every employer and worker performing work in respect of the <i>Project</i> complies with such program. 9.4.11 The <i>Contractor</i> shall arrange regular safety meetings, and shall supply and maintain, at its own expense, at its office or other well-known place at the job site, safety equipment necessary to protect the workers and general public against accident or injury as prescribed by the authorities having jurisdiction at the <i>Place of the Work</i>, including, without limitation, articles necessary for administering first-aid to any person and an emergency procedure for the immediate removal of any injured person to a hospital or a doctor's care. 9.4.12 The <i>Contractor</i> shall promptly report in writing to the <i>Owner</i> and the <i>Consultant</i> all accidents of any sort arising out of or in connection with the performance of the <i>Work</i>, whether on or adjacent to the job site, giving full details and statement of witnesses. If death or serious injuries or damages are caused, the accident shall be promptly reported by the <i>Contractor</i> to the <i>Owner</i> and the <i>Consultant</i> by telephone or messenger in addition to any reporting required under the applicable safety regulations."."

PART 10 GOVERNING REGULATIONS

GC 10.1 TAXES AND DUTIES

SC50.1	10.1.2	<u>Amend</u> paragraph 10.1.2 by <u>adding</u> the following sentence to the end of the paragraph: "For greater certainty, the <i>Contractor</i> shall not be entitled to any mark-up for overhead or profit on any increase in such taxes and duties and the <i>Owner</i> shall not be entitled to any credit relating to mark-up for overhead or profit on any decrease in such taxes. The <i>Contractor</i> shall provide a detailed breakdown of <u>Additional</u> taxes if requested by the <i>Owner</i> in a form satisfactory to the <i>Owner</i>."
	10.1.3	<u>Add</u> new paragraph 10.1.3 as follows: "10.1.3 Where the <i>Owner</i> is entitled to an exemption or a recovery of sales taxes, customs duties, excise taxes or <i>Value Added Taxes</i> applicable to the <i>Contract</i>, the <i>Contractor</i> shall, at the request of the <i>Owner</i>, assist with the application for any exemption, recovery or refund of all such taxes and duties and all amounts recovered or exemptions obtained shall be for the sole benefit of the <i>Owner</i>. The <i>Contractor</i> agrees to endorse over to the <i>Owner</i> any cheques received from the federal or provincial governments, or any other taxing authority, as may be required to give effect to this paragraph."

GC 10.2 LAWS, NOTICES, PERMITS, AND FEES

SC51.1	10.2.5	<u>Amend</u> paragraph 10.2.5 by <u>adding</u> the words "Subject to paragraph 3.4" at the beginning of the paragraph. -and- <u>Add</u> the following to the end of the second sentence:

		"...and no further <i>Work</i> on the affected components of the <i>Contract</i> shall proceed until these directives have been obtained by the <i>Contractor</i> from the <i>Consultant</i> ."
	10.2.6	<u>Amend</u> paragraph 10.2.6 by <u>adding</u> the following sentence to the end of the paragraph: "In the event the <i>Owner</i> suffers loss or damage as a result of the <i>Contractor's</i> failure to comply with paragraph 10.2.5 and notwithstanding any limitations described in paragraph 12.1.1, the <i>Contractor</i> agrees to indemnify and to hold harmless the <i>Owner</i> and the <i>Consultant</i> from and against any claims, demands, losses, costs, damages, actions suits or proceedings resulting from such failure by the <i>Contractor</i> ."
	10.2.7	<u>Amend</u> paragraph 10.2.7 by inserting the words "which changes were not, or could not have reasonably been known to the <i>Owner</i> or to the <i>Contractor</i> , as applicable, at the time of bid closing and which changes did not arise as a result of a public emergency or other <i>Force Majeure</i> event" to the second line, after the words "authorities having jurisdiction".
	10.2.8	<u>Add</u> new paragraph 10.2.8 as follows: "10.2.8 The <i>Contractor</i> shall furnish all certificates that are required or given by the appropriate governmental authorities as evidence that the <i>Work</i> as installed conforms with the laws and regulations of authorities having jurisdiction, including certificates of compliance for the <i>Owner's</i> occupancy or partial occupancy. The certificates are to be final certificates giving complete clearance of the <i>Work</i> , in the event that such governmental authorities furnish such certificates."

GC 10.4 WORKERS' COMPENSATION

SC52.1	10.4.1	<u>Delete</u> paragraph 10.4.1 and <u>replace</u> with the following: "10.4.1 Prior to commencing the <i>Work</i> , and with each and every application for payment thereafter, including the <i>Contractor's</i> application for payment of the holdback amount following <i>Substantial Performance of the Work</i> and again with the <i>Contractor's</i> application for final payment, the <i>Contractor</i> shall provide evidence of compliance with workers' compensation legislation in force at the <i>Place of the Work</i> , including payments due thereunder."

GC 11.1 INSURANCE

SC53.1	11.1	<u>Delete</u> entirety of GC 11.1 and <u>replace</u> with the following: "GC 11.1 INSURANCE 11.1.1 Without restricting the generality of GC 12 – INDEMNIFICATION, the <i>Contractor</i> shall provide, maintain, and pay for the insurance coverages specified in GC 11.1 – INSURANCE. Unless otherwise stipulated, the duration of each insurance policy shall be from the date of commencement of the <i>Work</i> until the expiration of the warranty periods set out in the <i>Contract Documents</i> . Prior to commencement of the <i>Work</i> and upon the placement, renewal, <u>amendment</u> , or extension of all or any part of the insurance, the <i>Contractor</i> shall promptly provide the <i>Owner</i> with confirmation of coverage and, if required, a certified true copy of the policies certified by an authorized representative of the insurer together with copies of any <u>amending</u> endorsements. .1 General Liability Insurance

		General liability insurance shall be in the name of the <i>Contractor</i>, with the <i>Owner</i> and the <i>Consultant</i> named as <u>Additional</u> insureds, with limits of not less than \$5,000,000.00 inclusive per occurrence for bodily injury, death, and damage to property, including loss of use thereof, for itself and each of its employees, <i>Subcontractors</i> and/or agents. The insurance coverage shall not be less than the insurance required by IBC Form 2100, or its equivalent <u>replacement</u>, provided that IBC Form 2100 shall contain the latest edition of the relevant CCDC endorsement form. To achieve the desired limit, umbrella, or excess liability insurance may be used. All liability coverage shall be maintained for completed operations hazards from the date of <i>Ready-for-Takeover</i>, as set out in the certificate of <i>Ready-for-Takeover</i>, on an ongoing basis for a period of 6 years following <i>Ready-for-Takeover</i>. Where the <i>Contractor</i> maintains a single, blanket policy, the <u>Addition</u> of the <i>Owner</i> and the <i>Consultant</i> is limited to liability arising out of the <i>Project</i> and all operations necessary or incidental thereto. The policy shall be endorsed to provide the <i>Owner</i> with not less than 30 days' notice, in writing, in advance of any cancellation and of change or <u>amendment</u> restricting coverage. .2 Automobile Liability Insurance Automobile liability insurance in respect of licensed vehicles shall limits of not less than \$2,000,000.00 inclusive per occurrence for bodily injury, death and damage to property, covering all licensed vehicles <i>owned</i> or leased by the <i>Contractor</i>, and endorsed to provide the <i>Owner</i> with not less than 30 days' notice, in writing, in advance of any cancellation, change or <u>amendment</u> restricting coverage. Where the policy has been issued pursuant to a government-operated automobile insurance system, the <i>Contractor</i> shall provide the <i>Owner</i> with confirmation of automobile insurance coverage for all automobiles registered in the name of the <i>Contractor</i>. .3 Aircraft and Watercraft Liability Insurance Intentional Deleted. Not Applicable .4 Property and Boiler and Machinery Insurance (1) Builder's Risk property insurance shall be in the name of the <i>Contractor</i> with the <i>Owner</i> and the <i>Consultant</i> named as <u>Additional</u> insureds. The policy shall insure against all risks of direct physical loss or damage to the property insured which shall include all property included in the <i>Work</i>, whether owned by the <i>Contractor</i> or the owner or owned by others, so long as the property forms part of the <i>Work</i>. The property insured also includes all materials and supplies necessary to complete the work, whether installed in the work temporarily or permanently, in storage on the project site, or in transit to the project site, as well as temporary buildings, scaffolding, falsework forms, hoardings, excavation, site preparation and similar work. The insurance shall be for not less than the sum of the amount of the contract price and the full value of products that are specified to be provided by the owner for incorporation into the work, if applicable, with the deductible of \$10,000.00 payable by the contractor. The insurance shall include the foregoing and, otherwise, shall not be less than the insurance required by IBC Form 4042 or its equivalent <u>replacement</u> provided that the IBC Form 4042 shall include the latest <u>Addition</u> of the relevant CCDC endorsement form. The coverage shall be based on a completed value form and shall be maintained continuously until ten (10) days after the date of the final certificate of payment.

		(2) Boiler and machinery insurance shall be in the name of the <i>Contractor</i>, with the <i>Owner</i> and the <i>Consultant</i> named as <u>Additional</u> insureds, for not less than the <u>replacement</u> value of the boilers, pressure vessels and other insurable objects forming part of the <i>Work</i>. The insurance provided shall not be less than the insurance provided by the "Comprehensive Boiler and Machinery Form" and shall be maintained continuously from commencement of use or operation of the property insured and until 10 days after the date of the final certificate for payment. (3) The policies shall allow for partial or total use or occupancy of the <i>Work</i>. (4) The policies shall provide that, in the case of a loss or damage, payment shall be made to the <i>Owner</i> and the <i>Contractor</i> as their respective interests may appear. The <i>Contractor</i> shall act on behalf of the <i>Owner</i> for the purpose of adjusting the amount of such loss or damage payment with the insurers. When the extent of the loss or damage is determined, the <i>Contractor</i> shall proceed to restore the <i>Work</i>. Loss or damage shall not affect the rights and obligations of either party under the <i>Contract</i> except that the <i>Contractor</i> shall be entitled to such reasonable extension of the <i>Contract Time</i>, relative to the extent of the loss or damage, as determined by the <i>Owner</i>, in its sole discretion. (5) The <i>Contractor</i> shall be entitled to receive from the <i>Owner</i>, in <u>Addition</u> to the amount due under the <i>Contract</i>, the amount at which the <i>Owner's</i> interest in restoration of the <i>Work</i> has been appraised, such amount to be paid as the restoration of the <i>Work</i> proceeds and as provided in GC 5.2 – APPLICATIONS FOR PROGRESS PAYMENT and GC 5.3 – PROGRESS PAYMENT. In <u>Addition</u>, the <i>Contractor</i> shall be entitled to receive from the payments made by the insurer the amount of the <i>Contractor's</i> interest in the restoration of the <i>Work</i>. (6) In the case of loss or damage to the <i>Work</i> arising from the work of other contractors, or the <i>Owner's</i> own forces, the <i>Owner</i>, in accordance with the <i>Owner's</i> obligations under paragraph 3.2.2.4 of GC 3.2 – CONSTRUCTION BY OWNER OR OTHER CONTRACTORS, shall pay the <i>Contractor</i> the cost of restoring the <i>Work</i> as the restoration of the <i>Work</i> proceeds and as provided in GC 5.2 – APPLICATIONS FOR PROGRESS PAYMENT and GC 5.3 – PROGRESS PAYMENT. .5 Contractors' Equipment Insurance "All risks" contractors' equipment insurance covering construction machinery and equipment used by the <i>Contractor</i> for the performance of the <i>Work</i>, excluding boiler insurance, shall be in a form acceptable to the <i>Owner</i> and shall not allow subrogation claims by the insurer against the <i>Owner</i>. The policies shall be endorsed to provide the <i>Owner</i> with not less than 30 days' notice, in writing, in advance of cancellation, change or <u>amendment</u> restricting coverage. Subject to satisfactory proof of financial capability by the <i>Contractor</i> for self-insurance of his equipment, the <i>Owner</i> agrees to waive the equipment insurance requirement. 11.1.2 The <i>Contractor</i> shall be responsible for deductible amounts under the policies except where such amounts may be excluded from the <i>Contractor's</i> responsibility by the terms of GC 9.1 - PROTECTION OF WORK AND PROPERTY and GC 9.2 - DAMAGES AND MUTUAL RESPONSIBILITY.

		11.1.3 Where the full insurable value of the <i>Work</i> is substantially less than the <i>Contract Price</i>, the <i>Owner</i> may reduce the amount of insurance required to waive the course of construction insurance requirement. 11.1.4 If the <i>Contractor</i> fails to provide or maintain insurance as required by the <i>Contract Documents</i>, then the <i>Owner</i> shall have the right to provide and maintain such insurance and provide evidence of same to the <i>Contractor</i>. The <i>Contractor</i> shall pay the costs thereof to the <i>Owner</i> on demand, or the <i>Owner</i> may deduct the amount that is due or may become due to the <i>Contractor</i>. 11.1.5 All required insurance policies shall be with insurers licensed to underwrite insurance in the jurisdiction of the <i>Place of the Work</i>."

***NEW* GC 11.2 CONTRACT SECURITY**

SC52.1	GC 11.2	<u>Add</u> new GC 11.2 – CONTRACT SECURITY as follows: "GC 11.2 CONTRACT SECURITY 11.2.1 The <i>Contractor</i> shall, prior to the execution of the <i>Contract</i>, furnish a performance bond and labour and material payment bond which meets the requirements under paragraph 11.2.2. 11.2.2 The performance bond and labour and material payment bond shall: .1 be issued by a duly licensed surety company, which has been approved by the <i>Owner</i> and is permitted under the <i>Construction Act</i>, .2 be issued by an insurer licensed under the <i>Insurance Act</i> (Ontario) and authorized to transact a business of suretyship in the Province of Ontario; .3 shall be in the form prescribed by the <i>Construction Act</i>; .4 have a coverage limit of at least 50 per cent of the <i>Contract Price</i>, or such other percentage of the <i>Contract Price</i> as stated in the <i>Contract Documents</i>; .5 extends protection to <i>Subcontractors</i>, <i>Suppliers</i>, and any other persons supplying labour or materials to the <i>Project</i>; and .6 shall be maintained in good standing until the fulfillment of the <i>Contract</i>, including all warranty and maintenance periods set out in the <i>Contract Documents</i>.. 11.2.3 It is the intention of the parties that the performance bond shall be applicable to all of the <i>Contractor's</i> obligations in the <i>Contract Document</i> and, wherever a performance bond is provided with language which conflicts with this intention, it shall be deemed to be amended to comply. The <i>Contractor</i> represents and warrants to the <i>Owner</i> that it has provided its surety with a copy of the <i>Contract Documents</i> prior to the issuance of such bonds. 11.2.4 Without limiting the foregoing in any way, the bonds shall indemnify and hold harmless the <i>Owner</i> for and against costs and expenses (including legal and <i>Consultant</i> services and court costs) arising out of or as a consequence of any default of the <i>Contractor</i> under this <i>Contract</i>. 11.2.4 The <i>Contractor</i> shall be responsible for notifying the surety company of any changes made to the <i>Contract</i> during the course of construction.

		11.2.5 The premiums for bonds required by the <i>Contract Documents</i> shall be included in the <i>Contract Price</i>. 11.2.6 Should the <i>Owner</i> require additional bonds by the <i>Contractor</i> or any of his <i>Subcontractors</i>, after the receipt of bids for the <i>Work</i>, the <i>Contract Price</i> shall be increased by all direct costs attributable to providing such bonds. The <i>Contractor</i> shall promptly provide the <i>Owner</i>, through the <i>Consultant</i>, with any such bonds that may be required."

PART 12 OWNER TAKEOVER

GC 12.1 READY-FOR-TAKEOVER

SC55.1	12.1.1	<u>Delete</u> GC 12.1.1 in its entirety and <u>replace</u> it with the following: "12.1.1 <i>Ready-for-Takeover</i> shall be achieved when all of the following has occurred, as verified and approved by the <i>Owner</i>: .1 <i>Substantial Performance of the Work</i> has been achieved, as certified by the <i>Consultant</i>; .2 a permit for occupancy of the <i>Place of the Work</i> has been obtained from the authorities having jurisdiction; .3 the <i>Work</i> to be performed under the <i>Contract</i> has satisfied the requirements for deemed completion in accordance with Section 2(3) of the <i>Construction Act</i>, .4 final cleaning and waste removal, as required by the <i>Contract Documents</i>; .5 the <i>Contractor</i> has delivered to the <i>Consultant</i> and the <i>Owner</i> all inspection certificates from authorities having jurisdiction with respect to any component of the <i>Work</i> which has been completed; .6 subject only to GC 12.1.2, the entire <i>Work</i> has been completed to the requirements of the <i>Contract Documents</i>, including completion of all items on the punch list prepared at the time of <i>Substantial Performance of the Work</i> and the <i>Work</i> is being used for its intended purpose, and is so certified by the <i>Consultant</i>; .7 subject only to GC 12.1.2, the <i>Contractor</i> has submitted to the <i>Owner</i> and the <i>Consultant</i> in a collated and organized matter, all <i>Close-Out Documentation</i> and any other materials or documentation required by the <i>Contract Documents</i>; .8 subject only to GC 12.1.2, all <i>Products</i>, systems and components of the <i>Project</i> have been commissioned and certified for operation and accepted by the <i>Owner</i> and <i>Consultant</i>, and 9 subject only to GC 12.1.2, the <i>Contractor</i> has submitted to the <i>Owner</i> and the <i>Consultant</i> full and complete as-built drawings and <i>Specifications</i> revised by the <i>Contractor</i> to reflect the as-built state of the <i>Work</i>, clearly showing changes to the <i>Drawings</i> and <i>Specifications</i> from the original <i>Contract Documents</i>, all of which have been approved by the <i>Owner</i> acting reasonably."
SC55.2	12.1.2	<u>Delete</u> GC 12.1.2 in its entirety and <u>replace</u> it with the following:

		"12.1.2 The <i>Owner</i> may, in its sole, absolute, and unfettered discretion, waive compliance with a requirement, or a part thereof, for achieving <i>Ready-for-Takeover</i> set out in GC 12.1.1.6 to 12.1.1.9 (inclusive). Where the <i>Owner</i> exercises the discretion afforded under this GC 12.1.2, the <i>Contractor</i> shall be required to comply with GC 5.5.1.2 as part of its application for final payment and the <i>Owner</i> and the <i>Contractor</i>, in consultation with the <i>Consultant</i>, shall establish a reasonable date for completing the <i>Work</i>."
SC55.3	12.1.3	<u>Delete</u> GC 12.1.3 in its entirety and <u>replace</u> it with the following: "12.1.3 When the <i>Contractor</i> considers the <i>Work Ready-for-Takeover</i>, it shall submit a written application to the <i>Owner</i> and the <i>Consultant</i> for review."
SC55.4	12.1.4	In GC 12.1.4, <u>delete</u> the words "list and" from the second line.
SC55.5	12.1.5	<u>Delete</u> GC 12.1.5 in its entirety and <u>replace</u> it with the following: "12.1.5 Following the confirmation of the date of <i>Ready-for-Takeover</i> by the <i>Consultant</i> and as confirmed by the <i>Owner</i>, the <i>Contractor</i> may submit a final application for payment in accordance with GC 5.5 – FINAL PAYMENT."
SC55.6	12.1.6	<u>Delete</u> GC 12.1.6 in its entirety.

GC 12.2 EARLY OCCUPANCY

SC56.1	GC 12.2	<u>Delete</u> GC 12.2 – EARLY OCCUPANCY BY THE OWNER in its entirety, including all subparagraphs thereunder and <u>replace</u> it with the following: "12.2.1 The Owner reserves the right to take possession of and use for any intended purpose any portion or all of the undelivered portion of the Project even though the Work may not have reached Substantial Performance of the Work. Where the Work extends beyond the Contract Time, progress and completion of the Work shall not unduly interfere with the delivery of scheduled school programs. The taking of possession or use of any such portion of the Project shall not be deemed to be the Owner's acknowledgement or acceptance of the Work or Project nor shall it relieve the Contractor of any of its obligations under the Contract. 12.2.2 Whether the Project contemplates Work by way of renovations in buildings which will be in use or be occupied during the course of the Work or where the Project involves Work that is adjacent to a structure which is in use or is occupied, the Contractor, without in any way limiting its responsibilities under this Contract, shall take all reasonable steps to avoid interference with fire exits, building access and egress, continuity of electric power and all other utilities, to suppress dust and noise and to avoid conditions likely to propagate mould or fungus of any kind and all other steps reasonably necessary to promote and maintain the safety and comfort of the users and occupants of such structures or adjacent structures."

GC 12.3 WARRANTY

SC57.1	12.3.1	<u>Delete</u> from the first line of paragraph 12.3.1 the words "one year" and <u>replace</u> it with the words "two years"
	12.3.2	<u>Delete</u> from the first line of paragraph 12.3.2 the word "The" and <u>replace</u> it with the words "Subject to GC 1.1.3, the..."
	12.3.7 to 12.3.12	<u>Add</u> new paragraphs 12.3.7 to 12.3.12 as follows: "12.3.7 Where required by the <i>Contract Documents</i>, the <i>Contractor</i> shall provide a maintenance bond as security for the performance of the <i>Contractor's</i> obligations as set out in GC 12.3 WARRANTY. 12.3.8 The <i>Contractor</i> shall provide fully and properly completed and signed copies of all warranties and guarantees required by the <i>Contract Documents</i>, containing: .1 the proper name of the <i>Owner</i>; .2 the proper name and address of the <i>Project</i>; .3 the date the warranty commences, which shall be at the "Ready-for-Takeover" unless otherwise agreed upon by the <i>Consultant</i> in writing. .4 a clear definition of what is being warranted and/or guaranteed as required by the <i>Contract Documents</i>; and .5 the signature and seal (if required by the governing law of the <i>Contract</i>) of the company issuing the warranty, countersigned by the <i>Contractor</i>. 12.3.9 Should any <i>Work</i> need to be repaired or replaced during the time period for which it is covered by the specified warranty, a new warranty shall be provided under the same conditions and for the same period as specified herein before. The new warranty shall commence at the completion of the repair or replacement. 12.3.10 The <i>Contractor</i> shall ensure that its <i>Subcontractors</i> are bound to the requirements of GC 12.3 – WARRANTY for the <i>Subcontractor's</i> portion of the <i>Work</i>. 12.3.11 The <i>Contractor</i> shall ensure that all warranties, guarantees or other obligations for <i>Work</i>, services or <i>Products</i> performed or supplied by any <i>Subcontractor</i>, <i>Supplier</i> or other person in connection with the <i>Work</i> are obtained and available for the direct benefit of the <i>Owner</i>. In the alternative, the <i>Contractor</i> shall assign to the <i>Owner</i> all warranties, guarantees or other obligations for <i>Work</i>, services or <i>Products</i> performed or supplied by any <i>Subcontractor</i>, <i>Supplier</i> or other person in connection with the <i>Work</i> and such assignment shall be with the consent of the assigning party, where required by law, or by the terms of that party's contract. Such assignment shall be in addition to, and shall in no way limit, the warranty rights of the <i>Owner</i> under the <i>Contract Documents</i>. 12.3.12 The <i>Contractor</i> shall commence or correct any deficiency within 2 <i>Working Days</i> after receiving a <i>Notice in Writing</i> from the <i>Owner</i> or the <i>Consultant</i>, and shall complete the <i>Work</i> as expeditiously as possible, except in the case where the deficiency prevents maintaining security or where basic systems essential to the ongoing business of the <i>Owner</i> and/or its tenants cannot be maintained operational as designed. In those circumstances all necessary corrections and/or installations of temporary replacements shall be carried out immediately as an emergency service. Should the <i>Contractor</i> fail to provide this emergency service within 8 hours of a request being made during the

		normal business hours of the <i>Contractor</i> , the <i>Owner</i> is authorized, notwithstanding GC 3.1, to carry out all necessary repairs or replacements at the <i>Contractor's</i> expense."

PART 13 INDEMNIFICATION AND WAIVER

GC 13.1 INDEMNIFICATION

SC58.1	GC 13.1	<u>Delete</u> GC 13.1 – INDEMNIFICATION in its entirety and <u>replace</u> it with the following: "13.1.1 The <i>Contractor</i> shall indemnify and hold harmless the <i>Owner</i>, its parent, subsidiaries and affiliates, their respective partners, trustees, officers, directors, agents and employees and the <i>Consultant</i> from and against any and all claims, liabilities, expenses, demands, losses, damages, actions, costs, suits, or proceedings (hereinafter called "claims"), whether in respect of claims suffered by the <i>Owner</i> or in respect of claims by third parties, that directly or indirectly arise out of, or are attributable to, the acts or omissions of the <i>Contractor</i>, its employees, agents, <i>Subcontractors</i>, <i>Suppliers</i> or any other persons for whom it is in law responsible (including, without limitation, claims that directly or indirectly arise out of, or are attributable to, loss of use or damage to the <i>Work</i>, the <i>Owner's</i> property or equipment, the <i>Contractor's</i> property or equipment or equipment or property adjacent to the <i>Place of the Work</i> or death or injury to the <i>Contractor's</i> personnel). 13.1.2 The <i>Owner</i> shall indemnify and hold the <i>Contractor</i>, its agents and employees harmless from and against claims, demands, losses, costs, damages, actions, suits or proceedings arising out of the <i>Contractor's</i> performance of the <i>Contract</i> which are attributable to a lack of or defect in title or an alleged lack of or defect in title to the <i>Place of the Work</i>. 13.1.3 The provisions of GC 13.1 - INDEMNIFICATION shall survive the termination of the <i>Contract</i>, howsoever caused and no payment or partial payment, no issuance of a final certificate of payment and no occupancy in whole or in part of the <i>Work</i> shall constitute a waiver or release of any of the provisions of GC 13.1 13.1.4 Notwithstanding the provisions of GC1.1 - CONTRACT DOCUMENTS, GC 1.1.6, GC13.1 - INDEMNIFICATION shall govern over the provisions of GC 1.3.1 of GC1.3 – RIGHTS AND REMEDIES."

GC 13.2 WAIVER OF CLAIMS

	13.2.1	In paragraph 13.2.1 in the third line after the word "limitation" <u>add</u> the words "claims for delay pursuant to GC 6.5 DELAYS" -and- <u>add</u> the words "(collectively "Claims")" after "<i>Ready-for-Takeover</i>" in the fourth line.
	13.2.1.1	In subparagraph 13.2.1.1, in each instance change the word "claims" to "Claims" and change the word "claim" to "Claim".

	13.2.1.2	In subparagraph 13.2.1.2 change the word “claims” to “Claims”.
	13.2.1.3	<u>Delete</u> subparagraph 13.2.1.3 in its entirety.
	13.2.1.4	In paragraph 13.2.1.4 change the word “claims” to “Claims”.
	13.2.2.1	In paragraph 13.2.2.1 <u>delete</u> the words “in paragraphs 13.2.1.2 and 13.2.1.3” and <u>replace</u> them with “in paragraph 13.2.1.2” -and- change the word “claims” to “Claims” in both instances and change the word “claim” to “Claim”.
	13.2.3	<u>Delete</u> paragraph 13.2.3 in its entirety.
	13.2.4	<u>Delete</u> paragraph 13.2.4 in its entirety.
	13.2.5	<u>Delete</u> paragraph 13.2.5 in its entirety.
	13.2.6	In paragraph 13.2.6 change the word “claim” to “Claim” in all instances in the paragraph.
	13.2.8	In paragraph 13.2.8 change “The party” to “The <i>Contractor</i> ” -and- change the word “claim” to “Claim” in all instances in the paragraph.
	13.2.9	In paragraph 13.2.9 <u>delete</u> the words “under paragraphs 13.2.1 or 13.2.3” and <u>replace</u> them with “under paragraph 13.2.1” -and- change both instances of the words “the party” to “the <i>Contractor</i> ”. Change the word “claim” to “Claim” in all instances in the paragraph.

***NEW* PART 14 OTHER PROVISIONS**

SC58.1	14.1	<u>Add</u> new PART 14 – OTHER PROVISIONS as follows: “PART 14 OTHER PROVISIONS GC 14.1 OWNERSHIP OF MATERIALS

		14.1.1 Unless otherwise specified, all materials existing at the <i>Place of the Work</i> at the time of execution of the <i>Contract</i> shall remain the property of the <i>Owner</i>. All <i>Work</i> and <i>Products</i> delivered to the <i>Place of the Work</i> by the <i>Contractor</i> shall be the property of the <i>Owner</i>. The <i>Contractor</i> shall remove all surplus or rejected materials as its property when notified in writing to do so by the <i>Consultant</i>."
	14.2	<u>Add</u> new GC 14.2 – CONSTRUCTION LIENS as follows: "GC 14.2 LIENS 14.2.1 Notwithstanding any other provision in the <i>Contract</i>, the <i>Consultant</i> shall not be obligated to issue a certificate, and the <i>Owner</i> shall not be obligated to make payment, subject to the <i>Owner's</i> requirement to issue a <i>Notice of Non-Payment</i> (Form 1.1) to the <i>Contractor</i>, if at the time such certificate or payment was otherwise due: .1 a claim for lien has been registered against the <i>Project</i> lands by a <i>Subcontractor</i> or a <i>Supplier</i> that has not been vacated or discharged by the <i>Contractor</i> in accordance with the requirements of this <i>Contract</i>, or .2 if the <i>Owner</i> or a mortgagee of the <i>Project</i> lands has received a written notice of a lien that has not been resolved by the <i>Contractor</i> through the posting of security or otherwise. 14.2.2 In the event a construction lien arising from the performance of the <i>Work</i> is registered or preserved against the <i>Project</i> lands by a <i>Subcontractor</i> or a <i>Supplier</i>, or a written notice of a lien is given or a construction lien action is commenced against the <i>Owner</i> by a <i>Subcontractor</i> or a <i>Supplier</i>, then the <i>Contractor</i> shall, at its own expense: .1 within 10 calendar days of registration of the construction lien, vacate or discharge the lien from title to the premises (i.e. the <i>Place of the Work</i>). If the lien is merely vacated, the <i>Contractor</i> shall, if requested, undertake the <i>Owner's</i> defence of any subsequent action commenced in respect of the lien, at the <i>Contractor's</i> sole expense; .2 within 10 calendar days of receiving notice of a written notice of a lien, post security with the Ontario Superior Court of Justice so that the written notice of a lien no longer binds the parties upon whom it was served; and .3 satisfy all judgments and pay all costs arising from such construction liens and actions and fully indemnify the <i>Owner</i> against all costs and expenses arising from same, including legal costs on a full indemnity basis. 14.2.3 In the event that the <i>Contractor</i> fails or refuses to comply with its obligations pursuant to paragraph 14.2.2, the <i>Owner</i> shall, at its option, be entitled to take all steps necessary to address any such construction liens including, without limitation and in addition to the <i>Owner's</i> rights under paragraph 13.2.4, the posting of security with the Ontario Superior Court of Justice to vacate the claim for lien from title to the <i>Project</i> lands, and in so doing will be entitled to a full indemnity from the <i>Contractor</i> for all legal fees, security,

		disbursements and other costs incurred and will be entitled to deduct same from amounts otherwise owing to the <i>Contractor</i>. 14.2.4 In the event that any <i>Subcontractor</i> or <i>Supplier</i> registers any claim for lien with respect to all or part of the <i>Place of Work</i>, the <i>Owner</i> shall have the right to withhold, in addition to the statutory holdback, the full amount of said claim for lien plus either: (a) \$250,000 if the claim for lien is in excess of \$1,000,000 or (b) 25% of the value of the claim for lien and to bring a motion to vacate the registration of said claim for lien and any associated certificate of action in respect of that lien, in accordance with Section 44 of the <i>Act</i>, by paying into court as security the amount withheld. 14.2.5 Nothing in this GC 14.2 serves to preclude the <i>Contractor</i> from preserving and perfecting its lien in the event of non-payment by the <i>Owner</i>."

**APPENDIX 1
to the Supplementary Conditions**

Project-specific requirements for a "Proper Invoice"

To satisfy the requirements for a *Proper Invoice*, the following criteria, as may be applicable in each case, must be included with the *Contractor's* application for payment:

- .1 the written bill or request for payment must be in writing;
- .2 the *Contractor's* name and current address;
- .3 the *Contractor's* HST registration number;
- .4 the date the application for payment was prepared by the *Contractor*;
- .5 the period of time in which the services or materials were supplied to the *Owner*;
- .6 the purchase order number provided by the *Owner*;
- .7 reference to the provisions of the *Contract* under which payment is being sought (e.g. GC 5.3 –PAYMENTS for progress payments, GC 5.4 – SUBSTANTIAL PERFORMANCE OF THE WORK AND PAYMENT OF HOLDBACK GC 5.5 – FINAL PAYMENT for final payment, etc.);
- .8 a description, including quantities where appropriate, of the services or materials, or a portion thereof, that were supplied and form the basis of the *Contractor's* request for payment;
- .9 the amount the *Contractor* is requesting to be paid by the *Owner*, set out in a statement based on the schedule of values approved under GC 5.2.4, separating out any statutory or other holdbacks, set-offs and HST;
- .10 a sworn Statutory Declaration in the form CCDC 9A-2018, only for second and subsequent progress payments;
- .11 a current Workplace Safety Insurance Board clearance certificate;
- .12 a pre-approved schedule of values, supplied by the *Contractor*, for Divisions 1 through 14 of the *Specifications* (or equivalent Construction Specifications Institute Masterformat) of the *Work*, aggregating the total amount of the *Contract Price*, including all supporting invoicing;
- .13 a separate pre-approved schedule of values, supplied by each *Subcontractor*, for each of Division 15, 16, and 17 of the *Specifications* (or equivalent Construction Specifications Institute Masterformat) of the *Work*, aggregating the total amount of the *Contract Price*, including all supporting invoicing;

- .14 invoices and other supporting documentation for all claims against the cash allowance;
- .15 a current, acceptable, and up to date *Construction Schedule Update*;
- .16 if requested by the *Owner*, a current and valid certificate(s) of insurance as required under GC 11.1 – INSURANCE;
- .17 the name, title, telephone number and mailing address of the person at the place of business of the *Contractor* to whom payment is to be directed;
- .18 a current, up to date, and approved *Shop Drawing* log;
- .19 in the case of the *Contractor's* application for final payment, in addition to the foregoing requirements (as applicable):
 - (a) any *Close-Out Documentation*, together with complete and final as-built drawings;
 - (b) the *Contractor's* written request for release of the deficiency holdback, including a statement that no written notices of lien have been received by it;
 - (c) the *Contractor's* written certification that there are no outstanding claims, pending claims or future claims from the *Contractor* or their *Subcontractors* or *Suppliers*; and
 - (d) sufficient evidence of the *Contractor's* compliance with GC 3.11.

END OF AMENDMENTS TO CCDC 2 - 2020

DIVISION 01 - GENERAL REQUIREMENTS

01 14 00 – Work Restrictions

1.0 GENERAL

1.1. SECTION INCLUDES

- .1 Connecting to existing services
- .2 Special scheduling requirements

1.2. RELATED SECTIONS

- .1 Section 01 53 00 - Temporary Construction.
- .2 Section 01 33 00 - Submittal Procedures.
- .3 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3. EXISTING SERVICES

- .1 Notify Owner and Consultant and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Consultant and Owner forty-eight (48) hours of notice for necessary interruption of mechanical or electrical service throughout the course of work.
 - .1 Keep duration of interruptions minimum.
 - .2 Perform interruptions after normal working hours of occupants, preferably on weekends.
- .2 Provide for vehicular, pedestrian and personnel traffic.
- .3 Construct barriers in accordance with Section 01 53 00.

1.2. AFTER HOURS WORK

- .1 Schedule Work with school staff through the Board's contact so as to limit disruption to school operations. Include for any overtime, to ensure orderly and continuous progression of Work and operation of school.
- .2 Direct calls from Contractors to Board staff to adjust alarms and to arrange for access will not be accepted. All correspondence must be through the Project Manager.
- .3 Arrange 48 hours in advance with the Board to obtain an access card and adjust security alarms for after hours Work.

- .4 Bidders are cautioned that the Board will be compensated by the Contractor for false alarms. Any costs associated with each false alarm will be levied against the Contractor for false fire alarm activation or security alarm activation. These costs may include, but are not limited to:
 - .1 Fines or penalties imposed by the local Fire Services,
 - .2 Fines or penalties imposed by the local Police Services,
 - .3 Overtime costs borne by the Board.
- .5 Contractors are responsible for ensuring doors and windows are secured prior to leaving school.
- .6 Unless specifically stated otherwise school activities take precedence over Contractor's activities.

1.3. SPECIAL REQUIREMENTS

- .1 Schedule and perform work in occupied areas to the Board Representative's approval.
- .2 Schedule and perform noise generating work to the Board Representative's approval.
- .3 Submit schedule of special requirements or disruptions in accordance with Section 01 33 00.
- .4 All Contractor personnel are restricted to the job site and necessary access routes. No personnel shall visit other areas or buildings without specific authorization.

END OF SECTION

01 19 00 – Specifications and Documents

1.0 GENERAL

1.1. RELATED DOCUMENTS

- .1 This section describes requirements applicable to all sections within Divisions 02 to 49.

1.2. WORDS AND TERMS

- .1 Conform to definitions and their defined meanings in the Agreement and Definitions portion of CCDC 2 for Supplementary Words and Terms listed in Section 00 56 13.

1.3. COMPLEMENTARY DOCUMENTS

- .1 Generally, drawings indicate graphically, the dimensions and location of components and equipment. Specifications indicate specific components, assemblies, and identify quality.
- .2 Drawings, specifications, diagrams and schedules are complementary, each to the other, and what is required by one, to be binding as if required by all.
- .3 Should any conflict or discrepancy appear between documents, which leaves doubt as to the intent or meaning, apply the Precedence of Documents article below or obtain guidance or direction from Consultant.
- .4 Examine all discipline drawings, specifications, schedules, diagrams and related Work to ensure that Work can be satisfactorily executed.
- .5 All specification sections of the Project Manual and Drawings are affected by requirements of Division 01 sections.

1.4. PRECEDENCE OF DOCUMENTS

- .1 In the event of conflict within and between the Contract Documents, the order of priority within specifications and drawings for this project are - from highest to lowest:
 - .1 the Agreement and Definitions between the Owner and the Construction
 - .2 the Defined Terms, Definitions;
 - .3 Supplementary Conditions;
 - .4 the General Conditions;
 - .5 Sections of Division 01 of the specifications;
 - .6 Technical specifications Sections of Divisions 02 through 49 of the specifications.

- .7 Schedules and Keynotes:
 - .1 Material and finishing schedules within the specifications, then;
 - .2 Material and finishing schedules on drawings, then;
 - .3 Keynotes and definitions thereto, then;
- .8 Drawings:
 - .1 Drawings of larger scale shall govern over those of smaller scale of the same date, then;
 - .2 Dimensions shown on drawings shall govern over dimensions scaled from drawings, then;
 - .3 Location of utility outlets indicated on architectural detail drawings takes precedence over positions or mounting heights located on mechanical or electrical Drawings.
- .9 Later dated documents shall govern over earlier documents of the same type.

1.5. SPECIFICATION GRAMMAR

- .1 Specifications are written in the imperative command mode, in an abbreviated form.
- .2 Imperative language of the technical sections is always directed to the Contractor identified as a primary constructor, as sole executor of the Contract, unless specifically noted otherwise.
 - .1 This form of imperative command mode statement requires the primary constructor to perform such action or Work.
 - .2 Perform all requirements of the Contract Documents whether stated imperatively or otherwise.
- .3 Division of the Work among subcontractors, suppliers, or others is solely the prime contractor's responsibility. The Consultant(s) and specification authors assume no responsibility to function or act as an arbiter to establish subcontract scope or limits between sections or divisions of Work.

END OF SECTION

01 21 00 – Allowances

1.0 GENERAL

1.1. RELATED SECTIONS

- .1 Section 01 45 00 – Quality Control.
- .2 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.2. GENERAL

- .1 Allowances included herein are for items of Work which could not be fully quantified prior to Bidding.
- .2 Expend each allowance as directed by the Consultant. Work covered by allowances shall be performed for such amounts and by such persons as directed by Consultant.
- .3 Funds will be expended by means of Cash Allowance allocations and contingency allowance allocations.
- .4 Progress payments for Work and Products authorized under allowances will be made in accordance with the payment terms set out in the Conditions of the Contract.
- .5 The Contractor shall bid the work involved and submit the Bids received to the Consultant and the Board, for approval
- .6 The Contractor shall submit 3 bids unless directed by the Board.

1.3. CASH ALLOWANCES

- .1 Cash allowances, cover the net cost to the Contractor of services, products, construction machinery and equipment, freight, handling, unloading, storage, installation where indicated, and other authorized expenses incurred in performing the Work. Cash allowances shall not be included by a subcontractor in the amount for their subcontract work.
- .2 Supply only allowances shall include:
 - .1 Net cost of Products.
 - .2 Delivery to Site.
 - .3 Applicable taxes and duties, excluding HST.
- .3 Supply and install allowances shall include:
 - .1 Net cost of Products.
 - .2 Delivery to Site.
 - .3 Unloading, storing, handling or products on site.

- .4 Installation, finishing and commissioning of products.
- .5 Applicable taxes and duties, excluding HST.
- .4 Inspection and testing allowances shall include:
 - .1 Net cost of inspection and testing services.
 - .2 Applicable taxes and duties, excluding HST.
- .5 Other costs related to work covered by cash allowances are not covered by the allowance, but shall be included in the Contract Price.
- .6 Where costs under a cash allowance exceed the amount of the allowance, the Contractor will be compensated for any excess incurred and substantiated plus an allowance for overhead and profit as set out in the Contract Documents.
- .7 Progress payments on accounts of work authorized under cash allowances shall be included in the monthly certificate for payment.
- .8 Submit, before application for final payment, copies of all invoices and statements from suppliers and subcontractors for work which has been paid from cash allowances.

1.4. ALLOWANCES SCHEDULE

Include in the Bid Price a cash allowance of to address the cost of the following items:

1	Designated Substance Removal. (Additional removal not already identified in the ACM Summary report)	\$2,500
2	Independent Testing & Inspection (mortar, structural steel) (As directed by the Consultant)	\$2,500
3	Data cabling installation and network equipment (Including terminations)	\$5,000
4	Soundfield system (power rough-in to be included in base bid)	\$38,500
Total of All Allowances:		\$48,500

END OF SECTION

01 31 00 – Project Managing And Coordination

1.0 GENERAL

1.1. RELATED SECTIONS

- .1 Section 01 32 00 - Construction Progress Documentation.
- .2 Section 01 33 00 - Submittal Procedures.
- .3 Section 01 53 00 – Temporary Construction Facilities
- .4 Section 01 61 00 – Product Requirements
- .5 Section 01 78 10 – Closeout Submittals and Requirements
- .6 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.2. PROJECT COORDINATION

- .1 Perform coordination of progress schedules, submittals, use of site, temporary utilities, construction facilities and construction Work, with progress of Work of other contractors, under instructions of the Consultant.
- .2 The Contractor shall have total control of the Work and shall effectively direct and supervise the Work so as to ensure conformity with the Contract Documents and within the Contract Time.
- .3 The Contractor shall be solely responsible for the construction means, methods, sequences, and procedures and for coordinating parts of the Work under the contract.
- .4 Coordinate progress of the Work, progress schedules, submittals, use of site, temporary utilities, construction facilities, safety regulations and fire protection, as per authorities having jurisdiction codes.
- .5 The Consultant has the authority to stop the Work:
 - .1 whenever they observe or are made aware of unsafe conditions.
 - .2 whenever it is deemed necessary to protect the interests of the Board,
 - .3 whenever materials or workmanship are in contravention to the Contract Documents.

1.3. SITE SUPERVISOR AND PROJECT MANAGER

- .1 If requested, the Contractor shall provide the Consultant, in writing, the name of the Project Manager and Site Supervisor, and proof of competent experience in similar projects.
- .2 Performance of the Contractors Project Manager and Site Supervisor

- .1 If the Board and or the Consultant become concerned with any of: Site Safety, Project Schedule, or general compliance with the tender documents due to the performance of the Site Supervisor or Project Manager, the Consultant and or the Board will identify the concerns in writing to the Contractor.
 - .2 The Contractor shall respond in writing to the Board and Consultant with a corrective action for each item within 24 hours.
 - .3 If it is found that any of the corrections are not immediately implemented, the Consultant and the Board shall meet with the General Contractor to review the credentials including curriculum vitae and comparable experience of a replacement Site Supervisor and or Project Manager proposed by that Contractor.
 - .4 All outstanding concerns initiating the replacement of the personnel will be immediately addressed to the satisfaction of the Consultant and the Board.
- .3 If the Board and or the Consultant become concerned with site safety, project schedule or general compliance with the tender documents due to the performance of the Site Supervisor or the Project Manager, the Consultant or the Board will issue the concerns in writing to the Contractor. The Contractor shall respond in writing within 24 hours to the Consultant and the Board. If any of the corrections are not immediately implemented, the Consultant or the Board will schedule a meeting with the Consultant, General Contractor and the Board. At this meeting the Contractor will introduce the new Project Manager, and or Site Supervisor and present the Curriculum Vitae for each showing proof of comparable experience in similar projects. The Contractor will then address the outstanding concerns to the satisfaction of the Consultant and the Board.
- .4 The Project Manager, and/or Site Supervisor shall not be replaced by the Contractor without prior written approval from the Board and the Consultant.

1.4. PERMITS

- .1 **The Board will obtain & pay for all building permits, but the Contractor is responsible for all other permits, including electrical inspection and fire alarm verification.**

1.5. CONSTRUCTION DOCUMENTS

- .1 The Consultant will provide the Contractor with PDF copies of both the drawings and the specification and CAD format files of the drawings at no charge to the Contractor. All printing will be at the cost of the Contractor including the AS-BUILT documents.

1.6. PRE-CONSTRUCTION MEETING

- .1 Immediately prior to construction and upon notification by the Consultant of a time and date, the Contractor shall attend the preconstruction meeting at a location as determined by the Consultant, along with authoritative representatives of certain key subcontractors as specifically indicated in the conference notice. Agenda to include following:
 - .1 Appointment of official representative of participants in Work.
 - .2 Project communications procedures
 - .3 Schedule of Work, progress scheduling (including long lead items, cash allowance items) as specified in Section 01 32 00.
 - .4 Schedule of submission of shop drawings, samples, colour chips as specified in Section 01 33 00.
 - .5 Requirements for temporary facilities, washrooms, refuse bin, site sign, offices, storage sheds, utilities, fences as specified in Section 01 53 00.
 - .6 Delivery schedule of specified equipment as specified in Section 01 61 00.
 - .7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, and administrative requirements.
 - .8 Owner furnished products.
 - .9 Record drawings as specified in Section 01 78 10.
 - .10 Maintenance material and data as specified in Section 01 78 10.
 - .11 Take-over procedures, acceptance, and warranties as specified in Section 01 78 10.
 - .12 Monthly progress claims, administrative procedures, photographs, and holdbacks.
 - .13 Appointment of inspection and testing agencies
 - .14 Insurances and transcript of policies.
 - .15 Review Vendor Performance Evaluation for the Contractor and Subcontractors
 - .16 Hot Work Permit Process
 - .17 Security Access, Fire Alarm shutdown procedures
 - .18 Any other items as required by the owner, contractor, or Consultant.

1.7. ON-SITE DOCUMENTS

- .1 Maintain at job site at all times, one copy (written or digital) each of the following:
 - .1 Complete set of Contract drawings.
 - .2 Specifications.
 - .3 All Addenda.

- .4 Site Instructions and Sketches
- .5 Reviewed shop drawings and samples.
- .6 Change Orders and Contemplated Change Orders.
- .7 Other modifications to Contract.
- .8 Site Instructions
- .9 Colour schedule
- .10 Hardware List
- .11 Field test reports.
- .12 Copy of approved Work schedule.
- .13 Manufacturers' installation and application instructions.
- .14 Progress reports and meeting minutes.
- .15 Approved building permit documents.
- .16 Copy of current Ontario Building Code and National Building Code.
- .17 CSA Standard, CGSB Specifications. ASTM Documents and other standards referenced to in the specifications.
- .18 Labour conditions and wage schedules.
- .19 Applicable current editions of municipal regulations and by-laws. Current building codes, complete with addenda bulletins applicable to the Place of the Work.

1.8. SCHEDULES

- .1 Within three weeks following the award of the Contract, submit a detailed, trade by trade progress schedule for the work in a bar chart form acceptable to the Consultant.
- .2 Submit preliminary construction progress schedule as specified in Section 01 32 00 to Consultant coordinated with Consultant's project schedule.
- .3 After review, revise and resubmit schedule to comply with revised project schedule.
- .4 During progress of Work revise and resubmit as directed by the Consultant.
- .5 Provide schedule updates every month with request for Payment, for duration of Contract.

1.9. CONSTRUCTION PROGRESS MEETINGS

- .1 Prior to the commencement of the Work, the Contractor together with the Consultant shall mutually agree to a sequence for holding regular "on site meetings".
- .2 The Contractor will organize site meetings. Ensure persons, whose presence is required, are present and relative information is available to allow meetings to be conducted efficiently.

- .3 Contractor, major subcontractors and consultants involved in Work are to be in attendance.
- .4 Post and forward copies of progress schedules for advice of Subcontractors, Owner and Consultant.
- .5 Notify parties minimum five (5) days prior to meetings.
- .6 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within two (2) days after meeting.
- .7 Agenda to include following:
 - .1 Review, approval of minutes of previous meeting.
 - .2 Review of Work progress since previous meeting.
 - .3 Field observations, problems, conflicts.
 - .4 Problems which impede construction schedule.
 - .5 Review of off-site fabrication delivery schedules.
 - .6 Corrective measures and procedures to regain projected schedule.
 - .7 Revision to construction schedule.
 - .8 Progress schedule, during succeeding work period.
 - .9 Review submittal schedules: expedite as required.
 - .10 Maintenance of quality standards.
 - .11 Review proposed changes for effect on construction schedule and on completion date.
 - .12 Review site security issues.
 - .13 Other business.
- .8 Schedule additional meetings, to expedite progress, should work require it.
- .9 Keep Owner and Consultant informed of progress, of delays and potential delays during all stages of Work. Do everything possible to meet progress schedule
- .10 Schedule and administer pre-installation meetings when specified in sections and when required to coordinate related or affected Work.

1.10. SUBMITTALS

- .1 Prepare and issue submittals to Consultant for review.
- .2 Submit preliminary Shop Drawings, product data and samples for review for compliance with Contract Documents; for field dimensions and clearances, for relation to available space, and for relation to Work of other contracts. After review, revise and resubmit for transmittal to Consultant.
- .3 Submit requests for payment for review, and for transmittal to Consultant.
- .4 Submit requests for interpretation of Contract Documents, and obtain instructions through Consultant.

- .5 Process substitutions through Consultant.
- .6 Process change orders through Consultant.
- .7 Deliver closeout submittals for review and preliminary inspections, for transmittal to Consultant.

1.11. RECORD (AS-BUILT) DOCUMENTS AND SAMPLES

- .1 Procedures for record as-built documents and samples as specified in Section 01 78 10.
- .2 Keep as-built documents and samples available for inspection by the Consultant.

1.12. CLOSEOUT PROCEDURES

- .1 Take-over procedures, acceptance, and warranties as specified Section 01 78 10
- .2 Notify Consultant and Board when Work is considered ready for Substantial Performance.
- .3 Accompany Consultant and Board on preliminary inspection to determine items listed for completion or correction.
- .4 Comply with Consultant's instructions for correction of items of Work listed in executed certificate of Substantial Performance.
- .5 Notify Consultant of instructions for completion of items of Work determined in Consultant's final inspection.

END OF SECTION

01 32 00 – Construction Progress Documentation

1.0 GENERAL

1.1. RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.2. SCHEDULES

- .1 Within seven 7 days following the award of the Contract, submit a detailed cash flow chart broken down on a monthly basis, in a manner acceptable to the Consultant. Cash flow chart shall indicate anticipated Contractor's monthly progress billings from commencement of work until completion.
- .2 Update cash flow chart whenever changes occur to scheduling and in manner and at times satisfactory to Consultant.
- .3 Submit schedule of values at least fourteen (14) days before the first application
- .4 Submit schedules as follows:
 - .1 Submittal Schedule for Shop Drawings and Product Data.
 - .2 Submittal Schedule for Samples.
 - .3 Submittal Schedule for timeliness of Owner-furnished Products.
 - .4 Product Delivery Schedule.
 - .5 Cash Allowance Schedule for acquiring Products and Installation.
 - .6 Shutdown or closure activity.

1.3. CONSTRUCTION PROGRESS SCHEDULING

- .1 Submit initial schedule to the Consultant and the Board in duplicate within seven (7) days after following the award.
- .2 Schedule Format.
 - .1 Prepare schedule in form of a horizontal bar chart.
 - .2 Split horizontally for projected and actual performance.
 - .3 Provide horizontal time scale identifying each Working Day of each week.
- .3 Schedule Submission.
 - .1 Consultant will review schedule and return reviewed copies within five (5) days after receipt.
 - .2 Submit schedules in electronic format, forward to the Consultant and Owner as a pdf. file.

- .3 Resubmit finalized schedule within five (5) days after return of review copy.
- .4 Submit revised progress schedule with each application for payment.
- .5 Distribute copies of revised schedule to:
 - .1 Job site office.
 - .2 Subcontractors.
 - .3 Other concerned parties.
- .6 Instruct Consultant to report to Contractor within ten (10) days, any problems anticipated by timetable shown in schedule.
- .4 Submit revised schedules with Application for Payment, identifying changes since previous version.
- .5 Select either of the following paragraphs to identify the type and format of schedule required.
- .6 Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.
- .7 Indicate estimated percentage of completion for each item of Work at each submission.
- .8 Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates, including those furnished by Owner and required by Allowances.
- .9 Include dates for commencement and completion of each major element of construction:
 - .1 Site clearing.
 - .2 Site utilities.
 - .3 Foundation Work.
 - .4 Structural framing.
 - .5 Subcontractor Work.
 - .6 Equipment Installations.
 - .7 Finishes.
- .10 Indicate projected percentage of completion of each item as of first day of month.
- .11 Indicate progress of each activity to date of submission schedule.
- .12 Indicate changes occurring since previous submission of schedule:
 - .1 Major changes in scope.
 - .2 Activities modified since previous submission.
 - .3 Revised projections of progress and completion.
 - .4 Other identifiable changes.
- .13 Provide a written report to define:

- .1 Problem areas, anticipated delays, and impact on schedule.
- .2 Corrective action recommended and its effect.
- .3 Effect of changes on schedules of other subcontractors.

1.4. PROGRESS PHOTOGRAPHS

- .1 Digital Photography:
 - .1 Submit electronic copy of progress photographs of project, Digital format, minimum 300 in megapixel resolution.
 - .2 Identification: Name and number of project and date of exposure indicated.
 - .3 Provide both interior and exterior photographs.
 - .4 Number of Viewpoints: Locations of viewpoints determined by Consultant.
 - .5 Frequency: Monthly with progress statement. Provide the required number of pictures to accurately reflect the submitted progress percentage.

1.5. SHOP DRAWING SUBMITTAL SCHEDULE

- .1 Include schedule for submitting shop drawings, product data, samples
- .2 Indicate dates for submitting, review time, resubmission time, and last date for meeting fabrication schedule.
- .3 Include dates when shop drawings and samples will be required for Owner-furnished products.
- .4 Include dates when reviewed submittals will be required from Consultant.
- .5 Provide final signed off copies of the shop drawings in digital format to the Board.

END OF SECTION

01 33 00 – Submittal Procedures

1.0 GENERAL

1.1 RELATED SECTIONS

1. Section 01 32 00 - Construction Progress Documentation.
2. Section 01 78 10 - Closeout Submittals.
3. This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.1 ADMINISTRATIVE

1. Submit to Consultant submittals listed for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work. Failure to submit 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.
2. Work affected by submittal shall not proceed until review is complete.
3. Present Shop Drawings, product data, samples and mock-ups in Metric (SI) units. Shop drawings containing imperial measurements will be rejected.
4. Where items or information is not manufactured or produced in SI Metric units, converted values within the metric measurement to the next largest imperial size available. Tolerances of .0625 acceptable.
5. 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 co-ordinated with requirements of Work and Contract Documents.
6. Submittals not stamped, signed, dated, identified as to specific project, and attesting to their being reviewed will be returned without being examined and shall be considered rejected.
7. Shop drawings which require the approval of a legally constituted authority having jurisdiction shall be submitted by Contractor to such authority for approval. Such shop drawings shall receive final approval of authority having jurisdiction before Consultant's final review.
8. No work, requiring a shop drawing submission, shall be commenced until the submission has received Consultant's final review. Only shop drawings bearing Consultant's review stamp are to be sent and used on the job site.
9. Notify Consultant, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

10. Shop drawings shall not contain substituted materials unless such substitutions have been requested in advance and approved by Consultant.
11. Verify field measurements and affected adjacent Work are coordinated.
12. Contractor's responsibility for errors and omissions in submission is not relieved by Consultant's review of submittals.
13. Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Consultant review.
14. Keep one (1) reviewed copy of each submission on site.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 The term "Shop Drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 The term "design team" means Consultant and Sub-consultants whether Sub-consultants are employees of Consultant or not, and includes structural, mechanical, electrical, etc.
- .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.
- .4 Allow fourteen (14) days for Consultant's review of each submission.
- .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.
- .6 Make changes in Shop Drawings as Consultant may require, consistent with Contract Documents. When resubmitting, notify Consultant in writing of any revisions other than those requested.
- .7 Accompany submissions with transmittal letter, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
- .8 Submissions shall include:
 - .1 Date and revision dates.

- .2 Project title and number.
- .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
- .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to other parts of the Work.
- .9 After Consultant's review, distribute copies.
- .10 Submit Shop Drawings in Pdf. format for each requirement requested in specification Sections and as consultant may reasonably request.
- .11 Submit product data sheets or brochures in Pdf. format for requirements requested in specification sections and as requested by Consultant where Shop Drawings will not be prepared due to standardized manufacture of product.
- .12 Delete information not applicable to project.
- .13 Supplement standard information to provide details applicable to project.
- .14 If upon review by Consultant, no errors or omissions are discovered or if only minor corrections are made, the drawings will be stamped as reviewed or reviewed as modified and will be returned. At this point fabrication and installation of Work may proceed. If Shop Drawings are rejected, noted copy will be returned and re-submission of corrected Shop Drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .15 Signed drawings shall be returned to and retained by Contractor who is then responsible for distribution of copies of corrected shop drawing to appropriate

Subcontractors for appropriate action and to municipal building department for their records of those subjects required by authorities.

- .16 The Consultant's review is for the sole purpose of ascertaining conformance with the general design concept. This review shall not mean the Consultant approves the detail design inherent in the shop drawings, responsibility for which shall remain with the Contractor submitting same, and this review shall not relieve the Contractor of his responsibility for meeting the requirements of the Contract Documents. The Contractor is responsible for dimensions to be confirmed and correlated at the job site for information that pertains solely to fabrication processes or to techniques of construction and installation and for coordination of the work of all subtrades.

1.3 SAMPLES

- .1 Submit for review to the Consultant three (3) samples as requested in respective specification Sections.
- .2 Submit samples with identifying labels bearing material or component description, manufacturer's name and brand name, Contractor's name, project name, location in which material or component is to be used, and date.
- .3 Deliver samples prepay any shipping charges involved for delivering samples to destination point and returning to point of origin if required.
- .4 Provide samples of special products, assemblies, or components when so specified.
- .5 No work requiring a sample submission shall commence until submission has received Consultant's final review.
- .6 Notify Consultant in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .7 Where colour, pattern or texture is criterion, submit full range of samples.
- .8 Adjustments made on samples 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.
- .9 Make changes in samples which Consultant may require, consistent with Contract Documents.
- .10 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.4 MOCK-UP

- .1 Erect mock-ups to Section 01 45 00.

1.5 ` CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after award of Contract, and prior to commencing the work submit the performance bond and the labour and materials payment bond as described in the bid documents.
- .2 Submit transcription of certified true copies of insurance immediately after award of Contract.
- .3 A current WSIB clearance certificate
- .4 The bidder's health and safety policy for the project.
- .5 A copy of the notice of project issued by the ministry of labour for the project
- .6 Building materials, components and elements specified without the use of trade or proprietary names shall meet requirements specified. If requested by Consultant, submit evidence of meeting requirements specified. Evidence shall consist of certification based on tests carried out by an independent testing agency. Certification based on previous tests for same materials, components or elements is acceptable. Certification shall be in form of written test reports prepared by testing agency.

END OF SECTION

01 35 17 – Fire Safety Procedures

1.0 GENERAL

1.1. RELATED SECTIONS

- .1 Section 01 14 00 – Work Restrictions.
- .2 Section 01 31 00 - Project Managing and Coordination.
- .3 Section 01 33 00 - Submittal Procedures.
- .4 Section 01 35 23 – Health and Safety
- .5 This section describes requirements applicable to all Sections within Divisions 02 to 49.
- .6 Appendix 01 35 17A Contractor Hot Work Permit

1.2. FIRE SAFETY PLAN

- .1 Contractors and their personnel will be familiar with this section and its requirements.
- .2 The contractor must take all necessary precautions during the carrying out of the work to prevent the possibility of fire occurring.

1.3. FIRE PROTECTION

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by the governing codes, regulations and bylaws.
- .2 The contractor will, at all times, when welding, brazing and performing any operation with an open flame, combustible adhesives or flammable solvents keep a portable, operable fire extinguisher within 3 meters of the operation.

1.4. HOT WORK

- .1 Take all precautions to Work safely and to provide the necessary protection to persons and property from Hot Work. This includes, but is not limited to Brazing, Cutting, Grinding, Soldering, Thawing Pipe, Torch Applied Roofing and Welding. With all such activity these steps are to be followed:
 - .1 Whenever possible, complete Hot Work in a welding shop or out of doors at the school.
 - .2 Flammable liquids, dust lint and oily deposits to be removed from within 50-ft (15m) of Work. Remove other combustibles where possible. Otherwise protect with fire-resistive tarpaulins or metal shields.

- .3 Explosive atmosphere in area eliminated. Floors swept clean. Combustible floors wet down, covered with damp sand or fire-resistive tarpaulins.
- .4 All wall and floor openings covered. Fire-resistive tarpaulins suspended beneath Work.
- .5 For on-site Work (indoor and out of doors), advise the Head Custodian, Principal, Consultant (if assigned) and Project Coordinator prior to Work being performed, and of related dangers.
- .6 Where the Fire Alarm system is required to be set to stand-by to discourage false alarms from smoke detectors provide a firewatch throughout the building or structure being worked on. NEVER put the fire alarm system in stand-by mode when the building is occupied by staff or students.
- .7 In the event of a fire as a result of the Hot Work, notify the fire department immediately. Report incident to the head custodian, the Consultant, if assigned, and Project Coordinator immediately, whether extinguished or not. Provide a fire incident report to the Board.
- .8 Barriers must be set up to protect staff and students (i.e. pylons, shields, and caution tape) from exposure to arc flash and smoke migration.
- .9 Have all necessary doors, windows and/or drapes closed. Confer with the Head Custodian to shut down all fan systems in the area to reduce or eliminate smoke distribution.
- .10 Provide and keep fire extinguishers handy and in good Working condition. Temporarily cover all smoke detectors in the area during time of Work.
- .11 Provide a fire watch/spot check for several hours after Work is completed. Uncover smoke detectors.
- .12 On new construction, the requirements of the Hot Work permit may be waived, until such time as either Substantial Completion or Occupancy is granted, whichever comes first.
- .13 On additions to existing buildings, the requirements for Hot Work permits shall remain in place.

1.5. HOT WORK PERMIT

- .1 **A sample Hot Work Permit is attached to the specifications – refer to attached Appendix 01 35 17-A**
- .2 Each permit is valid for seven (7) days only and must be renewed prior to its expiration date
- .3 The contractor must obtain Hot Work Permits from the School Board's representative prior to the start of work.

- .4 The contractor must complete the form as required and must keep the form on site.
- .5 Return each completed form to the School Board's representative on the date of expiration.
- .6 The most current version of the Permit and its requirements shall be used for the purposes of the Work.

1.6. FIRE PROTECTION SYSTEMS

- .1 Any Modifications to Fire Alarm system and its devices including service, additions and changes in device location must be performed only by a Certified Fire Alarm Technician as per the Ontario Fire Code section 1.1, subsection 1.1.5.
- .2 The Contractor will receive from the Board's contact a contact number for the monitoring service and a school system number.
- .3 Bidders are cautioned that the Board will be reimbursed for the cost of false alarms. Refer to Section 01 14 00 Work Restrictions, Para. 1.4.4.
- .4 An approved inspection firm shall verify all new fire alarm devices, in accordance with CSA regulations. Certificate of Verification is required before occupancy.

1.7. FIRE ALARM SHUT-DOWN PROCEDURE

- .1 Plan the operation such that the required work minimizes system down time to the least amount possible. Do not shut the system down or engage silence mode when the building is occupied by students. Only shut the system down when necessary.
- .2 For the purposes of this section, unoccupied shall mean when the school is not occupied by students.
- .3 Wherever possible, shut down only the zone needing work,
- .4 and schedule down time in unoccupied school hours.
- .5 Contractor(s) shall ensure all costs are included in their bid price for work related to the fire alarm system outside of regular hours and/or during unoccupied school hours. This shall include evening and weekend work.
- .6 A fire alarm system must remain active when the building is not occupied by school or contractor's forces and should never be offline overnight.
- .7 Procedure

The following procedure shall be followed when a fire alarm system is completely or partially affected by maintenance, shutdown, bypass, silence, loss of power, or any other nomenclature that affects the proper operation of the complete system.

- .1 Inform both the principal and head custodian whenever the fire alarm system is to be disabled prior to any partial or whole system shut down. Where

- school staff are not available, ensure that the Project Coordinator and/or area supervisor are informed.
- .2 Ensure that the school or building administration has advised all staff when the fire alarm system is disabled and/or when it is back online. This will include instructions to call 911 if they detect smoke or a fire.
 - .3 Immediately prior to alarm system shutdown and upon restoring the fire alarm system, the person supervising the shutdown must:
 - 1.7.7.1.3.1. obtain the school account number, located on a red decal attached to the fire alarm panel. This number will be formatted as 20-9xxx, with the xxx being the school location code,
 - 1.7.7.1.3.2. contact Direct Detect at 519-741-2494 (the fire alarm monitoring company), to inform them of the state of the fire alarm and the approximate amount of time the fire alarm will be offline. They will require the building name and account number, the contact name, the contractor name as well as any other information they request, and
 - 1.7.7.1.3.3. contact Bestell at 519-741-2494 (the current security monitoring company), to inform them of the state of the fire alarm and the approximate amount of time the fire alarm will be offline. They may require the building name and account number as well as any other information they request.
 - .4 A fire watch, at the Contractor's expense, shall be undertaken by a person with the sole and express purpose of completing the following tasks and in the event of the detection of smoke, fire, or any other emergency, notifying the fire department, and the building occupants. The fire watch patrol shall:
 - 1.7.7.1.4.1. patrol all halls and high-risk areas affected,
 - 1.7.7.1.4.2. have access to a phone and call 911 if they see or detect smoke or fire,
 - 1.7.7.1.4.3. report any other problems they encounter,
 - 1.7.7.1.4.4. notifying the building occupants in the event of an emergency and
 - 1.7.7.1.4.5. remain on patrol until the fire alarm system is reactivated and fully operational.
 - .5 Contact Direct Detect, Bestell, and school administration to inform them that the fire alarm is back online.
 - .6 In the event that a fire alarm system is activated, whether by smoke, fire or accidentally, the system must not be reset until authorized by the Fire

Department (verbally or in person) and the cause of the alarm has been investigated.

1.8. FIRE PROTECTION EQUIPMENT IMPAIRMENT

- .1 Fire Protection Equipment referred to in this section includes sprinkler systems, special fire suppression systems, and kitchen hood suppression systems.
- .2 The Contractor will take all precautions including restrict all Hot Work operations and shut down hazardous processes during all Fire protection equipment impairment.
- .3 Do not shut the Fire protection equipment down unless necessary. Plan the operation required to reduce system impairment time to the least amount possible.
- .4 Wherever possible, shut down only the Fire protection equipment needing Work and schedule this impairment time for unoccupied school hours. Allow for this in your bid pricing.
- .5 Discuss the possible down time with the head custodian and principal prior to any partial or whole system impairment.
- .6 The school administration shall advise all staff of Fire protection equipment shut down. This will include instructions to call 911 if they see a fire and when system is back online
- .7 The Contractor will plan to use temporary protection such as extra extinguishers, charged hose lines and temporary sprinkler protection during all Fire protection equipment impairment.
- .8 If the sprinkler system is restorable, either in whole or in part, the Contractor or subcontractor shall assign someone to restore the system promptly in the event of a fire.
- .9 A fire patrol may need to be established and will include the following at the Contractor's expense:
 - .1 Patrol all halls and high-risk areas affected.
 - .2 Fire patrol shall have access to a phone and call 911 if they see a fire.
 - .3 Report all other problems they encounter.
 - .4 Remain on patrol until the system is back on.
- .10 The Contractor shall inform all sub trades that the Board has a Red Tag Permit System and it shall be used for all Fire protection equipment impairment.
- .11 For ease of use, a Factory Mutual hanging wall kit has been put in place at all Board Fire protection equipment locations. Supplies of Red Tag Permits are provided there.

1.9. FIRE ALARM MODIFICATIONS AND MAINTENANCE

- .1 Very important changes to Ontario Building Code as they relate to the Standard for the Verification of Fire Alarm Systems CAN/ULC-S537-M have taken effect December 24, 1999. (Minister's Ruling 99-BC-01)
 - .1 Clause 5.1; "Addition of conventional field device(s), or modification(s), to existing input circuit(s) or output circuit(s) shall require re-verification of all devices served by those input circuit(s) or output circuit(s)." If one device is added to a zone, the entire zone or in the case of a single zone panel the entire system is to be verified.
 - .2 Clause 5.2 "Addition of input circuit(s) or output circuit(s) to an existing fire alarm system shall require verification of the new circuit(s) in accordance with this standard, and shall also require all previously existing circuit(s) to be tested as follows:
 - .3 TEST: One conventional field device on each circuit shall be operated to confirm activation of all output circuits in accordance with the systems design." Even though no other zones have been touched, one device per input zone is to be tested when the Fire Alarm system is modified.
 - .4 Clause 5.5 "Where a transponder is added to an existing system, the transponder shall be verified in accordance with subsections 3.2, Wiring; and subsection 3.3 Control Units; and with CAN/ULC-S536, Standard for the Inspection and Testing of Fire Alarm Systems as well as re-verification of existing field devices and verification of new conventional field devices." If a new addressable device is added to a system, the new device is to be tested; as well a test must be conducted on all addressable devices on the loop.
 - .5 Clause 5.6 "Where an existing fire alarm system control unit is replaced with a new control unit, it shall be verified in accordance with CAN/ULC-S536, Standard for the Inspection and Testing of Fire Alarm Systems. Replacement of any control panel will require the testing of all existing fire alarm devices.
- .2 The Contractor and subcontractors shall include in the bid price for the above ULC Standards requirements referenced in the Ontario Building Code.

1.10. INSTALLATION AND/OR REPAIR OF ROOFING

- .1 The Contractor will review with the Consultant and the Board's representative of the location of any asphalt kettles and the dates the kettles will be in use. The Contractor, in the course of performing roofing work, will ensure all personnel utilize the following precautions:
 - .1 Use only kettles equipped with thermometers or gauges in good working order.
 - .2 Locate kettles in a safe place outside of the building.
 - .3 Maintain continuous supervision while kettles are in operation and provide metal covers for the kettles to smother any flames in case of fire.
 - .4 All roofing materials stored in locations no closer than 15 meters to any structures.

1.11. FIRE DEPARTMENT ACCESS

- .1 Designated fire routes must be maintained. The Fire Department must be advised of any work that would impede fire apparatus response.

1.12. SMOKING PRECAUTIONS

- .1 Smoking is not permitted anywhere on Board properties. Workers who wish to smoke must leave the property, and not within sight of students. Any worker found to be in contravention of the Ontario Smoke Free Act will be subject to legislated fines.

1.13. FLAMMABLE LIQUIDS

- .1 The handling and storage on site of flammable liquids are to be governed by the current National Fire Code of Canada.
- .2 Flammable liquids such as gasoline, kerosene and naphtha may be kept for ready use in quantities not exceeding 10 imperial gallons provided they are stored in approved safety cans bearing the Underwriter's Laboratory of Canada or Factory Mutual seal of approval.
- .3 Transfer of flammable liquids is prohibited within buildings.
- .4 Transfer of flammable liquids must not be carried out in the vicinity of open flame or any type of heat producing devices.
- .5 Flammable liquids having a flashpoint below 100° F (37.7°C) such as naphtha or gasoline must not be used as solvents or cleaning agents.
- .6 Flammable waste liquids, for disposal, must be stored in approved containers located in a safe ventilated area. Quantities are to be kept to a minimum.

**END OF
SECTION**

Appendix - 013517-A

CONTRACTOR HOT WORK PERMIT

Avoid hot work or seek an alternative method if possible.

A SEPARATE PERMIT IS REQUIRED FOR EACH AREA

Contractor Responsibilities:

- i. Verify precautions taken in Section A.
- ii. Complete Section C during each day that Hot Works takes place
- iii. Return Part 2 to Board Supervisor/ Manager/Proj. Coordinator

Section A	Indicate Precautions Taken
☐	Available sprinklers, hose streams, and extinguishers available and in service
Within 35' or 11m of hot work	
☐	Flammable liquid, dust, lint and oily deposits removed
☐	Explosive atmosphere in area eliminated
☐	Floors swept clean
☐	All wall and floor openings covered
☐	Combustible floors covered with fire resistant sheets
☐	Protect or shut down ducts that might carry sparks/smoke
Hot work on walls, ceiling or roofs	
☐	Construction is noncombustible and without combustible covering or insulation
☐	Combustible materials on other side of walls, ceilings or roofs moved away
☐	Combustible structure wetted down
Hot work on enclosed equipment	
☐	Enclosed equipment cleaned of all combustible material
☐	Containers purged of flammable liquid/vapour
☐	Pressurized vessels, piping & equipment removed from service, isolated & vented
Fire watch/hot work and monitoring	
☐	Fire watch will be provided <u>during</u> and for <u>1 hour</u> after work opening break
☐	Fire watch is trained and supplied with suitable extinguishers
☐	Fire watch is trained in the use of sounding fire alarm
☐	Fire watch conducted in adjoining areas, above and below the work area where appropriate
☐	Monitor hot work area for an additional <u>2 hours</u> after fire watch
☐	Other precautions taken (please detail):

Board Supervisor/Manager/Proj. Coordinator: _____		
_____	Print Name	Signature
Permit Valid from / to: (max. 7 days)	_____	_____
	from This Date	to This Date
(Maximum 7 days or until end of hot work whichever is sooner)		

Dates: (max 7 days)	Name of Contractor conducting hot work	Name & signature of individual assigned to fire watch	Name & signature of individual assigned to fire monitoring

School: _____

Room/Area: _____

Nature of Job: _____

I verify the above location has been examined each day, the precautions listed in Section A have been taken each day, and permission is authorized for this work.

I further acknowledge that if activity is during school operational hours, that appropriate notification has been given to school administration.

Hot Works Contractor: _____

Signature

School Administrator notified: _____

Print Name

In Case of Emergency call: 911 - Then call: 519-570-0003 Ext. 4123

\\Facility Srv\\Controller\\Board Procedures\\2014-15\\Hot Work Permit - Contractors - Final.xls

01 35 23 – Health And Safety

1.0 GENERAL

1.1. RELATED SECTIONS

- .1 Section 01 31 00 - Project Managing and Coordination.
- .2 Section 01 33 00 - Submittal Procedures.
- .3 Section 01 35 17 – Fire Safety Requirements
- .4 Section 01 35 43 – Hazardous Materials
- .5 Section 01 41 00 – Regulatory Requirements
- .6 Section 01 53 00 – Temporary Construction Facilities
- .7 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.2. REFERENCES

- .1 Province of Ontario, including requirements for a "Prime Contractor" as defined by the Act.

1.3. SAFETY PLAN

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to commencing any site Work and continue to implement, maintain, and enforce plan until final demobilization from site. The Health and Safety Plan must address project specifications.
- .2 Consultant may respond in writing, where deficiencies or concerns are noted and may request resubmission with correction of deficiencies or concerns.
- .3 Be governed by pertinent safety requirements of Federal or Provincial Governments and of municipal bodies having authority, particularly the Ontario Construction Safety Act, The Occupational Health and Safety Act for Ontario, and regulations of Ontario Ministry of Labour, and work in conjunction with proper safety associations operating under the authority of Ontario Workers' Compensation Act. Protect Owner, Owner's employees, the public and those employed on the Work from bodily injury and to protect adjacent public and private property and Owner's property from damage. Furnish and maintain protection, such as warning signs, tarpaulins, guard rails, barriers, guard lights, night lights, railings around shafts, pits and stairwells, etc. as required. Remove temporary protective measures when no longer required.

1.4. TEMPORARY WORK

- .1 Temporary work requiring engineering proficiency for the design, erection, operation maintenance and removal shall be designed and bear the stamp of the registered professional Engineer or Architect. Detail drawings will be submitted to the Consultant for review prior to commencing any work.
- .2 Before a temporary structure is used, the person responsible for design, or their representative, shall inspect the structure and certify it has been constructed according to their design.

1.5. RESPONSIBILITY

- .1 The "Prime Contractor" according to applicable local jurisdiction, is responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to the extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.
- .3 Should any unforeseen or peculiar safety-related factor, hazard, or condition become evident during performance of Work, and follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Health and Safety Act having jurisdiction. Advise the Board and the Consultant verbally and in writing.
- .4 The Contractor shall make their own arrangements for emergency treatment of accidents. Any accidents shall be reported immediately to the Board contact.
- .5 The Contractor agrees to hold the Board harmless of any and all liability of every nature and description, which may be suffered through bodily injuries, involving deaths of any persons, by reasons of negligence of the Contractor, his agents, employees, or his subcontractors.

1.6. SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00.
- .2 Submit site-specific Health and Safety Plan: Within ten (10) days after the date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Results of site specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operation

- .3 Submit one (1) copy of Contractor's authorized representative's work site health and safety inspection reports to Consultant and Owner.
- .4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Submit Material Safety Data Sheets (MSDS) to Consultant.
- .7 Consultant's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .8 Medical Surveillance: Where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Consultant.
- .9 On-site Contingency and Emergency Response Plan: Address standard operating procedures to be implemented during emergency situations.
- .10 File Notice of Project with the Ministry of Labour prior to commencement of Work.

1.7. SAFETY ACTIVITIES

- .1 Perform site specific safety hazard assessment related to the project.
- .2 Schedule and administer Health and Safety meeting with Consultant prior to commencement of Work.
- .3 Perform Work in accordance with Section 01 41 00 - Regulatory Requirements and this section.

1.8. HEALTH AND SAFETY COORDINATOR

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Coordinator. Health and Safety Coordinator must:
 - .1 have previous experience as a Health & Safety coordinator,
 - .2 have working knowledge of occupational safety and health regulations,
 - .3 be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work,
 - .4 be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan, and
 - .5 be on site during execution of Work.

1.9. POSTING OF DOCUMENTS

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Health and Safety Act having jurisdiction, and in consultation with Consultant.

1.10. CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Consultant or by the Board.
- .2 Provide Consultant and/or Board with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Consultant and or the Board may stop Work if non-compliance of health and safety regulations is not corrected.

1.11. PROJECT/SITE CONDITIONS

- .1 Work at site will involve contact with:
 - .1 Refer to Section 01 35 43 Hazardous Materials

1.12. HAZARDOUS WORK

- .1 Blasting or other use of explosives is not permitted at the place of work.

1.13. WORK STOPPAGE

- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

1.14. LOCKOUT PROCEDURES

- .1 All Work to be done on electrical systems or machinery, where the unexpected switching on of the system or machinery could result in personal injury to a student, staff, employee, or the Contractor's employee, must be done in accordance with the Contractor's standard lockout procedure.
- .2 The Contractor shall provide his/her own locks for the above procedure.
- .3 The lock shall include contact information for the person(s) locking out such devices.

1.15. OVERHEAD LIFTING

- .1 Under no circumstances will a crane or lifting device be used over an occupied space.
- .2 When working adjacent to occupied spaces, ensure a clearance of one (empty) classroom, or a minimum of 10m between any occupied space and the furthest possible reach of the crane.

1.16. WARNING SIGNS AND NOTICES

- .1 Notices shall be posted advising of the hazard but will not be considered a substitute for providing approved protection, separation, and space from the hazard.

1.17. FIRE PROTECTION

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by the governing codes, regulations and bylaws.
- .2 Burning rubbish and construction waste materials is not permitted on site.
- .3 Maintain placed or installed Fire Protection to protect the portions of the Work during construction.

1.18. SCENT-FREE ENVIRONMENT

- .1 The Board requires that, where advised, a building may be deemed scent-free and as such, the wearing of scented products is prohibited.
- .2 Any methods or materials that are found to create negative responses in staff or students shall cease and be removed under advisement of the Consultant and or the Board, until alternate methods can be determined.

END OF SECTION

01 35 43 – Hazardous Materials

1.0 GENERAL

1.1. RELATED SECTIONS

- .1 Section 01 35 23 – Health and Safety Requirements.
- .2 Section 01 41 00 – Regulatory Requirements.
- .3 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.2. REFERENCES

- .1 Province of Ontario, including requirements for a "Prime Contractor" as defined by the Act.

1.3. ASBESTOS and OTHER REGULATED SUBSTANCES

- .1 An Asbestos Audit, as prepared by MTE Consultants Inc. for this facility, is attached under Appendix 013543 A. A duplicate set is also available in the Facilities Services Departments located in the Education Centre. Unless specifically covered by a Cash Allowance or Contingency Allowance that states otherwise, include in this Contract the required removal of all asbestos containing materials (ACM) to complete the work. No claims for extra costs will be accepted for areas known to contain ACM that are within the scope of this Work.
- .2 Comply with applicable legislation regarding asbestos. Should the Contractor encounter asbestos not noted in the referenced Asbestos Audit that would be disturbed during the course of the Work, they should stop the work in that immediate area and report the same to the Consultant and Board contact.
- .3 In addition, Lead, Mercury, Silica, and Isocyanates are anticipated to be present in existing facilities. New construction, renovations, or alterations require compliance by the Contractor with the applicable legislation.

1.4. PROTOCOL FOR ABATEMENT WORK

- .1 This Protocol establishes the requirements to be followed by all Asbestos Abatement Contractors involved with the Board. It applies to Type 1, Type 2 and Type 3 Operations as stated in the Regulations and applies to emergency and non-emergency work (directly retained or working as a sub-contractor).
- .2 Asbestos Abatement Contractors must maintain appropriate insurance coverage and WISB certification.

- .3 Contractors retained for asbestos abatement work shall use personnel certified by the Ontario College of Trades and must provide the Consultant and Board with proof of asbestos certification (AAS and AAW) for all supervisors / all staff involved.
- .4 School Access
 - .1 During school hours all asbestos contractors are to report to the school office upon arrival. After school hours, ensure card-in / card-out procedures are followed and building security is maintained.
- .5 Communication
 - .1 Establish communication contact list with email and phone numbers that shall include:
 - .1 Principal / Vice Principal
 - .2 Area Facility Manager
 - .3 Head Custodian
 - .4 Environmental Officer
 - .5 Manager of Mechanical, Electrical and Environmental Services
 - .6 Manager of Health Safety & Security
 - .7 Contractor staff
 - .8 Consultant
 - .2 Contact the School Principal / Vice to set up a firm date for the abatement (removal / repair). Schedule to allow at least 72 hours notice ahead of the work.
 - .3 Confirm the date by notifying via email the following:
 - .1 Principal / Vice-principal,
 - .2 Area Facility Manager, and
 - .3 Environmental Officer.
 - .4 Consultant
 - .4 Indicate the date, the start time, the anticipated completion time for the work and the work areas in the school.
 - .5 Identify personnel managing the project and provide current cell numbers for emergency contacts.
 - .6 For emergency work, as requested by Area Supervisors, Facility Managers or Environmental Officer, no notification to the school is required.
 - .7 Additionally, for Type 3 work also contact:
 - .1 Manager of Health, Safety & Security, and
 - .2 Notify the MOL (also for Type 2) where required by regulation.
 - .3 Consultant

- .8 Discussions with other groups, school staff, media and others is discouraged and shall be directed to the Board Communication Officer where warranted.
- .6 Asbestos Operations
 - .1 Emergency work shall be carried out the same day (evening/night) or under exceptional conditions the following day / evening / night. Contractors shall exercise discretion when working in the school to minimize anxiety of staff/school community. Where warranted, contact Area Supervisor, Facility Manager or Environmental Officer to obtain further direction.
 - .2 For non-emergency work, contractor is to assess the work on site and provide a cost estimate to the Environmental Officer, (daniela_budure@wrdsb.on.ca) and Consultant. Some work will require discussion with the Facility Manager or Environmental Officer to assess if additional work should be done as to completely remove all ACM material from the area or similar.
 - .3 Where the MTE report shows ACM requiring repair, remove and re-insulate where required.
 - .4 Before beginning any Type 1, Type 2 or Type 3 Operations, the work area must be secured, doors closed, warning signs added to all entrances, caution tape used in open areas and signs used to restrict access to the work area so as to keep persons not involved in the work from entering in the work area.
 - .5 Provide "Construction" warning signs on solid barriers between the Work and public areas. Install a sufficient number of "asbestos abatement" warning signs behind the barriers, posted to warn of the hazard, and that access to the work area is restricted to persons wearing protective clothing and equipment.
 - .6 The contractor is responsible to disable the mechanical ventilation serving the work area and positively prevent operation using Lock-out / Tag-out devices for each air handling unit / fan. Exercise caution during heating season to ensure areas of the building are maintained above freezing and ensure equipment is turned back on after abatement / air clearance completed.
 - .7 Contractor's employees shall put on / take off PPE within work area marked by construction signs. No employee shall leave the work area wearing PPE.
 - .8 All dust and waste is to be cleaned up and removed at frequent / regular intervals as the work proceeds and immediately upon completion. No waste bags or similar are to be left behind.

1.5. SUBMITTALS

- .1 Once the abatement is completed, forward a Letter of Completion to the Environmental Officer, (daniela_budure@wrdsb.on.ca). This letter shall be

received no later than 72 hours after completion and shall include any sample results.

- .2 For those projects requiring Air Clearance, ensure this info is sent without delay but in all cases no later than 24 hours after sampling. All Type 3 work must take into account that the initial samples may not pass and the contractor must allow one additional day to re-clean and re-sample before school is to resume operations. For those projects not under the direct supervision of a Environmental Consultant, the contractor is to expedite the air clearance sampling with the lab of their choice and carry these costs.
- .3 Forward Air Clearance results to:
 - .1 Principal / Vice-principal,
 - .2 Facility Manager,
 - .3 Environmental Officer,
 - .4 Manager of Mechanical, Electrical and Environmental Services, and
 - .5 Manager of Health, Safety & Security.
 - .6 Consultant

1.6. ACKNOWLEDGEMENT

- .1 The protocols for asbestos work must be read and understood by Asbestos Contractor.
- .2 Submit a signed copy of the most current copy of PROTOCOL FOR ABATEMENT WORK (ASBESTOS ABATEMENT CONTRACTORS) to the General Contractor, the Consultant, and the Board's Environmental Officer.

END OF SECTION

Appendix 01 35 43A Asbestos Audit Report



This report is provided for tender purposes and must be viewed in colour and in its entirety. An original copy is available at the school office along with annual inspection and abatement letters, if applicable.

Laurentian Public School

2023 Asbestos Audit Update Report

Project Location:

777 Westmount Road East, Kitchener, ON

Prepared for:

Waterloo Region District School Board
51 Ardelt Avenue, Kitchener, ON

Prepared by:

MTE Consultants
520 Bingemans Centre Drive
Kitchener, ON N2B 3X9

January 12, 2023

MTE File No.: C34532-941





MTE Consultants

520 Bingham Centre Drive, Kitchener, Ontario N2B 3X9

January 12, 2023

MTE File No.: C34532-941

Waterloo Region District School Board
51 Ardelt Avenue
Kitchener, ON N2C 2R5

RE: 2023 Asbestos Audit Update – Laurentian Public School
777 Westmount Road East, Kitchener, Ontario

1.0 Introduction

MTE Consultants Inc. (MTE) was authorized by the Waterloo Region District School Board (WRDSB) to conduct the 2023 Asbestos Audit Update for the subject building.

The purpose of the assignment was to re-assess and document the location, type, and condition of identified asbestos-containing materials (ACM) present within the building and make appropriate recommendations for management, abatement or remedial activities, as required.

The audit was conducted in accordance with the Ontario Ministry of Labour, *Regulation 278/05-Designated Substance-Asbestos on Construction Projects and in Buildings and Repair Operations* (O. Reg. 278/05). This report shall replace previous audit reports.

2.0 Scope of Work

The Scope of Work for this assessment was completed by MTE and included the following activities:

- Review of existing and historical reports and documentation pertaining to ACM within the building;
- Visual inspection to assess the condition of previously identified ACM, excluding portable structures;
- Collection of building material samples that are suspect ACM, as applicable;
- Submission of samples to an accredited laboratory, as applicable;
- Photographic log of damaged materials; and
- Preparation of this report with findings and recommendations.

3.0 Methodology and Assessment Criteria

This inspection was conducted by visual and laboratory identification methods for the assessment of ACM and their corresponding location, use, condition, and friability. The areas outlined in Section 2.0 were inspected limited to building components, materials and service connections. Notwithstanding that reasonable attempts were made to identify all ACMs, the

possibility of concealed material exists and may not become visible until substantial demolition has occurred and therefore are currently undocumented and did not include the following.

- Locations that may be hazardous to the surveyor, such as electrical equipment;
- Where invasive inspection could cause consequential damage to the property or impair the integrity of the equipment, such as roof systems, underground services or components of mechanical equipment;
- Locations concealed by building finishes that require substantial demolition or removal for access or determination of quantities;
- Materials that is present in such an inconsistent fashion that without complete removal of finishes, the extent cannot be determined;
- Non-permanent items or personal contents, furnishings; and
- Settled dust or airborne agents unless otherwise stated.

3.1 Condition of ACM

During the audit process the general condition of ACMs were observed and noted. Materials which are damaged can pose an increased exposure risk to workers, building occupants and the public. While assessing damage can be subjective, abatement items were grouped into two categories to aid in remedial prioritization.

Monitor Annually

These are items which display minor isolated damage; however, do not pose an immediate risk to workers from exposure to asbestos fibres due to the current condition of the material and/or location. No remediation is required at this time; however, these items should be monitored on a yearly basis for evidence of continued degradation. Should the condition of the material change, an evaluation should be completed by a competent person to determine remedial action.

Abatement Action Required

These are items which display damage and may pose potential risk to workers from exposure to asbestos fibres due to the physical condition and/or location of the material. Clean-up, repair or removal of these materials is required as soon as reasonably possible.

4.0 Findings

An inspection of the building was conducted by MTE on January 5, 2023. The one-storey school was constructed in 1968 with an addition in 1978. The inspection did not include areas of post 1990 construction or renovation (where all building finishes have been removed and replaced), as applicable.

The Asbestos Management Database is provided in **Appendix A** and associated Figures are provided in **Appendix B**. These together provide a current summary of the ACM identified throughout the building.

A summary of the damaged ACM identified at the time of the inspection is provided in **Appendix C**.

The bulk asbestos sample location and analytical summary is provided in **Appendix C**.

4.1 Analytical Results

During this inspection, no samples were collected.

Refer to Appendix C, Table 3 for a detailed summary of the analytical results for each sampled material.

4.2 Removed ACM

A summary of ACM that has been removed since the previous audit/inspection is provided below:

WRDSB Room 23.

- Parged asbestos Fittings on heating pipes – July 26, 2021 by Zero Environmental.

WRDSB Room 54.

- Asbestos-Containing pipe insulation and boiler breeching – March 15 2019 by Azbest Environmental.

WRDSB Room 77 Pipe Chase.

- 20 parged asbestos fittings.
- Asbestos cement fittings 90LF of insulation removal/replace and debris clean in location WRDSB Room 77 – December 30th, 2022 by Southern Environmental Inc.

4.3 Discovery of Additional ACM

No additional ACM or suspect ACM was identified.

4.4 Damaged ACM

Damaged ACM was identified. Refer to **Appendix C, Tables 1 and 2** for a detailed summary of required actions, specific to each material. At the time of the audit, all other ACM at the building was noted to be in good condition.

5.0 Recommendations

5.1 Remedial

Damaged ACM was identified. Refer to Appendix C, Tables 1 and 2 for a detailed summary of required actions, specific to each material. At the time of the audit, all other ACM at the building was noted to be in good condition.

Type 1 abatement Operations may be conducted internally by trained and qualified WRDSB staff. All other abatement work must be conducted by certified asbestos contractors trained and qualified to conduct the type of work required.

All asbestos work must be conducted by staff and/or contractors who are trained and experienced in the type of asbestos operations required, and should be overseen by a qualified third party Health, Safety and Environmental professional. In order to conduct Type 3 asbestos operations, contractors must be certified as Asbestos Abatement Workers AAW (Trade code 253W) and Asbestos Abatement Supervisors AAS (Trade code 253S) by The Ministry of Training, Colleges and Universities (Ministry of Advanced Education and Skills Development) as prescribed by Section 20 of O. Reg. 278/05.

5.2 Long Term Management

This audit was conducted for the long term management of ACM within the building. Prior to future construction or renovation projects, additional assessments and/or sampling may be required.

There are no requirements under current legislation to remove ACM from a building simply because it is present. However, O. Reg. 278/05 requires that an Asbestos Management Plan be implemented and maintained. Asbestos awareness training should be provided for staff that may come in contact with ACM during routine duties or in emergency situations.

ACM that will be disturbed, or will likely be disturbed, during building maintenance, renovations, construction, or demolition activities must be handled and disposed of in accordance with the procedures prescribed by O. Reg. 278/05.

ACM may also be present in concealed locations. If any construction, renovation, alteration, or maintenance activities are required or planned, invasive inspections of concealed locations for potential ACM must be performed prior to such activities. Should any suspect ACM be discovered, work should cease and the materials should not be disturbed. Suspect ACM must be treated as asbestos-containing or sampled and proven to not contain asbestos. Any activities that require disturbance of ACM must be performed in accordance with O. Reg. 278/05.

6.0 Limitations

Services performed by **MTE Consultants Inc.** (MTE) were conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the Environmental Engineering & Consulting profession. No other representation expressed or implied as to the accuracy of the information, conclusions or recommendations is included or intended in this report.

This report was completed for the sole use of MTE and the Client. It was completed in accordance with the approved Scope of Work referred to in Section 0. As such, this report may not deal with all issues potentially applicable to the site and may omit issues that are or may be of interest to the reader. MTE makes no representation that the present report has dealt with all-important environmental features, except as provided in the Scope of Work. All findings and conclusions presented in this report are based on site conditions, as they existed during the time period of the investigation. This report is not intended to be exhaustive in scope or to imply a risk-free facility.

Any use which a third party makes of this report, or any reliance on, or decisions to be made based upon it, are the responsibility of such third parties. MTE accepts no responsibility for liabilities incurred by or damages, if any, suffered by any third party as a result of decisions made or actions taken, based upon this report. Others with interest in the site should undertake their own investigations and studies to determine how or if the condition affects them or their plans.

It should be recognized that the passage of time might affect the views, conclusions and recommendations (if any) provided in this report because environmental conditions of a property can change. Should additional or new information become available, MTE recommends that it be brought to our attention in order that we may re-assess the contents of this report.

All of which is respectfully submitted,

MTE Consultants Inc.



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Attach.

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Appendix A

Asbestos Management Database

For Tender Purposes

		School Name		Legend:				Notes:		
		Laurentian Public School		HM - Homogenous Material - homogeneous with previously sampled material SL - Sample Location - Material Sampled VC - Visually Confirmed - Material not sampled, deemed ACM NF - Non-Friable F- Friable				All quantities provided on Figures, if known. Refer to the Asbestos Audit Update Report for condition of ACM and recommended actions.		
		Date Built:						Dates provided in Material Description/Room Description columns indicates date of installation/renovation and confirms the finishes as non-ACM.		
		Original: 1968								
		Addition(s): 1978								
WRDSB Fixed Reference Number	Room Description	Inspected Item	Inspected Material	Material Description	Friability	Asbestos Classification	Sample / Identification Summary	Sample ID	Sample Date	% Asbestos & Fibre Type
Structure/Additions										
	Original Building	Structure	Concrete	Concrete	-	Non ACM	-	-	-	-
	Original Building	Façade	Brick Veneer	Brick and Mortar	-	Non ACM	-	-	-	-
	Original Building	Façade	Concrete	Concrete	-	Non ACM	-	-	-	-
	Original Building	Deck	Metal Pan	-	-	Non ACM	-	-	-	-
	Original Building	Not Inspected	Not Inspected	Roofing Materials	NF	ACM	Deemed ACM	Sample prior to removal/disturbance	-	-
	Original Building	Window	Interior/Exterior Frame	Silicon	-	Non ACM	-	-	-	-
	Original Building	Door	Interior Frame	Black	-	Non ACM	SL	S01ABC	9-Sep-21	ND
	Original Building	Door	Exterior Frame	Silicon	-	Non ACM	-	-	-	-
	Original Building	Floor	Mastic	Black Mastic	-	Non ACM	SL	S01ABC	18-May-16	ND
	1978 Addition	Structure	Concrete	Concrete	-	Non ACM	-	-	-	-
	1978 Addition	Façade	Brick Veneer	Brick and Mortar	-	Non ACM	-	-	-	-
	1978 Addition	Façade	Concrete	Concrete	-	Non ACM	-	-	-	-
	1978 Addition	Deck	Metal Pan	-	-	Non ACM	-	-	-	-
	1978 Addition	Not Inspected	Not Inspected	Roofing Materials	NF	ACM	Deemed ACM	Sample prior to removal/disturbance	-	-
	1978 Addition	Window	Interior/Exterior Frame	Silicon	-	Non ACM	-	-	-	-
	1978 Addition	Door	Interior Frame	Black	-	Non ACM	HM	S01	9-Sep-21	ND
	1978 Addition	Door	Exterior Frame	Silicon	-	Non ACM	-	-	-	-
	1978 Addition	Floor	Mastic	Black Mastic	-	Non ACM	SL	S02ABC	9-Sep-21	ND
Level One										
1	Classroom 1	Floor	Vinyl Floor Tile 12"x 12"	Beige Dense Fleck	-	Non ACM	HM	S04	4-Dec-09	ND
1	Classroom 1	Wall	Concrete	-	-	Non ACM	-	-	-	-
1	Classroom 1	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S02	4-Dec-09	ND
1	Classroom 1	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Pinchin 1990	1990	50-75% Chrysotile
2	Classroom 2	Floor	Vinyl Floor Tile 12"x 12"	Beige Dense Fleck	-	Non ACM	HM	S04	4-Dec-09	ND
2	Classroom 2	Wall	Concrete	-	-	Non ACM	-	-	-	-
2	Classroom 2	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S02	4-Dec-09	ND
2	Classroom 2	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Pinchin 1990	1990	50-75% Chrysotile
3	Classroom 3	Floor	Vinyl Floor Tile 12"x 12"	Beige Dense Fleck	-	Non ACM	HM	S04	4-Dec-09	ND
3	Classroom 3	Wall	Concrete	-	-	Non ACM	-	-	-	-

		School Name		Legend:				Notes:		
		Laurentian Public School		HM - Homogenous Material - homogeneous with previously sampled material SL - Sample Location - Material Sampled VC - Visually Confirmed - Material not sampled, deemed ACM NF - Non-Friable F- Friable				All quantities provided on Figures, if known. Refer to the Asbestos Audit Update Report for condition of ACM and recommended actions.		
		Date Built:						Dates provided in Material Description/Room Description columns indicates date of installation/renovation and confirms the finishes as non-ACM.		
		Original: 1968								
		Addition(s): 1978								
WRDSB Fixed Reference Number	Room Description	Inspected Item	Inspected Material	Material Description	Friability	Asbestos Classification	Sample / Identification Summary	Sample ID	Sample Date	% Asbestos & Fibre Type
3	Classroom 3	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S02	4-Dec-09	ND
3	Classroom 3	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Pinchin 1990	1990	50-75% Chrysotile
4	Classroom 4	Floor	Vinyl Floor Tile 12"x 12"	Beige Dense Fleck (New)	-	Non ACM	-	-	-	-
4	Classroom 4	Wall	Concrete	-	-	Non ACM	-	-	-	-
4	Classroom 4	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S02	4-Dec-09	ND
5	Classroom 5	Floor	Vinyl Floor Tile 12"x 12"	Beige Dense Fleck (New)	-	Non ACM	-	-	-	-
5	Classroom 5	Wall	Concrete	-	-	Non ACM	-	-	-	-
5	Classroom 5	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S02	4-Dec-09	ND
6	Classroom 6	Floor	Vinyl Floor Tile 12"x 12"	White with Blue and Green	-	Non ACM	HM	S05	4-Dec-09	ND
6	Classroom 6	Wall	Concrete	-	-	Non ACM	-	-	-	-
6	Classroom 6	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S02	4-Dec-09	ND
7	Classroom 7	Floor	Vinyl Floor Tile 12"x 12"	Beige Dense Fleck	-	Non ACM	HM	S04	4-Dec-09	ND
7	Classroom 7	Wall	Concrete	-	-	Non ACM	-	-	-	-
7	Classroom 7	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S02	4-Dec-09	ND
8	Classroom 8	Floor	Vinyl Floor Tile 12"x 12"	Beige Dense Fleck	-	Non ACM	HM	S04	4-Dec-09	ND
8	Classroom 8	Wall	Concrete	-	-	Non ACM	-	-	-	-
8	Classroom 8	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S02	4-Dec-09	ND
9	Classroom 9	Floor	Vinyl Floor Tile 12"x 12"	Brown Dense Fleck	-	Non ACM	SL	S06abc	4-Dec-09	ND
9	Classroom 9	Wall	Concrete	-	-	Non ACM	-	-	-	-
9	Classroom 9	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S02	4-Dec-09	ND
10	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Beige Dense Fleck	-	Non ACM	HM	S04abc	4-Dec-09	ND
10	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
10	Classroom	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S01abc	4-Dec-09	ND
11	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Beige Dense Fleck	-	Non ACM	HM	S04abc	4-Dec-09	ND
11	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
11	Classroom	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S01abc	4-Dec-09	ND
12	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Beige Dense Fleck	-	Non ACM	HM	S04abc	4-Dec-09	ND
12	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
12	Classroom	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S01abc	4-Dec-09	ND
13	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Beige Dense Fleck	-	Non ACM	HM	S04abc	4-Dec-09	ND
13	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
13	Classroom	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S01abc	4-Dec-09	ND
14	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Beige Dense Fleck	-	Non ACM	HM	S04abc	4-Dec-09	ND
14	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-

		School Name		Legend:				Notes:		
		Laurentian Public School		HM - Homogenous Material - homogeneous with previously sampled material SL - Sample Location - Material Sampled VC - Visually Confirmed - Material not sampled, deemed ACM NF - Non-Friable F - Friable				All quantities provided on Figures, if known. Refer to the Asbestos Audit Update Report for condition of ACM and recommended actions.		
		Date Built:						Dates provided in Material Description/Room Description columns indicates date of installation/renovation and confirms the finishes as non-ACM.		
		Original: 1968								
		Addition(s): 1978								
WRDSB Fixed Reference Number	Room Description	Inspected Item	Inspected Material	Material Description	Friability	Asbestos Classification	Sample / Identification Summary	Sample ID	Sample Date	% Asbestos & Fibre Type
14	Classroom	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S01abc	4-Dec-09	ND
15	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Beige Dense Fleck	-	Non ACM	HM	S04abc	4-Dec-09	ND
15	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
15	Classroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S02abc	4-Dec-09	ND
16	Home Economics	Floor	Vinyl Floor Tile 12"x 12"	Green with White Streak	NF	ACM	HM	S03	4-Dec-09	0.5% Chrysotile
16	Home Economics	Wall	Concrete	-	-	Non ACM	-	-	-	-
16	Home Economics	Ceiling	Ceiling Tile 2' x 4'	Random Pinhole	-	Non ACM	SL	S09abc	4-Dec-09	ND
17	Science 17	Floor	Wood	-	-	Non ACM	-	-	-	-
17	Science 17	Wall	Concrete	-	-	Non ACM	-	-	-	-
17	Science 17	Ceiling	Ceiling Tile 2' x 4'	Random Pinhole	-	Non ACM	HM	S09abc	4-Dec-09	ND
17	Science 17	Piping	Pipe	Transite	NF	ACM	Deemed ACM	Sample prior to removal/disturbance	-	-
18	Storage Room	Floor	Vinyl Floor Tile 12"x 12"	Green with White Streak	NF	ACM	HM	S03	4-Dec-09	0.5% Chrysotile
18	Storage Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
18	Storage Room	Ceiling	Ceiling Tile 2' x 4'	Random Pinhole	-	Non ACM	HM	S09abc	4-Dec-09	ND
19	Tech.	Floor	Vinyl Floor Tile 12"x 12"	White with Blue and Green	-	Non ACM	HM	S05	4-Dec-09	ND
19	Tech.	Wall	Concrete	-	-	Non ACM	-	-	-	-
19	Tech.	Ceiling	Ceiling Tile 2' x 4'	Random Pinhole	-	Non ACM	HM	S09abc	4-Dec-09	ND
19	Tech.	Piping	Pipe	Transite	NF	ACM	Deemed ACM	Sample prior to removal/disturbance	-	-
20	Classroom	Floor	Vinyl Floor Tile 12"x 12"	Beige Dense Fleck	-	Non ACM	HM	S04abc	4-Dec-09	ND
20	Classroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
20	Classroom	Ceiling	Ceiling Tile 2' x 4'	Fibreglass	-	Non ACM	-	-	-	-
20	Classroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S02abc	4-Dec-09	ND
20A	Kitchen	Floor	Vinyl Floor Tile 12"x 12"	Beige Dense Fleck	-	Non ACM	HM	S04abc	4-Dec-09	ND
20A	Kitchen	Wall	Concrete	-	-	Non ACM	-	-	-	-
20A	Kitchen	Ceiling	Drywall	Drywall Joint Compound	NF	ACM	HM	S07 - 1081	18-May-16	3% Chrysotile
21	Music Room	Floor	Vinyl Floor Tile 12"x 12"	Grey Dense Fleck	-	Non ACM	SL	S02ABC - 1066	18-May-16	-
21	Music Room	Floor	Carpet	-	-	Non ACM	-	-	-	-
21	Music Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
21	Music Room	Ceiling	Ceiling Tile	Fibreglass	-	Non ACM	-	-	-	-
22	Computer Room	Floor	Vinyl Floor Tile 12"x 12"	Brown Dense Fleck	-	Non ACM	HM	S06abc	4-Dec-09	ND
22	Computer Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
22	Computer Room	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S01abc	4-Dec-09	ND
23	Library	Floor	Vinyl Floor Tile 12'x12"	Grey Dense Fleck	-	Non ACM	-	-	-	-
23	Library	Floor	Carpet	-	-	Non ACM	-	-	-	-

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23	Library	Wall	Concrete	-	-	Non ACM	-	-	-	-
23	Library	Ceiling	Ceiling Tile 2' x 4'	Random Fissure Small Pinhole + New Mosa	-	Non ACM	-	-	-	-
24	Art Room	Floor	Vinyl Floor Tile 12"x 12"	Green with White Streak	NF	ACM	SL	S03abc	4-Dec-09	0.5% Chrysotile
24	Art Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
24	Art Room	Ceiling	Ceiling Tile	Fibreglass	-	Non ACM	-	-	-	-
25	Resource Withdrawal	Floor	Vinyl Floor Tile 12"x 12"	Beige Dense Fleck	-	Non ACM	SL	S04abc	4-Dec-09	ND
25	Resource Withdrawal	Wall	Concrete	-	-	Non ACM	-	-	-	-
25	Resource Withdrawal	Ceiling	Ceiling Tile	Fibreglass	-	Non ACM	-	-	-	-
25	Resource Withdrawal	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Pinchin 1990	1990	50-75% Chrysotile
26	AV Room	Floor	Carpet	-	-	Non ACM	-	-	-	-
26	AV Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
26	AV Room	Ceiling	Ceiling Tile 2' x 4'	New - Mosaic	-	Non ACM	-	-	-	-
40	Meeting Room	Floor	Carpet	-	-	Non ACM	-	-	-	-
40	Meeting Room	Floor	Ceramic Tile	-	-	Non ACM	-	-	-	-
40	Meeting Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
40	Meeting Room	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S02	4-Dec-09	ND
40A	Closet	Floor	Ceramic Floor Tile	-	-	Non ACM	-	-	-	-
40A	Closet	Wall	Concrete	-	-	Non ACM	-	-	-	-
40A	Closet	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S02	4-Dec-09	ND
41	Office	Floor	Carpet	-	-	Non ACM	-	-	-	-
41	Office	Wall	Concrete	-	-	Non ACM	-	-	-	-
41	Office	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S02	4-Dec-09	ND
41	Office	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Pinchin 1990	1990	50-75% Chrysotile
42	Principal	Floor	Carpet	-	-	Non ACM	-	-	-	-
42	Principal	Wall	Concrete	-	-	Non ACM	-	-	-	-
42	Principal	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S01	4-Dec-09	ND
43	Office	Floor	Ceramic Floor Tile	-	-	Non ACM	-	-	-	-
43	Office	Wall	Concrete	-	-	Non ACM	-	-	-	-
43	Office	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S02	4-Dec-09	ND
43	Office	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Pinchin 1990	1990	50-75% Chrysotile
45	Staff Lounge	Floor	Vinyl Sheet Flooring	Grey with Black Streak (New)	-	Non ACM	-	-	-	-
45	Staff Lounge	Wall	Concrete	-	-	Non ACM	-	-	-	-
45	Staff Lounge	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S02abc	4-Dec-09	ND
45	Staff Lounge	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Pinchin 1990	1990	50-75% Chrysotile

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45A	Staff Lounge	Floor	Ceramic Floor Tile	-	-	Non ACM	-	-	-	-
45A	Staff Lounge	Wall	Concrete	-	-	Non ACM	-	-	-	-
45A	Staff Lounge	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S02abc	4-Dec-09	ND
45A	Staff Lounge	Piping	Pipe	Transite	NF	ACM	Deemed ACM	Sample prior to removal/disturbance	-	-
45B	Staff Lounge	Floor	Ceramic Floor Tile	-	-	Non ACM	-	-	-	-
45B	Staff Lounge	Wall	Concrete	-	-	Non ACM	-	-	-	-
45B	Staff Lounge	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S02abc	4-Dec-09	ND
46	Library and Office	Floor	Vinyl Floor Tile 12"x 12"	Green with White Streak	NF	ACM	HM	S03	4-Dec-09	0.5% Chrysotile
46	Library and Office	Floor	Carpet	-	-	Non ACM	-	-	-	-
46	Library and Office	Wall	Concrete	-	-	Non ACM	-	-	-	-
46	Library and Office	Ceiling	Ceiling Tile 2' x 4'	New Mosaic	-	Non ACM	-	-	-	-
47	Storage	Floor	Vinyl Floor Tile 12"x 12"	Green with White Streak	NF	ACM	HM	S03	4-Dec-09	0.5% Chrysotile
47	Storage	Floor	Carpet	-	-	Non ACM	-	-	-	-
47	Storage	Wall	Concrete	-	-	Non ACM	-	-	-	-
47	Storage	Ceiling	Ceiling Tile 2' x 4'	New Mosaic	-	Non ACM	-	-	-	-
48	Washroom	Floor	Vinyl Floor Tile	Grey with White and Black Fleck	-	Non ACM	SL	S01ABC - 1055	18-May-16	-
48	Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
48	Washroom	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S01abc	4-Dec-09	ND
49	Washroom	Floor	Vinyl Floor Tile	Beige Dense Fleck	-	Non ACM	-	-	-	-
49	Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
49	Washroom	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S01abc	4-Dec-09	ND
49	Washroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S02abc	4-Dec-09	ND
49	Washroom	Piping	Pipe	Transite	NF	ACM	Deemed ACM	Sample prior to removal/disturbance	-	-
50	Washroom	Floor	Vinyl Sheet Flooring	Beige	NF	ACM	SL	S10abc	4-Dec-09	35% Chrysotile
50	Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
50	Washroom	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S01abc	4-Dec-09	ND
50	Washroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S02abc	4-Dec-09	ND
50	Washroom	Piping	Pipe	Transite	NF	ACM	Deemed ACM	Sample prior to removal/disturbance	-	-
51	Office	Floor	Vinyl Floor Tile 12"x12"	Grey with Brown and White Streak	NF	ACM	SL	S06ABC - 1058	18-May-16	0.72% Chrysotile
51	Office	Wall	Concrete	-	-	Non ACM	-	-	-	-
51	Office	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	HM	S01abc	4-Dec-09	ND
51	Office	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S02abc	4-Dec-09	ND
52	Storage	Floor	Vinyl Floor Tile 12"x 12"	Light Brown with Brown and White Streak	NF	ACM	HM	S08abc	4-Dec-09	0.5% Chrysotile
52	Storage	Wall	Concrete	-	-	Non ACM	-	-	-	-

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52	Storage	Ceiling	Drywall	Drywall Joint Compound	NF	ACM	HM	S07 - 1081	18-May-16	3% Chrysotile
52A	Storage	Floor	Concrete	-	-	Non ACM	-	-	-	-
52A	Storage	Wall	Concrete	-	-	Non ACM	-	-	-	-
52A	Storage	Ceiling	Drywall	Drywall Joint Compound	NF	ACM	HM	S07 - 1081	18-May-16	3% Chrysotile
52A	Storage	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Pinchin 1990	1990	50-75% Chrysotile
53	Storage	Floor	Concrete	-	-	Non ACM	-	-	-	-
53	Storage	Wall	Concrete	-	-	Non ACM	-	-	-	-
53	Storage	Ceiling	Drywall	Drywall Joint Compound	NF	ACM	HM	S07 - 1081	18-May-16	3% Chrysotile
54	Boiler Room	Floor	Concrete	-	-	Non ACM	-	-	-	-
54	Boiler Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
54	Boiler Room	Ceiling	Drywall	Drywall Joint Compound	NF	ACM	HM	S07 - 1081	18-May-16	3% Chrysotile
54	Boiler Room	Boiler	Refractory	-	-	Non ACM	SL	S01abc	18-May-16	ND
55	Girls Dressing Room	Floor	Vinyl Floor Tile 12"x 12"	Beige with Brown and Yellow Streak	NF	ACM	HM	S07	4-Dec-09	0.5% Chrysotile
55	Girls Dressing Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
55	Girls Dressing Room	Ceiling	Drywall	Drywall Joint Compound	NF	ACM	HM	S07 - 1081	18-May-16	3% Chrysotile
56	Shower	Floor	Ceramic	-	-	-	-	-	-	-
56	Shower	Wall	Concrete	-	-	Non ACM	-	-	-	-
56	Shower	Ceiling	Drywall	Drywall Joint Compound	NF	ACM	HM	S07 - 1081	18-May-16	3% Chrysotile
57	Washroom	Floor	Vinyl Floor Tile 12"x 12"	Beige with Thick Brown Streak	NF	ACM	HM	S03 - 1042	18-May-16	0.73% Chrysotile
57	Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
57	Washroom	Ceiling	Drywall	Drywall Joint Compound	NF	ACM	HM	S07 - 1081	18-May-16	3% Chrysotile
58	INST.	Floor	Vinyl Floor Tile 12"x 12"	Green with White Streak	NF	ACM	HM	S03	4-Dec-09	0.5% Chrysotile
58	INST.	Wall	Concrete	-	-	Non ACM	-	-	-	-
58	INST.	Ceiling	Drywall	Drywall Joint Compound	NF	ACM	HM	S07 - 1081	18-May-16	3% Chrysotile
59	Washroom	Floor	Vinyl Floor Tile 12" x 12"	Beige with Brown Fleck - (Post 2020)	-	Non ACM	-	-	-	-
59	Washroom	Floor	Ceramic Tile	-	-	Non ACM	-	-	-	-
59	Washroom	Wall	Ceramic Tile	-	-	Non ACM	-	-	-	-
59	Washroom	Ceiling	Drywall	Drywall Joint Compound	NF	ACM	HM	S07 - 1081	18-May-16	3% Chrysotile
60	Gym	Floor	Vinyl Floor Tile	Wood Pattern	-	Non ACM	-	-	-	-
60	Gym	Wall	Concrete	-	-	Non ACM	-	-	-	-
60	Gym	Deck	Metal Pan	Steel	-	Non ACM	-	-	-	-
60	Gym	Pipe	Pipe Fitting	Parging Cement	F	ACM	HM	Pinchin 1990	1990	50-75% Chrysotile
60A	Gym	Floor	Vinyl Floor Tile	Wood Pattern	-	Non ACM	-	-	-	-
60A	Gym	Wall	Concrete	-	-	Non ACM	-	-	-	-

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60A	Gym	Deck	Metal Pan	Steel	-	Non ACM	-	-	-	-
61	Storage Room	Floor	Vinyl Floor Tile 12"x 12"	Green with White Streak	NF	ACM	HM	S03	4-Dec-09	0.5% Chrysotile
61	Storage Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
61	Storage Room	Ceiling	Drywall	Drywall Joint Compound	NF	ACM	HM	S07 - 1081	18-May-16	3% Chrysotile
62	Storage	Floor	Concrete	-	-	Non ACM	-	-	-	-
62	Storage	Wall	Concrete	Concrete Block	-	Non ACM	-	-	-	-
62	Storage	Deck	Steel	-	-	Non ACM	-	-	-	-
63		Floor	Wood	-	-	Non ACM	-	-	-	-
63		Wall	Concrete	-	-	Non ACM	-	-	-	-
63		Ceiling	Drywall	Drywall Joint Compound	NF	ACM	HM	S07 - 1081	18-May-16	3% Chrysotile
64	Boys Dressing Room	Floor	Vinyl Floor Tile 12"x 12"	Green with White Streak	NF	ACM	HM	S03	4-Dec-09	0.5% Chrysotile
64	Boys Dressing Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
64	Boys Dressing Room	Ceiling	Drywall	Drywall Joint Compound	NF	ACM	HM	S07 - 1081	18-May-16	3% Chrysotile
65	Washroom	Floor	Vinyl Floor Tile 12"x 12"	Oatmeal	-	Non ACM	-	-	-	-
65	Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
65	Washroom	Ceiling	Drywall	Drywall Joint Compound	NF	ACM	HM	S07 - 1081	18-May-16	3% Chrysotile
66	Shower	Floor	Ceramic Tile	-	-	Non ACM	-	-	-	-
66	Shower	Wall	Ceramic Tile	-	-	Non ACM	-	-	-	-
66	Shower	Ceiling	Drywall	Drywall Joint Compound	NF	ACM	HM	S07 - 1081	18-May-16	3% Chrysotile
67	INST.	Floor	Vinyl Floor Tile 12"x 12"	Light Brown with Brown and White Streak	NF	ACM	HM	S08	4-Dec-09	0.5% Chrysotile
67	INST.	Wall	Concrete	-	-	Non ACM	-	-	-	-
67	INST.	Ceiling	Drywall	Drywall Joint Compound	NF	ACM	HM	S07 - 1081	18-May-16	3% Chrysotile
68	Washroom	Floor	Ceramic Tile	-	-	Non ACM	-	-	-	-
68	Washroom	Floor	Vinyl Floor Tile 12"x 12"	Brown Dense Fleck (Post 2020)	-	Non ACM	-	-	-	-
68	Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
68	Washroom	Ceiling	Drywall	Drywall Joint Compound	NF	ACM	HM	S07 - 1081	18-May-16	3% Chrysotile
69	Boys Washroom	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
69	Boys Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
69	Boys Washroom	Ceiling	Drywall	Drywall Joint Compound	NF	ACM	HM	S07 - 1081	18-May-16	3% Chrysotile
70	Girls Washroom	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
70	Girls Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
70	Girls Washroom	Ceiling	Drywall	Drywall Joint Compound	NF	ACM	HM	S07 - 1081	18-May-16	3% Chrysotile
71	Custodial Room	Floor	Vinyl Floor Tile 12"x 12"	Brown Dense Fleck	-	Non ACM	HM	S06abc	4-Dec-09	ND
71	Custodial Room	Wall	Concrete	-	-	Non ACM	-	-	-	-

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71	Custodial Room	Ceiling	Drywall	Drywall Joint Compound	NF	ACM	HM	S07 - 1081	18-May-16	3% Chrysotile
72	Copier Room	Floor	Vinyl Floor Tile 12"x 12"	Light Brown with Brown and White Streak	NF	ACM	HM	S08abc	4-Dec-09	0.5% Chrysotile
72	Copier Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
72	Copier Room	Ceiling	Ceiling Tile 2' x 4'	Fibreglass	-	Non ACM	-	-	-	-
72A	Washroom	Floor	Vinyl Floor Tile 12"x 12"	Oatmeal	-	Non ACM	-	-	-	-
72A	Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
72A	Washroom	Ceiling	Ceiling Tile 2' x 4'	Fibreglass	-	Non ACM	-	-	-	-
73	Storage	Floor	Carpet	-	-	Non ACM	-	-	-	-
73	Storage	Wall	Concrete Block	-	-	Non ACM	-	-	-	-
73	Storage	Ceiling	Ceiling Tile 2'x4'	Short Fissure Random Pinhole	-	Non ACM	-	-	-	-
74	Storage	Floor	Carpet	-	-	Non ACM	-	-	-	-
74	Storage	Wall	Concrete	-	-	Non ACM	-	-	-	-
74	Storage	Ceiling	Drywall	-	-	Non ACM	-	-	-	-
75	Storage	Floor	Vinyl Floor Tile 12"x 12"	Light Brown with Brown and White Streak	NF	ACM	SL	S08abc	4-Dec-09	0.5% Chrysotile
75	Storage	Wall	Concrete	-	-	Non ACM	-	-	-	-
75	Storage	Ceiling	Drywall	Drywall Joint Compound	NF	ACM	HM	S07 - 1081	18-May-16	3% Chrysotile
76	Boys Washroom	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
76	Boys Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
76	Boys Washroom	Ceiling	Drywall	Drywall Joint Compound	NF	ACM	HM	S07 - 1081	18-May-16	3% Chrysotile
77	Custodial Room	Floor	Vinyl Floor Tile 12"x 12"	Beige with Brown and Yellow Streak	NF	ACM	SL	S07	4-Dec-09	0.5% Chrysotile
77	Custodial Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
77	Custodial Room	Ceiling	Drywall	Drywall Joint Compound	NF	ACM	HM	S07 - 1081	18-May-16	3% Chrysotile
77	Custodial Room	Ceiling	Pipe Fitting	Parged Cement	F	ACM	HM	Pinchin 1990	1990	50-75% Chrysotile
77	Fan Room above Rm 77	Ducting	Flex Joint	-	NF	ACM	Deemed ACM	Sample prior to removal/disturbance	-	-
77	Fan Room above Rm 77	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Pinchin 1990	1990	50-75% Chrysotile
78	Closet	Floor	Vinyl Floor Tile 12"x 12"	Beige with Thick Brown Streak	NF	ACM	HM	S03 - 1042	18-May-16	0.73% Chrysotile
78	Closet	Wall	Concrete	-	-	Non ACM	-	-	-	-
78	Closet	Ceiling	Drywall	Drywall Joint Compound	NF	ACM	HM	S07 - 1081	18-May-16	3% Chrysotile
79	Closet	Floor	Vinyl Floor Tile 12"x 12"	Beige with Brown and Yellow Streak	NF	ACM	HM	S07	4-Dec-09	0.5% Chrysotile
79	Closet	Wall	Concrete	-	-	Non ACM	-	-	-	-
79	Closet	Ceiling	Drywall	Drywall Joint Compound	NF	ACM	HM	S07 - 1081	18-May-16	3% Chrysotile
80	Girls Washroom	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
80	Girls Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
80	Girls Washroom	Ceiling	Drywall	Drywall Joint Compound	NF	ACM	HM	S07 - 1081	18-May-16	3% Chrysotile

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WRDSB Fixed Reference Number	Room Description	Inspected Item	Inspected Material	Material Description	Friability	Asbestos Classification	Sample / Identification Summary	Sample ID	Sample Date	% Asbestos & Fibre Type
81	Guidance	Floor	Vinyl Floor Tile 12"x 12"	Beige Dense Fleck	-	Non ACM	-	-	-	-
81	Guidance	Wall	Concrete	-	-	Non ACM	-	-	-	-
81	Guidance	Ceiling	Drywall	Drywall Joint Compound	NF	ACM	HM	S07 - 1081	18-May-16	3% Chrysotile
82	Work Room	Floor	Vinyl Floor Tile 12"x 12"	White with Blue and Green	-	Non ACM	SL	S05abc	4-Dec-09	ND
82	Work Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
82	Work Room	Ceiling	Ceiling Tile 2' x 2'	Fibreglass	-	Non ACM	-	-	-	-
82	Work Room	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	HM	S02	4-Dec-09	ND
83	Pipe Chase	Floor	Concrete	-	-	Non ACM	-	-	-	-
83	Pipe Chase	Wall	Concrete	-	-	Non ACM	-	-	-	-
83	Pipe Chase	Piping	Pipe	Transite	NF	ACM	Deemed ACM	Sample prior to removal/disturbance	-	-
801	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
801	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
801	Corridor	Ceiling	Drywall	Drywall Joint Compound	NF	ACM	HM	S07 - 1081	18-May-16	3% Chrysotile
801	Corridor	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	SL	S01abc	4-Dec-09	ND
801	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	SL	S02abc	4-Dec-09	ND
801	Corridor	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Pinchin 1990	1990	50-75% Chrysotile
801A	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
801A	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
801A	Corridor	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	SL	S01abc	4-Dec-09	ND
801A	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	SL	S02abc	4-Dec-09	ND
801A	Corridor	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Pinchin 1990	1990	50-75% Chrysotile
801D	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
801D	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
801D	Corridor	Ceiling	Drywall	Drywall Joint Compound	NF	ACM	HM	S07 - 1081	18-May-16	3% Chrysotile
801D	Corridor	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	SL	S01abc	4-Dec-09	ND
801D	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	SL	S02abc	4-Dec-09	ND
801D	Corridor	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Pinchin 1990	1990	50-75% Chrysotile
802	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
802	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
802	Corridor	Wall	Drywall	Drywall Joint Compound	NF	ACM	SL	S07AB - 1081	18-May-16	3% Chrysotile
802	Corridor	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	SL	S01abc	4-Dec-09	ND
802	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	SL	S02abc	4-Dec-09	ND
802	Corridor	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Pinchin 1990	1990	50-75% Chrysotile
803	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-

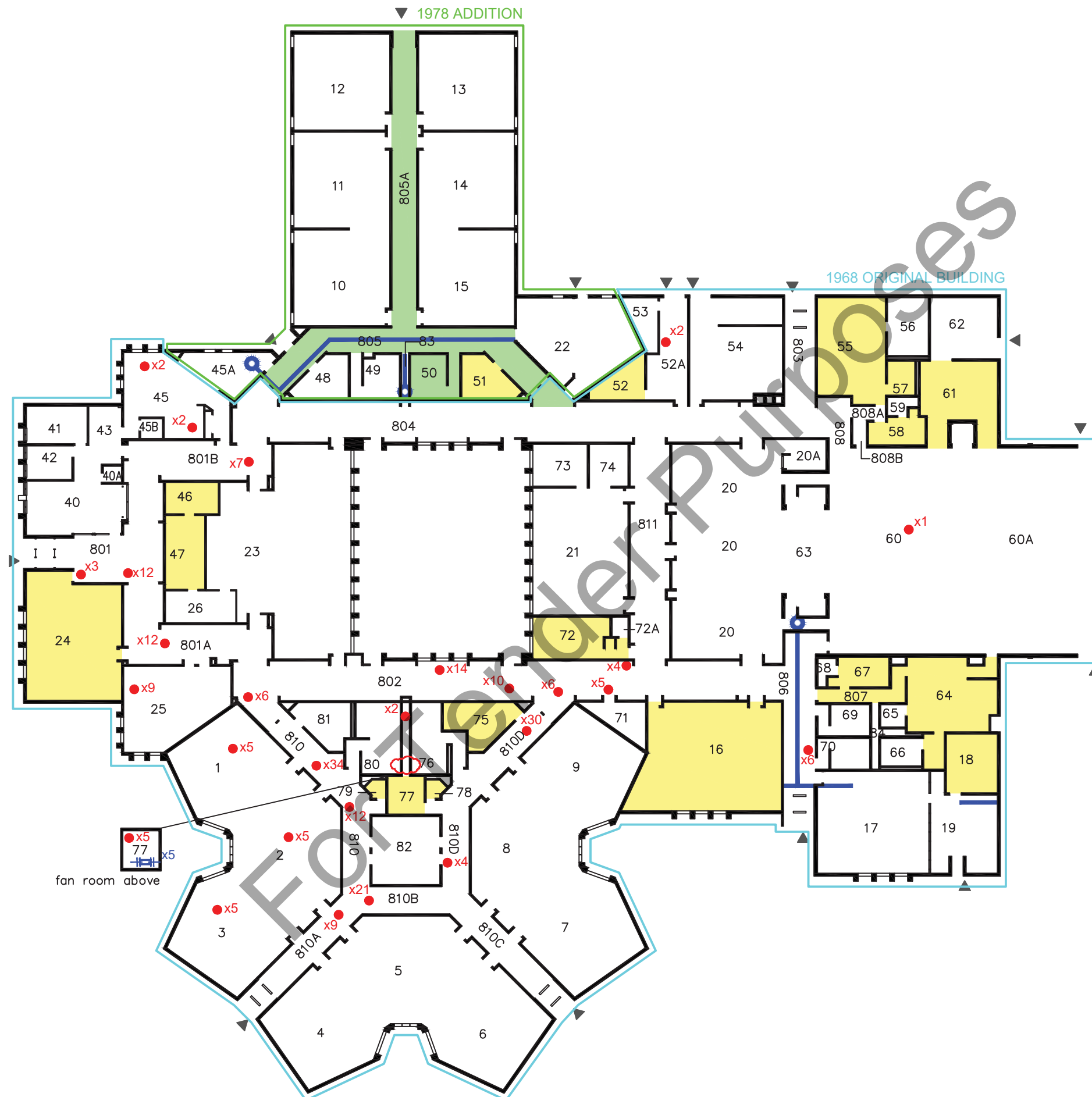
		School Name		Legend:				Notes:		
		Laurentian Public School		HM - Homogenous Material - homogeneous with previously sampled material SL - Sample Location - Material Sampled VC - Visually Confirmed - Material not sampled, deemed ACM NF - Non-Friable F- Friable				All quantities provided on Figures, if known. Refer to the Asbestos Audit Update Report for condition of ACM and recommended actions.		
		Date Built:						Dates provided in Material Description/Room Description columns indicates date of installation/renovation and confirms the finishes as non-ACM.		
		Original: 1968								
		Addition(s): 1978								
WRDSB Fixed Reference Number	Room Description	Inspected Item	Inspected Material	Material Description	Friability	Asbestos Classification	Sample / Identification Summary	Sample ID	Sample Date	% Asbestos & Fibre Type
803	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
803	Corridor	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	SL	S01abc	4-Dec-09	ND
803	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	SL	S02abc	4-Dec-09	ND
804	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
804	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
804	Corridor	Wall	Drywall	Drywall Joint Compound	NF	ACM	SL	S07C - 1081	18-May-16	3% Chrysotile
804	Corridor	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	SL	S01abc	4-Dec-09	ND
804	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	SL	S02abc	4-Dec-09	ND
805	Corridor	Floor	Vinyl Sheet Flooring	Beige	NF	ACM	HM	S10abc	4-Dec-09	35% Chrysotile
805	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
805	Corridor	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	SL	S01abc	4-Dec-09	ND
805	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	SL	S02abc	4-Dec-09	ND
805	Corridor	Piping	Pipe	Transite	NF	ACM	Deemed ACM	Sample prior to removal/disturbance	-	-
805A	Corridor	Floor	Vinyl Sheet Flooring	Beige	NF	ACM	HM	S10abc	4-Dec-09	35% Chrysotile
805A	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
805A	Corridor	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	SL	S01abc	4-Dec-09	ND
805A	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	SL	S02abc	4-Dec-09	ND
805A	Corridor	Piping	Pipe	Transite	NF	ACM	Deemed ACM	Sample prior to removal/disturbance	-	-
806	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
806	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
806	Corridor	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	SL	S01abc	4-Dec-09	ND
806	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	SL	S02abc	4-Dec-09	ND
806	Corridor	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Pinchin 1990	1990	50-75% Chrysotile
806	Corridor	Piping	Pipe	Transite	NF	ACM	Deemed ACM	Sample prior to removal/disturbance	-	-
807	INST.	Floor	Vinyl Floor Tile 12"x 12"	Light Brown with Brown and White Streak	NF	ACM	HM	S08	4-Dec-09	0.5% Chrysotile
807	INST.	Wall	Concrete	-	-	Non ACM	-	-	-	-
807	INST.	Ceiling	Drywall	Drywall Joint Compound	NF	ACM	HM	S07 - 1081	18-May-16	3% Chrysotile
808	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
808	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
808	Corridor	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	SL	S01abc	4-Dec-09	ND
808	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	SL	S02abc	4-Dec-09	ND
810	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
810	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
810	Corridor	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	SL	S01abc	4-Dec-09	ND

		School Name		Legend:				Notes:		
		Laurentian Public School		HM - Homogenous Material - homogeneous with previously sampled material SL - Sample Location - Material Sampled VC - Visually Confirmed - Material not sampled, deemed ACM NF - Non-Friable F- Friable				All quantities provided on Figures, if known. Refer to the Asbestos Audit Update Report for condition of ACM and recommended actions.		
		Date Built:						Dates provided in Material Description/Room Description columns indicates date of installation/renovation and confirms the finishes as non-ACM.		
		Original: 1968								
		Addition(s): 1978								
WRDSB Fixed Reference Number	Room Description	Inspected Item	Inspected Material	Material Description	Friability	Asbestos Classification	Sample / Identification Summary	Sample ID	Sample Date	% Asbestos & Fibre Type
810	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	SL	S02abc	4-Dec-09	ND
810	Corridor	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Pinchin 1990	1990	50-75% Chrysotile
810A	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
810A	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
810A	Corridor	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	SL	S01abc	4-Dec-09	ND
810A	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	SL	S02abc	4-Dec-09	ND
810A	Corridor	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Pinchin 1990	1990	50-75% Chrysotile
810B	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
810B	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
810B	Corridor	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	SL	S01abc	4-Dec-09	ND
810B	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	SL	S02abc	4-Dec-09	ND
810B	Corridor	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Pinchin 1990	1990	50-75% Chrysotile
810C	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
810C	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
810C	Corridor	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	SL	S01abc	4-Dec-09	ND
810C	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	SL	S02abc	4-Dec-09	ND
810D	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
810D	Corridor	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
810D	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
810D	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
810D	Corridor	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	SL	S01abc	4-Dec-09	ND
810D	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	SL	S02abc	4-Dec-09	ND
810D	Corridor	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	Non ACM	SL	S01abc	4-Dec-09	ND
810D	Corridor	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole	-	Non ACM	SL	S02abc	4-Dec-09	ND
810D	Corridor	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Pinchin 1990	1990	50-75% Chrysotile
810D	Corridor	Piping	Pipe Fitting	Parged Cement	F	ACM	HM	Pinchin 1990	1990	50-75% Chrysotile
Summary of Potential ACM Hidden or Not Assessed										
	Throughout Building	Not Inspected	Not Inspected	Wall Cavity Insulation						
	Throughout Building	Not Inspected	Not Inspected	Door Core Insulation						

Appendix B

Figures

For Tender Purposes



NOTES:

ALL DRAWINGS TO BE REFERENCED WITH THE ASSOCIATED REPORT. LOCATIONS AND QUANTITIES ARE APPROXIMATE.

ALL KNOWN OR SUSPECT ASBESTOS-CONTAINING MATERIALS AND/OR DESIGNATED MATERIALS ARE NOT DEPICTED ON THIS DRAWING. REFER TO THE REPORT FOR A COMPLETE LIST OF IDENTIFIED MATERIALS.

THIS FIGURE IS COLOUR DEPENDENT. PHOTOCOPIES MAY ALTER INTERPRETATION OF THE FIGURE. ALWAYS REFER TO ORIGINAL DRAWINGS AND REPORT.

Legend

13 Fixed Reference Number

No Access

Post 2000 Construction

Asbestos-Containing Materials (ACM):

- Floor Tile
- Rolled Flooring
- Ceiling Tile
- Friable Soft Textured Ceiling
- Non-Friable Hard Textured Ceiling
- Spray-On Fire Proofing
- Transite (Asbestos Cement) Paneling
- Duct Insulation
- Pipe Fitting Insulation w Quantity (Brackets Indicate # of Damaged Fittings)
- Pipe Insulation (Vertical and Horizontal)
- Transite (Asbestos Cement) Pipe (Vertical and Horizontal)
- Duct Expansion Joints w Quantity (Brackets Indicate # of Damaged Joints)
- Friable Debris



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WATERLOO REGION DISTRICT SCHOOL BOARD

PROJECT
2023 ASBESTOS AUDIT UPDATE

DRAWING
LAURENTIAN PUBLIC SCHOOL
LEVEL ONE

Project Manager	PXS	Date	January 2023
Design By	WRDSB	Project No.	34532-941
Drawn By	SGL	Drawing No.	1.0
Scale	N.T.S.		

Appendix C

Tables

For Tender Purposes

TABLE 1 - INTERNAL ABATEMENT MANAGEMENT						
Laurentian Public School						
Material	WRDSB Fixed Reference Number	Material Description	Approximate Quantity	Photograph - Context	Photograph - Detail	Required Action
Asbestos Non-Friable	24	12" x 12" Brown with White Streak Floor Tile	6 Tiles			Monitor Annually
Asbestos Non-Friable	77	12" x 12" Beige with Brown and Yellow STreaks Floor Tile	1 Tile			Monitor Annually
Notes: 1) A copy of this report should be provided to all prospective contractors prior to tender or quotation, in accordance with Section 30 of the Occupational Health and Safety Act. 2) Recommended actions are the minimum required actions, as prescribed by the appropriate Acts, regulations, guidelines, standards, codes and general best practice measures. The Contractor may choose to alter the approach and combine or break out sections of work. This is acceptable provided that the appropriate Acts, regulations, guidelines, standards and codes are followed and afford protection for the health and safety of workers, occupants and the public that is at least equal to the protection that would be provided by complying with the minimum requirements. 3) All waste generated is subject to characterization and disposal in accordance with Ontario Regulation 347.						

TABLE 2 - EXTERNAL ABATEMENT MANAGEMENT

Laurentian Public School						
Material	WRDSB Fixed Reference Number	Material Description	Approximate Quantity	Photograph - Context	Photograph - Detail	Required Action
Asbestos Friable	77	Parged Pipe Fitting Debris at Wall Cavity	<1 m ²			Removal/Repair in accordance with O. Reg. 278/05 as a Type 2 Operation
Notes: 1) A copy of this report should be provided to all prospective contractors prior to tender or quotation, in accordance with Section 30 of the Occupational Health and Safety Act. 2) Recommended actions are the minimum required actions, as prescribed by the appropriate Acts, regulations, guidelines, standards, codes and general best practice measures. The Contractor may choose to alter the approach and combine or break out sections of work. This is acceptable provided that the appropriate Acts, regulations, guidelines, standards and codes are followed and afford protection for the health and safety of workers, occupants and the public that is at least equal to the protection that would be provided by complying with the minimum requirements. 3) All waste generated is subject to characterization and disposal in accordance with Ontario Regulation 347.						

TABLE 3: BULK ASBESTOS SAMPLING SUMMARY

Sample #	Location	Material Description	Asbestos Content (%)	Fibre Type	Is Material ACM
2009 Asbestos Audit Update					
32523-Laurentian-S01a	1087	2' x 4' Ceiling Tile - Long Fissure Random Pinhole	ND	-	No
32523-Laurentian-S01b	1087	2' x 4' Ceiling Tile - Long Fissure Random Pinhole	ND	-	No
32523-Laurentian-S01c	1087	2' x 4' Ceiling Tile - Long Fissure Random Pinhole	ND	-	No
32523-Laurentian-S02a	1087	2' x 4' Ceiling Tile - Short Fissure Random Pinhole	ND	-	No
32523-Laurentian-S02b	1087	2' x 4' Ceiling Tile - Short Fissure Random Pinhole	ND	-	No
32523-Laurentian-S02c	1087	2' x 4' Ceiling Tile - Short Fissure Random Pinhole	ND	-	No
32523-Laurentian-S03a	1037	12" x 12" Floor Tile - Green with White Streak	0.5	Chrysotile	Yes
32523-Laurentian-S03b	1037	12" x 12" Floor Tile - Green with White Streak	NA	Chrysotile	Yes
32523-Laurentian-S03c	1037	12" x 12" Floor Tile - Green with White Streak	NA	Chrysotile	Yes
32523-Laurentian-S04a	1036	12" x 12" Floor Tile - Beige Dense Fleck	ND	-	No
32523-Laurentian-S04b	1036	12" x 12" Floor Tile - Beige Dense Fleck	ND	-	No
32523-Laurentian-S04c	1036	Mastic	ND	-	No
32523-Laurentian-S05a	1009	12" x 12" Floor Tile - Beige Dense Fleck	ND	-	No
32523-Laurentian-S05b	1009	12" x 12" Floor Tile - White with Blue and Grey Fleck	ND	-	No
32523-Laurentian-S05c	1009	12" x 12" Floor Tile - White with Blue and Grey Fleck	ND	-	No
32523-Laurentian-S06a	1008	12" x 12" Floor Tile - Brown Dense Fleck	ND	-	No
32523-Laurentian-S06b	1008	12" x 12" Floor Tile - Brown Dense Fleck	ND	-	No
32523-Laurentian-S06c	1008	12" x 12" Floor Tile - Brown Dense Fleck	ND	-	No
32523-Laurentian-S07a	1010	12" x 12" Floor Tile - Beige with Brown and Yellow Streak	0.5	Chrysotile	Yes
32523-Laurentian-S07b	1010	12" x 12" Floor Tile - Beige with Brown and Yellow Streak	NA	Chrysotile	Yes
32523-Laurentian-S07c	1010	12" x 12" Floor Tile - Beige with Brown and Yellow Streak	NA	Chrysotile	Yes
32523-Laurentian-S08a	1015	12" x 12" Floor Tile - Light Brown with Brown and White Streak	0.5	Chrysotile	Yes
32523-Laurentian-S08b	1015	12" x 12" Floor Tile - Light Brown with Brown and White Streak	NA	Chrysotile	Yes
32523-Laurentian-S08c	1015	12" x 12" Floor Tile - Light Brown with Brown and White Streak	NA	Chrysotile	Yes
32523-Laurentian-S09a	1018	2' x 4' Ceiling Tile - Random Pinhole	ND	-	No
32523-Laurentian-S09b	1018	2' x 4' Ceiling Tile - Random Pinhole	ND	-	No
32523-Laurentian-S09c	1018	2' x 4' Ceiling Tile - Random Pinhole	ND	-	No
32523-Laurentian-S10a	1057	Vinyl Sheet Flooring - Beige	0.5	Chrysotile	Yes
32523-Laurentian-S10b	1057	Vinyl Sheet Flooring - Beige	NA	Chrysotile	Yes
32523-Laurentian-S10c	1057	Vinyl Sheet Flooring - Beige	NA	Chrysotile	Yes
2016 Asbestos Audit Update					
S01A - 1055	1055	12"x12" Vinyl Floor Tile - Grey with White and Black Fleck	ND	-	No
S01B - 1055	1055	12"x12" Vinyl Floor Tile - Grey with White and Black Fleck	ND	-	No
S01C - 1055	1055	12"x12" Vinyl Floor Tile - Grey with White and Black Fleck	ND	-	No
S01A - 1055	1055	Mastic	ND	-	No
S01B - 1055	1055	Mastic	ND	-	No
S01C - 1055	1055	Mastic	ND	-	No
S02A - 1066	1066	12"x12" Vinyl Floor Tile - Grey Dense Fleck	ND	-	No
S02B - 1066	1066	12"x12" Vinyl Floor Tile - Grey Dense Fleck	ND	-	No
S02C - 1066	1066	12"x12" Vinyl Floor Tile - Grey Dense Fleck	ND	-	No
S02A - 1066	1066	Mastic	ND	-	No
S02B - 1066	1066	Mastic	ND	-	No
S02C - 1066	1066	Mastic	ND	-	No
S03A - 1042	1042	12"x12" Vinyl Floor Tile - Beige with Thick Brown Streak	0.73	Chrysotile	Yes
S03B - 1042	1042	12"x12" Vinyl Floor Tile - Beige with Thick Brown Streak	NA	Chrysotile	Yes
S03C - 1042	1042	12"x12" Vinyl Floor Tile - Beige with Thick Brown Streak	NA	Chrysotile	Yes
S03A - 1042	1042	Mastic	ND	-	No
S03B - 1042	1042	Mastic	ND	-	No
S03C - 1042	1042	Mastic	ND	-	No
S04A - 1046	1046	12"x12" Vinyl Floor Tile - Tan with Brown and White Streak	0.73	Chrysotile	Yes
S04B - 1046	1046	12"x12" Vinyl Floor Tile - Tan with Brown and White Streak	NA	Chrysotile	Yes
S04C - 1046	1046	12"x12" Vinyl Floor Tile - Tan with Brown and White Streak	NA	Chrysotile	Yes
S04A - 1046	1046	Mastic	ND	-	No
S04B - 1046	1046	Mastic	ND	-	No
S04C - 1046	1046	Mastic	ND	-	No
S05A - 1041	1041	12"x12" Vinyl Floor Tile - Teal Dense Fleck	ND	-	No
S05B - 1041	1041	12"x12" Vinyl Floor Tile - Teal Dense Fleck	ND	-	No
S05C - 1041	1041	12"x12" Vinyl Floor Tile - Teal Dense Fleck	ND	-	No
S05A - 1041	1041	Mastic	ND	-	No
S06A - 1058	1058	12"x12" Vinyl Floor Tile - Grey with Brown and White Streak	0.72	Chrysotile	Yes
S06B - 1058	1058	12"x12" Vinyl Floor Tile - Grey with Brown and White Streak	NA	Chrysotile	Yes
S06C - 1058	1058	12"x12" Vinyl Floor Tile - Grey with Brown and White Streak	NA	Chrysotile	Yes
S07A - 1081	1081	Drywall Joint Compound	3	Chrysotile	Yes
S07B - 1081	1081	Drywall Joint Compound	NA	Chrysotile	Yes
S07C - 1084	1084	Drywall Joint Compound	NA	Chrysotile	Yes
2016 Additional Sampling					
S01A	1063	Boiler Refractory	ND	-	No
S01B	1063	Boiler Refractory	ND	-	No
S01C	1063	Boiler Refractory	ND	-	No
2020 Asbestos Audit Update					
S01A	1037 (Original)	Interior Door Sealant - Black	ND	-	No
S01B	1037 (Original)	Interior Door Sealant - Black	ND	-	No
S01C	1037 (Original)	Interior Door Sealant - Black	ND	-	No
S02A	1053 (1978)	Floor Tile Mastic - Black	ND	-	No
S02B	1053 (1978)	Floor Tile Mastic - Black	ND	-	No
S02C	1053 (1978)	Floor Tile Mastic - Black	ND	-	No

NA: Not Analyzed due to stop positive method ND: No asbestos fibres detected above the laboratory minimum detection limit

A bulk material sample containing 0.5% or more asbestos therefore establishes that material as asbestos-containing. In accordance with Table 1 of O. Reg. 278/05, a minimum number of samples for the material to be classified as non asbestos. A homogeneous material is defined by O. Reg. 278/05 "as material that is uniform in colour and texture". Homogeneous samples are identified by an alphabetical suffix to sample names to represent multiple samples of a homogeneous material. When a homogeneous material is analysed it is determined to be asbestos-containing upon the first positive detection of asbestos equal to or greater than 0.5%. Subsequent samples of the same material are therefore not analysed. Some bulk samples are comprised of multiple layers and as such will require multiple analysis. In such cases each layer is isolated at the laboratory and analysed individually to determine asbestos content. As a result the laboratory may report additional samples beyond the submitted number of samples or include multiple analyses as subsets within a sample.

Appendix 01 35 34B– Lead Report- Not Applicable

01 42 00 – References

1.0 GENERAL

1.1. SECTION INCLUDES

- .1 References and standards.
- .2 Standards producing industry organizations and their addresses.

1.2. RELATED SECTIONS

- .1 Section 01 61 00 – Product Requirements.
- .2 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3. REFERENCES

- .1 For Products or quality specified by association, trade, or other references or consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- .2 Conform to reference standard by Ontario Building Code except where a specific date is established or required by code.
- .3 Obtain copies of standards where required by product specification sections.
- .4 Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of the Consultant shall be altered from the Contract Documents by mention or inference otherwise, in any reference document.

1.4. STANDARDS

- .1 The following associations and organizations are cited in specification sections. Acronym, name, address, and Internet URL addresses are as follows:
- .2 Canadian Organizations:
 - .1 Street, Suite 616, Ottawa, ON K1P 5G4; URL: <http://www.acec.ca>.
 - .2 **AWMAC** - Architectural Woodwork Manufacturers Association of Canada, 516-4 Street West, High River, AB T1V 1B6; URL: <http://www.awmac.com>.
 - .3 **Canada Green Building Council**, 330 - 55 rue Murray Street, Ottawa, ON. K1N5M3; Tel: 613-241-1184, Fax: 613-241-5750; URL: <http://www.cagbc.org>.
 - .4 **CCA** - Canadian Construction Association, 75 Albert St., Suite 400, Ottawa, ON K1P 5E7; URL: <http://www.cca-acc.com>.
 - .5 **CCDC** – Canadian Construction Documents Committee, Refer to ACEC, CCA, CSC or RAIC; URL: <http://www.CCDC.org>.
 - .6 **CGA** - Canadian Gas Association, 20 Eglinton Avenue West, Suite 1305, Toronto, ON M4R 1K8; URL: <http://www.cga.ca>.

- .7 **CGSB** - Canadian General Standards Board, Place du Portage, Phase III, 6B1, 11 Laurier Street, Hull, QC K1A 0S5; URL: <http://w3.pwgsc.gc.ca/cgsb>.
- .8 **CISC** - Canadian Institute of Steel Construction, 201 Consumers Road, Suite 300, Willowdale, ON M2J 4G8; URL: <http://www.cisc-icca.ca>.
- .9 **CLA** - Canadian Lumbermen's Association, 27 Goulburn Avenue, Ottawa, ON K1N 8C7; URL: <http://www.cla-ca.ca>.
- .10 **CNLA** - Canadian Nursery Landscape Association, RR #4, Stn. Main, 7856 Fifth Street, Milton, ON L9T 2X8; URL: <http://www.canadanursery.com>.
- .11 **CRCA** - Canadian Roofing Contractors Association, 155 Queen Street, Suite 1300, Ottawa, ON K1P 6L1; URL: <http://www.roofingcanada.com>.
- .12 **CSA** - Canadian Standards Association International, 178 Rexdale Blvd., Toronto, ON M9W 1R3; URL: <http://www.csa-international.org>.
- .13 **CSC** - Construction Specifications Canada, 120 Carlton Street, Suite 312, Toronto, ON M5A 4K2; URL: <http://www.csc-dcc.ca>.
- .14 **CSDMA** - Canadian Steel Door Manufacturers Association, One Yonge Street, Suite 1801, Toronto, ON M5E 1W7; URL: <http://www.csdma.org>.
- .15 **CSPI** - Corrugated Steel Pipe Institute, 652 Bishop Street N, Unit 2A, Cambridge, ON N3H 4V6; URL: <http://www.cspi.ca>.
- .16 **CSSBI** - Canadian Sheet Steel Building Institute, 652 Bishop St. N., Unit 2A, Cambridge, ON N3H 4V6; URL: <http://www.cssbi.ca>.
- .17 **CUFCA** - Canadian Urethane Foam Contractor's Association, Box 3214, Winnipeg, MB R3C 4E7; URL: <http://www.cufca.ca>.
- .18 **CWC** - Canadian Wood Council, 1400 Blair Place, Suite 210, Ottawa, ON K1J 9B8; URL: <http://www.cwc.ca>.
- .19 **EC** - Environment Canada, Conservation and Protection, Inquiry Centre, 351 St. Joseph Blvd, Hull, QC K1A 0H3; URL: <http://www.ec.gc.ca>.
- .20 **EFC** - Electro Federation of Canada, 5800 Explorer Drive, Suite 200, Mississauga, ON L4W 5K9; URL: <http://www.electrofed.com>.
- .21 **MPI** - The Master Painters Institute, 4090 Graveley Street, Burnaby, BC V5C 3T6; URL: <http://www.paintinfo.com>.
- .22 **NABA** - National Air Barrier Association, PO Box 2747, Winnipeg, MB R3C 4E7; URL: <http://www.naba.ca>.
- .23 **NLGA** - National Lumber Grades Authority, 406-First Capital Place, 960 Quayside Drive, New Westminster, BC V3M 6G2; URL: <http://www.nlga.org>.
- .24 **NRC** - National Research Council, Building M-58, 1200 Montreal Road, Ottawa, ON K1A 0R6; URL: <http://www.nrc.gc.ca>.

- .25 **QPL** - Qualification Program List, c/o Canadian General Standards Board, Place du Portage, Phase III, 6B1, 11 Laurier Street, Hull, QC K1A 1G6; URL: <http://www.pwgsc.gc.ca/cgsb>.
- .26 **RAIC** - Royal Architectural Institute of Canada, 55 Murray Street, Suite 330, Ottawa, ON K1N 5M3; URL: <http://www.raic.org>.
- .27 **SCC** - Standards Council of Canada, 270 Albert Street, Suite 2000, Ottawa, ON K1P 6N7; URL: <http://www.scc.ca>.
- .28 **TTMAC** - Terrazzo, Tile and Marble Association of Canada, 30 Capston Gate, Unit 5 Concord, ON L4K 3E8; URL: <http://www.ttmac.com>.
- .29 **ULC** - Underwriters' Laboratories of Canada, 7 Crouse Road, Toronto, ON M1R 3A9; URL: <http://www.ulc.ca>.
- .3 USA Organizations:
 - .1 **AA** - Aluminum Association, 900 19th Street N.W., Washington, DC 20006; URL: <http://www.aluminum.org>.
 - .2 **AASHTO** - American Association of State Highway and Transportation Officials, 444 N Capitol Street N.W., Suite 249, Washington, DC 20001; URL: <http://www.aashto.org>.
 - .3 **AHA** - American Hardboard Association, 1210W Northwest Hwy, Palatine, IL 60067; URL: <http://www.hardboard.org>.
 - .4 **AITC** - American Institute of Timber Construction, 7012 S. Revere Parkway, Suite 140, Englewood, CO 80112; URL: <http://www.aitc-glulam.org>.
 - .5 **AMCA** - Air Movement and Control Association Inc., 30 West University Drive, Arlington Heights, IL 60004-1893; URL: <http://www.amca.org>.
 - .6 **ANSI** - American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, NY 10036; URL: <http://www.ansi.org>.
 - .7 **APA** - The Engineered Wood Association, P.O. Box 11700, Tacoma, WA 98411-0700; URL: <http://www.apawood.org>.
 - .8 **API** - American Petroleum Institute, 1220 L St. Northwest, Washington, DC 20005-4070; URL: <http://www.api.org>.
 - .9 **ARI** - Air Conditioning and Refrigeration Institute, 4100 N Fairfax Drive, Suite 200, Arlington, VA 22203; URL: <http://www.ari.org>.
 - .10 **ASHRAE** - American Society of Heating, Refrigeration and Air-Conditioning Engineers, 1791 Tullie Circle NE, Atlanta, GA 30329; URL: <http://www.ashrae.org>.
 - .11 **ASME** - American Society of Mechanical Engineers, ASME Headquarters, 3 Park Avenue, New York, NY 10016-5990; URL: <http://www.asme.org>.

- .12 **ASTM International**, 100 Barr Harbor Drive West, Conshohocken, PA 19428-2959; URL: <http://www.astm.org>.
- .13 **AWCI** - Association of the Wall and Ceiling Industries International, 803 West Broad Street, Suite 600 , Falls Church, VA 22046; URL: <http://www.awci.org>.
- .14 **AWPA** - American Wire Producer's Association, 801 N Fairfax Street, Suite 211, Alexandria, VA 22314-1757; URL: <http://www.awpa.org>.
- .15 **AWPA** - American Wood Preservers' Association, P.O. Box 5690, Granbury TX 76049-0690; URL: <http://www.awpa.com>
- .16 **AWS** - American Welding Society, 550 N.W. LeJeune Road, Miami, FL 33126; URL: <http://www.amweld.org>.
- .17 **AWWA** - American Water Works Association, 6666 W. Quincy Avenue, Denver, CO 80235; URL: <http://www.awwa.org>.
- .18 **EIMA** - EIFS Industry Manufacturer's Association, 3000 Corporate Center Drive, Suite 270, Morrow, GA 30260; URL: <http://www.eima.com>.
- .19 **ISAP** - International Society for Asphalt Paving, 400 Selby Avenue, Suite 1, St. Paul, MN 55102; URL: <http://www.asphalt.org>.
- .20 **IEEE** - Institute of Electrical and Electronics Engineers, IEE Corporate Office, 3 Park Avenue, 17th Floor, New York, NY 10016-5997; URL: <http://www.ieee.org>
- .21 **MSS** - Manufacturers Standardization Society of the Valve and Fittings Industry, 127 Park Street, N.E., Vienna, VA 22180-4602; URL: <http://www.mss-hq.com>.
- .22 **NAAMM** - National Association of Architectural Metal Manufacturers, 8 South Michigan Avenue, Suite 1000, Chicago, IL 60603; URL: <http://www.naamm.org>.
- .23 **NEMA** - National Electrical Manufacturers Association, 1300 N 17th Street, Suite 1847, Rosslyn, VA 22209; URL: <http://www.nema.org>.
- .24 **NFPA** - National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9101 Quincy, MA 02269-9101; URL: <http://www.nfpa.org>.
- .25 **NFSA** - National Fire Sprinkler Association, P.O. Box 1000, Patterson, NY 12563; URL: <http://www.nfsa.org>.
- .26 **NHLA** - National Hardwood Lumber Association, 6830 Raleigh-La Grange Road, Memphis, TN 38184-0518; URL: <http://www.natlhardwood.org>.
- .27 **NSPE** - National Society of Professional Engineers, 1420 King Street, Alexandria, VA 22314-2794; URL: <http://www.nspe.org>.
- .28 **PCI** - Prestressed Concrete Institute, 209 W. Jackson Blvd., Suite 500, Chicago, IL 60606-6938; URL: <http://www.pci.org>.

- .29 **PEI** - Porcelain Enamel Institute, PO Box 920220, Norcross, GA 30010; URL: <http://www.porecelainenamel.com>.
- .30 **SSPC** - The Society for Protective Coatings, 40 24th Street, 6th Floor, Pittsburgh, PA 15222-4656; URL: <http://www.sspc.org>.
- .31 **TPI** - Truss Plate Institute, 583 D'Onofrio Drive, Suite 200, Madison, WI 53719; URL: <http://www.tpinst.org>.
- .32 **UL** - Underwriters' Laboratories, 333 Pfingsten Road, Northbrook, IL60062-2096; URL: <http://www.ul.com>.

END OF SECTION

01 45 00 – Quality Control

1.0 GENERAL

1.1. RELATED SECTIONS

- .1 Section 01 21 00 - Allowances.
- .2 Section 01 78 10 – Closeout Submittals and Requirements
- .3 Section 01 79 00 – Demonstration and Training
- .4 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.2. REFERENCES

- .1 **ISO/IEC 17025-2005** - General Requirements for the Competence of Testing and Calibration Laboratories.
- .2 **SCC** (Standards Council of Canada).

1.3. INSPECTION BY AUTHORITY

- .1 Allow Authorities Having Jurisdiction access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection whenever portions of the Work are designated for special tests, inspections or approvals, either when described in the Contract Documents or when required by law in the Place of the Work.
- .3 If 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 inspections or tests satisfactorily completed and make good such Work.

1.4. REVIEW BY CONSULTANT

- .1 Consultant may order any part of the Work to be reviewed or inspected if Work is suspected to be not in accordance with Contract Documents.
- .2 If, upon review such work is found not in accordance with Contract Documents, correct such Work and pay the cost of additional review and correction.
- .3 If such Work is found in accordance with Contract Documents, The owner will pay the cost of review and replacement.

1.5. INDEPENDENT INSPECTION AGENCIES

- .1 Independent Inspection and Testing Agencies will be engaged by Contractor for the purpose of inspecting and testing portions of Work.
- .2 The Board may, at their discretion, request that the Consultant direct the Contractor to engage independent inspecting and or testing agencies to review or test the Work.
- .3 Allocate Costs for inspections and testing to Section 01 21 00.
- .4 Provide equipment required for executing inspection and testing by appointed agencies.
- .5 Employment of inspection and testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .6 If defects are revealed during inspection and/or testing, the appointed agency will request additional inspection and testing to ascertain the full degree of defect. Correct defects and irregularities as advised by the Consultant at no cost to the Owner. Contractor shall pay costs directly to the inspection agency for retesting and re-inspection.

1.6. ACCESS TO WORK

- .1 Allow inspection and testing agencies access to Work, off site manufacturing and fabrication plants.
- .2 Cooperate to provide reasonable access and facilities for such access.

1.7. CONTRACTOR RESPONSIBILITIES

- .1 Notify appropriate agency minimum 48 hours in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in an orderly sequence so as not to cause delay in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.8. DUTIES & AUTHORITY OF TESTING AGENCY

- .1 Testing agency is expected to do the following:
 - .1 Act in a professional and unprejudiced basis and carry out inspection and testing functions to establish compliance with requirements of Contract Documents.

- .2 Check work as it progresses and prepare reports stating results of tests and conditions of work and state in each report whether specimens tested conform to requirements of Contract Documents, specifically noting deviations.
- .3 Distribute reports as follows
 - .1 Consultant
 - .2 Owner
 - .3 Contractor
- .2 Testing agency is not authorized to amend or release any requirements of Contract Documents, nor to approve or accept any portion of work.

1.9. REJECTED WORK

- .1 The Contractor shall remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by the Consultant as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.
- .3 If, it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, the Owner may choose to accept the condition. The difference in value between Work performed and that called for by Contract Documents shall be deducted from the Contract value via Change Order. The amount of this change shall be determined by the Consultant. The Contractor shall warrant the work performed for the time period specified as if it were performed in accordance with the Contract Documents.

1.10. TESTING OF EXCAVATION & BACKFILL

- .1 The Consultant must approve all Sample and fill tests prior to purchase.
- .2 In coordination with the Consultant and Contractor, inspect and test backfill and fill to ensure the degree of compaction specified has been obtained.
- .3 Inspect excavation at required levels in regard to bearing values for footings, foundations and floor slabs.
- .4 Authorization and calculation of extra excavation work, if required, due to unsatisfactory bearing shall be adjusted by Unit Price.

1.11. CONCRETE STRENGTH TESTS

- .1 Review the proposed concrete mix design and check test if considered necessary.

- .2 Obtain representative samples of fresh concrete for each mix design of concrete placed in any one day as directed by the Consultant.
- .3 Make standard slump tests.
- .4 Mould three (3) standard 150mm diameter cylindrical test specimens from each sampling of fresh concrete. Store specimens as per best practice while they are on the site. Cure all cylinders in the laboratory under standard moisture and temperature conditions. Compression test one of the cylinders at 7 days and the remaining two at 28 days after sampling. Each concrete cylinder test report shall contain the specific location of concrete represented by sample, design strength, aggregate size, admixtures used, date, hour and temperature at time of sampling, percentage air content, unit weight and test strength of cylinder.
- .5 When concrete is placed under the conditions of "Cold Weather Requirements" make one additional cylinder; store it in a heated enclosure for 24 hours and then store it on the job site in a place protected from disturbance and off the ground. Compressive test this cylinder 7 days after sampling.
- .6 Determine the air content of air entrained standard weight concrete.
- .7 Determine the air content and unit weight of light weight concrete by the volumetric method.
- .8 Additional testing required because of changes in materials or proportions of the mix requested by the Contractor as well as any extra testing of concrete or materials occasioned by their failure to meet specification requirements or testing of the structure or performance of the structure, including load testing, shall be carried out at the Contractor's expense.

1.12. INSPECTION OF STRUCTURAL STEEL

- .1 Ensure all steel has mill test reports that comply with the Specification prior to purchase.
- .2 Inspect fabrication of steel in the plant.
- .3 Inspect erection work at site including fit-up, placing, plumbing, levelling, temporary bracing, field cutting and alterations.
- .4 Shop and field inspect welded and bolted connections and painting.
- .5 High strength bolts - the installation and testing of bolts shall conform to the requirements of CSA S16-1969. Check one representative connection in ten by torque testing every bolt, and check each bolt in every connection with a tap of hammer for soundness. Enforce requirements of connection type.
- .6 Examine visually all welded joints for inclusions, porosity, lack of fusion penetration or even contour, undercuts and cracks. Root passes shall be checked for penetration

and cracks from the back of the joint. Any suspect welds shall be checked ultrasonically.

1.13. INSPECTION OF METAL DECK

- .1 Check deck for gauge, type and protective coating thickness to ensure compliance with Specification.
- .2 Inspect erection work at the site including anchorage.

1.14. INSPECTION AND TESTING OF PAVING

- .1 Testing shall be carried out in three stages as described below by means of sufficient site visits to ensure satisfactory results but in no case less than three site visits.
- .2 Test within 16 hours from time called to do so by the Contractor, since paving is a critical item at the end of the project.
- .3 Stage One:
 - .1 Visual inspection and compaction tests of subsoil.
- .4 Stage Two:
 - .1 Inspection of granular sub-base (after each layer is placed or after the last layer is placed and compacted).
 - .2 On site density tests.
 - .3 Verify thickness of various levels. (Minimum of 4 checks shall be done on thickness in a paved area of 250m² or less, and 1 additional check for each additional 250m² or part thereof).
 - .4 Laboratory tests: moisture content and grading of materials.
- .5 Stage Three:
 - .1 Inspection of asphalt installation.
 - .2 Checking of thickness and density of material and checking suitability of equipment used.
- .6 Standard Proctor Test shall be carried out for all projects.
- .7 Further, grain size analysis and Marshall test shall be carried out if visual inspection is not satisfactory or, if there is reason to suspect materials supplied are not acceptable.
- .8 All laboratory tests shall be performed according to A.S.T.M. methods, latest revisions
- .9 Paving Contractor shall obtain from their supplier grading tables of materials used and submit them to the testing laboratory for approval. The paving contractor shall ensure material delivered complies with grading tables.

- .10 Be responsible for all approvals given to the Paving Contractor. At completion of the paving project, inform the Consultant all tests were performed according to the Specifications and the Contractor's performance has been approved.
- .11 The Consultant will not entertain any credits for work either not performed or incorrectly performed by the contractor. If thicknesses or consistencies of sub-base are not as specified, or if asphaltic material is not as specified, then the Contractor shall remove the same at their expense and provide proper specified materials.

1.15. BUILDING THERMOGRAPHIC SCAN

- .1 Upon completion of the Work, the Consultant and/or Owner may arrange for an independent agency to carry out a thermographic scan of the building to determine acceptability of thermal performance of the building envelope.
- .2 Consultant, prior to start of construction work, will designate a sample area of the building to include a portion of exterior wall and roof.
- .3 Consultant will implement a special inspection program for this sample area to be carried out as construction progresses. Contractor shall not cover any completed work until notifying the Consultant and receiving acceptance of completed work. Contractor shall remove and replace any work which is installed in contravention of this requirement.
- .4 Results of a thermographic scan of the entire building will be evaluated and compared to those of the sample area to determine acceptance or rejection of any part of the building envelope.
- .5 Contractor shall carry out remedial work as required to bring the quality of any rejected portion of the building envelope to that of the sample area. Contractor shall pay for costs of any follow-up thermographic scans required to determine acceptability of remedial work. This procedure shall be repeated until all parts of the building envelope have been accepted.

1.16. TESTS AND MIX DESIGNS

- .1 Furnish test results and mix designs as may be requested.
- .2 The cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work shall be appraised by Consultant and may be authorized as recoverable.

1.17. MOCK-UP

- .1 Prepare mock-up for Work specifically requested in specifications. Include for Work of all Sections required to provide mock-ups.

- .2 Prepare mock-ups for Consultants review with reasonable promptness and in an orderly sequence, so as not to cause any delay in Work.
- .3 Failure to prepare mock-ups 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.
- .4 If requested, Consultant will assist in preparing a schedule fixing dates for preparation.
- .5 Remove mock-up at conclusion of Work or when acceptable to the Consultant. Repair any damage and clean-up at place of mock-up.
- .6 Approved mock-up may remain as part of Work.

1.18. EQUIPMENT AND SYSTEMS

- .1 Submit adjustment and balancing reports for mechanical and electrical systems to the consultant.
- .2 Refer to Sections 01.78.10 and 01.79.00 for definitive requirements.

END OF SECTION

01 51 00 – Temporary Utilities

1.0 GENERAL

1.1. RELATED SECTIONS

- .1 Section 01 52 00 - Construction Facilities.
- .2 Section 01 53 00 - Temporary Construction.
- .3 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.2. INSTALLATION AND REMOVAL

- .1 Provide temporary utilities controls in order to execute work expeditiously.
- .2 Location of temporary facilities shall be subject to the Consultant's approval.
- .3 Salvage and assist in recycling products for potential reuse wherever possible.
- .4 Remove temporary facilities from the site when directed by the Consultant.

1.3. DEWATERING

- .1 Provide temporary drainage and pumping facilities to keep excavations and the site free from standing water. Provide necessary pumps (including spare pumps) and temporary drainage for keeping the Work free of water throughout the construction period. Locate sumps away from foundation elements. Control grading around excavation to prevent surface water from draining into excavation and from damaging adjoining property.

1.4. WATER SUPPLY

- .1 Provide continuous supply of potable water for construction use until such time as permanent municipal water supply is available.
- .2 Hose extensions to be provided by subcontractors requiring them.
- .3 For New Builds, arrange for connection with the appropriate utility company and pay all costs for installation, maintenance, removal, and usage costs until occupancy has been achieved.
- .4 For Additions and renovations the contractor can use existing Board service unless noted otherwise.

1.5. TEMPORARY HEATING AND VENTILATION

- .1 Provide temporary heating required during construction period, including unit rental costs, maintenance.

- .2 Provide temporary heating fuel, if not already available on site, until such time as a permanent natural gas line is installed, and thereafter fuel costs shall be borne by the Board. The Contractor shall provide all connections and piping between the permanent fuel source and the heating appliance(s).
- .3 Provide temporary heat and ventilation in enclosed areas as required to:
 - .1 Facilitate progress of Work.
 - .2 Protect Work and products against dampness and cold.
 - .3 Prevent moisture condensation on surfaces.
 - .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
 - .5 Provide adequate ventilation to meet health regulations for a safe working environment.
- .4 Maintain temperatures of minimum:
 - .1 10 degrees C in areas where construction is in progress, until takeover by the Board. Contractor to ensure temporary enclosures remain sealed and penetrations are repaired or closed in a timely fashion.
 - .2 16 degrees C in areas where finishes are in progress.
 - .3 16 degrees C in building once it is enclosed.
 - .4 Refer to other Sections for intermittent heating requirements up to 21 degrees C. Provide insulated tarp enclosures for openings as required to enclose the building after completion of main building shell components and roof.
 - .5 If the Contractor fails to ensure the temporary enclosures remained sealed (including temp doors when not in use) the Consultant and or the Board shall require the contractor to pay 40% of that months usage charge
- .5 Use forced hot air heaters. Open-flame type heaters or salamanders are not permitted. Ventilate direct fired heating units to the outside.
- .6 Uniformly distribute heat to avoid hot and cold areas and to prevent excessive drying.
- .7 Early heating of the building shell will be required to expedite interior finishing to meet the project schedule.
- .8 Ventilating:
 - .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
 - .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into the atmosphere of occupied areas.
 - .3 Dispose of exhaust materials in a manner that will not result in harmful exposure to persons.

- .4 Ventilate storage spaces containing hazardous or volatile materials.
- .5 Ventilate temporary sanitary facilities.
- .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
- .7 Provide minimum 1 air change per hour for enclosed areas receiving architectural finishes.
- .8 Do not allow excessive build-up of moisture inside the building.
- .9 The permanent mechanical systems for the new building, when installed in safe operating conditions, may be used for temporary heating or cooling if approved in writing by the Consultant, without penalty to the warranty.
- .10 Follow the requirements of "Temporary Use of New Permanent Services and Equipment" if the permanent heating system installed under the contract is intended to be used for temporary heating during the construction.
- .11 Provide competent persons to operate and maintain permanent systems for the duration of temporary use period.
- .12 Perform required repairs and maintenance immediately after each inspection. Pay for operating costs. Upon termination of temporary use period, services and equipment shall be inspected, tested, adjusted, fitters replaced, balanced, cleaned and lubricated.
- .13 Permanent services and equipment shall be turned over to the Owner in new and perfect operating condition.
- .14 Use of permanent systems and equipment as temporary facilities shall not affect the guarantee conditions and guarantee period for such systems and equipment. Make due allowance to ensure Owner will receive full benefits of the equipment manufacturer's warranty from the date of Substantial Performance.
- .15 Ensure date of Substantial Performance of the Work and Warranties for heating system do not commence until entire system is in as near original condition as possible and is certified by Consultant.
- .16 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
 - .1 Conform with applicable codes and standards.
 - .2 Enforce safe practices.
 - .3 Prevent abuse of services.
 - .4 Prevent damage to finishes.
 - .5 Vent direct-fired combustion units to outside.
- .17 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.6. TEMPORARY POWER AND LIGHT

- .1 Provide temporary electrical service and system including lighting and power system for use by all Sections.
- .2 Contractor will provide a source for, and pay the costs of temporary power during construction for temporary lighting and operating of power tools until such time as a permanent source is available.
- .3 Contractor to ensure that the use of power from a source provided by the Board shall not exceed the capacity of the current use required for the operation of any existing facility.
- .4 Install and maintain temporary electrical service and systems in accordance with Construction Safety Association's "Temporary Wiring Standards on Construction Sites", the Ontario Electrical Code and other authorities having jurisdiction.
- .5 Provide at least one temporary panel on each floor with service capacity suitable for construction requirements and to authorities and utilities approval.
- .6 Provide temporary wiring with lighting to all areas of each floor to provide adequate lighting.
 - .1 Lighting levels must be maintained at a minimum of 10 foot candles, or to suit the particular location or operation, whichever is greater.
 - .2 Do not use materials of the temporary service in permanent installation.
 - .3 Increase lighting levels equivalent to the final requirements when finishing operations are underway.
- .7 Extension cords, lights, etc., required by various subcontractors and run from above outlet positions will be supplied and maintained by the party or parties requiring the same.
- .8 Follow requirements of "Temporary Use of New Permanent Services and Equipment" if electrical power and lighting systems installed under the contract are intended to be used for temporary electricity and lighting during the construction.
- .9 Electrical power and lighting systems installed under this contract can be used for construction provided damages are made good and all lamps that have been used for more than two months are replaced with new lamps.
- .10 For New Builds, arrange for connection with the appropriate utility company and pay all costs for installation, maintenance, removal and usage costs until occupancy has been achieved.
- .11 For Additions and renovations the contractor can use existing Board service unless noted otherwise.

- .12 Provide and pay for temporary power for electric cranes and other equipment requiring temporary power in excess of above noted requirements.

1.7. TEMPORARY COMMUNICATION FACILITIES

- .1 Contractor to provide and pay for temporary Phone, e-mail and printer hook up, for the duration of contract until completion for use by the contractor.
- .2 The site superintendent is to have email access and a printer on site.

END OF SECTION

01 53 00 – Temporary Construction Facilities

1.0 GENERAL

1.1. RELATED SECTIONS

- .1 Section 01 51 00 - Temporary Utilities.
- .2 Section 01 35 23 – Health and Safety
- .3 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.2. INSTALLATION AND REMOVAL

- .1 Provide temporary construction facilities in order to execute work expeditiously.
- .2 Remove temporary facilities from the site when directed by the Consultant.

1.3. PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

- .1 Protect surrounding private and public property from damage during performance of Work.
- .2 Be responsible for damage incurred.

1.4. PROTECTION OF SURROUNDING WORK

- .1 Provide protection for finished and partially finished Work from damage.
- .2 Provide necessary cover and protection.
- .3 Be responsible for damage incurred due to lack of or improper or inappropriate protection.

1.5. ROOF AND STRUCTURE PROTECTION

- .1 Ensure no part of Work or existing structures are subjected to a load, which will endanger its safety or will cause permanent deformation.
- .2 The Contractor when indicated by the Board Contact or Consultant shall provide roof protection. Ensure all precautions are taken to avoid liability for roof damage.
- .3 Typical roof protection shall consist of a layer of 1 inch rigid foam insulation set directly on the roof surface and a layer of 19 mm (3/4 inch) plywood in all places under scaffold legs, ladder legs and in areas of foot traffic or falling debris.

1.6. WORK SITE ENCLOSURE & SAFETY BARRIERS

- .1 Erect and maintain for the duration of the work:

- .1 a minimum 1800 mm high chain link fence or self-supporting, heavy duty, interconnected fence panels (commonly referred to as Insta-fence) for a temporary site enclosure (hoarding) completely around perimeter of work site,
 - .2 any temporary posts shall be completely removed by the contractor prior to occupancy,
 - .3 under no circumstance shall t-bar posts be used on board property
 - .4 any additional safety devices including full hoarding as required and noted on the drawings, to protect the students, staff, public and private property from injury and damage,
 - .5 any additional requirements as regulated by authorities having jurisdiction, local by-laws and zoning.
- .2 The Contractor is to assume full responsibility for any injury or damage caused due to failure to comply with Paragraph 1 above.
 - .3 Any hazardous conditions identified outside of the main fenced area will be barricaded with a fence complying to the above.
 - .4 Provide lockable truck entrance gate/gates and at least one (1) pedestrian door as directed and conforming to applicable traffic restrictions on adjacent streets. Equip gates with locks and keys with restricted availability, in the project office.
 - .5 Erect and maintain pedestrian walkways including roof and side covers, complete with signs and electrical lighting as required by law.
 - .6 Provide barriers around trees and plants designated to remain.
 - .7 Protect from damage by equipment and construction procedures.

1.7. TREE PROTECTION

- .1 Protect all existing trees to remain from damage during construction period. Make good, at Contractor's expense, trees damaged during construction.
- .2 Confine movement of heavy equipment, storage of same, and storage of materials to a predetermined area. Do not store materials or place equipment over root systems of any existing trees to remain.
- .3 Install fencing or approved equal at limits of drip line of existing trees to remain unless directed otherwise. Where this case is not practical, and only if approved by the Consultant, the trunks shall be protected with an approved tree guard.
- .4 No rigging cables shall be wrapped around or installed in trees. Do not flush concrete trucks or cement mixing machines over root systems or near trees. Flush concrete trucks or cement mixing machines in areas approved by the Consultant.
- .5 Areas where root systems of trees are exposed directly adjacent to a structure will be backfilled with good loam only.

- .6 Whenever excavating is required within branch spread of trees that are to remain, the contractor shall contact the consultant for direction prior to the start of work.
- .7 If any existing tree to remain is injured and does not survive the following year, it will, as determined by the Board, be removed in its entirety and be replaced with a tree of similar size and value, as directed by the Consultant.
- .8 Should the destroyed tree be of such a size or shape that it cannot be feasibly replaced, the Contractor shall compensate the Owner for the minimum sum of five thousand dollars (\$5,000.00) per destroyed tree.

1.8. GUARD RAILS AND BARRIERS

- .1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stairwells, open edges of floors and roofs.
- .2 Erect and maintain for the duration of the Work, safety devices and barricades including hoarding, as required, to protect the staff, students, public and private property, from injury and damage.
- .3 The Contractor is to ensure that all requirements from authorities having jurisdiction and all requirements from the Owner are met.
- .4 The Contractor is to assume full responsibility for any damage caused due to his failure to comply with paragraph 2 above.
- .5 Hazardous conditions on the exterior shall be fenced.

1.9. WEATHER ENCLOSURES

- .1 Provide weather-tight closures to unfinished door and window openings, tops of shafts and other openings in floors and roofs.
- .2 Close off floor areas where walls are not finished; seal off other openings; enclose building interior work for temporary heat.
- .3 Design enclosures to withstand wind pressure.

1.10. DUST TIGHT BARRIERS

- .1 Provide dust tight barriers and screens or partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.
- .2 Maintain and relocate protection until such work is complete.
- .3 Where required, adjust air handling units to eliminate migration of dust.

1.11. SCAFFOLDING

- .1 Erect scaffolding independent of walls and use in such a manner limiting interference with other work. When not in use, move scaffolding as necessary to permit installation of other work. Construct and maintain scaffolding in a rigid, secure and safe manner. Remove it promptly when no longer required. Protect the surface on which scaffolding is bearing.

1.12. SHORING, BRACING, PILING

- .1 Provide shoring, bracing, piling, sheeting and sheet piling and underpinning required to support soil banks, existing work and property in accordance with Construction Safety Act and other applicable regulations. Maintain shoring until the building is strong enough and sufficiently braced to withstand pressure of backfilling. Make construction aids free of permanent work so they may be removed entirely when no longer required, without damaging the Work. Locate construction aids so adequate room is left for damp-proofing foundation walls, laying substructure drainage and other work.
- .2 Shoring and false work over one tier in height shall be designed and shall bear the stamp of a registered professional engineer, having experience in this field.

1.13. HOISTING

- .1 Provide, operate and maintain services required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for use thereof.
- .2 Machinery shall be operated by qualified operator.

1.14. OVERHEAD LIFTING

- .1 Any condition requiring the use of a crane or lifting device over a Board structure must follow the requirements of Health and Safety Section 01 35 23, Paragraph 1.15 Overhead Lifting.

1.15. ELEVATORS/LIFTS

- .1 When elevators/lifts are to be used by construction personnel, provide protective coverings for finish surfaces of elevator cabs and entrances.
- .2 Co-ordinate use of elevator cabs with Consultant and the Board.

1.16. USE OF THE WORK

- .1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with Products.

- .2 Do not load or permit to load any part of Work with a weight or force that will endanger the Work.

1.17. CONSTRUCTION PARKING

- .1 Construction personnel vehicle parking, to be confined to the work site enclosure, or.
- .2 Parking will be permitted on site only where and if it does not disrupt the employees of the place of work as directed by the Board
- .3 Permission to park vehicles on site does not imply any liability or responsibility for safe keeping of vehicles and contents thereof by the School Board.

1.18. ACCESS TO SITE

- .1 Provide and maintain adequate access to the project site.
- .2 Build and maintain temporary roads where necessary and provide snow removal within the area of work, and access to the work, during the period of Work. The area shall be restored to the satisfaction of the Board at the completion of the project.
- .3 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractors' use of roads.
- .4 Clean roadways and taxi areas where used by Contractor's equipment.

1.19. SECURITY

- .1 The Contractor shall ensure the security of the work site, contents, and built structures for the duration of the project.
- .2 The Contractor shall be responsible to provide and pay for security personnel to guard the site and contents of the site after working hours and during holidays as required.
- .3 Notify the Board of the use of security guards or systems.
- .4 The Board shall not be responsible for the loss, theft, or vandalism.

1.20. OFFICES

- .1 Provide and maintain, until completion of Contract, for Contractor's use, a temporary office, large enough to accommodate site administrative activities and site meetings, complete with light, heat, air conditioning, ventilation, table and chairs. Do not store materials in the office area; keep clean and tidy.
- .2 Provide a clearly marked and fully stocked first-aid case in a readily available location.

- .3 Subcontractors may provide their own offices as necessary. Direct location of these offices.

1.21. EQUIPMENT, TOOL AND MATERIALS STORAGE

- .1 Provide and maintain, in a clean and orderly condition, lockable weatherproof sheds and platforms for storage of tools, equipment and materials.
- .2 Review storage areas on site with the Consultant. Store materials and equipment to ensure preservation of quality of product and fitness for the Work. Store materials and equipment on wooden platforms or other hard, clean surfaces, raised above the ground or in water tight storage sheds of sufficient size for storage of materials and equipment which might be damaged by storage in the open. Locate stored materials and equipment to facilitate prompt inspection.
- .3 Store packaged materials and equipment undamaged, in their original wrappings or containers, with manufacturer's labels and seals intact.
- .4 Locate materials not required to be stored in weatherproof sheds on site in a manner to cause least interference with work activities.
- .5 Storage sheds required by subcontractors shall be provided by them.

1.22. SANITARY FACILITIES

- .1 Provide weatherproof temporary toilet/sanitary facilities for the work force in accordance with governing regulations and ordinances.
- .2 Service temporary toilet/sanitary facilities as required by authorities but not less than weekly.
- .3 Post notices and take such precautions as required by local health authorities.
- .4 The use of existing washroom facilities is not allowed unless specifically approved by the Board. The Contractor will be required to clean and maintain the existing washrooms to Board standards.
- .5 Except where connected to the municipal sewer system, periodically remove wastes from Site.
- .6 Keep toilet/sanitary facilities clean and sanitary and protect from freezing.
- .7 Keep sanitary facilities clean and fully stocked with the necessary supplies at all times.

END OF SECTION

01 54 00 – Materials and Equipment

1.0 GENERAL

1.1. RELATED SECTIONS

- .1 This section describes requirements applicable to all Sections within Divisions 02 to 49

1.2. PRODUCT AND MATERIAL QUALITY

- .1 Products, materials, equipment and articles referred to as “Products”; throughout the specifications incorporated in the Work, shall be new, not damaged or defective, and of the best quality, compatible with specifications for the purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 Defective products will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is a precaution against oversight or error. Remove and replace defective products at own expense, and be responsible for delays and expenses caused by rejections.
- .3 Should any dispute arise as to the quality or fitness of products, the decision rests strictly with the Board contact, based upon requirements of the Contract Documents.
- .4 Current Material Safety Data Sheets shall be on file with the successful Contractor and shall be provided to the Board contact upon request, within twenty-four (24) hours.
- .5 Material safety data sheets are not required for products currently WHMIS exempt.

1.3. EQUIPMENT/TOOL MATERIALS STORAGE, HANDLING, AND PROTECTION

- .1 Handle and store products in a manner to prevent damage, adulterations, deterioration, and soiling, and in accordance with manufacturer’s instructions.
- .2 Store packaged or bundled products in original and undamaged condition, with manufacturer’s seals and labels intact.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Provide and maintain tools, equipment and materials in a clean and orderly condition. Board tools, ladders, lifts, power cords, flashlights etc. are not to be used.
- .5 Materials are to be stored in a manner to cause the least interference with Work activities.

- .6 The Contractor shall determine with the Board contact, prior to ordering materials, those locations that are suitable for receiving and storage of materials and equipment.
- .7 All materials and equipment shall be kept in a secure area, at Contractor's expense, or removed from the job site when Work is not actually in progress.
- .8 Vehicles, trailers or other similar apparatus may not be stored or parked overnight at site without written authorization from Board contact. Written requests are to be forwarded directly to the Board contact.
- .9 Approval for parking does not imply any liability or responsibility for safe keeping by the Board.
- .10 The Contractor may use the existing electrical and water services, as required, for the Work, and the costs of these services shall be borne by the Board.

1.4. WORKMANSHIP

- .1 Workmanship shall be the best quality, executed by Workers experienced and skilled in the respective duties for which they are employed. Immediately notify the Consultant if required Work is such as to make it impractical to produce required results.
- .2 Do not employ any unfit persons or anyone unskilled in their required duties.
- .3 Decisions as to the quality or fitness of Workmanship in cases of dispute rest solely with the Board contact, whose decision is final.
- .4 All Contractor personnel are restricted to the job site and necessary access routes. No personnel shall visit other areas or buildings without specific authorization.
- .5 The Contractor shall make their own arrangements for emergency treatment of accidents.
- .6 Any accidents shall be reported immediately to the Board contact.
- .7 The Contractor agrees to hold the Board harmless of any and all liability of every nature and description, which may be suffered through bodily injuries, involving deaths of any persons, by reasons of negligence of the Contractor, his agents, employees, or his Subcontractors.
- .8 The Contractor shall supply constant on-site supervision in the form of a Project Superintendent. The Project Superintendent shall have within their authority to negotiate minor changes regarding scheduling, manpower and equipment.

1.5. MANUFACTURER'S INSTRUCTIONS

- .1 Unless otherwise indicated in the specifications, install, apply or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.

1.6. TOOLS OF THE TRADE

- .1 The Board will not pay the Awarded Bidder a fee for tools and equipment that are considered "tools of the trade" that are required to perform the work in this Tender or any change orders.

1.7. EXISTING EQUIPMENT

- .1 Contractor shall demolish and dispose of all existing equipment specified to be removed and or replaced including obsolete services not being reused. The Board shall have first rights of refusal on all demolished equipment and or parts and the Contractor shall provide a minimum of (5) working days notice prior to disposal of the equipment, parts, or equipment and set aside same in a suitable location to be recovered by Board technicians.

END OF SECTION

01 61 00 – Product Requirements

1.0 GENERAL

1.1. RELATED SECTIONS

- .1 This section describes requirements applicable to all Sections within Divisions 02 to 49.
- .2 Section 01 31 00 – Project Managing and Coordination

1.2. TERMINOLOGY

- .1 New: Produced from new materials.
- .2 Renewed: Produced or rejuvenated from an existing material to like-new condition to serve a new or existing service.
- .3 Defective: A condition determined exclusively by the Consultant.

1.3. PRODUCT QUALITY

- .1 The term 'new' in the following paragraph does not exclude re-manufactured products that have some or all of the materials recycled from other sources. Preference in recycling is for post-consumer recycled materials.
- .2 Products, materials, equipment, parts or assemblies (referred to as Products) incorporated in Work:
- .3 New Product, not damaged or defective, of best quality (compatible with specification requirements) for purpose intended. If requested, provide evidence as to type, source and quality of Products provided.
- .4 Defective Products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective Products at own expense and be responsible for delays and expenses caused by rejection.
- .5 Should any dispute arise as to the quality or fitness of Products, decision rests strictly with Consultant.
- .6 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout the building.

1.4. AVAILABILITY

- .1 Immediately upon receipt of the Board's Purchase Order, review Product delivery requirements and anticipate foreseeable supply delays for any items.

- .2 Immediately upon receipt of the Board's Purchase Order the Contractor shall issue Purchase Orders and or Contracts to all Sub-trades. Provide proof to the Consultant and the Board within 3 days. The Subcontractors shall identify in writing any delivery issues within 14 days of receiving the Contractor's purchase order or contract. The Schedule noted in 01-31 00 1.7.1 shall incorporate all deliveries and installation.
- .3 If delays in supply of Products are foreseeable, notify Consultant of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
- .4 In the event of failure to notify Consultant at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Consultant reserves the right to substitute more readily available Products of similar character, at no increase in Contract Price or Contract Time.

1.5. STORAGE AND PROTECTION

- .1 Store and protect Products in accordance with manufacturers' written instructions.
- .2 Store with seals and labels intact and legible.
- .3 Store sensitive Products in weather tight, climate controlled, enclosures in an environment favourable to Product.
- .4 For exterior storage of fabricated Products, place on sloped supports above ground.
- .5 Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of Products.
- .6 Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- .7 Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.
- .8 Arrange storage of Products to permit access for inspection. Periodically inspect to verify Products are undamaged and are maintained in acceptable condition.

1.6. TRANSPORTATION AND HANDLING

- .1 Transport and handle Products in accordance with manufacturer's written instructions.
- .2 Promptly inspect shipments to ensure that Products comply with requirements, quantities are correct, and Products are undamaged.
- .3 Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.
- .4 Suitably pack, crate and protect products during transportation to site to preserve their quality and fitness for the purpose intended.

- .5 Store products in original, undamaged condition with manufacturer's labels and seals intact until they are being incorporated into completed work.
- .6 Protect materials from damage by extreme temperatures or exposure to the weather.

1.7. EXISTING UTILITIES

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum disturbance to the owner.
- .2 Protect, relocate or maintain existing active services. When services are encountered, cap off in a manner approved by authority having jurisdiction. Stake and record location of capped service.

1.8. MANUFACTURER'S WRITTEN INSTRUCTIONS

- .1 Unless otherwise indicated in specifications, install or erect Products to manufacturer's written instructions. Do not rely on labels or enclosures provided with Products. Obtain written instructions directly from manufacturers.
- .2 Notify Consultant in writing, of conflicts between specifications and manufacturer's instructions, so that Consultant may establish course of action.
- .3 Improper installation or erection of Products, due to failure in complying with these requirements, authorizes Consultant to require removal and reinstallation at no increase in Contract Price or Contract Time.

1.9. QUALITY OF WORK

- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Consultant if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. Consultant and or Board reserves right to require dismissal from site any workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Consultant, whose decision is final.
- .4 Products, materials, systems and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the applicable manufacturer's printed directions.

- .5 Where specified requirements are in conflict with manufacturer's written directions, follow manufacturer's directions. Where specified requirements are more stringent than manufacturer's directions, comply with specified requirements.

1.10. COORDINATION

- .1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.
- .3 Contractor is responsible to ensure suppliers or distributors of materials specified or alternatives accepted, which he intends to use, have materials with original schedule, and similarly it shall be the responsibility of all subcontractors and suppliers to so inform the Contractor.
- .4 Contractor shall contact Consultant immediately upon receipt of information indicating materials or items, will not be available on time, in accordance with the latest approved schedule, and similarly it shall be the responsibility of all subcontractors and suppliers to so inform the Contractor.
- .5 The above, in no way releases the Contractor, or their subcontractors and suppliers of their responsibility for ensuring timely ordering of materials and items required, including the necessary expediting, to complete the Work as scheduled in accordance with the Contract Documents including temp accommodations and or materials to ensure occupancy date is achieved.

1.11. CONCEALMENT

- .1 In finished areas, conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
- .2 Before installation, inform the Consultant if there is interference. Install as directed by the Consultant at no additional cost to the Board.

1.12. REMEDIAL WORK

- .1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Coordinate adjacent affected Work as required.
- .2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.13. LOCATION OF FIXTURES

- .1 Inform Consultant of conflicting installation. Install as directed.

1.14. FASTENINGS - EQUIPMENT

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use Type 304 or 316 stainless steel for exterior areas.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.15. PROTECTION OF WORK IN PROGRESS

- .1 Prevent overloading of any part of the Project.
- .2 Do not cut, drill or sleeve any load bearing structural member, unless specifically indicated, without written approval of the Consultant.

END OF SECTION

01 70 00 – Examination and Preparation

1.0 GENERAL

1.1. RELATED SECTIONS

- .1 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.2. REFERENCES

- .1 Owner's identification of existing survey control points and property limits.

1.3. SUBMITTALS

- .1 Submit name and address of Surveyor to Consultant.
- .2 On request of Consultant, submit documentation to verify accuracy of field engineering work.
- .3 Submit certificate signed by surveyor certifying that elevations and locations of completed Work conforms with Contract Documents.

1.4. QUALIFICATIONS OF SURVEYOR

- .1 Qualified registered land surveyor, licensed to practice in the Place of the Work.

1.5. SURVEY REFERENCE POINTS

- .1 Existing base horizontal and vertical control points are designated on Drawings.
- .2 Locate, confirm and protect control points prior to starting site Work. Preserve permanent reference points during construction.
- .3 Make no changes or relocations without prior written notice to the Consultant.
- .4 Report to Consultant when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
- .5 Require the surveyor to replace control points in accordance with original survey control.

1.6. SURVEY REQUIREMENTS

- .1 Establish existing and new permanent bench marks on site, referenced to established benchmarks by survey control points.
- .2 Record locations, with horizontal and vertical data in Project Record Documents.
- .3 Establish lines and levels, locate and lay out, by instrumentation.
- .4 Establish pipe invert elevations.

- .5 Stake batter boards
- .6 Establish foundation and floor elevations.
- .7 Establish lines and levels for mechanical and electrical work.

1.7. SUBSURFACE CONDITIONS

- .1 Promptly notify Consultant in writing if discovered surface or subsurface conditions at Place of Work differ materially from those indicated in Contract Documents.
- .2 Advise the Consultant of a reasonable assumption of probable conditions when determined.
- .3 After prompt investigation, should Consultant determine that conditions do differ materially, instructions will be issued for changes in Work.

1.8. EXAMINATION

- .1 The Contractor is expected to be totally familiar with site conditions and shall assume full responsibility for the cost involved in repairing any damage to the building, site and services, city property, adjacent buildings, etc., during general construction, regardless of the extent of the damage.
- .2 Inspect existing conditions, including elements or adjacent Work subject to irregularities, damage, movement, including Work during cutting and patching.
- .3 The Contractor shall provide all equipment necessary to make a full and detailed site evaluation. This shall include but not be limited to ladders, flashlights and hand tools.
- .4 The Contractor expressly agrees that conditions above existing suspended acoustic ceilings, but below fixed structure, unless obscured by an additional ceiling above, shall be considered exposed conditions for the purposes of making findings under the provisions of the Contract. There shall be no claims for extra costs for extra Work in these areas.
- .5 After uncovering, inspect conditions affecting performance of the Work.
- .6 Beginning of cutting or patching means acceptance of existing conditions.

1.9. PREPARATION

- .1 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of the project from damage.
- .2 Provide protection from elements for areas which may be exposed by uncovering work; maintain excavations free of water.

1.10. EXISTING SERVICES

- .1 Before commencing work, establish location and extent of service lines in the area of Work and notify the Consultant of findings.
- .2 Remove abandoned service lines running through existing and new structures. Cap or seal lines at cut-off points as directed by the Consultant.

1.11. LOCATION OF EQUIPMENT AND FIXTURES

- .1 Inform Consultant of conflicting installations, install as directed.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3 Inform Consultant of impending installation and obtain approval for actual location.
- .4 Submit field drawings to indicate relative position of various services and equipment when required by Consultant.

1.12. SURVEY RECORD

- .1 Maintain a complete, accurate log of control and survey work as it progresses.
- .2 On completion of foundations and major site improvements, prepare a certified survey showing dimensions, locations, angles and elevations of Work.
- .3 Record locations of maintained, re-routed and abandoned service lines.

END OF SECTION

SECTION 01 73 30 – EXECUTION AND CUTTING AND PATCHING

1.0 GENERAL

1.1. RELATED SECTIONS

- .4 Section 01 32 00 - Construction Progress Documentation: Submittals and scheduling.
- .5 Section 01 61 00 - Product Requirements.
- .6 Section 01 70 00 – Examination and Preparation
- .7 Individual Product Specification Sections:
 - .1 Cutting and patching incidental to work of the section.
 - .2 Advance notification to other sections of openings required in Work of those sections.

1.2. SUBMITTALS

- .8 Submit written request in advance of cutting or alteration which affects:
 - .1 Structural integrity of any element of Project.
 - .2 Integrity of weather exposed or moisture resistant element.
 - .3 Efficiency, maintenance, or safety of any operational element.
 - .4 Visual qualities of sight exposed elements.
 - .5 Work of Owner or separate contractor.
- .9 Include in request:
 - .1 Identification of Project.
 - .2 Location and description of affected Work.
 - .3 Necessity for cutting or alteration.
 - .4 Description of proposed Work and Products to be used.
 - .5 Alternatives to cutting and patching.
 - .6 Effect on work of Owner or separate contractor.
 - .7 Written permission of affected separate contractor.
 - .8 Date and time work will be executed.

1.3. TOLERANCES

- .10 Monitor fabrication and installation tolerance control of Products to produce acceptable Work.
- .11 Do not permit tolerances to accumulate beyond effective or practical limits.
- .12 Comply with manufacturers' tolerances. In case of conflict between manufacturers' tolerances and Contract Documents, request clarification from the Consultant before proceeding.

- .13 Adjust Products to appropriate dimensions; position and confirm tolerance acceptability, before permanently securing Products in place.

2.0 PRODUCTS

2.1. MATERIALS

- .1 Primary Products: Those required for original installation.
- .2 Product Substitution: For any proposed change in materials, submit a request for substitution described in Section 01 33 00.

3.0 EXECUTION

3.1. EXAMINATION

- .1 Examine existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.
- .2 After uncovering existing Work, assess conditions affecting performance of work.
- .3 Beginning of cutting or patching means acceptance of existing conditions.

3.2. PREPARATION

- .1 Provide temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of the Project from damage.
- .2 Provide protection from elements for areas which may be exposed by uncovering work.
- .3 Maintain excavations free of water.

3.3. CUTTING

- .1 Execute cutting and fitting as needed to complete the Work. Prior to any cutting and or coring of concrete floors the contractor shall confirm the area is free of services or rebar. Notify the Consultant of any interferences.
- .2 Uncover work to install improperly sequenced work.
- .3 Remove and replace defective or non-conforming work.
- .4 Remove samples of installed work for testing for Hazardous materials.
- .5 Provide openings in the Work for penetration of mechanical and electrical work.
- .6 Employ experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- .7 Cut rigid materials using a masonry saw or core drill. Pneumatic tools are not allowed without prior approval.

- .8 Do all cutting, patching, and making good, to leave a finished condition and to make the several parts of the work come together properly. Coordinate work to keep cutting and patching to a minimum.
- .9 Make cuts with clean, true, smooth edges. Fit unit to tolerance established by test standard practice for applicable work. Make patches invisible in the final assembly.
- .10 Cutting shall be done in a manner to keep patching to minimum. Obtain Consultant's approval of method to be used to conceal new mechanical and electrical services before beginning cutting. Chasing of concrete surfaces is not permitted.
- .11 Cutting or coring of any structural concrete is to be reviewed and approved by the Consultant.
- .12 Do not endanger any work by cutting, digging or otherwise altering, and do not cut nor alter any load bearing element without written authorization by Consultant. Provide bracing, shoring and temporary supports as required to keep construction safely supported at all times
- .13 Any cost caused by omission or ill-timed work shall be borne by the party responsible thereof.
- .14 Regardless of which Section of work is responsible for any portion of cutting and patching, in each case tradesmen qualified in work being cut and patched shall be employed to ensure it is correctly done.

3.4. PATCHING

- .1 Execute patching to complement adjacent Work.
- .2 Fit Products together to integrate with other Work.
- .3 Execute work by methods to avoid damage to other Work, and which will provide appropriate surfaces to receive patching and finishing.
- .4 Employ original installer to perform patching for weather exposed and moisture resistant elements, and sight-exposed surfaces.
- .5 Restore work with new Products in accordance with requirements of Contract Documents.
- .6 Fit work with adequate support to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .7 At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with firestop material.
- .8 Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to the nearest intersection or natural break. For an assembly, refinish the entire unit.
- .9 Complete and tightly fit all construction to pipes, ducts and conduits which pass through construction to completely prevent the passage of air.

- .10 Patching and making good shall be done by trade specialists in material to be treated, and shall be made undetectable in finished work when viewed from a distance of 1.5m under normal lighting.

END OF SECTION

01 74 00 – Cleaning and Waste Management

1.0 GENERAL

1.1. RELATED SECTIONS

- .1 Common Work by All Trades
- .2 This section describes requirements applicable to all Sections within Divisions 02 to 49.
- .3 Conduct cleaning and disposal operations to comply with local ordinances and environmental protection legislation.
- .4 Store volatile wastes in covered metal containers, and remove them from premises at the end of each working day.
- .5 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

2.0 PRODUCTS

2.1. CLEANING PRODUCTS

- .1 Cleaning Agents and Materials: Low VOC content wherever possible. The Consultant and the Board shall be notified prior to use of any exception.

3.0 EXECUTION

3.1. CLEANING DURING CONSTRUCTION

- .1 Maintain the Work in tidy condition, free from accumulation of waste products and debris, other than that caused by the Owner or other Contractors.
- .2 Remove waste material and debris from the work areas and deposit in a waste container at the end of each working day.
- .3 Vacuum clean interior areas prior to the start of finishing work. Maintain areas free of dust and other contaminants during finishing operations.
- .4 Individual Subcontractors are responsible for the daily clean-up and removal of debris related to, or generated by, their own work. The overall responsibility for project cleanliness rests with the Contractor.
- .5 The Contractor shall be responsible for snow removal within the construction area.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 Wherever possible recycle materials

- .8 Containers:
 - .1 Provide adequate number and sizes of on-site garbage and recycling containers within designated work site as required for collection of waste materials and debris on a daily basis.
 - .2 Provide additional waste containers when the extent of work warrants.
 - .3 Provide and use clearly marked, separate bins for recycling.
- .9 Dispose of waste materials and debris at registered waste disposal and recycling facility.
- .10 Remove oily rags, waste and other hazardous substances from premises at close of each day, or more often when required.
- .11 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

3.2. WASTE MANAGEMENT

- .1 Audit, separate and dispose of construction waste generated by new construction or by demolition of existing structures in whole or in part, in accordance with Ontario Regulations 102/94 and 103/94 made under the Environmental Protection Act.
- .2 Containers:
 - .1 Provide adequate number and sizes of on-site garbage and recycling containers within designated work site as required for collection of waste materials and debris on a daily basis.
 - .2 Provide additional waste containers when the extent of work warrants.
 - .3 Provide and use clearly marked, separate bins for recycling.
- .3 Fires, and burning of rubbish or waste on site is strictly prohibited.
- .4 Burying of rubbish or waste materials on site is strictly prohibited.
- .5 Disposal of waste or volatile materials such as mineral spirits, oil, gasoline or paint thinner into ground, waterways, or sewer systems is prohibited.
- .6 Empty waste containers on a regular basis to prevent contamination of site and adjacent properties by wind-blown dust or debris

3.3. PREPARATION FOR FINAL CLEANING

- .1 Prior to final cleaning the General Contractor shall:
 - .1 remove all surplus products, tools, construction machinery and equipment not required for the performance of remaining work, and thereafter remove any remaining materials, equipment, waste and debris,
 - .2 replace all filters installed on any equipment in operation in the area of work,

- .3 remove all paint spots or overspray from all affected surfaces, and

3.4. FINAL CLEANING PRIOR TO ACCEPTANCE: INTERIOR

- .1 Prior to applying for Substantial Performance of the Work, or, prior to Owner occupancy of the building or portion of the building affected by the Work, whichever comes first, conduct full and complete final cleaning operations for the areas to be occupied.
- .2 Final cleaning operations shall be performed by an experienced professional cleaning company, possessing equipment and personnel sufficient to perform full building cleaning operations. Contractors "broom cleaning" is not acceptable as a "Final Clean". The cleaning contractor shall:
 - .1 clean interiors of all millwork and surfaces of any furniture and equipment present,
 - .2 use only cleaning materials recommended by the manufacturer of the surface to be cleaned,
 - .3 remove all stains, spots, scuff marks, dirt, dust, remaining labels, adhesives or other surface imperfections,
 - .4 clean and polish all glass and mirrors and remove remaining manufacturer's and safety "X" labels,
 - .5 clean and polish all finished metal surfaces such as enamelled or stainless steel, chrome, aluminum, brass, and bronze,
 - .6 clean and polish all vitreous surfaces such as plumbing fixtures, ceramic tile, porcelain enamel, or other such materials,
 - .7 clean all ceramic tile surfaces in accordance with the manufacturer's instructions,
 - .8 vacuum, clean and dust behind grilles, louvres and screens,
 - .9 steam clean all unprotected carpets immediately prior occupancy by Owner, and
 - .10 clean all equipment and fixtures to a sanitary condition.
- .3 For any areas to be occupied after the owner's initial occupancy, provide full cleaning operations as outlined above prior to turning over to owner,
- .4 The Board's supplies and equipment must not be used for any cleaning operations including, but not limited to: garbage cans, mops, brooms, rags, ladders, chemicals etc.

3.5. FINAL CLEANING PRIOR TO ACCEPTANCE: EXTERIOR

- .1 For areas affected by construction final exterior cleaning operations shall be performed by the General Contractor or competent Subcontractor. Contractor's "broom cleaning" only is not acceptable.
- .2 Final exterior cleaning shall include:
 - .1 broom clean and wash exterior walkways, steps, and surfaces; rake clean other surfaces of grounds,
 - .2 remove dirt and other disfiguration from exterior surfaces,
 - .3 sweep and wash clean paved areas,
 - .4 replace filters of mechanical equipment for all equipment that was in use during construction,
 - .5 clean all roofs, gutters, downspouts, areaways, drywells, and drainage systems,
 - .6 remove debris and surplus materials from crawl areas and other accessible concealed spaces.
 - .7 remove overspray

END OF SECTION

01 78 10 – Closeout Submittals and Requirements

1.0 GENERAL

1.1. RELATED SECTIONS

- .1 Section 01 78 10 – WRDSB Warranty Card, Appendix 00 41 13A

1.2. TAKE-OVER PROCEDURES

- .1 Take over procedures will be in strict accordance with the requirements as set out in this Section.

1.3. SUBSTANTIAL PERFORMANCE

- .1 Prior to requesting a Substantial Performance deficiency inspection submit 2 hard copies, 1 digital copy of the Operating and Maintenance Manuals for Consultants approval.
- .2 Application for Substantial Performance must include.
 - .1 One (1) electronic copy of inspection and acceptance certificates required from regulatory agencies, including but not limited to.
 - .1 Certificates of Approval of the Work by the local Building Department.
 - .2 Electrical Inspection Certificate of Inspection.
 - .3 Fire Alarm Verification Certificate.
- .3 Advise Consultant in writing, when the project has been substantially completed. If Consultant agrees this stage has been reached, the Consultant shall prepare a complete list of deficiencies and submit copies of this list to Contractor and the Board.

1.4. COMMENCEMENT OF LIEN PERIODS

- .1 The date of publication of the Certificate of Substantial Performance of the Work, provided to the contractor by the Consultant, shall be the date for commencement of the lien period.

1.5. TOTAL PERFORMANCE

- .1 Prior to requesting a final inspection submit written certificate that the following have been performed:
 - .1 Work has been completed and inspected for compliance with Contract Documents and is ready for final inspection
 - .2 Defects have been corrected and deficiencies have been completed.

- .3 Equipment and systems have been tested and are fully operational. Submit two copies of the balancing reports
- .4 Certificates required by the contractor have been submitted.
- .5 Operation of systems have been demonstrated to Owner's personnel.
- .6 Submit Record drawings.
- .7 Submit maintenance materials.
- .8 Provide certified site survey
- .2 When items noted above are completed, request final inspection of Work by consultant, and building inspector. If Work is deemed incomplete by Consultant, complete outstanding items and request re-inspection.

1.6. PAYMENT OF SUBSTANTIAL PERFORMANCE HOLDBACK

- .1 Prior to the release of lien holdback provide one copy of the following by the Contractor and each subcontractor:
 - .1 Statutory Declaration or Declaration of Last supply
 - .2 Workplace Safety and Insurance Board "Certificate of Clearance".
- .2 The Contractor shall submit an application for payment of the holdback amount.
- .3 After the receipt of an application for payment which will include a Statutory Declaration and WSIB Clearance from the, the Consultant will issue a certificate for payment of the holdback amount.

1.7. FINAL PAYMENT

- .1 When the Contractor considers final deficiencies and defects have been corrected and it appears requirements of Contract have been completed, make application for final payment.
- .2 When the Consultant finds the Contractor's application for final payment valid, the Consultant will issue a final certificate of payment
- .3 The Board reserves the right to charge the Contractor for school access card(s) that have not been returned.
- .4 The cost to reprogram or replace the card(s) access system is estimated at \$50.00 (fifty dollars) for each card issued, \$30.00 (thirty dollars) for each keybox key, plus \$35.00 (thirty five dollars) administration fee.

1.8. CLOSEOUT SUBMITTALS

- .1 Prepare instructions and data using personnel experienced in maintenance and operation of described products and submit them to the Consultant for review.
- .2 Copy will be returned to the contractor with the Consultant's comments.

- .3 Revise content of documents as required prior to final submission.
- .4 Two (2) weeks prior to Substantial Performance of the Work, submit to the Consultant, the final copies of operating and maintenance manuals.
- .5 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
- .6 If requested, furnish evidence as to type, source and quality of products provided.
- .7 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .8 Pay costs of transportation.

1.9. OPERATION AND MAINTENANCE MANUAL FORMAT

- .1 Provide two copies of operating and maintenance data, prepared on 215 X 280mm sheets in printed or typewritten form, contained in 3-ring binders with soft vinyl covers for materials and equipment which require special maintenance or operating procedures.
- .2 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder at the front of each volume.
- .3 Cover: Identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .4 Arrange content by the divisions of the specifications under Section numbers and sequence of Table of Contents.
- .5 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .6 Include the following in each manual:
 - .1 Complete list of subcontractors and suppliers, their addresses and telephone numbers. Provide 24 hour emergency telephone numbers for such subcontractors as Plumbing, Electrical, Sprinklers, Fire System, Heating, etc.
 - .2 Specified warranties for contractor, each subcontractor and supplier.
 - .3 WRDSB Project Asset and Warranty Card, Appendix 00 41 13A
 - .4 Copy of finish hardware list, complete with all amendments and revisions and lock manufacturer's descriptive and service literature.
 - .5 Schedule of paints and coatings. Include sufficient explanation to fully identify each surface with the applicable paint or coating used. Enclose a copy of the colour schedule.
 - .6 Maintenance instructions for finished surfaces.
 - .7 Brochures, cuts of equipment and fixtures.

- .8 Operating and maintenance instructions for equipment.
- .9 Submit copies of letters from manufacturers of equipment and systems indicating their technical representatives have inspected and tested systems and are satisfied with methods of installation, connection and operations. These letters shall state names of persons present at testing, methods used and list of functions performed.
- .10 Submit one complete set of reviewed shop drawings of architectural, structural, mechanical and electrical items, folded to 215 x 280mm size, contained in heavy duty manila envelopes, numbered and labelled. Follow specification format with no more than one Section per envelope, hard copy and PDF.
- .11 Relevant certificates issued by authorities having jurisdiction
- .12 Computer disc or flash drive with all the above documentation in PDF format

1.10. RECORDING ACTUAL SITE CONDITIONS

- .1 Record information on a set of black line opaque drawings, and within the Project Manual.
- .2 Annotate with coloured felt tip marking pens, maintaining separate colours for each major system, for recording changed information.
- .3 Record information concurrently with construction progress. Do not conceal Work of the Project until required information is accurately recorded.
- .4 Contract drawings and shop drawings: legibly mark each item to record actual construction, including:
 - .1 Measured depths of elements of foundation in relation to finish first floor datum.
 - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .4 Field changes of dimension and detail.
 - .5 Changes made by change orders.
 - .6 Details not on original Contract Drawings.
 - .7 References to related shop drawings and modifications.
- .5 Specifications: legibly mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.

- .6 Other Documents: Maintain warranties, test reports and samples required by individual specifications sections.

1.11. RECORD (AS-BUILT) DOCUMENTS AND SAMPLES

- .1 Store AS-BUILT documents and samples in the field office apart from documents used for construction. Provide files, racks, and secure storage.
- .2 Label AS-BUILT documents and file in accordance with section number listings in List of Contents of the Project Manual. Label each document AS-BUILT DOCUMENTS in neat, large, printed letters.
- .3 Maintain AS-BUILT documents in clean, dry and legible condition. Do not use as-built documents for construction purposes.
- .4 Keep as-built documents and samples available for inspection by the Consultant.

1.12. RECORD DRAWINGS

- .1 Prior to Substantial Performance of the Work, update the marked up information from the AS-BUILT documents to a master set of drawing.
- .2 Submit one set of completed AS-BUILT documents to the Consultant for review.
- .3 Documents will be returned to the contractor with the Consultant's comments.
- .4 Revise content of documents as required prior to final submission.
- .5 After the review is completed resubmit to the Consultant for Consultant to produce electronic record drawings for the owner to use.

1.13. SPARE PARTS

- .1 Provide spare parts, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Receive and catalogue all items. Submit inventory listing to Consultant. Include approved listings in the Maintenance Manual.
- .4 Obtain receipt for delivered products and submit prior to final payment.

1.14. REPLACEMENT (MAINTENANCE) MATERIALS

- .1 Deliver to site, unload and store where directed, replacement (maintenance) materials as required elsewhere in these Specifications. Obtain a signed receipt from the Owner's Representative for delivered materials and include a copy of receipt in Operation and Maintenance manuals.
- .2 Package materials so they are protected from damage and loss of essential properties.
- .3 Label packaged materials for proper identification of contents.

1.15. SPECIAL TOOLS

- .1 Provide special tools, in quantities specified in the individual specification section.
- .2 Provide items with tags identifying their associated function and equipment.
- .3 Receive and catalogue all items. Submit inventory listing to Consultant. Include approved listings in Maintenance Manual

1.16. FINAL SITE SURVEY

- .1 Submit final site survey certificate in accordance with Section 01 70 00, certifying that elevations and locations of completed Work are in conformance Contract Documents.

1.17. WARRANTIES AND BONDS

- .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
- .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
- .3 Except for items put into use with Owner's permission, leave the date of beginning of time of warranty until the Date of Substantial Performance is determined. The date of Substantial Performance of the Work shall be the date for commencement of the warranty period.
- .4 Verify that documents are in proper form, contain full information, and are notarized.
- .5 Co-execute submittals when required.
- .6 Retain warranties and bonds until time specified for submittals.

END OF SECTION

01 78 40 – Maintenance Requirements

1.0 GENERAL

1.1. SECTION INCLUDES

- .1 Equipment and systems.
- .2 Materials and finishes.
- .3 Spare parts
- .4 Maintenance manuals.
- .5 Special tools.
- .6 Storage, handling and protection.
- .7 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.2. RELATED SECTIONS

- .1 Section 01 45 00 - Quality Control.
- .2 Section 01 78 40 – Maintenance Requirements.
- .3 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3. EQUIPMENT AND SYSTEMS

- .1 Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer's printed operation and maintenance instructions.

- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide coordination Drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide a list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include test and balancing reports as specified in Section 01 45 00.
- .15 Additional requirements: As specified in individual specification sections.

2.0 PRODUCTS

2.1. MATERIALS AND FINISH

- .1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Moisture-protection and Weather-exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .4 Building Envelope: include copies of drawings of building envelope components, illustrating the interface with similar or dissimilar items to provide an effective air, vapour and thermal barrier between indoor and outdoor environments. Include an outline of requirements for regular inspections and for regular maintenance to ensure that on-going performance of the building envelope will meet the initial building envelope criteria.
- .5 Additional Requirements: as specified in individual specifications sections.

2.2. SPARE PARTS

- .1 Provide spare parts, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Receive and catalogue all items. Submit inventory listing to Consultant. Include approved listings in the Maintenance Manual.
- .4 Obtain receipt for delivered products and submit prior to final payment.

2.3. MAINTENANCE MATERIALS

- .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Receive and catalogue all items. Submit inventory listing to Consultant. Include approved listings in the Maintenance Manual.
- .4 Obtain receipt for delivered products and submit prior to final payment.

2.4. SPECIAL TOOLS

- .1 Provide special tools, in quantities specified in the individual specification section.
- .2 Provide items with tags identifying their associated function and equipment.
- .3 Receive and catalogue all items. Submit inventory listing to Consultant. Include approved listings in the Maintenance Manual.

3.0 EXECUTION

3.1. DELIVERY TO SITE

- .1 Deliver to place of work and store.
- .2 General Contractor to receive and acknowledge delivery from contractors and subcontractors of all parts and materials assembled for maintenance requirements. Provide a summary inventory list to the Consultant and/or the Board after all materials are gathered and verification of location. Signatures of receipt will not be accepted from anyone except the General Contractor's representative.

3.2. STORAGE, HANDLING AND PROTECTION

- .1 Consult with the Board to determine location for storage.
- .2 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .3 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .4 Store components subject to damage from weather in weatherproof enclosures.
- .5 Store paints and freezable materials in a heated and ventilated room.
- .6 Remove and replace damaged products at own expense and to the satisfaction of the Consultant.

END OF SECTION

01 79 00 – Demonstration and Training

1.0 GENERAL

1.1. SECTION INCLUDES

- .1 Procedures for demonstration and instruction of Products, equipment and systems to Owner's personnel.
- .2 Seminars and demonstrations.

1.2. RELATED SECTIONS

- .1 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3. DESCRIPTION

- .1 At Substantial Performance, at a time acceptable to Owner and Consultant, but not before operations and maintenance manual have been reviewed and accepted by the consultant; contractor shall give a complete demonstration in the presence of consultant; Sub-consultants, Owner and Owner's personnel of operation and maintenance of systems and equipment once they are 100% complete.
- .2 Owner will provide a list of personnel to receive instructions and will coordinate their attendance at agreed-upon times.

1.4. COMPONENT DEMONSTRATION

- .1 Manufacturer to provide authorized representative to demonstrate operation of equipment and systems.
- .2 Instruct Owner's personnel, and provide written report that demonstration and instructions have been completed.

1.5. SUBMITTALS

- .1 Submit schedule of time and date for demonstration of each item of equipment and each system one (1) week prior to designated dates, for Consultant's approval.
- .2 Submit reports within forty eight (48) after completion of demonstration, that demonstration and instructions have been satisfactorily completed.
- .3 Give time and date of each demonstration, with a list of persons present.

1.6. CONDITIONS FOR DEMONSTRATIONS

- .1 Equipment has been inspected and put into operation in accordance with manufacturer's instructions and contract requirements.
- .2 Testing, adjusting, and balancing have been performed in accordance with manufacturer's instructions and contract requirements, and equipment and systems are fully operational.
- .3 Provide information packages as required for use in demonstrations and instructions.

2.0 PRODUCTS

2.1. NOT USED

- .1 Not used.

3.0 EXECUTION

3.1. PREPARATION

- .1 Verify that suitable conditions for demonstration and instructions are available.
- .2 Verify that designated personnel are present.
- .3 Prepare agendas and outlines.
- .4 Establish seminar organization.
- .5 Explain component design and operational philosophy and strategy.
- .6 Develop equipment presentations.
- .7 Present system demonstrations.
- .8 Accept and respond to seminar and demonstration questions with appropriate answers.

3.2. PREPARATION OF AGENDAS AND OUTLINES

- .1 Prepare agendas and outlines including the following:
 - .1 Equipment and systems to be included in seminar presentations.
 - .2 Name of companies and representatives presenting at seminars.
 - .3 Outline of each seminar's content.
 - .4 Time and date allocated to each system and item of equipment.
 - .5 Provide a separate agenda for each system.

3.3. SEMINAR ORGANIZATION

- .1 Coordinate content and presentations for seminars.

- .2 Coordinate individual presentations and ensure representatives scheduled to present at seminars are in attendance.
- .3 Arrange for presentation leaders familiar with the design, operation, maintenance and troubleshooting of the equipment and systems. Where a single person is not familiar with all aspects of the equipment or system, arrange for specialists familiar with each aspect.
- .4 Coordinate proposed dates for seminars with Owner and select mutually agreeable dates.

3.4. EXPLANATION OF DESIGN STRATEGY

- .1 Explain design philosophy of each system. Include following information:
 - .1 An overview of how the system is intended to operate.
 - .2 Description of design parameters, constraints and operational requirements.
 - .3 Description of system operation strategies.
 - .4 Information to help in identifying and troubleshooting system problems.

3.5. DEMONSTRATION AND INSTRUCTIONS

- .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment.
- .2 Instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.
- .3 Instruct personnel on control and maintenance of sensory equipment and operational equipment associated with maintaining energy efficiency and longevity of service.
- .4 Review contents of manual in detail to explain all aspects of operation and maintenance.
- .5 Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instructions.

END OF SECTION

1 GENERAL

1.1 INSTRUCTIONS

- .1 Comply with the General Conditions of the Contract, the Supplementary Conditions and the General Requirements of Division 01.

1.2 SUMMARY

- .1 Section Includes Provide articles, labour, materials, equipment and transportation to complete the work of this Section.
 - .2 Provide masonry units, and related products including but not limited to the following:
 - .1 Brick
 - .2 Concrete masonry units - non load bearing.
 - .3 Mortar and mortar aggregate.
 - .4 Mortar net.
 - .5 Masonry lintels and reinforcement.
 - .6 transitions and flashings.
 - .7 Masonry reinforcement, ties, anchors, connectors and accessories.
 - .3 The summarized breakdown of the above mentioned work does not set out all the work of this Section of the Contract but rather outlines the essentials. Provide any masonry work indicated on the drawings or hereinafter specified all whether enumerated above or not.
 - .4 Products Installed But Not Supplied Under This Section
 - .1 Build, bed and secure into the masonry work the following materials which are supplied by other trades.
 - (1) Masonry inserts, hangers, anchors, sleeves, bolts, etc.
 - (2) Steel lintels supplied by structural steel and/or miscellaneous metals contractor.
 - (3) Louvres in masonry, supplied by general contractor or mechanical trade.
 - (4) Conduit, boxes and devices supplied by general contractor, mechanical and electrical contractors
 - .5 Related Sections
 - .1 Section 07 92 00 – Joint Sealants.
 - .2 Section 09 90 00 – Painting and Coating
- ### **1.3 REFERENCES**
- .1 ASTM A82-05: Standard Specification for Steel Wire, Plain, For Concrete Reinforcement.
 - .2 ASTM A123/A123M-02: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

- .3 ASTM A153/A153M-05: Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- .4 ASTM A167-99 (2004): Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- .5 ASTM A580/A580M-06: Standard Specification for Stainless Steel Wire.
- .6 ASTM A641/A641M-03: Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
- .7 ASTM A1011/A1011M-06b: Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
- .8 ASTM C207-06: Standard Specification for Hydrated Lime for Masonry Purposes.
- .9 ASTM C331-05: Standard Specification for Lightweight Aggregates for Concrete Masonry Units.
- .10 CAN/CSA A82.1-M87 (R2003): Burned Clay Brick (Solid Masonry Units Made from Clay or Shale).
- .11 CSA A165 Series-04: CSA Standards on Concrete Masonry Units.
- .12 CSA A179-04: Mortar and Grout for Unit Masonry.
- .13 CSA A370-04: Connectors for Masonry.
- .14 CSA A371-04: Masonry Construction for Buildings.
- .15 CAN/CSA-A3001-03: Cementitious Materials for Use in Concrete.
- .16 CAN/CSA-A3002-03: Masonry and Mortar Cement.
- .17 CAN/CSA-G30.18-M92 (R2002): Billet-Steel Bars for Concrete Reinforcement.
- .18 CSA S304.1-04: Design of Masonry Structures.
- .19 CAN/CGSB-1.40-M89: Primer, Structural Steel, Oil Alkyd Type.
- .20 CISC CPMA 2-75: Quick Drying Primer for Use on Structural Steel.

1.4 SUBMITTALS

- .1 Submit a list of products to be used in the work of this section, including insulation manufacturer, mortar supplier, concrete unit masonry supplier, and air barrier products for review by the Consultant.
- .2 Prior to commencing the work submit manufacturers' complete set of standard details for the air/vapour barrier membrane system showing a continuous plane of air tightness throughout the building envelope.

1.5 SAMPLES

- .1 Submit samples as specified in Section 01 33 00.
- .2 Samples: duplicate full-size samples of each type of specified masonry unit; showing size, colour, design and pattern of faces.

1.6 QUALITY ASSURANCE

- .1 Submit documentation verifying that the air barrier applicator is a recommended installer by the air barrier manufacturer.

1.7 MOCK-UPS

- .1 Construct a mock-up of the inner wythe masonry together with air/vapour barrier, insulation, and transition membranes to window frame. Once approved, this will become the standard for the work.
- .2 Construct a mock-up of a brick veneer cavity wall assembly on site, complete with back-up masonry wall, overall size to be 1200 mm high x 1800 mm long. Build in the bond and with the mortar and jointing as specified for the brick and concrete unit masonry. The panel shall show the range of the brick in a colour pattern and be representative of the quality of work by this Contractor. Brick veneer cavity wall assembly work shall not commence until the mock-up has been approved by the Consultant. If the panel is not satisfactory, erect a further mock-up or mock-ups until the range, pointing, joints, etc., are satisfactory to the Consultant. The mock-up panel when accepted will be used as the quality standard for the project.

1.8 ENVIRONMENTAL REQUIREMENTS

- .1 Thaw and dry ice and snow which have formed on the bedding surface by the application of heat.
- .2 Remove masonry that has, in the opinion of the Consultant, been frozen or damaged due to weather conditions, before that section of wall is continued.
- .3 Do not lay masonry units that are wet or covered with ice.
- .4 Heating Requirements
 - .1 Provide heat enclosures and heat as required, in accordance with CSA A371.
 - .2 Observe the following heating requirements:
 - (1) Air Temperature 4°C – 0°C: Mortar aggregate or mixing water shall be heated to produce mortar temperatures between 5°C and 45°C.
 - (2) Air Temperature 0°C - -4°C: Mortar aggregate and mixing water shall be heated to produce mortar temperatures between 5°C and 45°C. Mortar temperatures shall be maintained above freezing on the boards.
 - (3) Air Temperature -4°C - -7°C: Mortar aggregate and mixing water shall be heated to produce mortar temperatures between 5°C and 45°C. Mortar temperatures shall be maintained above freezing on the boards. Salamanders or other sources of heat shall be used on both sides of walls under construction. Wind breaks shall be employed when wind is excess of 25 km/hour
 - (4) Air Temperature -7°C and below: Mortar aggregate and mixing water shall be heated to produce mortar temperatures between 5°C and 45°C. Enclosure and auxiliary heat shall be provided to maintain air temperatures above 0°C. Temperature of units when laid shall not be less than -7°C.
- .5 Protection Requirements for Completed Masonry
 - .1 The following protection requirements apply to complete masonry and masonry not being worked:
 - (1) Air Temperature 4°C – 0°C: Masonry shall be protected from rain or snow for 24 hours by covering with a weather resistive membrane.

- (2) Air Temperature 0°C - -4°C: Masonry shall be completely covered with weather resistive membrane for 24 hours.
 - (3) Air Temperature -4°C - -7°C: Masonry shall be completely covered with insulating blanket or equally protected for 24 hours.
 - (4) Air Temperature -7°C and below: Masonry temperature shall be maintained above 0°C for 24 hours by enclosure and supplementary heat, by electric heating blankets, infra-red heat lamps or other approved method.
- .6 Construct and maintain temporary protection as required to permit continuous progress of the Work. Areas so protected shall be of sufficient size to permit progress of all work necessary to maintain an orderly and efficient sequence of construction operations.
- .7 Provide temporary lighting at levels adequate to permit work to be performed in accordance with the Contract Documents.
- .8 Give adequate notification to the Consultant and Sub-contractors prior to the erection and removal of temporary protective enclosures.

1.9 DELIVERY, STORAGE AND HANDLING

- .1 Refer to Section 01 61 00.
- .2 Deliver Products in dry condition, and keep dry until use.
- .3 Deliver cement, lime and other packaged materials in original unbroken and undamaged packages with the marker's name and brand distinctly marked therein, and upon delivery store in a shed until used on the work.
- .4 Deliver masonry units palletized and protected with Shrink-Film.
- .5 Store or pile mortar aggregate on plywood, asphalt or concrete area, and protect from dirt and rubbish.
- .6 Store masonry units off the ground with care to avoid damage. Damaged units will not be acceptable for face work.
- .7 Do not double stack cubes masonry units.

2 PRODUCTS

2.1 MORTAR MATERIALS

- .1 Portland Cement: to CAN/CSA-A3001, Type GU, Grey colour.
- .2 Masonry Cement: to CAN/CSA-A3002, Type S.
- .3 Hydrated Lime: to ASTM C207, Type S – Special.
- .4 Sand: to CSA A179, standard masonry type; free from loam, clay, vegetable or organic matter, acid, alkali, salt or other soluble or deleterious matter.
- .5 Water: clean, potable.

2.2 MASONRY UNITS

- .1 Face Brick: to match existing colour. Owner and Consultant to choose a colour based on samples provided by General Contractor.

- .2 Concrete Masonry Units – Normal Weight (CMU): to CSA A165.1, using N aggregate; 190 x 390 mm, 140 x 390 mm and 90 x 390 mm size solid, size, bed depth as indicated on Drawings; solid factory-finished ends with bull nosed corners for use at exposed wall corners, special shapes as required; types as follows:

- .1 Hollow: Type H/15/A/M.
- .2 Solid (100 percent): SF/15/A/M.
- .3 Solid (75 percent): SS/15/A/M.

2.3 JOINT REINFORCEMENT

- .1 Single Wythe Joint Reinforcement: Truss type, 3.7 mm side rods with 3.7 mm cross ties; to ASTM A82; hot dipped galvanized; e.g. Dur-O- Wal D/A 300.
- .2 Multiple Wythe Joint Reinforcement: Truss type, 3.7 mm side rods with 3.7 mm cross ties; to ASTM A82; hot dipped galvanized; e.g. Dur-O-Wal D/A 330.
- .3 Bed Joint Reinforcement: single 3.7 mm OD wire rod to ASTM A82; hot dipped galvanized.
- .4 Reinforcing Steel: to CSA G30.18, as specified in Section 03 20 00; sizes as indicated on Drawings.
- .5 Strap Anchors: 4.76 mm thick steel plate, hot dipped galvanized; U-shaped and Z-shaped to suit application; e.g. BLT11 by Blok-Lok.

2.4 VENEER WALL TIES

- .1 Wall Tie (CMU Back-up): adjustable, dual component slotted design; e.g. Fero Slotted Block Tie (Type I), comprised of:
 - .1 Slotted Block Plate: 1.61 mm thick hot dipped galvanized steel plate, to ASTM A1011/A1011M; length to suit air space and CMU width dimension, less 6 mm.
 - .2 V-Tie: 4.76 mm diameter hot dipped galvanized steel wire to ASTM A82 length to provide placement of tie legs at centerline of veneer.

2.5 MORTAR TYPES

- .1 Mortar Types: to CSA A179 as follows:
 - .1 Non-loadbearing Interior Partitions: Type N (compressive strength 750 psi)
 - .2 Exterior Masonry Veneer: Type N Mortar for exterior masonry veneer.
- .2 Mortar Colour
 - .1 Colour of mortar as directed by the Consultant. Loading shall be as directed by the Consultant (6% maximum).
 - .2 Use natural mortar (without colour additives) in all areas to be painted or covered.
 - .3 Colour of mortar as directed by the Consultant. Mortar pigments shall be Harcos Pigments Canada or Bayferrox Pigments by Bayer. Loading shall be as directed by the Consultant; 6% maximum.

2.6 CONCRETE GROUT

- .1 Proportion normal density concrete to meet the following criteria for concrete grout in reinforced masonry units.
 - .1 Portland Cement Type GU
 - .2 Supplementary Cementing Materials Permitted
 - .3 Minimum 28 Day Compressive Strength 15 MPa
 - .4 Minimum Cementitious Content As required
 - .5 Normal Size for Course Aggregate 10 mm
 - .6 Slump Range at Point of Discharge 180 to 220 mm
 - .7 Air Content Less than 3%
 - .8 Water/Cementing Materials Ratio 0.55

2.7 MORTAR MIXING AND RE-TEMPERING

- .1 Add mortar colour, when specified, in rates determined by manufacturer. Provide 4' x 3' sample panel in an enclosed area for inspection after 24 hours drying, to determine if colour is correct. Wait for Consultant's approval before proceeding with the work.
- .2 Do not use anti-freeze compounds to lower the freezing point of mortar.
- .3 Machine mix masonry cement mortar in a drum type mixer for not less than 3 minutes and not more than 5 minutes with only enough water to produce a workable consistency.
- .4 Stiffened mortar due to the evaporation of water may be re-tempered within 2 hours of original mixing provided the temperature is not over 25°C. If the temperature is over 25°C, it may only be re-tempered within one hour of the original mixing.

2.8 SHOP FINISHES

- .1 Hot Dip Galvanizing:
 - .1 Horizontal Joint Reinforcement Wire and V-Ties: to ASTM A153/A153M, Class B2, minimum 458 g/m² zinc coating.

3 EXECUTION

3.1 EXAMINATION

- .1 Prior to the commencement of work, examine all areas that are to receive the work of this Section.
- .2 Report misalignments that may affect the Work to the Consultant for correction.
- .3 Commencement of the work or any parts thereof shall mean acceptance of the prepared substrate.

3.2 RELATIONSHIP TO OTHERS

- .1 Cooperate with other Sections, leaving chases, slots and reglets.

- .2 Build-in frames, sleeves, anchors, bolts, etc. as supplied by others. Ensure items are set square and true.
- .3 Set metal, wood, and wood buck frames for louvres, pressed metal screens and doors, etc. All pressed metal and wood frames for doors and screens in masonry and concrete shall be set and braced by others. Be responsible for and ensure that all frames are set plumb, true and accurately remain in position. Solidly build-in all frames and anchor with the backs of all jambs solidly packed with mortar unless otherwise noted on Drawings.
- .4 Provide openings and lintels in masonry walls where required by other Sections or where indicated; including those required by the Mechanical and Electrical Sub-contractors. Locations of such openings must be coordinated by the Sub-contractor involved. Cutting and patching for openings that have been missed or incorrectly located shall be provided at no cost to the Owner.
- .5 Accurately locate and neatly finish chases and openings to the required sizes.
- .6 Do not cover pipe, conduit chases or enclosures until advised that the work has been inspected and tested.

3.3 QUALITY OF WORK

- .1 Perform work by skilled workers under the continuous supervision and direction of skilled and experience foremen in each branch of the work. At least one thoroughly experienced and competent man is to be in charge of all mortar mixing.
- .2 Build work plumb, true, level and square, accurately to the dimensions shown and with all angles and reveals at right angles to faces unless distinctly shown otherwise.
- .3 Set out and build masonry work to the respective dimensions called for on drawings. Build and lay work true in line, plumb, square and level; align vertical joints. Keep angles, reveals etc., strictly true and square and plumb.
- .4 All masonry courses to be of uniform height, and both vertical and horizontal joints to be of equal and uniform thickness.
- .5 Do not use chipped, cracked or otherwise damaged units in exposed and load-bearing masonry walls.

3.4 NON-LOADBEARING PARTITIONS

- .1 Extend non-loadbearing partitions in all cases from the top of the structural floor to the bottom surface of the floor or roof construction above unless noted otherwise on Drawings.
- .2 Anchor wall to the underside of the floor structure according to Standard Details.
- .3 In walls exposed to view, support tops of walls with concealed angle clips fastened to deck above wall.

3.5 DAMPPROOFING MEMBRANE

- .1 At the joint between foundation walls and masonry above, provide a continuous horizontal dampproofing membrane for the full width of masonry wall.
- .2 Use adhesive to seal spliced lapping joints minimum 100 mm.

3.6 MOISTURE CONTROL

- .1 Interior wythes of masonry must be protected from rain with tarpaulins. Excessive moisture will cause blistering of the air vapour barrier, and will cause longer drying out periods before finishing work can commence.

3.7 PROVISION FOR MOVEMENT

- .1 Leave 25 mm space between top of non load-bearing walls and partitions and structural elements.
- .2 Do not use wedges.
- .3 Fill space with mineral wool.

3.8 TEMPORARY WALL BRACING

- .1 Provide temporary engineered wall bracing design.
- .2 Brace masonry walls to resist wind pressure and other temporary lateral loads during the construction period.

3.9 BRICKWORK

- .1 Brick having absorption rates in excess of 30 g/min/194 cm² shall be wetted from 3 to 4 hours before it is used and the method of wetting shall be such as to ensure that each brick is uniformly wetted. All bricks shall be free from water adhering to their surfaces when they are placed in the wall. No bricks shall be wetted during freezing weather.
- .2 Use face brick on exterior and interior wall surfaces as indicated. Lay Brickwork up in a full mortar bed, and with vertical joints filled solid.

3.10 BONDS AND COURSING

- .1 Lay face brick in a running bond unless otherwise detailed.
- .2 Course brick to half running bond.
- .3 Set brickwork out on a storey rod and bricks arranged to line up with masonry openings and exposed structural members with full course.

3.11 CONCRETE UNIT MASONRY

- .1 Lay units in face shell mortar bedding, plumb, level and true in line, in running bond and properly jointed with other connecting work. Units with open cells exposed in walls will not be permitted.
- .2 Remove excess mortar and objects. Exercise special care to prevent breaking block corners and the tooled joints shall be made uniform on exposed work.
- .3 Use special concrete unit masonry as indicated on the drawings.
- .4 Use bull-nosed concrete unit masonry for all interior external corners unless noted otherwise on the drawings.
- .5 While laying units, avoid over-plumbing and pounding of the corners and jambs to fit stretcher units after they are set in position. Where an adjustment must be made after the mortar has started to harden, remove mortar and replace with fresh mortar.

- .6 Exercise special care in laying up concrete unit masonry in locations where plastic wall coating finish or painting is indicated. Plumb and tool all joints of concrete unit masonry walls in these locations.
- .7 Tie tee-shaped intersecting walls together with truss-type joint reinforcement. Do not use masonry header bond. Rake and tool joints as indicated on Drawings.
- .8 Sealants to be completed by Section 07 92 00.
- .9 Acoustical Masonry Units
 - .1 Lay acoustical concrete masonry units with open end down.
 - .2 Do not allow mortar to fall into cavities.
 - .3 Do not rake joints.

3.12 CAVITY WALLS

- .1 The air space in cavity walls must be kept free of mortar.
- .2 Provide weep hole vents in vertical joints immediately over flashings, in exterior wythes of cavity wall and masonry veneer wall construction, at maximum horizontal spacing of 600 mm OC. Mortar or debris must not plug holes.
- .3 Provide vent holes in vertical joints at top of walls and/or immediately below flashings, in exterior wythes of cavity wall and masonry veneer wall construction, at maximum horizontal spacing of 600 mm OC. Mortar or debris must not plug holes.
- .4 Mortar Dropping Control: After the first one or two courses of brick are laid, place one continuous row of the mortar net in the collar joint or cavity on the flashing against the inside of the outer wythe at the base of the wall, zig-zag side up. No adhesives or fasteners are required, and the mortar need not have set for cavities larger than 25 mm, several thicknesses of the mortar net may be combined or rigid insulation extending at least 6" above the top of the mortar net may be used as a filler.
- .5 The inner wythe may be constructed to its full height if it is laterally braced to withstand wind forces.
- .6 Tie the outer brick wythe to the inner wythe using the approved cavity wall masonry reinforcing on every second bedding course.
- .7 Provide vertical galvanized sheet metal separators across cavity continuous between top and bottom of cavity at maximum 1.5 m from all external corners and as indicated on Drawings. Sheet metal to extend out to face of exterior wythe and shall be embedded in the control joint.

3.13 AIR BARRIER MEMBRANE

- .1 Primer
 - .1 Apply primer for self-adhering membranes at rate recommended by manufacturer.
 - .2 Apply primer to all areas to receive self-adhering air barrier membrane and/or through-wall flashing membrane, as indicated on drawings by roller or spray and allow minimum 30 minute open time. Primed surfaces not covered by transition membrane or through-wall flashing membrane during the same working day must be re-primed.

- .2 Air Barrier Membrane (self-adhering type)
 - .1 Align and position self-adhering membrane, remove protective film and press firmly into place. Ensure minimum 50 mm overlap at all end and side laps.
 - .2 Tie-in to window frames, aluminum screens, hollow metal doorframes, spandrel panels, roofing system and at the interface of dissimilar materials as indicated in drawings.
 - .3 Promptly roll all laps and membrane with a counter top roller to effect seal.
 - .4 Ensure all preparatory work is complete prior to applying liquid-applied air barrier.
 - .5 Allow air/vapour barrier membrane to fully cure prior to placement of insulating materials.
 - .6 Inspection: Notify Consultant when sections of work are complete so as to allow for review prior to installing insulation.
 - .7 Protection: air barrier membranes are not designed for permanent exposure. Cover and protect from environment and UV radiation as soon as possible.
- .3 Through-Wall Flashing Membrane (self-adhering type)
 - .1 Align and position the leading edge of self-adhering through-wall flashing membrane with the front horizontal edge of the foundation walls or shelf angles, partially remove protective film and roll membrane over surface and up vertically.
 - .2 Press firmly into place. Ensure minimum 50 mm overlap at all end and side laps.
 - .3 Promptly roll all laps and membrane to effect the seal.
 - .4 Ensure all preparatory work is complete prior to applying self-adhering through-wall flashing membrane.
 - .5 Ensure through-wall flashing membrane extends fully to the exterior face of the exterior masonry veneer. Trim off excess as directed by the consultant.
 - .6 Apply through-wall flashing membrane along the base of masonry veneer walls, over windows, doors and all other wall openings. Membrane shall form continuous flashing and shall extend up a minimum of 200 mm up the back-up wall.
- .4 Primary Air/Vapour Barrier
 - .1 When transition membrane is installed, apply a complete and continuous air/vapour barrier membrane. Overlap transition membrane a minimum of 25mm. Seal around projections ensuring a complete and continuous air seal.
 - .5 Inspection: Notify Consultant when sections of work are complete so as to allow for review prior to installing insulation.
 - .6 Protection: air barrier membranes are not designed for permanent exposure. Cover and protect from environment and UV radiation as soon as possible.

3.14 MORTAR JOINTS

- .1 Mortar Joint Thickness: to CSA A371.

- .2 Mortar joints shall be straight, clean and uniform in thickness.
- .3 Tool joints to a dense, slightly concave curved surface well bonded to the unit at the edges.

3.15 POINTING

- .1 Point and fill holes and cracks in exposed mortar joints.
- .2 Cut out defective joints, refill solidly with mortar and tool to form a neat joint to match existing.

3.16 CONCRETE UNIT MASONRY REINFORCING

- .1 Continuously reinforce and tie together with reinforcing in every second block bed joint concrete unit masonry. Refer to Standard Details.
- .2 Provide horizontal reinforcing in first and second bed joints above and below openings. The first bed joint immediately above and below openings shall have continuous reinforcing. In second bed joint, the reinforcing shall extend 600 mm beyond each side of the opening. Refer to Standard Details.
- .3 Place continuous reinforcing in the second bed joint below the top of the wall. Refer to Standard Details.
- .4 Lap reinforcement a minimum of 150 mm at splices, and cut and bend at corners. Overall width of reinforcement shall be according to the manufacturer's recommendations for the various wall thicknesses.
- .5 Do not use crimped metal wall ties.
- .6 Where vertical bars are called for, fill cores of block full with concrete grout.

3.17 CONTROL JOINTS

- .1 Provide control joints at locations in accordance with Portland Cement Association Concrete Masonry Handbook and determined by the Consultant unless indicated on the drawings to maintain construction integrity.
- .2 Break vertical mortar bond with extruded neoprene gasket.
- .3 Prime control joint surfaces to prevent drying out of sealant.
- .4 Provide 2:1 width-to-depth joint for sealant Section 07 92 00.
- .5 To form control joints in interior block walls, fill completely with mortar the core of a full height vertical joint after inserting a strip of building paper to keep the mortar from bonding to one side. Refer to Standard Details.

3.18 BEARING

- .1 Use solid concrete masonry units where indicated on Drawings.

3.19 BEAMS AND LINTELS

- .1 Steel beam lintels are supplied in Section 05 10 00.
- .2 Clean steel lintels by scraping, wire brushing or other effective means to remove loose scale, rust, grease, oil or other foreign matter.

- .3 Apply one coat of paint prior to installation, unless lintels are galvanized.
- .4 Angle lintels shall have a bearing of not less than 150 mm at each end.

3.20 THROUGH-WALL FLASHINGS

- .1 Provide flashings in masonry in accordance with CSA A371.
- .2 Provide through-wall flashings in the following locations:
 - .1 Under exterior masonry walls bearing on foundation walls or slabs
 - .2 Over shelf angles
 - .3 Over steel angle lintels
 - .4 At window frame and door frame heads
- .3 Provide a soft joint at the soffit of shelf angles, and a slip joint at lintels for movement control.
- .4 In double wythe walls and veneered walls, carry flashings from front edge of masonry, under outer wythes, then up backing not less than 150 mm and as follows:
 - .1 For masonry backing embed flashing 25 mm in joint.
 - .2 For concrete backing, insert flashing into reglets and seal joint.
 - .3 For frame backing, secure flashing to studs behind moisture barrier.
- .5 Lap joints 150 mm and seal with compatible adhesive.
- .6 Flashing over openings shall be installed with dams at both ends to prevent water from travelling horizontally past the flashing ends.
- .7 Horizontal (base) flashing shall be returned a minimum of 100 mm around corner to overlap abutting flashing. Overlapped flashing shall be sealed with compatible adhesive.
- .8 Protect base wall flashing from mortar droppings.
- .9 Ensure that flashings have a drip edge extending 12 mm past exterior wall face. Provide safety edge on exposed edges.

3.21 SHEET METAL WORK

- .1 Cut and form reglets in masonry walls as required for the securing of flashings.

3.22 ANCHORAGE TO CONCRETE

- .1 Provide continuous dovetail anchor slots to be supplied and set by the Concrete Contractor in the concrete for the anchorage of all masonry facing, furring, abutting walls and partitions to the concrete walls, concrete spandrels, concrete columns, etc. Slot shall be for full height as required equal to D & R galvanized steel dovetail type with fibreglass filler and provided complete with adjustable galvanized steel anchors to be placed at 400 mm vertically. Slots are to be at 400 mm.

3.23 FIELD QUALITY CONTROL

.1 Drying Out

- .1 When masonry work is completed, provide ventilation and heat as required to reduce moisture level in masonry to maximum 15%, sustained for a 48 hour period. Timing for achieving this to be determined by Contractor, but no later than start of finishing work.
- .2 Testing may be performed as specified in Section 01 40 00. In the absence of such testing, random sampling with moisture meter will be conducted by the Consultant.

.2 Air Barriers

- .1 Arrange for inspection of air barrier application by the air barrier manufacturer, of a 1.5 x 1.5 metre sample panel. Obtain report from air barrier manufacturer identifying any recommendations/requirements based on visual review.
- .2 Arrange for inspection of the air barrier application before the insulation is installed, as specified in Section 01 40 00.
- .3 Provide inspection report from a qualified building sciences inspection company that the air vapour barrier has been satisfactorily installed in accordance with the performance criteria. Refer to Section 01 40 00.
- .4 The air leakage rate of the air-barrier assembly is limited to a maximum of 0.1 L/s.m².
- .5 Site testing of assembled components will be done using ASTM E1186, if the inspection and testing company recommends and the owner approves such testing.
- .6 The Inspection and Testing Company shall arrange a meeting to discuss the principal requirements of the air-barrier assembly with all Sub-contractors involved in the assembly prior to commencement of construction.
 - (1) This meeting will be attended also by the Consultant and the Contractor.
 - (2) The meeting will also enable all parties to discuss the sequencing necessary to ensure a continuous air-barrier assembly.
 - (3) The Contractor will be responsible for carrying out the work in the agreed sequence.
- .7 A mock-up of the building exterior wall measuring 2.0 metres wide and incorporating the air-barrier connections at glazed areas, (sill, jamb, head) as well as the wall to roof transition is required to be constructed prior to commencing the building envelope.
 - (1) This mock-up will serve as the model for the work on the building.
 - (2) The mock-up may become part of the final exterior wall as long as it is constructed before the main work of the exterior wall assembly is started.
 - (3) If any mock-up assembly specimen is found to be defective with respect to specified requirements for the air-barrier assembly, further fabrication or installation of this assembly will be stopped until the cause(s) of the defect has been identified and a new test assembly has been retested.
- .8 Based on a schedule of work prepared by the Contractor, the inspection and testing company are to be notified by the Contractor at the following milestones: The inspection and testing company will attend the site at these times:
 - (1) completion of primer coat if applicable.

- (2) completion of spray/trowel applied membrane, or installation of sheet material.
 - (3) during assembly of exterior wythe (in cavity wall construction) to inspect insulation adhesion; cavity clearance, continuity, and compartmentalization.
 - (4) installation of all transitions, prior to commencement of interior finishes.
 - (5) installation of flashings at roof.
- .9 The Inspection and Testing Company will provide inspection reports at each milestone, indicating if the work is satisfactory, or if re-inspection is required.
- .10 If the performance of building envelope cannot be determined by visual inspection, the inspection and testing company may recommend that a differential pressure test be performed on the mock-up and again on the exterior wall assembly.
- (1) If the performance of the overall building envelope does not meet the air leakage limitation, then the Contractor will be required to undertake remedial repairs at his own expense.
 - (2) Do not proceed with insulation installation until air/vapour barrier installation has been approved.
- .3 Hose Test: On completion of masonry cavity walls, and prior to installing parapets, perform a hose test at 5 metre intervals along length of walls by inserting water hose into top of cavity wall; have Consultant review the test in progress; continue until Consultant is satisfied that the cavities are clear and free draining.

3.24 PROTECTION

- .1 Cover walls exposed to the elements with waterproof membranes at the end of each Working Day and keep covered until work is re-commenced.
- .2 Protect visually-exposed Products from marks and damage.

END OF SECTION

1 GENERAL

1.1 INSTRUCTIONS

- .1 Comply with the Instructions to Bidders, the General Conditions of the Contract, the Supplementary Conditions and the General Requirements of Division 01.
- .2 Report in writing to the General Contractor any defects of surfaces or work prepared by other Sections which affect the quality or dimensions of the Work. Commencement of work implies acceptance of existing conditions and work by others.

1.2 INTENT

- .1 Provide all articles, labour, materials, equipment, transportation, hoisting and incidentals noted, specified or required to complete the work of this Section.

1.3 SECTION INCLUDES

- .1 Provide all miscellaneous metal items as detailed on the Architectural drawings, specified herein or required for the proper execution of the project including those listed below. Provide each item complete with all the required anchorage and such accessories as are necessary for the proper installation and for correlation with the adjoining work. Shop drawings for steel guards and handrails to be submitted with Engineer's seal for review and execution.
- .2 Itemized List
 - .1 Steel guards and handrails – stainless steel and galvanized. Refer to drawings for locations.
 - .2 Steel framing not shown on structural drawings but required by architectural details.

1.4 RELATED SECTIONS

- .1 Section 03 01 00 –Concrete Forming and Accessories: placement of metal fabrications in concrete.
- .2 Section 03 30 00 – Cast-In-Place Concrete: placement of metal fabrications in concrete.

1.5 REFERENCES

- .1 ASTM A167-99 (2004): Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- .2 ASTM A269-04: Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- .3 ASTM A325M-05: Standard Specification for Structural Bolts, Steel, Heat Treated, 830 MPa Minimum Tensile Strength (Metric).
- .4 ASTM B36/B36M-06: Standard Specification for Brass Plate, Sheet, Strip, and Rolled Bar.
- .5 ASTM B101-02: Standard Specification for Lead-Coated Copper Sheet and Strip for Building Construction.
- .6 ASTM B209M-06: Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
- .7 ASTM A101-066: Standard Specification for Steel, Sheet, and Strap.
- .8 ASTM B221M-06: Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods,

Wire, Profiles, and Tubes (Metric).

- .9 ASTM B370-03: Standard Specification for Copper Sheet and Strip for Building Construction.
- .10 CSA G40.21-04: General Requirements for Rolled or Welded Structural Quality Steel.
- .11 CAN/CSA-G164-M92 (R2003): Hot Dip Galvanizing of Irregularly Shaped Articles.
- .12 CAN/CSA-S136-01: North American Specification for the Design of Cold-Formed Steel Structural Members.
- .13 CSA W47.1-03: Certification of Companies for Fusion Welding of Steel Structures.
- .14 CSA W59-03: Welded Steel Construction (Metal Arc Welding).

1.6 SUBMITTALS

- .1 Submit Shop Drawings and erection drawings as specified in Section 01 33 00.
- .2 Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories.
- .3 Shop drawings must be stamped, signed and dated by the fabricator's design engineer.

1.7 QUALITY ASSURANCE

- .1 Fabricator's Design Engineer: a professional Structural Engineer experienced in design of steel stairs, guards and railings, and licensed in the Place of the Work.
- .2 Fabricator: company specializing in fabricating metal fabrications with institutional experience.
- .3 Welders: individual or organization certified by the Canadian Welding Bureau to CSA W47.1.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Refer to Section 01 61 00.
- .2 Handle and store Products in a manner to prevent damage to other materials, to any existing building or property, and to the Work.
- .3 Store Products to avoid disruption in the progress of the Work.

2 PRODUCTS

2.1 MATERIALS

- .1 Sheet Steel: to CSA G40.20, Grade 300W.
- .2 Steel Sections and Plates: to CSA G40.21, Grade 300W.
- .3 High Strength Bolts: to ASTM A325M, including suitable nuts and plain hardened washers; hot dipped galvanized for exterior members.
- .4 Welding Materials: to CSA W59.
- .5 Shop Primer: to CPMA 2-75.

2.2 FABRICATION

- .1 Fabricate components to CAN/CSA-S136 and in accordance with the approved Shop Drawings.
- .2 Fit and shop assemble components for delivery in largest practical sections.
- .3 Continuously seal joined pieces by continuous welds. Conform to CSA W59.
- .4 Grind exposed joints flush and smooth with adjacent finish surface.
- .5 Make exposed joints butt tight, flush and hairline.
- .6 Exposed Mechanical Fastenings: Flush countersunk screws or bolts; except where specifically noted otherwise.
- .7 Supply components required for anchorage of fabrications.
- .8 Quality of work shall be the best grade of modern shop and field practice known to recognized fabricators specializing in this work. Accurately fit joints and intersecting members and make in true planes with adequate fastening. All work shall be plumb, true, square, straight, level, accurate to sizes detailed and free from distortion or defects detrimental to appearance and/or performance.
- .9 After fabrication, clean and scrape all surfaces to remove rust, mill scale, oil and grease of extraneous material.

2.3 SHOP FINISHES

- .1 Do not prime surfaces in direct contact with concrete or where field welding is required.
- .2 Prime painted items with two coats.
- .3 Galvanizing: to CAN/CSA-G164-M, hot dipped method, minimum 0.9 oz/ft² zinc coating.
- .4 Stainless Steel: No. 4 - Brushed.

3 EXECUTION

3.1 EXAMINATION

- .1 Prior to fabrication, verify all existing conditions which may affect the work of this Section and take any field measurements necessary to ensure a perfect fit of all miscellaneous metal items.
- .2 Report deficiencies and misalignments to the Consultant for correction.

3.2 PREPARATION

- .1 Supply items to be built into the work for the anchorage of miscellaneous metal work including templates or information required for sleeves or openings to the Trade involved at the proper time.

3.3 ERECTION

- .1 Install miscellaneous metal items as required by welding, bolting or lagging to the building structure.
- .2 Erect all items square, plumb, straight and true, accurately fitted with tight joints and intersections.
- .3 Field weld components to CSA W59.
- .4 Field bolt and weld to match shop bolting and welding.
- .5 Supply necessary anchor bolts, washers, nuts, lag screws, expansion shields, toggles, straps,

sleeves, brackets etc. required to complete the installation to the satisfaction of the Consultant. Secure items to be screwed with sufficient self-tapping "shake-proof" screws with flat countersunk heads.

- .6 Mechanically fasten joints butted tight, flush, and hairline.
- .7 Grind welds smooth and flush.
- .8 Carry out all cutting and drilling of concrete and masonry required for the installation of miscellaneous metal items. All making good after shall be carried out by the Trade whose work was affected at the expense of this Contractor.

3.4 FIELD QUALITY CONTROL

- .1 Defective materials or quality of work whenever found at any time prior to final acceptance of the work shall be rejected regardless of previous inspection. Inspection will not relieve responsibility but is a precaution against oversight and error.
- .2 Remove and replace defective materials and work of other trades affected by this replacement, at no additional cost to the Owner.

3.5 ADJUSTING

- .1 Upon completion of erection, all areas from which shop paint has been scraped or chipped, bolts, nuts, welds, etc. shall receive one coat of primer as previously specified.
- .2 Touch-up galvanized materials with zinc-rich paint.
- .3 Grind smooth and prime paint field welded connections.

END OF SECTION

1 GENERAL

1.1 INSTRUCTIONS

- .1 Comply with the Instructions to Bidders, the General Conditions of the Contract, the Supplementary Conditions and the General Requirements of Division 1.
- .2 Report in writing to the General Contractor any defects of surfaces or work prepared by other Sections which affect the quality or dimensions of the Work. Commencement of work implies acceptance of existing conditions and work by others.

1.2 INTENT

- .1 Provide all articles, labour, materials, equipment, transportation, hoisting, and incidentals noted, specified or required to complete the work of this Section.

1.3 SECTION INCLUDES

- .1 Rough Carpentry, including:
 - .1 Wood nailers and blocking.
 - .2 Nylon/acrylic blocking
 - .3 Exterior Plywood sheathing, curbs, cants, etc.
 - .4 Hardware for anchoring rough carpentry to masonry, concrete, steel, etc.

1.4 RELATED SECTIONS

- .1 Section 06 20 00 – Finish Carpentry.
- .2 Section 06 40 00 – Architectural Woodwork.

1.5 REFERENCES

- .1 CSA B111-1974 (R2003): Wire Nails, Spikes and Staples.
- .2 CSA O80 Series-97 (R2002): Wood Preservation.
- .3 CAN/CSA-O86-01: Engineering Design in Wood.
- .4 CSA O121-M1978 (R2003): Douglas Fir Plywood
- .5 CSA O141-05: Softwood Lumber.
- .6 CSA O151-04: Canadian Softwood Plywood.
- .7 CSA O437 Series-93 (R2001): Waferboard and Strandboard.
- .8 National Lumber Grades Authority: Standard Grading Rules for Canadian Lumber.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Refer to Section 01 61 00.

- .2 Store Products under waterproof cover both in transit and at the Place of the Work in such a manner as to prevent damage to other materials, to any existing building or property or to the Work.
- .3 Co-ordinate delivery schedule of Products with Suppliers.

2 PRODUCTS

2.1 MATERIALS

- .1 Lumber: well seasoned stock, free from shakes, splits, dry rot, mildew or other defects which would impair strength and durability; SPF species, NLGA No. 2 and Better Grade Mix; S-Dry; sizes as indicated on Drawings.

Blocking: shall be non-wood material, structural sound and suitable to installation of new windows. Mold and moisture resistant, waterproof material such as acrylic or nylon Plywood Sheathing: DFP to CSA 0121, Grade "C" veneer; laminated using waterproof glue; thicknesses as indicated on Drawings; exterior grade for exterior applications.

- .2 Nails: to CSA B111, Type 304 or 316 stainless steel, common wire type for general use and spiral type for structural connections.
- .3 Anchors: toggle bolt type for anchorage to hollow masonry, expansion shield and lag bolt type for anchorage to solid masonry or concrete, or bolts or ballistic fasteners for anchorages to steel.
- .4 Mineral Fibre Wool Insulation: by Roxul or Fibrex.

2.2 SHOP-TREATMENT OF WOOD

- .1 Wood Preservative - Pressure Treatment: to CSA O80; using alkaline copper quaternary (ACQ) preservative.
- .2 Wood Preservative - Surface Application: to CSA O80, brush-applied.

3 EXECUTION

3.1 CO-OPERATION WITH OTHER TRADES

- .1 Give sufficient notice to Section 09 90 00 so that untreated or unprimed carpentry items or material can be primed immediately upon delivery to the Place of the Work.
- .2 Supply fastenings with installation locations and necessary templates to other trades to which wood is to be secured.

3.2 SITE-APPLIED WOOD PRESERVATIVE

- .1 Treat wood nailers, blocking, wood sills, etc. in contact with concrete or masonry with green Pentox to ensure full protection against rot and decay.
- .2 Apply two coats of preservative to new surfaces when treated lumber is cut or sawn for fabrication or drilled and countersunk for bolts etc.
- .3 Treat all wood curbs and blocking for roof ventilators, Electrical and Mechanical equipment on the roof.

3.3 INSTALLATION

- .1 Provide blocking where indicated on Drawings and as required for attachment of windows, fitments and equipment by other Sections.
- .2 Provide wood copings, nailing strips, etc. as specified in Section 07 51 00. Construct curb and cant members of single pieces per location. Curb roof openings except where prefabricated curbs are provided.
- .3 Form corners by lapping side members alternately.
- .4 Provide mineral fibre wool insulation where required at curbs, parapets then in locations as shown on the architectural drawings and details.
- .5 Fastenings to solid masonry or concrete surfaces shall be with expansion shields and lag screws, unless otherwise specified, and to steel with bolts and nuts. Wood or inorganic fibre plugs shall not be permitted. Powder activated fasteners and staples shall not be used unless permitted by the Consultant.
- .6 Accurately fit all work to sit level and true and securely fastened.

3.4 FIELD QUALITY CONTROL

- .1 Defective materials or quality of work whenever found, at any time prior to final acceptance of the work, shall be rejected.
- .2 Inspection will not relieve this Contractor of responsibility but is a precaution against oversight or errors.
- .3 Defective materials shall be removed and replaced by this Contractor at his own expense, and he shall be responsible for the cost of the work of other trades affected by this replacement.

END OF SECTION

1 GENERAL

1.1 INSTRUCTIONS

- .1 Comply with Instructions to Bidders, the General Conditions of the Contract as amended by the Supplementary Conditions including all Sections outlined in Division 00 – Procurement and Contracting Requirements and Division 01 - General Requirements.
- .2 Report in writing to the General Contractor any defects of surfaces or work prepared by other Sections which affect the quality or dimensions of the Work. Commencement of work implies acceptance of existing conditions and work by others.

1.2 SECTION INCLUDES

- .1 Provide millwork and casework as shown on the Drawings, including but not limited to the following:
 - .1 Provide prefinished millwork where shown on Drawings as specified herein and as needed for a complete and proper installation.
 - .2 Provision of rough hardware, including fastening devices required to secure in place items of carpentry and millwork.
 - .3 Installation of finishing hardware for millwork by this Millwork Contractor Section 06 40 00.
 - .4 Supply and installation of miscellaneous trims, scribes, filler panels, plastic laminate windowsills.
 - .5 Supply and installation of grilles, etc. on millwork items. Coordinate with Mechanical Contractor for perimeter radiant heating grilles set in countertops.
 - .6 Provide cut-outs in the millwork for the sinks, gas outlets, electrical outlets and all other necessary cut-outs regarding the millwork.

1.3 INTENT

- .1 The intent of this Section is that casework shall be manufactured and finished at the plant, delivered to the site and immediately installed by this Section, including provision of necessary strapping, backings, bearers, rough hardware and finish hardware and miscellaneous support metals and stainless steel metal components. Touch-up finish immediately prior to completion of the work and leave in perfect condition.

1.4 RELATED SECTIONS

- .1 Section 06 10 00 – Rough Carpentry.
- .2 Section 07 92 00 – Joint Sealants.
- .3 Section 09 21 16 – Gypsum Board Assemblies.
- .4 Section 09 65 00- Resilient Flooring
- .5 Section 09 90 00 – Painting and Coating.
- .6 Divisions 20, 22 and 23 – Mechanical.
- .7 Division 26 – Electrical.

1.5 REFERENCES

- .1 Architectural Woodwork Manufacturers Association of Canada (AWMAC): Architectural Woodwork Quality Standards Illustrated.

1.6 SUBMITTALS

- .1 Submit shop drawings as specified in Section 01 33 00.
- .2 Shop Drawings:
 - .1 Shop drawings only required where not detailed by "AW" Drawing. Copies of "AW" are to be marked up to indicate changes. "AW" Drawings refer to WRDSB Millwork Standards Drawings contained in the Specifications or Drawing sets.
 - .2 Before shop drawings and fabrication is started, take critical measurements at the site to facilitate installation, fitting of work and access required to move millwork into final location. Take such measurements prior to fabrication of the work of this Section and in ample time to avoid delays in the work.
 - .3 Draw shop drawings in related and/or dimensional positions with sections. Scale minimum 1:10.
 - .4 Shop drawings shall show fabrication details, materials, jointing, description of anchorage and hardware.
 - .5 Submit four (4) sets for approval.
 - .6 Do not commence work until reviewed shop drawings have been returned as approved by Consultant and WRDSB.
 - .7 The drawings are to be photocopied, confirmed to fit openings and sizes, marked up in red and returned for approval.

1.7 SHOP FINISH

- .1 All cabinet work, including wood for change room bench seating and all other cabinet trims, to be shop finished by this Section and per Section 09 90 00.

1.8 SAMPLES

- .1 Submit samples as specified in Section 01 33 00.
- .2 Samples:
 - .1 Samples melamine 12 in. x 12 in. mm, plastic laminate, edging, hinges, pulls, bumpers, drawer slides and shelf clip.
 - .2 Submit duplicate 12 in. long samples of each type of molding.
 - .3 Submit samples of construction methods and of all hardware.

1.9 QUALITY ASSURANCE

- .1 Perform work to latest edition of Architectural Woodwork Manufacturers' Association of Canada (AWMAC), Custom Grade.
- .2 Fabricate millwork by a manufacturer that is a recognized millwork supplier, well experienced in the manufacturing techniques of a millwork shop.
- .3 Employ fully trained mechanics who are regularly employed in this field.

1.10 DELIVERY, STORAGE AND HANDLING

- .1 Refer to Section 01 61 00.
- .2 Give Painter sufficient notice so that untreated or unprimed carpentry items or materials can be primed immediately upon delivery to site.
- .3 No equipment shall be delivered to the site until portion of the building in which it is to be installed is completely ready for equipment as approved by Consultant.
- .4 Store finished work properly and keep under cover both in transit and at site. Finish woodwork shall not be delivered to site until concrete and masonry work has dried out.
- .5 Cover all plastic laminate and prefinished top surfaces at shop with heavy Kraft paper.
- .6 Carefully protect from damage of any kind.

1.11 COOPERATION

- .1 Water, drainage, gas and air piping, faucets, hose cocks, retort rod and bases, traps, ventilation ducts, sinks, electric receptacles and wiring are supplied and installed by the Mechanical and Electrical Sections at all rooms. Coordinate the work with these trades and make provision in the construction of the fitments to accommodate this work. Methods of construction shall be such as to permit mechanical and electrical work being concealed in the fitments, cut and frame accordingly, provide removal access panels in the units or provide proper access for installation and repairs.
- .2 Cabinet hardware, pilaster strips, locks, finishing hardware will be supplied by this section. Miscellaneous metals used in this section will be supplied and installed by miscellaneous metals contractor unless otherwise noted.
- .3 Woodwork, not shop primed, will be primed and back painted as per painting section immediately upon delivery to the site. Care shall be taken that all surfaces cut after priming are brush coated with an approved primer before installation.

1.12 MAINTENANCE

- .1 Provide Owner with printed instructions for "Care and Maintenance of Plastic Laminate" and millwork finishes.

1.13 WARRANTY

- .1 Warranty all workmanship against manufacturing defects, including warpage or delamination, for a period of five (5) years from date of Substantial Completion. Make good or replace work showing defects in this period, as requested, at no expense to the Owner.

2 PRODUCTS

2.1 MATERIALS

- .1 Finishing Work: Materials used for finish work shall be sound, free from defects that would mar finished appearance, well-seasoned and air dried and of good quality for intended purposes. Wood laminates pressure bonded.
- .2 Plywoods:
 - .1 Select Plain Sliced Maple architectural Grade 'A' No. 1 Face grade; as in compliance with C.S.A. 0115-M1982 with a minimum 5 ply plywood veneer waterproof core, laminated with waterproof adhesive. Plywood shall be good both sides except where concealed by construction. Exposed faces to be natural grade per AWMAC. Interior of doors to be classified as exposed. Provide marine grade plywood with all plastic laminate child care sink cabinets.
 - .2 Melamine Faced Particleboard: to CAN3-0.188.1-M78, grade "H" particleboard sanded faces, ½ in., 5/8 in., ¾ in., 1-1/8 in. and 1¼ in. thickness, faced with laminated plastic. Melamine resin impregnated cover sheet with coloured and/or patterned paper inner layer. Melamine shall be thermally fused to rigid particle board substrate. Melamine faces shall be 120 Gram Weight Paper. Colour to be Hardrock Maple or as noted on the Drawings. Maximum of six colours/patterns to be chosen by Consultant from manufacturer's full range. Alternate colours will be chosen in feature areas of the school, such as the office and the library.
 - (1) Acceptable Material: Flakeboard, Uniboard or approved equal. Final colour by Architect at Shop Drawing submission.
 - .3 Particleboard: CSA-0118-1975 Type 11, Grade R, minimum 690 K8/m³, 4.5 to 8% moisture content.
- .3 Hardwood: shall be selected Soft Maple, Hard, all shall be Architectural Grade (knots will not be accepted). It shall be selected for colours and graining when used for stain work. Sizes and thicknesses as shown on drawings.
- .4 Wood Edging: 1/4" hardwood to match plywood unless indicated otherwise (if maple, use hard maple).
- .5 Melamine Faced Particle Board Edge Banding: solid polyvinylchloride (PVC), 3 mm thickness x full width of board, wood core, wood grain type to match melamine face by Canada Wood tape or approved colour equal. Edging rigid PVC with a measured degree of hardness of "95 shore D" and thickness of "1/8 in. (+0.15 mm, -0.2 mm)" with the primer side having a concave measuring 0.10 to 0.25 mm.
 - .1 Edging adhesive: Ethylene vinylacetate thermalset adhesive with a temperature resistance of not less than 100 degrees C; A Processing range of 190 degrees - 200 degrees C and natural in colour.
 - .2 Edging is to be applied using only equipment designed for the application of thick PVC in strict accordance with the specifications of both the thick PVC and hot-melt adhesive manufacturers. All edges and all corners of this 1/8 in. PVC edge banding are to be machined to a 1/8 in. radius for all cabinet parts.
 - .3 Care should be taken during application to achieve the thinnest glue line consistent with a good bond without causing skips or un-spread areas. Final colour by Architect.

- .6 Plywood Concealed by Construction: Douglas Fir plywood shall be veneer core, waterproof, bonded, sanded, complying with CSA 0121-M1978. Solid grade where concealed by construction.
- .7 Concealed Framing Lumber: N.L.G.A.C. select eastern white pine, kiln dried to a 5% moisture content.
- .8 Unexposed Plywood for Framing: Waterproof fir plywood minimum 1/2" thickness unless indicated otherwise.
- .9 Adhesive:
 - .1 Waterproof synthetic resinous glue of approved general type conforming to CSA 0112.
 - .2 For plastic laminate - as recommended by plastic laminate manufacturer and to conform to CSA 0120-M1978.
 - .3 Approved waterproof type.
- .10 Plastic Laminate:
 - .1 Laminated Plastic for Flatwork: .050" thick decorative, melamine surfaced, high pressure laminated plastic sheeting in suede finish to conform to CAN3-A172-M1979 Grade G.P., Type 1. Manufacturer shall thoroughly sand back of sheet to form a homogeneous bonding surface. Plastic laminates shall be as manufactured by Arborite, Formica, Wilsonart or Nevamar. Backing sheet .020" thick, sanded one side. Products may be selected based upon manufacturer's full standard range of colours and patterns.
 - .2 Laminated plastic for post-forming work and preforming work: to CAN3-A172-M79 Grade P.F., Type 3, .050" thick, based on standard colours with suede finishes as selected by Architect. The colour will be non-stock.
 - .3 Plastic Laminate casework to be Formica, or equal unless otherwise indicated. Final colour to be selected by Consultant.
- .11 Nails and Staples: to CSA Bill-1974. Use spiral threaded nails and barbed staples.
- .12 Shelves: adjustable shelves longer than 38 in. and fixed shelves without centre supports longer than 38 in. to be 28.6 mm thick wood veneer plywood or melamine faced particleboard as detailed. Shelves shorter than lengths specified above are to be 3/4 in. thick wood veneer plywood core and melamine faced particleboard for alternate price items. Front edges of adjustable shelves to be edge-banded. Front edges of fixed shelves to edge banded, rear edge to be secured to cabinet back panel.
- .13 Glazing: Doors 6 mm tempered clear glazing.
- .14 Aluminum Angles: 2 in. x 2 in. x 1/8 in. aluminum angles for vertical corners at mobile storage units.
- .15 Exposed Fasteners: All millwork units secured to walls shall be secured with Tapcon screws and cup washers. All specialty fasteners such as acorn head bolts shall be supplied and installed by this section. Submit samples for Architect's approval. 'D' profile.
- .16 Countertops: to be plastic laminate postformed on particleboard or marine grade plywood with hardwood edge at counters with sinks or as noted on the drawings.
 - .1 Adhesives: to CSA 0112.5M, waterproof type.

- .2 Countertops are to have no open seams. Joints, where unavoidable in bench tops to be over a gable. Shop drawings shall identify location of all proposed seams. Consultant may modify location to suit design or function.
- .3 Coordinate with Mechanical subtrade for installation of sinks and gas outlets in new countertops.
- .4 Countertops to be quartz/engineered stone where shown on drawings. Countertops to have straight edge profile.
- .17 Stainless Steel: 16 gauge type 304 stainless steel where shown on drawings. Countertops to have finished edge. Provide sound deadening coating to underside of counters.
- .18 Windowsills: To be plastic laminate on veneer cove waterproof plywood or as noted on drawings.
- .19 Pencil grilles (linear bar grilles):
 - .1 Heavy duty, aluminum, linear bar grille
 - .2 3-½" inches wide, x 75 percent of length of countertops where millwork conceals perimeter radiant piping. (refer to Mechanical and Architectural drawings)
 - .3 Distributed by Price Industries
 - .4 Or approved equal
- .20 Backer standard: to be .028 thick. Panels shown to have backer panel shall be balanced with 0.5 mm (0.030) backing sheet manufactured by the same manufacture as the facing sheet. Core CSA 0115-M1982 (G/SO) or CSA0121-M1978 Grade "B" or CAN3-0188.1-M78, Grade R.

2.2 HARDWARE

- .1 The cabinet work manufacturer shall furnish and install cabinet hardware. Finish of hardware shall be used US32D or US28 depending on base material. Hardware shall be manufactured as follows or approved equal:
 - .1 Pulls - door and drawer, Canadian Building Hardware CBH 255 x C26D.
 - .2 Hinges - Blum Model 170BL91-653 with Blum mounting plate BL175.810 or approved equal or specified other on Drawings or Hafela Aximat hinges self-closing 270 degree if noted on Drawings.
 - .3 Cabinet locks door and drawer - National #C8053-5, Schlage CL 1000, or approved equal. Locks to be capped in stainless steel. All cupboard doors in a room to be keyed the same. Each room to be keyed different. Provide six (6) master keys for cupboard locks. Teacher's cabinets (cylinder lock to be supplied by Hardware Section – 08 70 00 and installed by this Section. All other hardware associated with Teacher closets locks are supplied and installed by this Section.
 - .4 Shelf support - Richelieu - # 5834-180 for 1¼ in. spaced holes in all gables or recessed pilaster strips see Drawings complete with neoprene sleeves typical all shelf supports.
 - .5 Door Bumper - Richelieu # AMP5312-11.
 - .6 Elbow Catch - Richelieu # BP3675-2G.
 - .7 Toe Kick and Counter Vent - Richelieu # 191180.

- .8 Drawer slides - Blum Metabox 320M integrated runner system using epoxy steel carcasses, adjustable front fixing brackets and ½ in. melamine with 1/8 in. PVC on all exposed edges for bottoms and back panels. Install screws to all pre-drilled holes. Use deepest Metabox possible for space available or approved equal.
 - (1) See Drawings for other slides called for specific locations.
- .9 Rough Hardware - Nails, screws, bolts, lag screws, anchors, special fastening devices and supports required for erection of carpentry components. Use galvanized components if exposed to exterior atmosphere. Galvanize in accordance with the requirements of CSAG164-M1981.
 - (1) Install all hardware to manufacturer specifications.
- .10 Glass Sliding Doors: Glass sliding doors to be 6mm tempered complete with track from Richelieu, lock in track and ground in finger pulls 12mm x 64mm. Glass shelves to be 6mm tempered.
- .11 Finishes
 - (1) Melamine Composite Panels simulated Hardrock Maple or as noted on the Drawings.
 - (2) Edge Banding: simulated Hardrock Maple grain or as noted on the Drawings.
- .12 Display Case Shelf Brackets and Standards:
 - (1) Brackets: Knappe & Vogt 187 Series length as shown on Drawings to suit glass shelf width.
 - (2) Standards: Knappe & Vogt Series 87.
- .13 Computer Grommets: Standard recessed 3" diameter. Colour as selected by Architect.
- .14 Slide Bolts: Gallery 73 - 3" or approved equal.
- .15 Casters from Colson in Cambridge - lockable model 22.04156.445, non-lockable model 2.04056.445.
- .16 Closet rod: Metal rod chrome 1 in. diameter #122.108.140 and matching flanges #8332-140 by Richelieu
- .17 Coat Hooks: Henkel Hook from Henkel Diversified Inc. (519-641-5872). Supply and install Henkel Hook for all Teachers closets (AW 329 – AW 331). To be made of high strength polycarbonate. Release weight to be 26 lb. Colour to be Honey Beige.

2.3 FABRICATION

- .1 Fitments shall be machined, assembled in mill where possible and delivered to job in units. Construct in accordance with details using first class cabinet construction with joints dowelled, glued and properly fastened. Machine all surfaces of finished woodwork to an even smooth surface; fit all joints and miters accurately. Frame materials with tight joints held in place,
 - .1 Conceal joints and connections where possible. Joints made on site shall be equal in quality of work to joints made in the shop.
 - .2 Check job dimensions and conditions and notify the Consultant in writing of unacceptable conditions. Design construction methods for expansion. Do not proceed until remedial instructions are received.

- .3 Deliver work to the job ready for installation. Leave ample allowance for fitting and scribing on the job. Shop assemble work for delivery to site in size easily handled and to ensure passage through building openings, Design units to fit together if site assembly is required.
- .4 Fabricate work square and to the required lines. Recess and conceal fasteners and anchor heads. Fill with matching wood plugs.
- .5 Comply with glue manufacturer's recommendations for lumber moisture content, glue life, pot life, working life, mixing spreading, assembly time, time under pressure and ambient temperature.
- .6 The interior of counters, cupboards, shelving units, desks, shall be considered "exposed". Finish all exposed edges with 1/8 in. thick PVC edge banding material, applied by an Edge-Bander using Hot Melt adhesive. Colour to match the melamine. Radius all exposed edges and corners (PVC edging or Wood edging). Counter tops which are to receive plastic laminate coverings may be 3/4" (19 mm) thick sanded veneer core plywood where specified. Particle core shall be used for shelving and gables, countertops specifically called for as solid material or as otherwise specified. Include all filler strips and to match the face colour.
- .7 Refer to Drawings and Architectural Detail sheets for location, details, number of units required and location of fittings.
- .8 Interior fitments shall be complete in every respect with special fittings required and hardware.
- .9 Provide exposed end grain of solid members and edges of exposed plywood with matching solid hardwood edging at least 1/4" thick and thicker where specified. At melamine faced particle board provide 1/8 in. PVC edging complete with 1/8 in. radius on all exposed edges and corners as per millwork sections. Edging to melamine faced particle board shall be applied with an Edge-Bander using hot melt adhesive.
- .10 Make all necessary cut-outs in the furniture for sinks, gas cocks, appliances, and electrical switch and outlet boxes and pre-drill all mounting holes for faucets, fittings, and outlet boxes. Refer to electrical and mechanical drawings and specifications.
- .11 Provide and install pipe covers, scribing pieces, top, bottom and/or closures and filler panels where necessary, including wherever units require furring out or blocking to existing conduits, pipes, etc.
- .12 Service cover panels to be provided at all kneehole drawer units, kneehole front rails and knee drawer table assemblies. End closing panels to be provided at all exposed ends of service strips and island/peninsula assemblies. Front filler panels to be provided where called for on Drawings and as required by field conditions.
- .13 Telephone and electrical receptacles and wiring are specified under Electrical Division. Co-ordinate work of this trade, make provision to accommodate this work and cut tops for and provide wood bearers for support.
- .14 Cooperate with others engaged in work on the building to the end that proper unity of action will assure the orderly progress of the work. Do necessary boxing and protecting of sills, jambs, and the like. Construct scaffold, ramps, and other temporary staging necessary.
- .15 Provide 3/4" plywood adjustable or fixed shelving where detailed. Maximum unsupported span for shelving shall be 3'-0". Fixed shelves shall be dowelled into gables and divisions. Where shelves are set on clips only, gables shall be drilled 1 1/4 in. OC for total height of gables.

- .16 The plywood used in interior fitments throughout regardless of whether for paint or stain finish, shall have exposed edges edged with solid strips 1/4" wide, unless noted otherwise by full thickness of plywood. No exposed edges of plywood will be permitted. Strips shall be glued and accurately fixed to edges. Adjustable shelves shall have strips applied to front edge.
 - .17 Exposed framing members and trim shall be solid hard maple or birch.
 - .18 Plastic laminate coverings to fitments, cupboards and counters shall be in colours selected by Architect and applied in accordance with manufacturer's directions. Where plastic laminate occurs, exposed edges and edges around cut-outs such as sinks shall be edged in the same material. Seal remaining exposed edges of surfaces with heavy Kraft paper prior to shipment. Paper shall not be removed until final cleaning. When cutting holes in plastic laminate work, corners shall be rounded and filed smooth.
 - .19 When cutting holes in plastic laminate work, corners shall be rounded and filed smooth.
 - .20 Protection erected by this trade shall be removed, damage to this work and adjoining work due to the lack or failure of such protection, made good and debris, surplus materials, plant, and equipment removed and premises and the whole left clean and tidy to Architect's satisfaction.
 - .21 Melamine on all surfaces unless noted otherwise.
 - .22 Fabricate all plywood and melamine faced particle board backs, gables, and bottoms of millwork units together by means of 3/8 in. x 1 in. hardwood dowels or with hardwood biscuits. All backs to be 1/2" stock. Dowel all panel cabinet components using 1/4 in. x 1 in. hardwood dowels or biscuits at maximum 4" OC. All drawer bottoms and backs are 1/2" stock or greater. All exposed edges on all melamine faced particle board units to be edged with solid 1/8 in. PVC c/w 1/8 in. radius edges and corners including drawer parts and with 1/4" matching hardwood edge banding at Maple and Birch units. Kick material for normal application shall be 3/4" waterproof spruce/fir plywood to be used. Resilient base by Section 09 65 00 and quarry tile base by Section 09 30 00.
- .2 Cupboard Doors
- .1 Doors shall be 3/4" thick particle core veneer plywood. Doors shall be flush, slab type, accurately fitted, free of warp and twist. Care must be taken in sawing and assembling so that there is no splintering of finish face. Splintered doors that mar the appearance will be rejected by the Architect.
 - (1) Where melamine is specified; construct doors of 3/4" particle core with melamine good - two sides.
 - .2 Provide two door silencers/bumpers per panel mechanically fastened to the cabinet frames.
- .3 Drawers
- .1 Fabricate Blum Metabox drawer bottom and backs with 5/8 in. melamine composite panel.
 - .2 Where melamine is specified: drawer fronts to be 3/4" particle core with melamine, good two (2) sides.
 - .3 Extend all backs in file drawers for use with hanging file hardware. Metabox units used should also allow for legal width hanging folders to run front to back and letter width side to side where space permits.

- .4 Fronts to match cupboard doors finish.
- .5 Provide two drawer silencers/bumpers per drawer panel mechanically fastened to the cabinet frame.
- .4 Counters, Cupboards, Shelving, Circulation Desk etc.
 - .1 Adjustable shelves c/w clips and drilled holes at 1¼ in. centers. Base cabinet's c/w one (1) shelf, wall cabinet's c/w two (2) shelves, and tall cabinet's c/w five (5) shelves, the center shelf is fixed unless drawings show otherwise.
 - .2 Factory installs all hardware firmly into position for long life under hard use. Install two (2) hinges on doors up to 3 feet in height, three (3) hinges to 1½ feet in height and four (4) hinges for doors greater than 1½ feet in height or shown otherwise.
 - (1) Frame as detailed with ¾" thick, or as noted otherwise, plywood gables, tops and bottoms. House intermediate dividers and plywood backs, into gables and top and bottom shelves, for all fitments. Plywood shall be birch or oak as called for in this Section unless otherwise indicated. Cabinet backs to be 1/2" plywood.
 - (2) Where melamine specified: horizontal and vertical gables; and shelving to be ¾" particle core with melamine, good two sides. Cabinet backs to be 1/2" particle core with melamine, good one side.
 - (3) Fabricate cabinet carcass: The 1¼ in. system from ¾ in. thick melamine composite panel using flush frameless construction and exposed edges, to AWMAC Standard "Custom grade" c/w 1/8 in. thick PVC edge banding on exposed edges. All exposed edge banding c/w 1/8 in. radiuses edges and corners.
 - (4) Do not exceed 32 in. maximum width of cabinet without a divider or specified otherwise.
 - (5) Carcass construction: Backs 5/8 in., bottoms, rails, doors, drawer fronts ¾ in. of melamine composite panels, assembled with glued hardwood dowels 3/8 in. x 1¼ in. or wafers.
 - .3 Cut countertops for sinks and provide bearers. Provide splash-back at back of sink for entire length of the unit and at return ends where walls or other vertical surface occur within 24 in. of sink or other wet location.
 - .4 Countertop and splash-back will be plastic laminate unless noted otherwise. Stainless steel to be provided at Child Care kitchen. Engineered stone (quartz) where noted on drawings.
 - .5 Provide removable plywood access panels, screwed in place, where necessary for access to concealed wiring.
 - .6 Fit trim and scribe molds to fitments as shown and as required to hide voids at walls, partitions and ceilings.
 - .7 Provide cut-outs for inserts, outlets, grilles, appliances, etc. occurring in fitments.
 - .8 Bottom of units blocked up to form a 4" high x 3" deep toe space and fabricated from 19mm waterproof veneer core plywood of fir or spruce.
 - .9 Fit fillers between fitments, of same material as fitments, where necessary to fill voids between fitments and walls.
 - .10 Lighting fixtures and outlets to be supplied and installed under Division 26.
 - .11 Provide cut-outs and access panels where required for Mechanical Divisions and covers over ductwork (stove exhaust fans) or piping that run exposed above counters and upper shelves.

.12 Provide extended top, bottom, and exposed gables where furring out of upper cupboards is required due to pipes, conduits, and the like behind to provide a flush face at walls.

.13 Plastic Laminate Work:

- (1) Comply with CAN3-A172-M79, Appendix "A".
- (2) Veneer laminated plastic to core material in accordance with adhesive manufacturer's instructions. Ensure core and laminate profiles coincide to provide continuous support and bond over entire surface. Provide cores of not less than 3/4" nominal thickness solid face Douglas Fir.
- (3) Form shaped profiles and bends as indicated, using post-forming grade laminate to laminate manufacturer's instructions.
- (4) Use straight self-edging laminate strip .062" thick for flatwork to cover exposed edge of core material. Chamfer exposed edges uniformly at approximately 20 degrees. Do not mitre laminate edges. Curved self-edging shall be post-formed material or bending grade.
- (5) Apply laminate backing sheet to reverse side of core of plastic laminate work where specified. Provide backing sheet of sufficient thickness to compensate for stresses caused by the facing sheet.
- (6) Locate joints where indicated, where not indicated at approximately 8'-0" or 12'-0" centres also include joints at corners, and changes in superficial area.
- (7) Accurately fit decorative laminate together to provide tight, flush, butt joints. Joints in cored panels shall be made with 1/4" blind splines and draw bolts, one draw bolt for widths up to 6", two or more draw bolts at maximum 18" OC for widths exceeding 6".
- (8) Keep joints min. 2'-0" from sink cut-outs.
- (9) Seal the core at joints and exposed edges with sealer.
- (10) Countertops apply Tremco Tremsil 200 silicone sealant at junction of plastic laminate or phenolic tops when tops are joined. All joints to be over a gable or supported otherwise.
- (11) Use draw bolts in counter top joints.
- (12) Apply a small bead of mildew-resistant paintable silicone sealant at junction of plastic laminate counter back and adjacent wall finish.

3 EXECUTION

3.1 EXAMINATION

.1 Preparation and Protection.

.1 Protect work of other trades from damage.

.2 Make Good any resulting damage, to the satisfaction of the Consultant, at no additional cost to the owner.

3.2 WORKMANSHIP

- .1 Fabricate and install work in accordance with the best practice. Finished work shall be free from drag, feathers, slivers or roughness of any kind. Remove machine marks by sanding. Give finished work smooth surfaces, ready for painting or varnish application.
- .2 Mortise and tenon joints shall be glued and pinned. All panels shall be secured together with specified glued and dowelled method. Glue blind screw all fabricated component work unless otherwise specified. Set surface nails and plug countersunk screws with matching wood plugs. Use screws with cap washers where units with doors are secured to walls behind.

- .3 Finished woodwork shall be free from bruises, blemishes, mineral marks, knots, shakes and other defects.
- .4 All metal items such as grilles, tracks, supports, legs, brackets, etc. supplied by other trades shall be built into fitments, panelling, wood doors, etc., in strict accordance with directions of trades supplying such.
- .5 Furnish rough hardware, nails, expansion shields, screws, brackets and incidentals required to assemble and install the fitments in their proper locations.
- .6 Fit small scribe moulds or fillers of same materials as fitment to hide or fill voids at walls, partitions ceilings, furrings, exposed tops of millwork units, at base locations where rubber base occurs.
- .7 Plywood Edging: all exposed 3/4" plywood edges shall be covered with glued on 1/4" thick hardwood strips.

3.3 MILLWORK WORKMANSHIP

- .1 Fitments shall have joints dowelled and all joints shall be glued and nailed or screwed. All cabinet bases shall be of 3/4" plywood, blocked 3'-0" OC maximum and at corners.
- .2 Countertops shall have splash backs where sinks occur.
- .3 Shelving shall be 3/4" plywood, adjustable or fixed as detailed. Maximum unsupported span for shelving shall be 3'-0". Adjustable shelves shall be set on angle clips or metal pilaster strips. Loose shelves shall have PVC edges on front edge.
- .4 Laminates shall be pressure bonded to back-up board. Countertops shall be self-edged and have plastic laminate covered back splash. Back-up material for counter tops shall be particle core unless otherwise noted.
- .5 Plastic laminate surface shall be level, without bubbles and core ghosting. Core edges in counter cut-outs shall be sealed with asphalt compound. All exposed plastic edges shall be matched and sanded.

3.4 INSTALLATION

- .1 Welded bench brackets to be supplied and installed by others. Installation of wood work to the bench brackets to be completed by this Section.
- .2 Commencement of work implies total acceptance of surface and site conditions.
- .3 Set and secure all materials and components in place, rigid plumb and square.
- .4 Provide all furring strips and strapping required fixing millwork and casework to walls, etc. Provide all filler strips to seal any openings or joints at adjacent surfaces.
- .5 After installation, fit and adjust operating hardware to align all doors and drawers.
- .6 Clean up as the work proceeds and upon completion remove all rubbish and surplus materials resulting from the foregoing work.

.7 Plumbing.

.1 Sink installation.

- (1) Cut hole, clean the counter top with alcohol.
- (2) Use Tremco, Tremsil #200 a silicone sealant that gives protection against fungi and bacteria.
- (3) Install Tremsil around the cuts, and then place a bead of Tremsil on the top before installing the sink.
- (4) Millwork Contractor to make sure the Plumber installs as specified.

.2 Installation and assembly work on the job shall be executed by skilled forces under supervision of a competent joinery foreman.

.3 Furnish rough hardware, nails, expansion shields, screws, brackets and incidentals required to assemble and install fitments in proper locations. Units shall be adequately fastened and secured in place with concealed fixings wherever possible. Include grounds and furring where required.

.4 Fitments shall be installed level, plumb and true and complete in all respects.

.5 Provide smooth surfaces with fastenings sunk and filled over to receive stain and sealer.

.6 Use draw bolts in countertop joints.

.7 At junction of plastic laminate counter, back splash and adjacent wall finish, apply small bead of silicone sealant as per Section 07 92 00 in colour as selected by Architect.

.8 Apply water resistant building paper over wood framing members in contact with masonry or cementitious construction.

3.5 HARDWARE INSTALLATION

- .1 Locate concealed European style hinges in accordance with manufacturer of hinge and with best standard practice. Set knobs, locks, and cylinders square with doors and escutcheons plumb. Apply accurately and neatly, to operate quietly and smoothly. Knobs shall turn easily, bolts slide freely and smoothly.
- .2 All cupboard doors and drawer locks except as noted below shall be keyed alike in each room unless otherwise stated. All such keys shall be labelled as to their lock location and shall be turned over to the Owner. All locks, slide bolts, etc. shall be supplied with the appropriate strikes and screws. Provide slide bolts at all locked pair of doors on interior side of door leaf without lock.

NOTE: No locks on doors below sink units.

- .3 All pilaster strips, where specified, shall be recess mounted and installed with the numbers on the pilaster at equal heights.
- .4 At completion of the work, moving parts shall be gone over, made to work easily, smoothly and efficiently. Work carefully cleaned down and left in complete and finished condition satisfactory to Architect.

3.6 RESILIENT BASE

- .1 Supply and installation of resilient base or quarry tile base at millwork to match adjacent flooring installation by Section 09 65 00.

END OF SECTION

1 GENERAL

1.1 INSTRUCTIONS

- .1 Comply with the Instructions to Bidders, the General Conditions of the Contract, the Supplementary Conditions and the General Requirements of Division 01.
- .2 Report in writing to the General Contractor any defects of surfaces or work prepared by other Sections which affect the quality or dimensions of the Work. Commencement of work implies acceptance of existing conditions and work by others.

1.2 SECTION INCLUDES

- .1 Cold Applied Built-up bituminous roofing system.

1.3 RELATED SECTIONS

- .1 Section 06 10 00 - Rough Carpentry: cants, blocking and curbs.
- .2 Section 07 62 00 - Sheet Metal Flashing and Trim.
- .3 Division 22 – Plumbing

1.4 REFERENCES

- .1 ASTM C931/931M-01: Standard Specification for Exterior Gypsum Soffit Board.
- .2 ASTM D4601-98: Standard Specification for Asphalt-Coated Glass Fibre Base Sheet Used In Roofing.
- .3 CSA A123.4 M1979: Bitumen for Use in Construction of Built Up Roof Coverings and Dampproofing and Waterproofing Systems.
- .4 CGSB 37 GP 9Ma: Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing.
- .5 CGSB 37-GP-52M: Roofing and Waterproofing Membrane, Sheet Applied, Elastomeric.
- .6 CAN/CGSB 51.33 M89: Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction.
- .7 CAN/ULC-S704-2001: Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
- .8 CAN/ULC-S706-02: Standard for Wood Fibre Thermal Insulation for Buildings.

1.5 PERFORMANCE REQUIREMENTS

- .1 Install at specified Roof Area; - Cold Process Built Up Roof System Gravelled
 - .1 Prime any new metal or wood components using Tremprime WB that are to receive asphaltic materials.
 - .2 Install self-adhering AVC membrane and associated primer over existing deck.
 - .3 Install 1 layer of Polyisocyanurate into Low Rise Foam Insulation Adhesive. Contractor is to verify existing insulation thickness and are to match.
 - .4 Install Cover Board 0.5" Asphalt Coated Fiberboard into Low Rise Foam Insulation Adhesive.

- .5 A built up roof membrane – 3 Ply Cold Process
- .6 Install Roofing Membrane as follows:
 - (1) Plies: Three
 - (2) Ply Type: Composite Felt, Three plies.
 - (3) Interply Adhesive: Burmastic Cold Process Adhesive
- .7 Surfacing: 3/8" Clean round pea gravel, free of all fines, splinters etc. into Cold Process Flood Coat.
- .2 Specified Flashings and accessories: Install flashings at all roof perimeters, projections, and drains incorporating:
 - .1 Reinforced EPDM/SBR Rubber sheet adhered with Elastomeric Bedding Adhesive as per detail drawings.
 - .2 Provide Products that are compatible with one another under field conditions, as demonstrated by roofing manufacturer.
 - .3 Provide watertight roofing system capable of resisting specified uplift pressures, thermally induced movement and exposure to weather without failing during the specified warranty period.

1.6 CERTIFICATES

- .1 Manufacturer Certificates: Signed by roofing manufacturer verifying that installer is approved, authorized or licensed by manufacturer to install specified Products.
- .2 Vendor Approved Contractors are as follows:
 - Atlas Apex Roofing (Kitchener) Inc – (519)894-4422
 - D. Thackeray Roofing Company Ltd – (519)745-7386
 - Flynn Canada Ltd (Cambridge) – (519)624-8797
 - Lafleche Roofing Services (800)387-1549
 - Nedlaw Roofing Ltd – (519)648-2218
 - Schreiber Brothers Ltd – (905)561-7780
 - Semple Gooder Roofing Ltd – (519)623-3300
 - Spinton Roofing Ltd – (905)575-3686
 - Triumph Roofing & Sheet Metal Inc – (416)534-8877
 - Wm. Green Roofing Ltd – (519)822-6414
- .3 Installer Certificates: Signed by installer verifying that they have the specified qualifications described below.

1.7 TEST REPORTS

- .1 Manufacturer Field Inspection Reports: manufacturer's written acceptance of roofing installation based on daily inspections.

1.8 QUALITY ASSURANCE

- .1 Manufacturer: qualified manufacturer having roofing systems listed by UL and approved for use by Factory Mutual.
- .2 Installer: a company and persons specializing in the application of protected elastomeric roofing, with documented experience and approved to apply roofing system by manufacturer.
- .3 Conform to CRCA Roofing Specifications and roofing membrane manufacturer's instructions.

1.9 PRE-INSTALLATION MEETINGS

- .1 Conduct pre-installation meeting.
- .2 Meeting: prior to commencement of deck installation, review and document methods and procedures related to roof deck and roofing system construction, including the following:
 - .1 Participants: authorized representatives of the General Contractor, Consultant, Owner, Roofing Subcontractor, Roofing Manufacturer, and installers of roof accessories and roof-mounted equipment.
 - .2 Review methods and procedures related to roofing installation, including manufacturer's written installation instructions.
 - .3 Review construction schedule and confirm availability of Products, Subcontractor personnel, equipment and facilities.
 - .4 Review deck installation criteria and finishes for conformance with roofing system criteria, including issues of flatness and fastening.
 - .5 Review structural loading conditions and limitations of roof deck both during and after roofing application.
 - .6 Review flashing details, special roofing details, roof drainage, roof penetrations, equipment curbs, and other conditions affecting roofing installation.
 - .7 Review governing regulatory requirements, and requirements for insurance and certificates as applicable.
 - .8 Review safety requirements, including temporary fall-arrest measures.
 - .9 Review field quality control procedures.

1.10 DELIVERY, STORAGE AND HANDLING

- .1 Deliver and store Products undamaged in original containers with manufacturer's labels and seals intact.
- .2 Store Products in designated areas elevated off the ground and protected from ultra-violet radiation, inclement weather and construction activities.
- .3 Store solvent-based liquids away from excessive heat and open flame.
- .4 Store adhesives and sealants at temperature above -5 degrees Celsius.
- .5 Store membrane rolls on end, dry, and protected from moisture and damage. Cover rolls, insulation and other moisture-sensitive Products with tarpaulins.

- .6 Store Products on roof deck in a manner to prevent overloading the structure and properly secured to prevent movement due to wind or other forces

1.11 SITE CONDITIONS

- .1 Protect adjacent properties from damage as a result of contract operations.
- .2 Protect the Work and the Owner's property from damage as a result of contract operations.
- .3 Confine equipment, material storage, and operations of workers to limits indicated by laws, ordinances, permits, and prior arrangements with the Owner.
- .4 Do not interrupt or hamper occupant operations without prior written approval.
- .5 Remove progressively all debris created by the execution of the Work and dispose of same at appropriate disposal sites.
- .6 Alert the General Contractor to the expected presence of odours, fumes, or dust and co-ordinate the shielding of ventilation equipment or scheduling of process to achieve acceptable abatement.
- .7 Upon completion of the work, leave premises in original order and condition.

1.12 ENVIRONMENTAL REQUIREMENTS

- .1 Do not install roofing during weather that might adversely affect the performance of the system.
- .2 Do not install roofing over surfaces that are wet, icy, dirty or otherwise unacceptable to the system being installed.
- .3 Secure the Work in a safe and watertight fashion before the onset of inclement weather and at the end of each day's work.

1.13 WARRANTY

- .1 Submit warranties in accordance with the General Conditions of the Contract.
- .2 Installer's Warranty: standard 2 year warranty, commencing from the date of Substantial Performance of the Work.

2 PRODUCTS

2.1 PRODUCTS

- .1 All primers, adhesives, sealants (including hardener), joint filler, grout, epoxy, sealers, and finishes applied on site and within weather barrier shall meet environmental requirements for low emitting materials.

2.2 MANUFACTURERS

- .1 Manufacturers of cold-applied built-up asphalt roofing systems having Products considered acceptable for use as per Tender 6862-KP-18:
 - .1 Tremco Canada.

2.3 MATERIALS

- .1 Primer:

- .1 Tremprime WB by Tremco.
- .2 Insulation: To match existing and confirmed by contractor.
 - (1) Insulation 1 layer of Polyisocyanurate Insulation
 - (2) Overlay Insulation – 0.5" Asphalt Coated Fiberboard
- .2 Insulation Adhesive:
 - .1 Low Rise Foam Insulation Adhesive by Tremco.
- .3 Vapour Retarder
 - .1 AVC Membrane and Primer.
- .4 Flashing Membrane
 - .1 TRA membrane
- .5 Cold Applied BUR. Burmastic by Tremco
 - .1 Three Ply Composite Ply HT Felt
- .6 Reinforcing Membrane:
 - .1 Burmesh by Tremco.
- .7 Ballast:
 - .1 3/8" Pea Gravel free of fines and long splinters.

2.4 ACCESSORIES

- .1 Stack Flashings: Prefabricated aluminum sleeves as manufactured by Thaler Metal Industries or equivalent.
- .2 Drains: Prefabricated drains as manufactured by Altra Metal Specialties – Mode ABD-CR-X-SS: Aluminum Body Roof Drain complete with clamping ring.
- .3 Metal Flashings and Coping
 - .1 Metal counter flashings and caps shall be 26 gauge, G90 galvanized Grade A steel conforming to ASTM A525. Finish to be Stelco 8000 series and colour to be as selected by the Board. Obtain written confirmation of colour prior to ordering.
 - .2 Two-piece gooseneck flashings are to be installed around all electrical projections.
- .4 Sealant
 - .1 One-part polyurethane – approved product and manufacturer – Dymonic by Tremco.

2.5 SHOP FINISHING

- .1 Galvanizing: to ASTM A653/A653M, zinc coating, hot dip process, minimum G90 coating.

- .2 Shop Painted Finish: baked ceramic pigmentation coating, applied to a minimum 1 mil dry film thickness and having a specular gloss of 30 (plus or minus 5) gloss units when measured with a Gardner 60 degree gloss meter; eg. Colorite HMP by Valspar, colour as selected by Consultant from standard range of colours.

3 EXECUTION

3.1 PREPARATION – ROOF AREAS AS PER DRAWINGS

- .1 Examine all drains and report any plugged drains to the Inspector. Any drains not reported and found plugged at the end of the contract will be deemed the responsibility of the contractor. Use temporary plugs during roof removal operations and remove before the end of each working day or when rain is imminent.
- .2 Remove existing roofing, insulation and vapour retarder to allow for installation of new roof curbs.
- .3 Verify acceptability of deck, projections, curbs, parapets, walls and other constructions as these pertain to the roofing work and its expected performance.
- .4 Correct any deficiencies in these constructions or advise General Contractor of conditions believed to be beyond the Scope of Work.
- .5 Fill and pack all joints, cracks, seams, and openings in the deck and its appurtenances to prevent air leakage from the building interior.

3.2 ROOF DECK

- .1 Deck reattachment:
 - .1 Mechanically reattach loose sections of deck to steel or wood support members according to existing fastening pattern.
- .2 Deck replacement:
 - .1 Remove defective decking. Examine supports. If unsound, contact General Contractor immediately for future action.
 - .2 Install new decking in accordance with appropriate building regulations and CSSBI, (Canadian Sheet Steel Building Institute).
- .3 Deck protection (Metal):
 - .1 Remove loose flaking rust, down to clean, dust free, sound metal surface.
 - .2 Apply one coat of rust inhibitive paint over prepared surface at the rate of 6 m²/litre (250 ft²/gal).

3.3 AIR BARRIER

- .1 Apply primer and install on to substrate, overlapping side and end laps in conformance with manufacturer's written recommendations. Begin work at bottom of slopes, unroll and align on substrate. Ensure all edges are supported.
- .2 Remove release sheet and adhere membrane, working in sections to avoid wrinkles in membrane.
- .3 Seal membrane at insulation perimeters and around penetrations to ensure sealed connections with base sheet at upstands.
- .4 Sprayed in Place Foam:

- .1 Fill all cavities and joints with foam according to manufacturer's directions.

3.4 VAPOUR RETARDER

- .1 Self-Adhering Membrane
 - .1 Apply primer and install on to substrate, overlapping side and end laps in conformance with manufacturer's written recommendations. Begin work at bottom of slopes, unroll and align on substrate. Ensure all edges are supported.
 - .2 Remove release sheet and adhere membrane, working in sections to avoid wrinkles in membrane.
 - .3 Seal membrane at insulation perimeters and around penetrations to ensure sealed connections with base sheet at upstands.

3.5 INSULATION

- .1 NB: Adhered with Low Rise Foam Insulation Adhesive
 - .1 Firmly butt each insulation board to surrounding boards. Do not jam or deform owners.
 - .2 Minimize elevation variation between boards at joints to provide level surface to accommodate subsequent roofing.
 - .3 Stagger joints at least 150mm (6 inches).
 - .4 Leave no voids at blocking, penetrations, walls, or parapets.
 - .5 At all drains and scuppers slope insulation for a radius of 1200 mm (48 inches) to ensure positive drainage.
 - .6 Adhere insulation into ribbons of low rise foam insulation adhesive in ½" to ¾" beads approximately 12" o.c.
 - .7 Immediately after placement, walk insulation boards into adhesive to achieve solid contact.

3.6 COLD APPLIED BUR

- .1 Three Ply – Cold
 - .1 Starting at the low point of the Roof, install three (3) plies of ply sheet, shingle fashion. Overlap starter strips 660 mm (26 inches) with first ply, then overlap each succeeding ply 625 mm (24 2/3 inches). Place ply sheets to ensure water will flow over or parallel to; but never against exposed edges.
 - .2 Embed into Cold Process Adhesive, 300, 600 and 900 mm (12, 24 and 36 inch) wide plies to start and finish roof membrane along roof edges and terminations.
 - .3 Solidly coat each ply of felt for the full width with Cold Process Adhesive. Immediately after installation, broom and/or roll ply sheet. Ensure complete and continuous seal and contact between adhesive and felts, including ends, edges and laps without wrinkles, fish mouths, or blisters.
 - .4 Extend all plies to the top edge of all cant strips and cut off evenly.
 - .5 Apply uniform and continuous pressure to exposed edge and end laps to ensure complete adhesion.

- .6 Avoid walking on plies until adhesive has set.
- .7 Overlap previous days' work 600 mm (24 inches) as required.
- .8 Cut out fishmouths/side laps which are not completely sealed and patch. Replace all sheets which are not fully and continuously bonded.
- .9 Lap ply membrane ends 150 (6 inches). Stagger end laps 1 metre (3 feet) minimum.
- .10 Adhesive application rate: Minimum 1.0 Litres/Sq. Metre (2.5 Gals per 100 Sq. ft).

3.7 TEMPORARY WATERSTOP/TIE-INS

- .1 Remove embedded gravel, dirt and debris from top ply of felt along termination for a distance of 450 mm (18 inches).
- .2 Extend roofing system at least 300 mm (12 inches) onto prepared area installing insulation fillers as required.
- .3 Seal edge with 150 mm (6 inch) wide reinforcing membrane embedded between alternate courses of temporary waterstop adhesive.
- .4 At beginning of next day's work, remove temporary connection by cutting felts evenly along edge of existing roof system and remove insulation fillers.
- .5 Temporary waterstop adhesive application rate:
 - .1 Cold 3.3 l/m² (12 ft²/gallon)

3.8 PERMANENT WATERSTOP/TIE-INS

- .1 Remove embedded gravel, dirt and debris from top ply of felt along termination for a distance of 450 mm (18 inches).
- .2 Install 450 mm (18 inch) wide ply sheet(s) from exposed deck to the existing roofing with a continuous application of permanent waterstop adhesive.
- .3 Extend roofing system beyond permanent waterstop ply sheet and at least 300 mm (12 inches) onto prepared area of adjacent roofing.
- .4 Seal leading edge of new membrane with 300 mm (12 inch) wide reinforcing membrane embedded between alternate courses of flashing adhesive.
- .5 Permanent waterstop adhesive application rate:
 - .1 Cold Adhesive 3.3 l/m² (12 ft²/gallon)

3.9 FLASHINGS

- .1 Curb Details - Elastomeric Sheeting:
 - .1 Adhere sheeting completely to horizontal and vertical blocking surfaces with flashing adhesive. Press sheeting into adhesive. Ensure complete bond and continuity without wrinkles or voids.
 - .2 Sheeting width: Sufficient to extend from 50 mm (2 inches) down inside face of curb down onto adjacent roofing 150 mm (6 inches), minimum. Mechanically fasten sheeting on inside face of curb.

- .3 Lap sheeting ends 100 mm (4 inches); and adhere with flashing adhesive.
- .4 Overcoat lap edges with end lap stripping adhesive and membrane.
- .5 Tie in leading edge of sheeting with stripping ply membrane embedded between alternate continuous courses of stripping ply adhesive.
- .2 Pitch pans:
 - .1 Apply 1.5 mm (1/16 inch) uniform layer of flashing adhesive to surface receiving metal flange.
 - .2 Install pre-manufactured pitch pan into adhesive. Prime flange prior to installation.
 - .3 Pitch pans shall be a 24-gauge galvanised steel, a minimum 100 mm (4 inches) high. There shall be at least 50 mm (2 inches) clearance between the projection and side wall.
 - .4 Adhere elastomeric sheeting completely to flashing surface with flashing adhesive. Cover flange completely. Extend flashing at least 100mm (4 inches) onto adjacent roofing. Ensure complete bond and continuity without wrinkles and voids. Lap sheeting ends 100mm (inches).
 - .5 Overcoat lap edges with end lap stripping adhesive and membrane.
 - .6 Tie in leading edge of sheeting with stripping ply membrane embedded between alternate courses of stripping ply adhesive.
 - .7 Fill pitch pan 25 mm (1 inch) from top with pitch pan base filler.
 - .8 Fill remainder with pitch pan topping mastic. The mastic shall be crowned in order to ensure water run-off.
 - .9 Install metal cap and caulk opening.
- .3 At piping through roof boxes
 - .1 Install wood blocking.
 - .2 Fabricate and install two-piece pipe box. The bottom portion shall be fabricated with 100 mm (4 inch) flange. The top section shall be notched to fit over piping. Openings shall be a minimum 200 mm (8 inches) above the roof surface.
 - .3 Set flange in mastic, nail flange to wood blocking 75 mm (3 inches) o.c. Prime flange.
 - .4 Fill box interior with batt insulation.
 - .5 Fasten top and closure detail to bottom.
 - .6 Wipe clean metal surfaces of box and piping with metal cleaner. Prime metal with metal primer. Caulk joint between box and piping. Tool neatly.
 - .7 Install elastomeric sheeting with flashing adhesive and membrane.
 - .8 Flashing detail shall conform to drawing entitled, Piping Through Roof Deck.
 - .9 Overcoat lap edges with end lap stripping adhesive and membrane.
 - .10 Tie in leading edge of sheeting with stripping ply membrane embedded between alternate courses of stripping ply adhesive.

3.10 METAL FLASHINGS

- .1 Installation of metal flashing shall be in accordance with the metal flashing section of the Canadian Roofing Contractors' Association (CRCA) manual.

3.11 SURFACING APPLICATION

- .1 Gravel Finish
 - .1 Prior to application of surface treatment system, contractor shall inspect roof with manufacturer's representative.
 - .2 Ensure surface is clean and dry. Flood coat the entire roof with specified flood coat bitumen at the rate of 6 gallons per square (cold adhesive) or 60 lbs. per square
 - .3 Immediately broadcast minimum 25 kg per sq. metre (500 lbs. per 100 sq. ft.) of new, clean, dry roofing gravel. Cover flood coat material completely.
 - .4 Rake out gravel to provide a neat even surface.

3.12 CLEANING

- .1 Refer to Section 01 74 00.
- .2 Clean drains of debris, ensuring free drainage.
- .3 Clean adjacent roof surfaces, levels and ground level areas of debris and excess Products.

3.13 PROTECTION

- .1 Adequately protect Products and work from damage by weather, traffic and other causes.
- .2 At the end of each Working Day, seal exposed edges of roofing membrane to be watertight.
- .3 Protect adjacent Work from damage. Repair damage.

END OF SECTION

1 GENERAL

1.1 INSTRUCTIONS

- .1 Comply with Instructions to Bidders, the General Conditions of the Contract as amended by the Supplementary Conditions including all Sections outlined in Division 00 – Procurement and Contracting Requirements and Division 01 - General Requirements.
- .2 Report in writing to the General Contractor any defects of surfaces or work prepared by other Sections which affect the quality or dimensions of the Work. Commencement of work implies acceptance of existing conditions and work by others.

1.2 SUMMARY

- .1 Section includes: Provide all articles, labour, materials, equipment, transportation, hoisting and incidentals noted, specified or required to complete the work of this Section, including but not limited to the following:
 - .1 Prefinished metal (steel) flashings and trims
 - .2 Non-shrink grout
- .2 Related sections: The following is included for reference only and shall not be presumed complete:
 - .1 Section 06 10 00 – Rough Carpentry
 - .2 Section 07 92 00 – Joint Sealants
 - .3 Division 23 – Heating, Ventilation and Air Conditioning

1.3 REFERENCES

- .1 Reference Standards: Versions of the following standards current as of the date of issue of the project apply to the Work of this Section. Where regulatory requirements use older version of a standard, comply with the version year adopted by the Authority Having Jurisdiction.
 - .1 The Aluminum Association Inc. (AAI)
 - (1) AA Aluminum Design Manual - Part VIII Guidelines for Aluminum Sheet Metal Work in Building Construction.
 - (2) AAI DAF45 - Designation System for Aluminum Finishes.
 - .2 American Architectural Manufacturers Association (AAMA)
 - (1) AAMA 611 - Voluntary Specifications for Anodized Architectural Aluminum.
 - (2) AAMA 621 - Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Substrates.
 - (3) AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
 - (4) AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
 - (5) AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

- .3 American National Standards Institute (ANSI)
 - (1) ANSI/SPRI/FM 4435/ES-1, Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems, latest edition.
- .4 ASTM International
 - (1) ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - (2) ASTM A606/A606M - Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance.
 - (3) ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - (4) ASTM A755/A755M - Standard Specification for Steel Sheet, Metallic coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
 - (5) ASTM A 792/A 792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - (6) ASTM B32 - Standard Specification for Solder Metal.
 - (7) ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - (8) ASTM B 370 - Standard Specification for Copper Sheet and Strip for Building Construction.
 - (9) ASTM D 523 - Standard Test Method for Specular Gloss.
 - (10) ASTM D1970/D1970M - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 - (11) ASTM D4587 - Standard Practice for Fluorescent UV-Condensation Exposures of Paint and Related Coatings.
 - (12) ASTM F1667 – Standard Specification for Driven Fasteners: Nails, Spikes and Staples.
- .5 Canadian General Standards Board (CGSB)
 - (1) CAN/CGSB-51.32 – Sheathing, Membrane, Breather Type.
- .6 Canadian Roofing Contractors Association (CRCA)
 - (1) Roofing Specifications Manual, latest edition.
- .7 Canadian Sheet Steel Building Institute (CSSBI)
 - (1) CSSBI S8 – Quality and Performance Specification for Prefinished Sheet Steel Used for Building Products.
 - (2) CSSBI B17 – Barrier Series Prefinished Steel Sheet: Product Performance & Applications.
 - (3) CSSBI Sheet Steel Facts #12 – Fastener Guide for Sheet Steel Building Products.
- .8 Canadian Standards Association (CSA):
 - (1) CSA A123.3 – Asphalt Saturated Organic Roofing Felt.
 - (2) CSA A123.22 – Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
- .9 Sheet Metal and Air Conditioning Contractors Association of North America (SMACNA)
 - (1) Architectural Sheet Metal Manual, latest edition.

1.4 SUBMITTALS

- .1 Submittals under this Section shall be in accordance with Section 01 33 00.

.2 Shop Drawings:

.1 Submit shop drawings including the following:

- (1) Plans, elevations, sections, and attachment details.
- (2) Detail fabrication and installation layouts, expansion-joint locations, and key details. Distinguish between shop and field assembled work.
- (3) Include identification of material, thickness, weight, and finish for each item and location in the work.
- (4) Include details for forming, including profiles, shapes, seams, and dimensions.
- (5) Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
- (6) Include details of termination points and assemblies.
- (7) Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contracting from fixed points.
- (8) Include details of roof penetrations flashing.
- (9) Include details of edge conditions, including crickets, and counter flashings as applicable.
- (10) Include details of special conditions.
- (11) Include details of connections to adjoining work.

.3 Samples:

- .1 Submit full-size samples of each specified flashing material formed to detailed profile including corner, curb, cap, and parapet flashing, and coping including lock- joints and hold-down clips.
- .2 Submit 2 - 50 mm x 50 mm (2" x 2") samples of each type of sheet metal material, colour and finish.

1.5 QUALITY ASSURANCE

.1 Qualifications:

- .1 Installers: Provide work of this section, executed by competent installers with experience in application of Products, systems and assemblies specified and with approval of Product manufacturers.
 - (1) Sealant shall be applied by a Subcontractor of recognized standing, having experience in this type of work, and who has the necessary equipment and skilled mechanics to carry out the work of this section satisfactorily and can substantiate this to satisfaction of Consultant.

.2 Quality standards:

- .1 Quality of fabrication and installation of sheet metal work shall comply with recommendations published by National Roofing Contractors Association.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials of this Section in accordance with Section 01 61 00.
- .2 Keep materials and equipment free from debris, ice, snow and contaminants. Allow air to circulate around metal components, sheets and break shapes.
- .3 Protect holes, and reglets from water and ice during freezing weather.

2 PRODUCTS

2.1 PERFORMANCE/DESIGN CRITERIA

- .1 Design members to withstand wind loads as calculated in accordance with the building code to maximum allowable deflection without permanent deformation.

2.2 MATERIALS

- .1 Sheet steel: Commercial quality to ASTM A653/A653M-11 with Z275 designation zinc coating.
 - .1 Minimum thickness: 0.61 mm (0.0239") (24 gauge).
- .2 Flexible flashing membrane; high temperature grade for use at locations where membrane is not protected by insulation:
 - .1 Description:
 - (1) Thickness: 0.76 mm (30 mils) minimum.
 - (2) Self-adhesive grade rubberized membrane backed by high density polyethylene.
 - (3) Primer for substrate.
 - (4) High temperature grade to resist softening at 105°C minimum.
 - .2 Acceptable Products:
 - (1) Bakor 'Blueskin PE 200 HT'.
 - (2) Firestone 'Clad-Gard SA'.
 - (3) Grace 'Ultra'.
 - (4) Soprema 'LASTOBOND SHIELD HT'.
- .3 Non-shrink grout:
 - .1 Cementitious Grout: CSA-A23.1/A23.2.
 - (1) Portland Cement: CSA-A3001, Type [GU].
 - (2) Grout Aggregate: CSA-A3001, standard type.
 - (3) Non-Shrink Admixture: as per manufacturer.
 - (4) Substrate Bonding Agent: Latex type.
 - (5) Water: Clean and potable.
 - .2 Grout Mixing and Testing:
 - (1) Thoroughly mix grout ingredients in quantities needed for immediate use.
 - (2) Add admixtures to manufacturer's written instructions; mix uniformly.
 - (3) Do not use anti-freeze compounds to lower the freezing point of grout.
 - (4) Testing of Grout Mix: ASTM C942 for compressive strength and ASTM C882 for bond strength.
 - .3 Acceptable Products:
 - (1) Mapei 'Planigrout 712'.
 - (2) Equivalent by approved manufacturer.

2.3 FABRICATION

- .1 Fabricate metal flashings and other sheet metal work in accordance with applicable NRCA Roofing Manual: Membrane Roof Systems 2011, details and as indicated.
- .2 Form pieces in 3048 mm (10 ft) maximum lengths. Make allowance for expansion at joints.
- .3 Sealed joints: Form non-expansion but movable joints in metal to accommodate sealant.
- .4 Expansion provisions: Form expansion joints of intermeshing hooked flanges, not less than 25.4 mm (1") deep, filled with silicone sealant concealed within joints.
 - .1 Joints that provide expansion and contraction capabilities should be located near the corners within approximately 610 mm (24") from each direction of the corner measured from the interior side.
- .5 Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" and by FMG Loss Prevention Data Sheet 1-49 for application, and of greater thickness of metal being secured.
- .6 Hem exposed edges on underside 12.7 mm (1/2"). Mitre and seal corners with sealant.
- .7 At parapets, provide 25.4 mm (1") minimum overlap between bottom of wood blocking or flashing anchorage support and edge of drip or termination of flashing.
- .8 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .9 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.
- .10 Provide 25.4 mm (1") gap between drip edges and wall finish material to redirect water runoff away from walls.
- .11 Provide 25.4 mm (1") minimum overlap between bottom of wood blocking or flashing anchorage support and edge of drip or termination of flashing.
- .12 Shop fabricate inside and outside corners.

2.4 PREFINISHED METAL FINISHES

- .1 Provide the following finish to exposed prefinished metal (steel/aluminum as applicable):
 - .1 Finish: Silicone polyester, with ceramic pigments and other select inorganic pigments, 2-coat system.
 - (1) Coating shall not crack, chip, or peel (lose adhesion) for twenty-five (25) years from date of application. This does not include minute fracturing that may occur during the normal fabrication process. Coating shall not chalk in excess of a number eight (No. 8) rating, in accordance with ASTM D4214-98 method D659 at any time for twenty (20) years from date of application; will not change colour more than five (5) Hunter ΔE units as determined by ASTM method D2244-02.
 - (2) Colour to later selection by Consultant from manufacturer's full range.
 - (3) Acceptable Products:
 - .1 ArcelorMittal Dofasco 'Perspectra Series'.
 - .2 Firestone Metal Products (SMP or Kynar).
 - .3 Valspar 'WeatherX'.

2.5 ACCESSORIES

- .1 Isolation coating: to CAN/CGSB-1.108, bituminous type.
- .2 Sealants: in accordance with Section 07 92 00, colour as selected by Consultant from manufacturer's full range.
- .3 Cleats: of matching metal to flashing material, continuous, and of greater thickness than flashing material. Joints in cleats shall not coincide with joints in perimeter edge metal. Allow a 12.7 mm (1/2") gap between pieces.
- .4 Fasteners:
 - .1 Screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.
 - .2 General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head:
 - (1) Exposed screws: 38 mm (1-1/2") long minimum at 450 mm (18") on centre maximum. Heads matching colour of sheet metal using plastic caps or factory- applied coating. Provide metal-backed EPDM washer under heads of exposed fasteners.
 - (2) Blind fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - (3) Cleat fasteners: Corrosion-resistant barbed angular ring or screw shank nail; length to achieve approximately 32 mm (1-1/4") penetration into nailer; fasten at 150 mm (6") on centre.
 - .3 Fasteners for prefinished aluminum sheet: Aluminum or Series 300 stainless steel.
 - .4 Fasteners for prefinished galvanized steel sheet: Series 300 stainless steel or hot dip galvanized steel to ASTM A153/A153M-09 and ASTM A653/A653M-11 Class G185.
 - .5 Fasteners and plates to meet the requirements of FM 4470-12 for wind uplift and corrosion resistance.

3 EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions:
 - .1 Examine all work of other Sections upon which the Work of this Section depends.
 - .2 Report in writing to the Consultant any defects of surfaces or work prepared by other Sections which affect the quality or dimensions of the Work of this Section.
 - .3 Do not proceed with Work of this Section until all unsatisfactory conditions have been rectified and site conditions are ready to receive work.
 - .4 Commencement of work implies acceptance of existing conditions and work by others.

3.2 INSTALLATION

- .1 Install Work of this Section in compliance with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

- .2 Use concealed fasteners except where approved before installation.
- .3 Flexible Flashing Underlayment Installation:
 - .1 Apply primer to concrete masonry and precast concrete substrates.
 - .2 Install in a consecutive weatherboard method starting at bottom or base of wall and working up.
 - .3 Provide minimum of 100 mm (4") side laps and 75 mm (3") end laps.
 - .4 Cut to manageable lengths, position membrane for alignment, remove protective poly-film and firmly apply pressure to assure adhesion.
 - .5 Eliminate wrinkles or gaps, roll entire membrane surface (including seams) with a counter top or "J-roller" to ensure full contact and adhesion.
 - .6 Seal membrane terminations, heads of mechanical fasteners, masonry tie fasteners, around penetrations, duct work, electrical and other apparatus extending through the air barrier membrane and around the perimeter edge of membrane terminations.
 - .7 Flashing membrane shall be applied in weatherboard fashion starting at bottom of base of wall and working up, in and around the full perimeter of openings, to provide water tight protection and according to the following procedures:
 - (1) Apply the first strip horizontally immediately below the sill, cut it sufficiently long to extend past each side of the window, so that it projects even with the vertical jamb flashing to be applied later. Turn sill flashing up 50 mm (2") at ends of sill.
 - (2) Sill flashing shall overlap wall membrane. Overlap jamb at head flashing membrane in the same manner.
- .4 Roof Flashing Installation
 - .1 Install sheet metal work in accordance with applicable NRCA Roofing Manual: Membrane Roof Systems 2011, details and as indicated.
 - .2 Provide watertight flashing installing capable of resisting specified uplift pressures in accordance with roofing specifications, thermally induced movement and exposure to weather.
 - .3 Provide minimum 10% slope for drainage towards roof at parapet locations, with minimum 2% sloped to drain at remaining flashing locations.
 - .4 Provide continuous cleats for attachment of flashings at exterior face of wall and cleats for interior face of wall.
 - .5 Provide radius (3-piece) copings for curved wall condition unless otherwise indicated.
 - .6 Prefabricate corner copings in 610 mm (24") x 610 mm (24") sections.
 - .7 Concealed fastenings and cleats, from view except where exposed flashings are accepted by Consultant prior to installation.
 - .8 Install surface mounted flared joint true and level, and caulk top of reglet with sealant at reglets.
 - .9 Insert metal flashings to other materials and flashings to form weather-tight junction.
 - .10 Provide prefinished metal flashing over equipment curbs which are covered with roofing membrane.

- .11 Expansion provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 3048 mm (10 ft) and provide uniform joint spacing with no joints allowed within 610 mm (24") of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 25.4 mm (1") deep, filled with sealant concealed within joints.
- .5 Wall Flashing Installation
 - .1 General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to NRCA recommendations and as indicated. Through-wall flashing: Installation of through-wall flashing is specified in Division 4.
- .6 Installation of Roof Accessories
 - .1 Incorporate devices to which roofing and flashing may be secured.
 - .2 Install work to ensure that roofing and flashings will be properly applied to maintain building envelope weather-tight.
- .7 Tolerances:
 - .1 Installation tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 6 mm in 6 m (1/4 inch in 20 feet) on slope and location lines as indicated and within 3.2 mm (1/8") offset of adjoining faces and of alignment of matching profiles.

3.3 SITE QUALITY CONTROL

- .1 Non-Conforming Work:
 - .1 Defective materials or quality of work, whenever found, at any time prior to acceptance of the work, shall be rejected regardless of previous inspection. Inspection will not relieve responsibility but is a precaution against oversight or errors.
 - .2 Replace damaged work which cannot be satisfactorily repaired, restored or cleaned, to the satisfaction of the Consultant at no additional cost to the Owner.

3.4 CLEANING

- .1 Clean work area daily in accordance with Section 01 74 00.
- .2 Remove all excess materials from site as Work proceeds and at completion.
- .3 On completion of the Work remove all tools, containers, surplus materials, equipment, waste, etc., and leave Site neat, clean and tidy to the satisfaction of the Owner.
- .4 Remove deposits, stains or protections and wash metals left unpainted and exposed to view as recommended by manufacturer of metal or paint finish.
- .5 Clean and make good surfaces soiled or otherwise damaged as a result of Work of this Section at no additional cost to the Owner.
- .6 Leave surfaces clean and ready for subsequent Work.

3.5 PROTECTION

- .1 Protect Work of this Section during remaining construction to ensure that work will be left without damage or deterioration other than natural weathering.

END OF SECTION

1 GENERAL

1.1 INSTRUCTIONS

- .1 Comply with the General Conditions of the Contract, the Supplementary Conditions and the General Requirements of Division 01.

1.2 SUMMARY

- .1 Section Includes
 - .1 Roof hatches, with integral support curbs, operable hardware and counter-flashings.
- .2 Related Sections
 - .1 Section 06 10 00 – Rough Carpentry.
 - .2 Section 07 51 00 – Built-up Bituminous Roofing.
 - .3 Section 07 92 00 – Joint Sealants.
 - .4 Section 09 90 00 – Painting and Coating.

1.3 REFERENCES

- .1 AAMA 2603-98: Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
- .2 ASTM B209-00 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- .3 CSA G40.20-04: General Requirements for Rolled or Welded Structural Quality Steel.
- .4 CAN/CSA-G164-M92 (R2003): Hot Dip Galvanizing of Irregularly Shaped Articles.

1.4 SUBMITTALS

- .1 Submit Product data as specified in Section 01 33 00.
- .2 Product Data: indicating unit construction, sizes, configuration, jointing methods and locations when applicable, and attachment method.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Refer to Section 01 61 00.
- .2 Deliver and store Products in original wrappings, cartons or containers clearly marked as to type and manufacturer.
- .3 Store Products in a dry area, under cover.

1.6 WARRANTY

- .1 System Warranty: For a period of two (2) years from substantial completion for parts and labour including coverage against defects in design, materials and workmanship.

2 PRODUCTS

2.1 MANUFACTURERS

- .1 Manufacturers of roof hatches having Product considered acceptable for use:

- .1 Bilco.
- .2 Lexcor.

2.2 MATERIALS

- .1 Sheet Steel: to CSA G40.20.
- .2 Sheet Aluminum: to ASTM B209, 3003 alloy, H14 temper.
- .3 Sealant: as specified in Section 07 92 00.

2.3 COMPONENTS

- .1 Roof Hatch, Type NB by Bilco, aluminum, thermally broken complete with perimeter guard and external lockset; comprised from the following:
 - .1 Integral Curb: Thermally broken aluminum with R20 insulation; integral cap flashing to receive roof flashing; extend flange for mounting, 400 mm high.
 - .2 Flush Cover: Thermally broken aluminum with R20 insulation; continuous thermoplastic rubber gasket to provide weatherproof seal.
 - .3 Hardware:
 - (1) Compression spring operator and shock absorbers;
 - (2) Steel manual pull handle for interior and exterior operation;
 - (3) Automatic hold open arm with vinyl covered grip handle for easy release;
 - (4) Components zinc plated and chromate sealed finish;
 - (5) Integral dead bolt keyed to the master key for the school;
 - (6) Hinges: heavy duty pintle type.
 - (7) Guard (safety bar) on 2 sides and gate at access point. Bolt to side of hatch; no roof penetrations.

2.4 FABRICATION

- .1 Fabricate components free of visual distortion or defects. Weld corners and joints.
- .2 Provide for removal of condensation occurring within components or assembly. Fit components for weather-tight assembly.

2.5 SHOP FINISHING

- .1 Galvanizing: to CAN/CSA-G164-M, hot dipped method, minimum 275 g/m² zinc coating.

3 EXECUTION

3.1 EXAMINATION

- .1 Report to the Consultant, in writing, all defects of surfaces or work prepared by other trades and on unsatisfactory site conditions.
- .2 Thoroughly examine all surfaces scheduled to receive work of this Section to see that they are secure, rigid, true and not liable to impair performance or appearance.
- .3 Commencement of work implies acceptance of existing conditions.

3.2 PREPARATION

- .1 Prior to fabrication, verify and field measurements necessary to ensure a perfect fit.

3.3 INSTALLATION

- .1 Install Products in accordance with manufacturer's installation guidelines.
- .2 Securely install Products level, secure and watertight.
- .3 Coordinate with installation of roofing system and related flashings. Refer to Section 07 51 00.

END OF SECTION

1 GENERAL

1.1 INSTRUCTIONS

- .1 Comply with the Instructions to Bidders, the General Conditions of the Contract, the Supplementary Conditions and the General Requirements of Division 1.
- .2 Report in writing to the General Contractor any defects of surfaces or work prepared by other Sections which affect the quality or dimensions of the Work. Commencement of work implies acceptance of existing conditions and work by others.

1.2 SECTION INCLUDES

- .1 Firestopping, smoke seals and accessories.

1.3 RELATED SECTIONS

- .1 Section 04 20 00 - Unit Masonry: penetrations in rated masonry assemblies.
- .2 Section 07 92 00 - Joint Sealants: non-rated joint sealants.
- .3 Section 09 21 16 - Gypsum Board Assemblies: penetrations in rated gypsum board assemblies.
- .4 Section 23 33 16 – Fire Dampers
- .5 Section 26 01 13 – Electrical Contract General Requirements

1.4 REFERENCES

- .1 ASTM E84-05: Standard Test Method for Surface Burning Characteristics of Building Materials.
- .2 ASTM E119-05a: Standard Test Methods for Fire Tests of Building Construction and Materials.
- .3 ASTM E814-02: Standard Test Method for Fire Tests of Through-Penetration Fire Stops.
- .4 ASTM E2174-04: Standard Practice for On-Site Inspection of Installed Fire Stops.
- .5 CAN/CGSB-19.13-M87: Sealing Compound, One Component, Elastomeric, Chemical Curing.
- .6 CAN/CGSB-19.24-M90: Multicomponent, Chemical Curing Sealing Compound.
- .7 CAN/ULC-S102-03: Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
- .8 ULC-S115-95 (R2001): Standard Method of Fire Tests of Firestop Systems.
- .9 CAN/ULC-S702-97: Standard for Thermal Insulation, Mineral Fibre, for Buildings.
- .10 Underwriters' Laboratories of Canada: List of Equipment & Materials.

1.5 SYSTEM DESCRIPTION

- .1 Firestopping and smoke seals is a complete and integrated system. Bid as a separate work scope and include all firestopping and smoke seal requirements as specified herein and shown on the drawings.

- .2 Provide firestopping and smoke seals within mechanical (i.e., inside ducts, dampers) and electrical assemblies (i.e., inside bus ducts) as part of the work of Divisions 21, 22, 23, 25, 26, 27 and 28 respectively. Firestopping and smoke seals around the outside of such mechanical and electrical assemblies where they penetrate rated fire separations shall be part of the work of this Section.
- .3 Firestopping Materials: tested to ULC-S115 to achieve the required fire rating in accordance with ULC or Warnock Hersey Design Numbers.
- .4 Work of this Section comprises firestopping and smoke seal materials and systems to provide closures to fire and smoke at openings around penetrations, at unpenetrated openings, at projecting or recessed items, and at openings and joints within fire separations and assemblies having a fire-resistance rating, including openings and spaces at perimeter edge conditions.
- .5 Provide seals to form draft tight barriers to retard the passage of flame and smoke.
- .6 The installed seal shall provide and maintain a fire resistance rating equivalent to the rating of the adjacent floor, wall or other fire separation assembly to the requirements of and acceptable to the authorities having jurisdiction, and the Consultant.
- .7 ULC systems used must provide a flame, temperature in cable and cable tray penetrating and hose stream rating in accordance with those outlined in the applicable codes and provide an effective barrier against the passage of flame, smoke and gases.
- .8 All firestopping seals except for wall joints in visible areas must be of an easily identifiable colour, to be clearly distinguished from other building materials.
- .9 For firestopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control, use an elastomeric seal. Do not use a cementitious or rigid seal at such locations, unless penetrant is isolated by firestop pipe insulation or mechanical movement isolators.
- .10 Firestopping and smoke seals at joints and spaces designed and required to allow movement: A flexible, elastomeric seal suitable to withstand the required movement and capable of returning to original configuration without damage to the seal and without adhesive or cohesive failure; do not use a cementitious or rigid seal at building movement joints, sway joints, deflection spaces, control joints, expansion joints, and other such locations, unless used to minimize non-moving part of seal (i.e., firestop mortar deck flute fill).

1.6 SUBMITTALS

- .1 Submit Shop Drawings and Product data as specified in Section 01 33 00.
- .2 Product Data: sealant manufacturer's installation instructions and standard drawings, indicating ULC or WHI test designations.
- .3 Shop Drawings: Indicate sizes of openings, nature of penetrations, and tested method of firestop and smoke seal protection being proposed.
- .4 Shop Drawings are to be sealed, signed and dated by manufacturer's design engineer.
- .5 Submit shop drawings to Consultant and to the authority having jurisdiction for their review and approval.

1.7 CERTIFICATES

- .1 Submit certification as specified in Section 01 33 00.
- .2 Certificate: sealant manufacturer's letter of certification verifying that Products meet or exceed specified requirements.

1.8 TEST REPORTS

- .1 Submit test reports as specified in Section 01 33 00.
- .2 Test Reports: certified laboratory reports, indicating that Products proposed for use conform to ASTM E814 and ULC-S115, and are so classified by the Underwriter's Laboratories of Canada or Warnock-Hersey International.

1.9 QUALITY ASSURANCE

- .1 Manufacturer's Design Engineer: a registered professional engineer licensed to practice in the Place of the Work and having a minimum of 10 years documented experience designing firestop and smoke seal systems.
- .2 Applicator: approved and acceptable to sealant material manufacturer.
- .3 Firestopping compounds shall not contain volatile solvents or require special application to protect plastic pipe from firestopping compound.

1.10 PRE-INSTALLATION MEETING

- .1 Prior to commencement of firestopping, arrange and conduct a pre-installation meeting as specified in Section 01 31 00.
- .2 Pre-installation Meeting: discuss proposed methods and materials to be used in all instances.
- .3 Representatives of the Owner, Consultant, Contractor, installer, manufacturer and the authority having jurisdiction are to be in attendance.
- .4 Do not conduct meeting unless all identified parties are present.

1.11 MOCK-UPS

- .1 Construct job site mock-up as specified in Section 01 40 00.
- .2 Apply one sample seal on representative substrates on each site for each fire rating required at each type of wall, floor or roof construction.
- .3 Comply with project requirements as to thickness and density of application to achieve fire rating.
- .4 Proceed with installation only after Consultant has reviewed and accepted mock-up.
- .5 Acceptable mock-up may remain as part of the completed Work as standard.

1.12 DELIVERY, STORAGE AND HANDLING

- .1 Refer to Section 01 61 00.

- .2 Deliver Products to the Place of the Work in their original unopened packages.
- .3 Store Products in an enclosed shelter, preventing damage to containers.

1.13 PROJECT CONDITIONS

- .1 Do not apply sealants when temperature of substrate material and surrounding air is below 5 degrees C (42 degrees F).
- .2 Maintain sealant at a minimum 18 degrees C (68 degrees F) for best workability.

2 PRODUCTS

2.1 MANUFACTURERS

- .1 Manufacturers of firestopping and smoke seals having Product considered acceptable for use:
 - .1 3M Canada
 - .2 Tremco
 - .3 A/D Fire Protection Systems Inc.
 - .4 Dow-Corning Canada Inc.
 - .5 Hilti Canada.
- .2 Substitution Procedures: refer to Section 01 25 00.

2.2 MATERIALS

- .1 Firestop Sealant, Type A: non-sag; asbestos-free; single component sealant composed of high temperature ceramic fibers and organic and silica binders; ULC labelled; to ULC-S115 and CAN/ULC-S102-M.
- .2 Firestop Sealant, Type B: three component; epoxidized polyurethane terpolymer; accommodating joint movement of +40/-25%; ULC labelled; to CAN/CGSB-19.24-M and ULC-S115.
- .3 Firestop Sealant, Type C: three component; self-levelling; chemically curing polyurethane sealant; ULC labelled; to ULC-S115.
- .4 Firestop Sealant, Type D: single component; low modulus; silicone rubber; moisture curing; ULC labelled; to CAN/CGSB-19.13-M and ULC-S115.
- .5 Firestop Sealant, Type E: single component; modified polyurethane; moisture curing; ULC labelled; to CAN/CGSB-19.13-M and ULC-S115.
- .6 Primer: as recommended by sealant manufacturer for specific material, substrate and end use.
- .7 Firestop Insulation: to CAN/ULC-S702, Type 2; mineral fibre manufactured from rock or slag, suitable for manual application:
 - .1 Density: 72 kg/m³ when tested to ASTM C303.
 - .2 Combustibility: Noncombustible to CAN/ULC-S114.

- .3 Melt Temperature: greater than 1,175 degrees C (2,385 degrees F).
- .4 Surface Burning Characteristics: to CAN/ULC-S102, maximum flame spread of 0, smoke developed of 0.
- .5 Moisture Sorption: 0.04 percent when tested to ASTM C1104.
- .6 Smoulder Resistance: 0.01 percent when tested to CAN/ULC-S129.

2.3 COMPONENTS

- .1 Provide firestopping and smoke sealing systems to ULC-S115 and as described below:
 - .1 Asbestos free materials and systems fully capable of maintaining an effective barrier against gases, flame and smoke in compliance with ULC-S115, not exceeding opening sizes stated.
 - .2 Service Penetration Assemblies: certified by ULC-S115 and used by ULC Guide 40 U19. Service components listed as certified in this guide are noted under Label Service of ULC.
 - .3 Fire resistance rating of fire stopping material assembly must meet or exceed the fire resistance rating of the floor or wall section being penetrated.
 - .4 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 a cementitious or rigid seal at such locations.
 - .5 Damming and back up materials, supports and anchoring devices shall be to manufacturer's recommendations, and in strict accordance with tested assembly being installed as acceptable to authorities having jurisdiction.
 - .6 Sealants: non-sagging type for vertical joints.

3 EXECUTION

3.1 EXAMINATION

- .1 Confirm compatibility of surfaces to receive sealant materials.
- .2 Verify that surfaces of openings are sound, clean, dry, and ready to receive application of sealant.
- .3 Verify that penetration elements are securely fixed and properly located.
- .4 Commencement of installation means acceptance of existing conditions.

3.2 PREPARATION

- .1 Protect adjacent surfaces and equipment from damage.
- .2 Clean contact surfaces of dirt, dust, grease, oil, loose material, or other matter that may affect bond of sealant.
- .3 Remove incompatible materials that affect bond by scraping, brushing, water or solvent cleaning, or sandblasting.

3.3 PENETRATION SIZING

- .1 The following shall regulate sizing of service penetrations to be fire stopped, in an effort to standardize and minimize penetration sizes:
 - .1 Sleeve single, circular penetrations except in fire rated gypsum wallboard, under work of mechanical and electrical Subcontractors.
 - .2 Multiple penetrations of circular elements are defined as more than one circular penetration having a maximum space of 100 mm (4") between closest faces of such penetrating elements. Forming of such multiple penetrations is responsibility of respective sections whose service penetrates the rated assembly, and such formed opening shall be a square or rectangular frame around a group of penetrations in which maximum clearance between outer penetration element and face of opening shall be 25 mm (1"). This also applies to single circular penetrations in fire rated gypsum wallboard. Fire rated pipe insulation, where applied is to be considered penetrant requiring above mentioned amounts.
 - .3 Square penetrations shall be created in same manner as the above mentioned multiple circular penetrations, but the edge clearance may be increased to maximum 50 mm (2").
 - .4 Exception: At fire dampers, clearances are governed by testing authorities' requirements.

3.4 APPLICATION

- .1 Install mineral fibre insulation in compacted thicknesses required by ULC design. Compress insulation approximately 33 percent.
- .2 Apply sealant in strict accordance with manufacturer's instructions and ULC certification.
- .3 Coordinate and cooperate with adjacent, contiguous and related materials trades, such as concrete, drywall, plumbing, conduit, electrical wiring, communication systems, etc., to ensure a proper and timely installation.
- .4 Seal holes or voids made by penetrating items to ensure an effective fire and smoke barrier.
- .5 Seal all intersections and all penetrations of floors, ceilings, walls and columns.
- .6 Seal around all cutouts for lights, cabinets, pipes and plumbing, ducts, electrical boxes, etc.
- .7 Wrap non-insulated heated pipes that may be subject to movement with a non-combustible smooth material to permit the pipe to move without damaging the firestopping and smoke seal.
- .8 Maintain the integrity of any insulation and vapour retarders on insulated pipes and ducts at the fire separation.
- .9 Where floor openings exceed 100 mm (4") in width and may be subjected to traffic or loading, install cover plate systems capable of supporting same loading as floor.
- .10 Apply tags on each mechanical and electrical seal, either on penetrant(s), on seal or next to seal, at Subcontractor's option. Wall seals require tags on each side. Tag floor seals on the top only. Tags need not exceed 3 sq.in. in size but shall state seal number, installation date, installer's initial and the following text, "Firestop system not to be severed unless prepared to repair immediately".

3.5 FIELD QUALITY CONTROL

- .1 Perform field testing and inspection as specified in Section 01 45 00.
- .2 Conduct inspections to ASTM E2174.
- .3 Examine finished penetrations to ensure proper installation before concealing or enclosing any areas of work.
- .4 Keep areas of work accessible until inspection has been completed.
- .5 Manufacturer's Field Service: inspect to verify and confirm that systems installation is in strict accordance with manufacturer's and ULC requirements.
- .6 Correct unacceptable work and provide further inspection to verify compliance with requirements.

3.6 CLEANING

- .1 Immediately remove all spots, smears, stains, residues, adhesives, etc., from the work of this Section and from upon adjacent areas or surfaces which resulted from the work of this Section.
- .2 Upon completion of firestopping, remove debris, trash, containers, residue, remnants and scraps from the Place of the Work.
- .3 Cleaning to be free of volatile solvents. Leave the Work in a clean and satisfactory condition.

3.7 PROTECTION

- .1 After installation, and until Owner occupancy, protect the rated firestop systems from damage.
- .2 Remove damaged materials and replace with new, undamaged Product, at no additional cost to Owner.

3.8 SCHEDULES

LOCATION	FIRE RATING	ULC ASSEMBLY
1. Corridor separation from Classrooms	¾ Hours	UL U407 or equivalent

END OF SECTION

1 GENERAL

1.1 INSTRUCTIONS

- .1 Comply with the Instructions to Bidders, the General Conditions of the Contract, the Supplementary Conditions and the General Requirements of Division 1.
- .2 Report in writing to the General Contractor any defects of surfaces or work prepared by other Sections which affect the quality or dimensions of the Work. Commencement of work implies acceptance of existing conditions and work by others.

1.2 SECTION INCLUDES

- .1 Joint Sealants.

1.3 RELATED SECTIONS

- .1 Section 06 20 00 – Finish Carpentry
- .2 Section 06 40 00 - Architectural Woodwork
- .3 Section 07 84 00 - Firestopping: firestop sealants.
- .4 Section 09 21 16 - Gypsum Board Assemblies
- .5 Section 09 51 00 - Acoustical Ceilings: sealants used in conjunction with suspended metal ceiling systems.

1.4 REFERENCES

- .1 ASTM C920-05: Standard Specification for Elastomeric Joint Sealants.
- .2 CAN/CGSB-19.13-M87: Sealing Compound, One Component, Elastomeric, Chemical Curing.
- .3 CAN/CGSB-19.17-M90: One Component Acrylic Emulsion Base Sealing Compound.
- .4 CAN/CGSB-19.22-M89: Mildew Resistant Sealing Compound for Tubs and Tiles.
- .5 CAN/CGSB-19.24-M90: Multicomponent, Chemical Curing Sealing Compound.

1.5 SYSTEM DESCRIPTION

- .1 Remove sealant from existing joints indicated and clean joints.
- .2 Seal all areas indicated on Drawings, in list following and where required to make building watertight and weathertight:
 - .1 Exterior and interior of masonry control joints. If these are not indicated assume 8000 mm (26'-0") on centres for full height of wall.
 - .2 Abutting masonry walls.
 - .3 Both sides of hollow metal frames.
 - .4 Interior and exterior of aluminum window and door frames.

- .5 All pipes, grilles and equipment passing through walls.
- .6 Joint where two different materials abut.
- .7 Plumbing fixtures.

1.6 SUBMITTALS

- .1 Submit Product data and samples as specified in Section 01 33 00.
- .2 Submit manufacturers' test data as specified in Section 01 45 00.

1.7 QUALITY ASSURANCE

- .1 Applicator: a recognized specialized applicator having skilled mechanics, thoroughly trained and competent in all phases of caulking work, and a member in good standing of the Caulking Contractor's Association of Ontario.

1.8 PRE-CONSTRUCTION MEETING

- .1 Conduct a pre-construction meeting as specified in Section 01 31 00.
- .2 Representatives of the Consultant, Contractor, applicator, and sealant manufacturer(s) are to be in attendance.
- .3 Confirm prior to application that correct Products and methods are being used in specific instances.

1.9 DELIVERY, STORAGE AND HANDLING

- .1 Refer to Section 01 61 00.
- .2 Deliver and store Products in undamaged and original containers, with labels intact and showing the manufacturer's name, brand, colour, etc.
- .3 Ensure at time of use that Products are still within recommended shelf life.
- .4 Maintain storage area at a temperature in accordance with manufacturer's recommendations.

1.10 ENVIRONMENTAL CONDITIONS

- .1 Do not install solvent curing sealants in enclosed building spaces.
- .2 Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.11 WARRANTY

- .1 Submit extended warranties in accordance with the General Conditions of the Contract.
- .2 Extended System Warranty: for a period of 2 years, including coverage against delamination, cracking, running, loss of adhesion and cohesion, blistering, peeling, colour change and staining.
- .3 Extended Manufacturer Warranty: for a period of 10 years, including coverage against failure of the sealant material to achieve air tight and watertight seal, exhibit loss of adhesion or cohesion, maintain stability, or not cure.

2 PRODUCTS

2.1 MANUFACTURERS

- .1 Manufacturers of joint sealants having Products considered acceptable for use:
 - .1 Canadian General Electric.
 - .2 CSL Silicones Inc.
 - .3 Dow Corning.
 - .4 PRC Chemicals.
 - .5 Sika Canada Inc.
 - .6 Tremco Canada.
- .2 Substitution Procedures: refer to Section 01 33 00.

2.2 MATERIALS

- .1 Sealant A: 2-part, polysulphide; CAN/CGSB-19.24-M, Type 2, Class B
- .2 Sealant B: (non-sag, for non-glazing) 2-part, polysulphide; CAN/CGSB-19.24-M, Type 2, Class A
- .3 Sealant C: (non-sag, for glazing) 1-part, acrylic emulsion latex CAN/CGSB-19.17-M.
- .4 Sealant D: 1-part, chemical curing, silicone CAN/CGSB-19.22-M
- .5 Sealant E: 1-part, moisture curing, polyurethane CAN/CGSB-19.13-M
- .6 Joints In Bathrooms, Laundries, Etc.
 - .1 Sealant: Mildew Resistant
 - (1) Silicone Sanitary Sealant (1702 Series) by Canadian General Electric.
 - (2) 786 by Dow Corning.
 - (3) Tremoil 600 by Tremco
- .7 Thinners and Primers: type compatible with appropriate sealant and substrate as recommended by manufacturer.
- .8 Cleaning material: As recommended by manufacturer.
- .9 Joint backing material: preformed, compressible, resilient, non-staining foam compatible with primers, sealants, outsize 30%, polyethylene, extruded closed cell foam, Shore "A" hardness 20, tensile strength 20-30 psi, such as PRC Backer Rod or equal. Outsize 50%, polyethylene, extruded open cell foam, Shore "A" hardness 10, tensile strength 140-150 psi, such as PRC open cell.
- .10 Bond breaker: where joint configuration does not allow for proper depth/width ratio with the use of backer rod (see Section 3.2.5.) - a pressure sensitive plastic tape such as 3M #226 or #481 which will not bond to the sealant shall be placed at the back of the joint.
- .11 Sealant Colours: as selected by Consultant from manufacturers' standard colour range.

3 EXECUTION

3.1 EXAMINATION

- .1 Report to the Consultant, in writing, defects of surfaces or work prepared by other trades and unsatisfactory site conditions.
- .2 Commencement of work implies total acceptance of surface and site conditions.
- .3 Thoroughly examine surfaces scheduled to receive sealants to ensure that they are dry, clean, level; free from cracks, ridges, dusting, scaling, carbonation, mortar droppings, parging, curing compounds, rust, grease, oil, paint, or other foreign material likely to impair adhesion, performance or appearance.
- .4 Test substrate for adhesion and staining if any doubt exists.
- .5 Verify at the site that joints and surfaces have been provided as specified under the work of other sections; and that joint conditions will not adversely affect execution, performance or quality of completed work; and that they can put into acceptable condition by means of preparation specified in this section.
- .6 Ascertain that sealers and coatings applied to sealant substrates are compatible with sealant used and that full bond between the sealant and substrate is attained.
- .7 Request samples of the sealed or coated substrate from their fabricators for testing of compatibility and bond if necessary.
- .8 Verify that specified environmental conditions are ensured before commencing work.
- .9 Ensure that releasing agents, coating or other treatments have either not been applied to joint surfaces or that they are entirely removed.
- .10 Defective work resulting from application to unsatisfactory joint conditions will be considered the responsibility of those performing the work of this section.
- .11 Protect adjacent Products from damage and make good any resulting damage in accordance with the Contract Documents.

3.2 PREPARATION

- .1 Remove dust, paint, loose mortar and other foreign matter and dry joint surfaces.
- .2 Remove dust, silt, scale, and coating from ferrous metals by wire brush, grinding or sandblasting.
- .3 Remove oil, grease, and other coating from non-ferrous metals.
- .4 Prepare concrete, masonry, glazed and vitreous surfaces as recommended by sealant manufacturer.
- .5 Examine joint sizes and modify to achieve proper width-to-depth ratio.
- .6 For joints wider than 50 mm (2"), contact sealant manufacturer's representative for recommendations.
- .7 Install backer rod or apply bond breaker tape to achieve correct joint configuration.
- .8 Where necessary to prevent staining, mask adjacent surfaces with tape prior to priming and application of sealant.

- .9 Prime sides of joint in accordance with manufacturer's directions, immediately prior to sealing.
- .10 Prior to application, test each sealant with proposed substrate for indications of staining or poor adhesion.
- .11 At locations where another surface will cover the sealed joint (e.g. cove base) ensure the sealant is finished flush with adjacent surfaces.

3.3 QUALITY OF WORK

- .1 Quality of work shall be in accordance with good practice and in strict compliance with the recommendations of the manufacturer of materials being used.
- .2 Check work area for adequate light and heat.
- .3 Carefully mask adjacent surfaces, materials and items not scheduled to receive sealant, taking care to see that masking remains intact until application is complete. Remove masking immediately upon completion of caulking.
- .4 Do not apply sealant to substrate until thoroughly cured and dried.

3.4 APPLICATION

- .1 Prime sides of joints before placing joint backing. Use bond breaker where joint backing not required.
- .2 Mix and apply sealant in strict accordance with manufacturer's directions and under supervision of manufacturer's field representative.
- .3 Sealants shall be of gun grade or knife grade consistency to suit joint condition.
- .4 Apply sealants in accordance with manufacturer's directions, using a gun with proper size nozzle. Use sufficient pressure to fill voids and joints solid, as indicated on Drawings.
- .5 Form surface of the sealant with full bead, smooth, free from ridges, wrinkles, sags, and embedded impurities. Neatly tool surface to a slight concave joint.
- .6 Clean adjacent surfaces immediately and leave work neat and clean. Remove excess and droppings using recommended cleaners as work progresses. Remove masking tape immediately after tooling of joints.
- .7 In masonry cavity construction with an air seal, vent sealed joints from cavity to beyond external face of wall.
- .8 Superficial pointing with the skin bead is not acceptable.
- .9 Provide test results of pull test performed by the manufacturer representative before completion of sealant work.
- .10 Promptly, as the work proceeds and upon completion, clean-up and remove from the Place of the Work masking tapes, rubbish and surplus material.

3.5 SCHEDULE

- .1 Sealant AE:
 - .1 Masonry to metal

- .2 Masonry to masonry
- .3 Masonry to stucco
- .4 Masonry to wood
- .5 Metal to metal
- .6 Wood to stucco
- .2 Sealant B:
 - .1 Glass to all materials
- .3 Sealant C E:
 - .1 Gypsum board to gypsum board
 - .2 Gypsum board to wood
- .4 Sealant D:
 - .1 Plumbing fixtures to wall and floor surfaces

END OF SECTION

1 GENERAL

1.1 INSTRUCTIONS

- .1 Comply with the Instructions to Bidders, the General Conditions of the Contract, the Supplementary Conditions and the General Requirements of Division 1.
- .2 Report in writing to the General Contractor any defects of surfaces or work prepared by other Sections which affect the quality or dimensions of the Work. Commencement of work implies acceptance of existing conditions and work by others.

1.2 SECTION INCLUDES

- .1 Non-load-bearing steel stud partitions
- .2 Ceiling and bulkhead framing
- .3 Wall furring
- .4 All gypsum wallboard
- .5 Gypsum wallboard trims

1.3 RELATED SECTIONS

- .1 Section 06 10 00 - Rough Carpentry.
- .2 Section 09 51 00 - Acoustical Ceilings.

1.4 REFERENCES

- .1 CAN/CGSB-71.25-M88: Adhesive, for Bonding Drywall to Wood Framing and Metal Studs.
- .2 CAN/CSA-A82.27-M91: Gypsum Board.
- .3 CSA A82.31-M1980: Gypsum Board Application.
- .4 Gypsum Drywall Construction Handbook by Canadian Gypsum Company.
- .5 Manual of Gypsum Wallboard Construction by Gypsum Drywall Contractors International.

1.5 QUALITY ASSURANCE

- .1 Employ fully trained mechanics who are regularly employed in this field.

1.6 REJECTIONS

- .1 Defective materials or quality of work whenever found at any time prior to acceptance of the work shall be rejected regardless of previous inspection. Inspection will not relieve responsibility, but is a precaution against oversight and error.

- .2 Remove and replace defective materials and work of other Trades affected by this replacement, at no additional cost to the Owner.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Refer to Section 01 61 00.
- .2 Deliver and store Products in a dry area under cover, in original wrappings, cartons or containers clearly marked as to type, colour and manufacturer.
- .3 Store gypsum board flat. Take care to avoid undue sagging damage to ends, edges, or surfaces. Avoid stacking unequal lengths together.
- .4 Store gypsum board so that it is not in contact with new concrete floors - use dunnage at 400 mm (16") OC to raise board piles.

1.8 PROJECT CONDITIONS

- .1 Co-operate in co-ordinating work of other Sections with work of this Section, in order that the work may proceed in an orderly and effective manner.

2 PRODUCTS

2.1 MANUFACTURERS

- .1 Manufacturers of gypsum products having Products considered acceptable for use:
 - .1 CertainTeed.
 - .2 Canadian Gypsum Company.
 - .3 G-P Gypsum Company.
- .2 Manufacturers of metal studs, track, trim and accessories having Products considered acceptable for use:
 - .1 Bailey Metal Products.
 - .2 Canadian Gypsum Company.
 - .3 Chicago Metallic.
 - .4 Gordon Arch. Alum. Specialties.
 - .5 Pittcon Industries.
 - .6 Fire Trak Corp.

2.2 MATERIALS

- .1 Steel Studs: Minimum 0.55 mm (25 ga.) hot dipped or electro-galvanized sheet steel at 400 mm (16") OC, to ASTM C645; knockout pass-through holes at 460 mm (18") OC; Flanges minimum 30 mm (1¼") wide, edges bent back 90 degrees and doubled over; single length floor to ceiling.

- .2 Floor and Ceiling Track (standard application): Minimum 0.55 mm (25 ga.) hot dipped or electro-galvanized sheet steel at 400 mm (16") OC, to ASTM C645; Leg design minimum 25 mm (1") high; width to suit studs. Provide deflection track as required to suit deflection anticipated by structural conditions.
- .3 Ceiling Track (deflection application): Inner and outer deflection type tracks; minimum 0.91 mm (20 ga) x size to fit 92 mm (3 5/8") stud, and full galvanized G60 steel; by Bailey or approved equal. Refer to Standard Details.
- .4 Ceiling track (curved walls): Two 0.55 mm (25 ga.) continuous angles, crimped/cut to suit shape.
- .5 Ceiling Deflection Track and Firestop System: Fire Trak System by Fire Trak Corp., Kimball, MN (1-800-394-9875). System shall include 16 gauge galvanized steel ceiling runner profile (Shadowline, Cavity Shadowline, Reveal or Cavity Reveal) and Fire Trak Stud Clips.
- .6 Furring Channels: 19 mm, 22 mm (3/4", 7/8") - minimum .55 mm (25 gauge) G90 galvanized steel at 400 mm (16") OC.
- .7 Fasteners: Manufacturer's standard, suitable for application intended.
- .8 Tie Wire: 1.6 mm (16 gauge) galvanized soft annealed steel wire.
- .9 Hangers: 4.1 mm (No. 8) galvanized wire.
- .10 Carrying Channels: 39 mm x 19 mm - 1.6 mm (1½" x 3/4" - 16 gauge) G90 galvanized steel channel, for bulkhead construction.
- .11 Ceiling Suspension Systems
 - .1 Rigid "X" drywall suspension system by CGC Inc. or approved equal.
 - .2 System shall be comprised of 30 mm x 24 mm (1½" x 15/16") tee sections of 0.60 mm (24 gauge) steel and 73 mm x 22 mm (2 " x 7/8") cross channels of 0.38 mm (26 gauge) hot dipped galvanized steel.
- .12 Furring Clips: Snap-on clips - 2.6 mm (12 gauge) wire.
- .13 Partition Attachment to T-bar: Use partition attachment clips PACS15 (standard edge) or PACR15 (Reveal Edge) by CGC Interiors.
 - .1 Securement Channel: 0.55 mm (25 gauge) galvanized steel - 50 mm x 25 mm (2" x 1") by Bailey or approved equal.
 - .2 Fasteners: Non-powder activated as recommended by manufacturer, suitable for wall composition by Rawl Tapcon or approved equal.
- .14 Gypsum Board: to CAN/CSA A82.27-M, as follows:
 - .1 Moisture and mold resistant wall panels conforming to ASTM C1658, glass mat water-resistant gypsum panel.
 - (1) 16mm (5/8") tapered edge, straight cut ends.
 - (2) 13mm (1/2") tapered edge, straight cut ends.
 - (3) Acceptable Products:

- (a) DensArmour Plus by Georgia-Pacific Gypsum
- (b) Glass-Mat Panels Mold Tough by CGC
- .2 Fire Resistant Board (Type "X"): Minimum 16 mm (5/8") thick, tapered edges, straight cut ends, type X., identified for use in a ULC tested assembly.
- .3 Abuse-Resistant Board: 16 mm (5/8") Sheetrock Abuse-resistant gypsum panels; tapered edges; panel weight minimum 2500 lbs./MSF
- .4 Impact Resistant Board: 16 mm (5/8") high density core 40 bls. Hardness "Fiberbond" by Louisiana - Pacific (Phone: 1-800-411-2500 / 902-625-3070)

2.3 ACCESSORIES

- .1 Corner Bead, Bailey Tear off L Trim
- .2 Screws: Self-drilling, self-threading case hardened steel; length as recommended by board manufacturer for each application.
- .3 Adhesive: High strength, waterproof, compatible with materials; to CAN/CGSB-71.25-M.
- .4 Joint Filler: Casein, vinyl or latex base, slow setting, as recommended by board manufacturer.
- .5 Joint Tape: 50 mm (2") wide perforated paper as recommended by board manufacturer.
- .6 Primer Sealer: Alkyd based material recommended by board manufacturer.
- .7 Texture Finish and Primer - Sealer: Water based spray finish recommended by board manufacturer.

3 EXECUTION

3.1 EXAMINATION

- .1 Thoroughly examine all surfaces scheduled to receive work of this Section to see that they are secure, rigid, true and not liable to impair performance or appearance of this Trade's work.
- .2 Commencement of work implies total acceptance of surface and site conditions.

3.2 PREPARATION

- .1 Protect work of other trades from damage resulting from work of this trade.
- .2 Make good any resulting damage, to the satisfaction of the Consultant, at no additional cost.
- .3 Maintain uniform temperature in work area, adequate for work being performed, as recommended by materials manufacturer.
- .4 Keep temperature as uniform as possible with deflectors or screens.
- .5 Provide air circulation if humidity is excessive. Avoid high temperature with low humidity. Avoid force drying.
- .6 Allow concrete and masonry to dry thoroughly before installing gypsum board.
- .7 Protect installed materials from weather and dampness.

- .8 Replace any damaged work before further work proceeds.
- .9 Promptly, as the work proceeds and upon completion, clean-up and remove from the site all rubbish and surplus material resulting from work of this trade.

3.3 QUALITY OF WORK

- .1 Erect framing level, plumb and true; to a tolerance of 5 mm in 3 metres (1/4" in 10'), and square with adjoining work.

3.4 APPLICATION

.1 Framing System

.1 Metal Stud Partitions

- (1) Place studs vertically at 400 mm (16") centres and not more than 50 mm (2") from abutting walls, openings, and each side of corners. Install studs in tracks at floors and ceiling.
- (2) Provide freedom for deflection under beams and structural slabs.
- (3) Permanently attach studs for cornice height partition to top and bottom track.
- (4) Full-height stud each side of opening.
- (5) Erect track at head and/or sill of opening to accommodate intermediate studs above and/or below opening in same manner and spacing as wall studs. Screw fasten members together adjacent to openings.

.2 Deflection Head Allowance

- (1) Allow for a maximum of 2" deflection under beams and structural slabs by utilizing outer and inner top tracks as per Standard Details in this Section.

.3 Fire Dampers in Fire Rated Partitions

- (1) Frame openings for fire dampers required by the Mechanical Contractor. Provide a 13 mm (1/2") drywall filler piece inside the perimeter of opening before installation of the damper so as to maintain the partition fire rating.

.4 Ceiling Suspension System

- (1) Hangers for suspended gypsum board ceilings shall support the grillage independent of walls, columns, pipes, ducts: erect plumb and securely anchor to the structural frame or imbed into concrete slabs.
- (2) Install angle moulding at wall perimeter at a level above the finished ceiling line equal to the total thickness of wallboard to be used. Install only on walls perpendicular to cross channels.
- (3) Hang main tees in parallel rows spaced 1220 mm (4'-0") apart and supported by hanger wires spaced 1220 mm (4'-0") apart at same level as angle moulding. Main tees in adjacent rows must have cross tee slots in perpendicular alignment.
- (4) Install cross-channels by snap locking into position in perpendicular rows spaced 400 mm (16") apart and not less than 200 mm (8") from parallel walls. Fasten ends of cross-channels to angle moulding with screws or pop rivets.
- (5) Fire rated assemblies shall have additional cross-channels within 200 mm (8") of all butt joints and openings for ducts or light fixtures. Allowable percentage of openings and additional wallboard enclosures shall conform to U.L.C. design criteria.

.2 Wall Furring

- .1 Attach furring channels to masonry or concrete surfaces at 400 mm (16") OC and not more than 100 mm (4") from corners and openings.
- .2 Wallboard Application: Always leave a 3 mm (1/8") to 6 mm (1/4") gap between wall board and floor.

.3 Single Layer Board

.1 Screw-on Application

- (1) Erect gypsum board horizontally or vertically on walls; across framing on ceilings; and secured to the framing with drywall screws at:
 - (2) Ceilings: 300 mm (12") OC
 - (3) Walls:
 - (a) 300 mm (12") OC along ends of board
 - (b) 200 mm (8") OC at perimeters of board
 - (c) 300 mm (12") OC through centre of board.
 - (4) Where it must be applied parallel, support or furring must be provided at maximum 400 mm (16") OC.
 - (5) Allow for 1/4" gap between bottom of gypsum board and top of floor.
 - (6) Ceiling board: 12.7 mm (1/2") minimum thickness.

.2 Adhesive Application

- (1) Apply panel adhesive in 6 mm (1/4") beads to face of framing members or masonry substrate, using caulking gun. Avoid adhesive squeeze-out at joints.
- (2) Erect gypsum board immediately, press firmly into place and drive supplementary screw fasteners at 600 mm (24") centres.
- (3) Apply adhesive in well ventilated area. Avoid open flame.

.3 Screw-on Application

- (1) Apply base layer horizontally and screw fasten. Apply face layer vertically and screw fasten in the same manner as base layer.
- (2) Screw fastening spacing shall be at 300 mm, 600 mm (12", 24") centres.
- (3) Locate joints over framing and secure with screws.

.4 Adhesive Application

- (1) Adhere base layer to framing with 6 mm (1/4") adhesive beads.
- (2) Laminate face layer to base layer, using Panel Adhesive (Joint Filler).

.4 Tilebacker Board

- .1 Fasten to framing with screws at 200 mm (8") centres where ceramic tile finish is called for on stud partitions.
- .2 Apply 50 mm (2") glass fibre tape over joints and corners, embed with mortar or adhesive used to set tile.

.5 Control Joints

- .1 Gypsum board surfaces should be isolated with control joints or other stress relief where:
 - (1) partition or furring abuts a structural element or dissimilar wall or ceiling;
 - (2) ceiling abuts a structural element, dissimilar wall or partition or other vertical penetration;
 - (3) construction changes within the plane of the partition or ceiling;
 - (4) partition or furring run exceeds 9 m (30');
 - (5) ceiling dimensions exceed 15 m (50') for drywall in either direction;
 - (6) exterior soffit dimensions exceed 9 m (30') in either direction;
 - (7) wings of "L", "U" and "T" -shaped ceiling areas are joined;
 - (8) expansion or control joints occur in the structural elements of the building.
- .2 Ceiling-height door frames may be used as control joints, as may less-than-ceiling-height door frames if control joints extend to ceiling from both corners.
- .3 Leave a 13 mm (1/2") continuous opening between gypsum boards for insertion of surface-mounted joint.
- .4 Interrupt wood floor and ceiling plates with a 13 mm (1/2") gap, wherever there is a control joint in the structure.
- .5 Do not attach steel studs on one side of control joint.
- .6 Provide separate supports for each control joint flange.
- .7 Provide an adequate seal behind control joint where sound and/or fire ratings are prime considerations.
- .8 Agree on exact locations of joints with the Consultant.
- .9 Use drywall screws to fasten board to framing.
- .10 Minimum fastener length to provide:
 - (1) 10 mm (3/8") minimum penetration into steel framing.
 - (2) 16 mm (5/8") minimum penetration into wood framing.
- .11 Drive screws perpendicular to face of board with sufficient penetration of screw head to sink below the surface of board without breaking the paper face.
- .12 Start securing board from the centre and work towards perimeter.
- .13 Hold board firmly to framing while fastening.
- .14 Do not set unlike edges together; always mate square to square or tapered to tapered edges.
- .15 Install casing bead at junction with dissimilar materials.

3.5 FINISHING

- .1 Install corner bead and other metal trims as required to finish board.
- .2 Fill and tape joints and fill over fastenings. Sand lightly.

- .3 Where painted surfaces are required fill and tape all joints and nail holes in the conventional manner. Allow to dry thoroughly and then skim coat all board surfaces by mixing the joint compound slightly thinner than for joint taping. Lightly cover the entire board surface using a trowel or board knife. Immediately scrape the excess joint compound off to fill surface texture and variations. Allow the skim coat to dry completely then carefully sand away any ridges in preparation for painting.
- .4 Leave finished work smooth, plumb and true ready for painting (vinyl wall covering) by others.

END OF SECTION

1 GENERAL

1.1 INSTRUCTIONS

- .1 Comply with the Instructions to Bidders, the General Conditions of the Contract, the Supplementary Conditions, and the General Requirements of Division 1.
- .2 Report in writing to the General Contractor any defects of surfaces or work prepared by other Sections which affect the quality or dimensions of the Work. Commencement of work implies acceptance of existing conditions and work by others.

1.2 INTENT

- .1 Provide all articles, labour, materials, equipment, transportation, hoisting, and incidentals noted, specified, or required, to complete the work of this Section.

1.3 SECTION INCLUDES

- .1 Provide all acoustic tile and required accessories as indicated on the working drawings, room finish schedule, including but not limited to the following:
 - .1 Acoustic Tile
 - .2 "T" Grid Suspension System

1.4 RELATED SECTIONS

- .1 Section 09 21 16 - Gypsum Board Assemblies.
- .2 Mechanical and Electrical Divisions: for installation of grilles, diffusers, lighting and additional requirements

1.5 REFERE NCES

- .1 ASTM C635-00: Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- .2 ASTM C636-04: Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
- .3 ASTM E84-06: Standard Test Method for Surface Burning Characteristics of Building Materials.
- .4 ASTM E1264-98: Standard Classification for Acoustical Ceiling Products.

1.6 SAMPLES

- .1 Submit minimum 300 mm x 300 mm (1'-0" x 1'-0") samples of acoustic tile, as required for completion of the work for the Consultant's review before proceeding with the acoustic tile work.
- .2 Submit samples of acoustic products in type specified for approval by the Consultant.

1.7 CLOSE-OUT SUBMITTALS

- .1 Submit two copies of the manufacturer's maintenance directions for each type of acoustic panel or tile.

1.8 PERFORMANCE REQUIREMENTS

- .1 Design and install the ceiling system to support the weight of the light fixtures, maximum deflection of 1/360 of the span.
- .2 Submit a letter stating that the ceiling system is capable of supporting the light fixtures. This letter is required to obtain Ontario Hydro-Electric Commission approval.

1.9 REJECTIONS

- .1 Defective materials or quality of work whenever found at any time prior to acceptance of the work shall be rejected regardless of previous inspection. Inspection will not relieve responsibility, but is a precaution against oversight and error.
- .2 Remove and replace defective materials and work of other Trades affected by this replacement, at no additional cost to the Owner.

1.10 DELIVERY, STORAGE AND HANDLING

- .1 Refer to Section 01 61 00.
- .2 Deliver acoustic tile and materials in undamaged and original containers and make certain that the storage area is dry.

1.11 EXTRA MATERIALS

- .1 Furnish the Owner with 2 percent extra materials of each type of ceiling tile to be used for future repair work.

2 PRODUCTS

2.1 MANUFACTURERS

- .1 Armstrong World Industries Limited (Ceiling Tile and Suspension)
- .2 CGC Limited (Ceiling Tile and Suspension)
- .3 Bailey Metal Products (Suspension)

2.2 ACOUSTIC CEILING TILE TYPE 1

- .1 Suspension system: to ASTM C635; Prelude XL 15/16" by Armstrong, Colour: white.
- .2 Acoustical Panels: to ASTM E1264, Cortega 823 Fireguard by Armstrong (610mm x 1220mm x 16mm), Colour: white.

3 EXECUTION

3.1 EXAMINATIONS

- .1 Report to the Consultant, in writing, all defects of work prepared by other trades and on unsatisfactory site conditions.

- .2 Do not commence the work of this Division until this Contractor has thoroughly examined all areas to receive an acoustic tile installation and has ascertained the compatibility of the installation of his material with the other trades involved directly or indirectly with this work, and has found the areas in a condition suitable for the commencement.
- .3 Consult and co-operate with trades whose work precedes or follows his work to permit an orderly and effective procedure in the execution of the work of this section.
- .4 Commencement of the work of this Section implies total acceptance of all applicable conditions by the Acoustic Tile Contractor.
- .5 Waive the right to any after claims by failure to comply with the above procedure of examinations.

3.2 QUALITY OF WORK AND APPLICATION

- .1 Install the tile and suspension system to ASTM C636, and in accordance with the manufacturer's specifications.
- .2 Plumb and square finish work with adjoining work.
- .3 Lay the work out, in accordance with the Consultant's approved reflected ceiling plan, symmetrical within each area to obtain uniform borders of at least half the acoustic panel size.
- .4 Distribute variations in shades of finish from several cartons of panels uniformly over the ceiling area.
- .5 Erect the suspension system level with tolerance of 3 mm (1/8") in 3600 mm (12').
- .6 Exposed main tees shall be as long in length as practical to minimize joints. Joints shall be tight, square flush, and reinforced with splines. Distribute jointing over the ceiling area.
- .7 Use edge moulding or shadow moulding where ceiling abuts vertical surfaces as indicated on the drawings. Use corner moulding along external edges at ceiling steps.

3.3 CLEANING AND PROTECTION

- .1 Be responsible for protection of all materials and work of this trade from damage during period of construction.
- .2 Be responsible for the protection of the work of other Contractors (trades) from damage resulting from work of this trade. He shall make good any resulting damage, to the satisfaction of the Consultant at his own expense.
- .3 Promptly, as the work proceeds and on completion, clean-up and remove from the premises all rubbish and surplus materials resulting from the foregoing work.

END OF SECTION

1 GENERAL

1.1 INSTRUCTIONS

- .1 Comply with Instructions to Bidders, the General Conditions of the Contract as amended by the Supplementary Conditions including all Sections outlined in Division 00 – Procurement and Contracting Requirements and Division 01 - General Requirements.
- .2 Report in writing to the General Contractor any defects of surfaces or work prepared by other Sections which affect the quality or dimensions of the Work. Commencement of work implies acceptance of existing conditions and work by others.

1.2 INTENT

- .1 Provide all articles, labour, materials, equipment, transportation, hoisting and incidentals noted, specified or required, to complete the work of this Section.

1.3 SECTION INCLUDES

- .1 Provide resilient floors, adhesives and bases as indicated on the working drawings & room finish schedule, including but not limited to the following:
 - .1 Sheet Vinyl
 - .2 Rubber Base
 - .3 Adhesives and Surface Preparation
 - .4 Reducer Strips
 - .5 Transition Mouldings
- .2 Include levelling of existing surfaces as required to achieve slopes and/or finished floor elevations as noted on drawings.

1.4 REFERENCES

- .1 ASTM F1066-04: Standard Specification for Vinyl Composition Floor Tile.
- .2 ASTM F1303-04: Standard Specification for Sheet Vinyl Floor Covering with Backing.
- .3 ASTM F1861-02: Standard Specification for Resilient Wall Base.
- .4 ASTM F1913-04: Standard Specification for Sheet Vinyl Floor Covering without Backing.

1.5 SUBMITTALS

- .1 Submittals under this Section shall be in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's technical product data for each type of ceiling unit and suspension system required, special installation requirements including special procedures, perimeter conditions requiring special attention. Include safety data sheets for reference on Site.

- .3 Selection Samples: duplicate 1'-0" x 1'-0" size samples, illustrating available colours and patterns for selection by Consultant.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Refer to Section 01 61 00.
- .2 Deliver and store materials undamaged in original wrapping or cartons.
- .3 Store materials in warm, dry room; stack rolled sheet goods on end, stack tiles not more than four (4) cartons high.

2 PRODUCTS

2.1 MATERIALS

- .1 Floor Leveller: Mapei "Ultra-Plan" or "Plani-Patch" as recommended by the manufacturer for the specific application.
- .2 Patching compound: "Pro Patch" polymer modified patching compound, manufactured by Proma Adhesives Inc.
- .3 Sheet Vinyl to ASTM F1913:
 - .1 Thickness/Wearlayer: 2.0 mm (0.080 inch)
 - .2 Test data:
 - (1) Flexibility (ASTM F137): Passes
 - (2) Chemical Resistance (ASTM F925): Passes
 - (3) Static Load Limit (ASTM F 970): Passes 250 psi
 - (4) Resistance to Heat (ASTM F1514): $\Delta E \leq 8$
 - (5) Resistance to Light (ASTM F1515): $\Delta E \leq 8$
 - (6) Residual Indentation (ASTM F1914): Passes
 - (7) Static Coefficient of Friction (ASTM D 2047): ≥ 0.5 SCOF
 - (8) Flammability (ASTM E648, Critical Radiant Flux): Class 1 (≥ 0.45 W/cm²)
 - .3 Allow for colours and patterns as per drawings. Colour to be selected by Consultant.
 - .4 Acceptable products and manufacturers:
 - (1) Palettone PUR by Polyflor.
 - (2) Mipolam Affinity by GerFloor
 - (3) IQ Optima by Tarkett
- .4 Rubber Base: to ASTM F1861; 4" high by Armstrong or Johnsonite; colour integrated rubber wall base. Colour: to be selected by Consultant.
- .5 Transition Mouldings: suitable for wheel traffic and ADA compliant (Barrier free); as follows:
 - .1 CTA-XX-H: 1/4" carpet to 1/8" resilient.
 - .2 CTA-XX-J 5/16" carpet to substrate
 - .3 CTA-XX-K 3/8" ceramic to 1/8" resilient.

.4 CTA-XX-L 3/8" ceramic to 1/4" carpet.

.6 Flooring Adhesive:

.1 Use manufacturer's specified adhesive only.

.7 Base Adhesive

.1 Johnsonite #960 wall base adhesive for porous wall surfaces (unpainted) gypsum or masonry substrates).

.2 Johnsonite #945 contact bond adhesive for non-porous wall surfaces (metal, painted, ceramics, etc.).

.3 Refer to Drawings for locations and sizes.

3 EXECUTION

3.1 EXAMINATIONS

.1 Verification of Conditions:

.1 Examine all work of other Sections upon which the Work of this Section depends.

.2 Do not proceed with installation until all wet work such as concrete and painting has been completed and thoroughly dried.

.3 Report in writing to the Project Manager any defects of surfaces or work prepared by other Sections which affect the quality or dimensions of the Work of this Section.

.4 Do not proceed with Work of this Section until all unsatisfactory conditions have been rectified and site conditions are ready to receive work.

.5 Commencement of work implies acceptance of existing conditions and work by others.

3.2 QUALITY OF WORK

.1 Install resilient flooring employing mechanics with the necessary training and experience as certified by the manufacturer.

.2 Do not commence laying Resilient base until just prior to completion of the building when all trades (except painter) has completed their work.

.3 Temperature of room and material shall be maintained at a minimum 20 degrees C (70 degrees F) 72 hours before, during and at least 72 hours after installation.

.4 Concrete slabs shall be a minimum of 28 days old before commencing application and be below 2½% moisture content at centre of slab and free of surface moisture.

3.3 PREPARATION

.1 Clean floor and base surfaces to be covered: using a vacuum cleaner. Remove all substances deleterious to adhesive bond.

3.4 APPLICATION

- .1 Adhesive
 - .1 Apply adhesive uniformly with an approved notch-tooth spreader at the Manufacturer's recommended rate. Do not spread more adhesive than can be covered before initial set takes place.
- .2 Base
 - .1 Install base on top of flooring.
 - .2 Install top set cove base in accordance with manufacturer's recommendations. Set base in adhesive tightly against wall and floor surfaces. Space joints uniformly.
 - .3 Accurately scribe around door-frames, fitments and other obstructions.
 - .4 Install base at all columns, walls and built-in fitments, in rooms where base is indicated.
 - .5 Form external corners and end stops from preformed units. Internal corners to be coped (not mitered) to produce a tight fit.

3.5 MAINTENANCE

- .1 Furnish Owner with two copies of manufacturer's maintenance instructions.

3.6 ADJUSTMENTS

- .1 Work shall be examined approximately ten days after completion and all adjustment of defects made good.

3.7 CLEANING AND PROTECTION

- .1 Clean work area daily in accordance with Section 01 74 00.
- .2 Protect all resilient flooring work during period of construction.
- .3 Upon completion of the resilient flooring installation, remove all excess tiles, clipping, etc. and remove any dirt spots and foreign materials to the satisfaction of the Project Manager.
- .4 Protect the finished floor with suitable and durable material or by keeping traffic off the floor until the building or room is ready for occupancy.
- .5 Upon completion of work, remove equipment and debris resulting from the work of this Section.

END OF SECTION

1 GENERAL

1.1 INSTRUCTIONS

- .1 Comply with Instructions to Bidders, the General Conditions of the Contract as amended by the Supplementary Conditions including all Sections outlined in Division 00 – Procurement and Contracting Requirements and Division 01 - General Requirements.
- .2 Report in writing to the General Contractor any defects of surfaces or work prepared by other Sections which affect the quality or dimensions of the Work. Commencement of work implies acceptance of existing conditions and work by others.

1.2 SECTION INCLUDES

- .1 Complete painting of all surfaces noted on drawings, on Room Finish Schedule and as follows:
 - .1 Interior:
 - .1 Gypsum surfaces
 - .2 Metal surfaces - prime painted and galvanized, including but not confined to hollow metal doors and frames, access panels, exposed piping, exposed structure.
 - .3 Masonry surfaces
 - .4 Concrete surfaces

1.3 RELATED SECTIONS

- .1 Section 07 92 00 – Joint Sealants.

1.4 REFERENCES

- .1 CAN/CGSB-1.57-2003: Interior Alkyd Semi-gloss Enamel.
- .2 CAN/CGSB-1.100-99: Interior Flat Latex Paint.
- .3 CAN/CGSB-1.119-2000: Interior Latex Primer-Sealer.
- .4 CAN/CGSB-1.175-97: Polyurethane Interior Coating.
- .5 CAN/CGSB-1.188-2004: Emulsion Filler for Masonry Block.
- .6 CAN/CGSB-1.195-99: Interior Latex Semi-gloss Paint
- .7 CAN/CGSB-1.209-2003: Interior Latex Low Gloss Paint.
- .8 Environmental Choice Program ECP 07.89: Water-borne Surface Coatings.
- .9 Environmental Choice Program ECP 02.89: Solvent-borne Paints.
- .10 Master Painters Institute: Architectural Painting Specification Manual.
- .11 Steel Structures Painting Council.
- .12 C.P.C.A. – Canadian Painting Contractors Association – Painting Manual.
- .13 G.G.S.B. – Standard for Paint.

1.5 SAMPLES

- .1 Submit brush-outs 150 mm x 150 mm of each paint application, labelled as to product and location.
- .2 Proceed with painting and staining mock-up only when colour and finish has been approved.

1.6 QUALITY ASSURANCE

- .1 Employ fully trained workmen who are regularly employed in this field.
- .2 Comply with VOC limits set out by Green Seal Organization for all non-alkyd and non-epoxy coatings/paints.

1.7 REJECTIONS

- .1 Defective materials or quality of work, whenever found, at any time prior to acceptance of the work, shall be rejected regardless of previous inspection. Inspection will not relieve responsibility but is a precaution against oversight or errors.
- .2 Remove and replace defective materials and work of others affected by this replacement, at no additional cost to the Owner.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Refer to Section 01 61 00.
- .2 Bring materials to the site in the original unopened containers labelled to indicate the name of the manufacturer, brand, colour and quality of the contents.
- .3 Store thinners, loose soaked rags and similar combustible materials in closed containers. Remove from site or store in an assigned area.
- .4 Store paint materials at temperatures recommended by manufacturer.

1.9 PROJECT CONDITIONS

- .1 Cooperate in coordinating the work of other Sections with the work of this Section, so that the work may proceed in an orderly and effective manner.
- .2 If requested, provide proof of purchase of all paint materials needed for the job.

1.10 ENVIRONMENTAL CONDITIONS

- .1 Maintain minimum interior temperature of 18 degrees C during application and drying of paint and maintain until handover to Owner.
- .2 Do not paint when ambient air and surface temperatures are less than 15 degrees C for 24 hours before or during painting application.
- .3 Test for moisture content in each location immediately before commencing application of paint. Do not apply paint on surfaces where moisture content exceeds 14%. Promptly notify Consultant if such conditions exist.

1.11 SCHEDULING

- .1 Unoccupied Areas: Cooperate with other trades to minimize touch-ups, but to ensure completion prior to installation of floor coverings and furniture.
- .2 Occupied Buildings: Schedule painting to prevent disruption to occupants. Painting shall be carried out as arranged/agreed with Owner.

1.12 EXTRA MATERIALS

- .1 Supply one (1) litre of each finish material in each colour used at the Place of the Work, properly labelled.

1.13 TEST AREA

- .1 A room or area in the building will be designated by the Architect as a test area to establish standard or workmanship, texture, gloss and coverage.
- .2 Prior to any painting being started, request a meeting on Site between Architect, Contractor, Sub-contractor, to review conditions, surfaces, anticipated problems and to clarify quality of workmanship acceptable to Architect. Minutes are to be documented by the Contractor and distributed to all parties at the meeting.
- .3 Apply finishes to each type of surface within room with correct material, coats, colour, texture and degree of gloss in sample area and have same approved prior to providing Work of this Section. On concrete block walls complete one wall with block filler only, one wall with block filler and one finish coat, one wall with block filler and two finish coats.
- .4 Clearly mark area as the test area. Retain test area until after completion of Work. Test area to be minimum standard for the Work.
- .5 Failure to comply with the above will be cause for the Architect to request all Work previously painted to be repainted.

2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS AND PRODUCT

- .1 Paints, stains and varnish:
 - .1 General Paint
 - .2 Benjamin Moore
 - .3 Sherwin-Williams
 - .4 Zinsser
 - .5 Glidden
- .2 Water-based Epoxy:
 - .1 Sherwin-Williams B70W00211 Water-based Catalyzed Epoxy Extra White/Tint base
A/B60V00025-Water-based Catalyzed Epoxy Egg Shell or Semi-Gloss Hardener Part B

- .2 Glidden – 4420 - True Glaze Water born Epoxy / 4426 True Glaze Egg Shell or Semi-Gloss Converter
- .3 Latex Super Adherent Primer:
 - .1 General Paint 51-050 Premium Latex Plastic Primer
 - .2 Benjamin Moore #23-00 Freshstart Acrylic Primer Sealer
 - .3 Zinsser 1-2-3 Acrylic Primer Sealer
 - .4 Sherwin-Williams – B51WQ8850 – Adhesion Primer
 - .5 Glidden Latex Super Undercoat 94280
- .4 Interior Latex Block Filler:
 - .1 Glidden # 36250 Concrete Block Filler
 - .2 Sherwin-Williams B42W00046 Heavy Duty Block Filler
 - .3 General Paint 70-224 Premium Latex Block Filler
 - .4 Benjamin Moore #595-01 Latex Block Filler
- .5 Stain Suppressant Sealer/Primer Hi-Hide:
 - .1 General Paint, 60-200 X-Terminator 2 Later Sealer
 - .2 Zinsser BIN Primer, hi-hide (spot priming only)
 - .3 Sherwin-Williams B49WQ8820 Multipur LTX Primer
 - .4 Glidden Jammer 200
- .6 Rust Inhibiting Metal Primer:
 - .1 Sherwin-Williams B66-310 Pro-Cryl Universal Primer
 - .2 Devoe Coatings, Devflex 4020PF Direct to Metal Primer
- .7 Dry Fall:
 - .1 Benjamin Moore and Co. Ltd. #597-01 Sweep-Up Spray Latex Flat
 - .2 Glidden #10120 Spraymaster Latex Eggshell
 - .3 Sherwin-Williams B42W2 Waterborne Acrylic Dry Fall, Eggshell

2.2 MATERIALS

- .1 Colours shall be those selected by the Architect as per finish plan. All primers and undercoats may be tinted to no more than 25% of the intensity of the finish colour. Where deep/intense colours are specified, only colours from the nearest factory premixed colour selection shall be altered to match those specified. The application of Clear Base Deep Tints in either Primer or Finish is not acceptable.

- .2 All primer and paint must be delivered to the job site in manufacturer's original containers.
- .3 All materials used in this painting contract are to be applied according to product label directions and in accordance with information stated on the Products Data Specification sheet.
- .4 Unless otherwise indicated two coats of the specified finish paint are required.
- .5 Any work not conforming to the specification, or not meeting with the approval of the Architect, shall be removed, or corrected and or/repainted.

3 EXECUTION

3.1 INSPECTION

- .1 Verify that all surfaces and substrate conditions are ready to receive work, as per the instructions of the product manufacturer.
- .2 Minimum application temperatures for latex paints:
 - .1 Interior 7°C; Exterior 10°C.
- .3 Beginning of installation means acceptance of site conditions.

3.2 PREPARATION

- .1 The painting contractor shall be wholly responsible for the quality of his work and is not to commence any part of it until surface is in proper condition.
- .2 If the painting contractor considers any surface unsuitable for proper finishing, he is to notify the Architect of this fact in writing. He is not to apply any material until corrective measures have been taken or they have instructed him to proceed.
- .3 All surfaces are to be clean, dry, and free from contaminates such as, but not limited to oil, grease, or dust. If for any reason the surface cannot be cleaned, this condition shall be reported to the Architect promptly.
- .4 If the painting contractor has been instructed by the Architect to begin painting under conditions and circumstances he believes could result in poor performance and early failure of the coatings, he shall request an order to proceed in writing. The first coat of primer or finish should be applied soon after surface has been cleaned properly to prevent contamination of the substrate.
- .5 All manufacturers' directions must be followed regarding surface and product preparation. Product failure due to non-compliance and any indicated corrective measures shall be the Contractor's responsibility. Surface irregularities and blemishes shall be repaired with materials which match strength, and texture of surrounding surfaces.
- .6 Walls and Ceilings: Preparation shall consist of a strong solution of tri-sodium phosphate and water, followed by a clear water rinse.

- .7 Metal surfaces: Such as but not limited to; hollow metal doors and frames, ducts, metal roof decks. Solvent wash to remove protective oil films consistent with SSPC -SP1. All surfaces must be free of grease, oil, mildew, dirt and shall be cleaned in accordance with SSPC-SP1 Solvent cleaning. This method employs the use of emulsifiers or solvents to remove surface contaminants such as oil, grease, soil, cutting compounds, etc. Thoroughly scrub entire surface with solvent. Replace cleaning rags frequently to avoid spreading the surface contaminants around. Repeat process at least once. Use clean rags for final cleaning. Use this cleaning standard as a first step prior to any abrasive blasting standards.
- .8 Wooden surfaces: All surfaces must be free of grease, oil, wax, and dust. Use solvents to remove surface contaminants. Thoroughly scrub entire surface with solvent using steel wool or Scotch Brite pads. Replace cleaning rags frequently to avoid spreading the surface contaminants around. Repeat the process at least once. Use clean rags for final cleaning.
- .9 Walls and Ceilings: Loose or flaking paint must be removed, and feather edge sanded to produce a smooth uniform surface. Any defects should be filled with an appropriate patching compound. Bare surfaces or patch compound must be primed with specified primer. High gloss painted surfaces must be dulled with sandpaper especially those that are high gloss alkyd or urethane. Surfaces to receive paint must be finished to a level 5 finish.
- .10 Metal Surfaces: Such as, but not limited to previously painted hollow metal doors and frames, ducts, metal roof decks. Remove loose mill scale, non-adherent rust, scaling paint, and other foreign matter consistent with SSPC-SP2 by employing the use of scrapers, sandpaper, wire brushes, or hand impact tools. Bare surfaces must be primed with specified primer. High gloss painted surfaces must be dulled with sandpaper especially those that are high gloss alkyd or urethane.
- .11 Wooden Surfaces: All surfaces shall be free of loose or failing paint or clear coatings. Sand using 100 grit sand paper with the grain or employ a paint scraper in a manner consistent with removing the coating only so as to not damage the surface of the wood. Paint stripper may be employed taking care not to contact and damage adjacent surfaces. Sand surface to a final smoothness with the grain using 220 grit sandpaper wipe surface with a clean tack cloth to remove sanding dust. Spot prime any bare wood areas with the appropriate primer or clear coating.
- .12 Prepare surfaces in accordance with covering manufacturer's instructions.

3.3 APPLICATION

- .1 Perform mandatory surface cleaning and preparation prior to commencing this section.
- .2 Application of primers and finishes shall be by brush, roller, spray, or a combination of those methods.
- .3 On each designated substrate, apply in compliance with this specification, only the approved products or product combinations.
- .4 Exterior Precast – Previously Painted:
 - .1 Exterior grade latex super adherent primer: one coat
 - .2 Exterior grade water based catalyzed epoxy semi-gloss: two coats
- .5 Concrete Block – Previously Painted:
 - .1 Latex super adherent primer: one coat
 - .2 Water based catalyzed epoxy semi-gloss: two coats

- .6 Drywall Board
 - .1 Latex super adherent primer: one coat
 - .2 Water based catalyzed epoxy egg-shell or semi-gloss: two coats
 - .3 Ceilings are to receive egg-shell finish
- .7 Hollow Metal Doors/Frames
 - .1 Sherwin-Williams Pro-Cryl Universal Primer: one coat
 - .2 Water based catalyzed epoxy semi-gloss: two coats
- .8 Woodwork to be Stained and Varnished
 - .1 1-coat wood stain
 - .2 2-coats varnish (satin)
- .9 Apply products in accordance with manufacturer's instructions.
- .10 Sand lightly between coats to achieve required finish.
- .11 Do not apply finishes to surfaces that are not dry.
- .12 Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surfaces.
- .13 Finishes and number of coats specified in the schedule are intended to cover surfaces perfectly. If they do not, apply further coats until perfect coverage and colour are achieved as required.
- .14 Dark colours will require multiple coats to full saturation and coverage. Acceptance will be confirmed by Consultant.
- .15 Any areas exhibiting incomplete or unsatisfactory coverage shall have the entire plane painted. Patching will not be acceptable.
- .16 Walls needing repainting, entire wall/plane shall be painted to the satisfaction of the Architect.
- .17 Primer and subsequent top coats are to be products from same manufacturer unless otherwise stated in this specification.
- .18 Concrete Block: Block filler is to be applied at the minimum rate of 80 sq ft per gallon (1.63 m² per litre), or as required by block texture to completely fill block. **Pinholes will not be accepted.** Apply more block filler if necessary to completely fill the block before applying finish coats. Note that lightweight block requires more block filler to fill than standard weight block does and adjust application rate as required.
- .19 Paint gas piping on exterior of building.
- .20 Paint all exposed piping within school.
- .21 Paint all exposed structural steel.

3.4 PROTECTION

- .1 Protection (drop sheets, tarps, plywood decking and masking) for surfaces not being painted under this Specification shall be supplied and kept in place during the project. It will be the Contractor's responsibility to repair any and or all damaged surfaces.
- .2 Wall mounted electrical fixture face plates, such as but not limited to; receptacles, switch boxes, cover plates, etc. are to be removed before painting and are to be replaced at completion of painting.
- .3 Upon completion of a room or area, it shall be left in a clean and orderly condition and all paint splatters, contaminated rags and trash shall be removed.
- .4 Upon completion of the job, the Painting Contractor is to remove all surplus materials and scaffolds that relate to his trade from the premises.
- .5 It will be the Contractor's responsibility to ensure the rooms being painted have adequate fresh air for safe occupancy by workers.

3.5 CLEANING

- .1 As work proceeds, promptly remove paint where spilled, splashed or spattered.

END OF SECTION

1 GENERAL

1.1 INSTRUCTIONS

- .1 Comply with the Instructions to Bidders, the General Conditions of the Contract, the Supplementary Conditions and the General Requirements of Division 1.
- .2 Report in writing to the General Contractor any defects of surfaces or work prepared by other Sections which affect the quality or dimensions of the Work. Commencement of work implies acceptance of existing conditions and work by others.

1.2 INTENT

- .1 The following prefabricated items to be supplied and installed:
 - .1 Whiteboards
 - .2 Tackboards.
 - .3 Aluminum trim.
 - .4 Projection Screens with all mounting brackets and accessories.
 - .5 Projector Mounting arm, brackets and accessories.

1.3 SUBMITTALS

- .1 Shop Drawings
 - .1 Submit shop drawings as specified in Section 01 33 00, specifically provide the following:
 - (1) Location, type, size and panel arrangement.
 - (2) Backing, hardware and anchor details.
 - (3) Frame, trim and accessories.

1.4 REJECTIONS

- .1 Defective materials or quality of work, whenever found, at any time prior to acceptance of the work, shall be rejected regardless of previous inspection. Inspection will not relieve responsibility but is a precaution against oversight or errors.
- .2 Approved Manufacturers: The manufacturers listed are only approved if they can provide the product as described.
- .3 Remove and replace defective materials and work of other trades affected by this replacement, at no additional cost to the Owner.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Refer to Section 01 61 00.
- .2 Deliver and store materials undamaged in original cartons or wrappings.
- .3 Store material in a secure, dry area.

2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- .1 ASI Visual Display Products: Mississauga, Ontario. Phone: 905-822-4287.
- .2 CPE Design Solutions: Contact: Robert Scheidler. Phone: 905-334-3925
- .3 Global School Products: Mississauga, Ontario. Phone: 905-565-9314.

2.2 MATERIALS

- .1 Manual projection screens:
 - .1 Heavy duty, spring roller operated, steel case. Pentagonal, flat back design, steel case with scratch-resistant white textured finish. Universal hanging brackets for attachment to wall or ceiling. Case 22 gauge steel with matching end caps with integral roller brackets.
 - .2 Screen size: 96 in x 96 in
 - .3 Locations: as shown on Drawings.
 - .4 Accessories:
 - (1) Chain Hangers
 - (2) All mounting hardware.
 - (3) Pull rods (1 each).
 - (4) Ceiling trim kits.
 - .5 Acceptable Products
 - (1) Luma 2 with AR, by Draper Shade and Screen Company Inc., Spiceland IN (distributed by First Vision, Toronto ON).
 - (2) Model C with CSR, by DA-Lite Screen Company, Warsaw IN.
- .2 "VDP" (video-digital-projector), mounting pipe and mount
 - .1 At locations shown on Drawings, provide Chief RPAU projector mount with Chief CMA 395 angled ceiling adapter and CMS extension pole.
 - .2 Mounting pipe shall have 1-1/2 in. NPS threads.
 - .3 VDP bracket mounting pipe to be mechanically fastened to existing precast beams where shown on Drawings, centered on projection.
 - .4 Bottom of VDP bracket mounting pipe to be level with top of projection screen. Projection screen to be mounted 4" below ceiling.
 - .5 Provide shop drawings.
 - .6 Shop paint exposed pipe flat black.

.3 Whiteboards

- .1 Whiteboards core shall be impregnated sound absorbing fibreboard, 12 mm (7/16") thick. Laminate under heat and pressure.
- .2 All whiteboards shall consist of face panel, core, balancing rear sheet, trim and chalk rails.
- .3 Face panel shall be 28 gauge high quality enamelling steel base with a porcelain enamel writing surface fused to a ground coat of not less than 0.076 mm (.003") nor more than 0.127 mm (.005") after firing at temperatures between 730 Deg C. (1350 Deg F) and 760 Deg C (1400 Deg F), in accordance with the Porcelain Enamel Institute Standards PEI S104 as regards to durability, smoothness of texture, colour continuity and a gloss factor of 6-8 as measured by 45 Deg glossometer. Colour: white.
- .4 Surface shall be washable. General household detergents shall not damage face panel in any manner. Surface shall be cleanable with acetone, alcohol, and cleaning fluid.
- .5 Balancing rear sheet shall be 28 gauge zinc coated stretcher leveled steel in one unjointed section. Overall thickness of whiteboard lamination shall not exceed 12.5 mm (1/2").
- .6 Vertical jambs shall be provided for all chalkboards/whiteboards, same length of board, complete with contour fittings and castings.
- .7 Trim shall be aluminum 6063T5 alloy with clear etched, anodized satin finish 0.051 mm (.002") satin finish, free from extruding draw marks and surface scratches. Perimeter trim shall be 19 mm (3/4") exposed face, weight of approximately 91 g (.20 lbs) per linear foot. Use A.S.P. Series 200 Trim, or approved equal. Use A.S.P. No. 207 divider bar – aluminum trim for adjacent whiteboard/whiteboard panels, whiteboard/tackboard panels to be 12.7 mm (1/2") exposed face and weight of approximately 113 g (.25 lbs) per linear foot. Use No. 206 map rail over all whiteboards. Use No. 200 perimeter to sides of whiteboard and around fixed tackboard.
- .8 Use No. 264 marker tray and end caps where whiteboard is located over architectural woodwork. Use No. 212 marker tray and end caps in all other whiteboard locations. Provide recessed marker tray for whiteboards in gymnasium.
- .9 Accessories manufacturer's standard:
 - (1) Map hooks every 90 mm o.c.

.4 Tackboards

- .1 All tackboards shall be 12.5 mm (1/2") factory prelaminated. One half the thickness indicated shall be A.S.P. natural cork, fine grain laminated to 6.25 mm (1/4") particleboard or Masonite substrate under mechanical pressure.
- .2 Maximum panel sizes shall be 1200 mm x 2400 mm (4' x 8'). Use bonding of materials by a waterproof adhesive that will not delaminate or rupture at the contact surfaces for all material bonding.
- .3 Trim shall be aluminum 6063T5 alloy with clear etched, anodized 0.051 mm (0.002") satin trim 0.051 mm (.002") satin finish, free from extruding draw marks and surface scratches. Weight shall be 90 g (0.20 lbs) per foot.

.4 All tackboards shall be mounted as per manufacturer's instructions. See drawing for location. Perimeter trim shall be 19 mm (3/4") exposed face.

.5 See plans for tackboard size, location, and number.

3 EXECUTION

3.1 EXAMINATION

- .1 Report to the Consultant, in writing, all defects of work prepared by other trades and on unsatisfactory site conditions.
- .2 Do not commence the work of this Division until surfaces, area, conditions specified or indicated on drawings, to receive manufactured specialties, are compatible with the manufacturer's installation requirements.
- .3 Commencement of work implies total acceptance of all preliminary installation requirements by the Contractor installing manufactured specialty items.
- .4 Waive any after claims by failure to comply with the above procedure of examination.

3.2 INSTALLATION

- .1 Carry out installation of information specialties by tradesmen with the necessary training and experience, and certified by the manufacturer or the Contractor.
- .2 Conform to manufacturer's printed installation instructions and/or shop drawings.
- .3 Install components to ensure a rigid, straight, square, plumb installation with horizontal lines level.
- .4 Securely attach aluminum trims to ensure that all fastenings are concealed.
- .5 Adhere tackboards to wall surface with an approved adhesive in egg-size blobs at approximately 200 mm (8") OC. Press tackboards firmly into adhesive, ensuring proper adhesion.
- .6 Join chalkboards together using steel spline and extruded polyvinyl slotted inserts to ensure a flush butt joint with a hairline appearance.

3.3 CLEANING AND PROTECTION

- .1 Be responsible for protection of all manufactured specialty work during period of construction.
- .2 Upon completion of installation of all manufactured specialty items remove all excess material, empty cartons, wrappings, etc. and remove any dirt spots and foreign material from the installed items, leaving them in a clean, usable condition.

3.4 CLEAN-UP

- .1 Upon the completion of work, remove from the site all surplus materials and debris caused by this work and leave the site in a clean condition to the satisfaction of the Consultant.

END OF SECTION

Division 20 Common Requirements for Mechanical

20 00 01	Mechanical Specification Index
	Common Contract Requirements for Mechanical
20 02 51	Mechanical Contract General Requirements
	Common Work Results for Mechanical
20 05 11	Mechanical General Requirements
20 05 21	Demolition and Renovation
20 05 34	Bases, Hangers and Supports (Indoor)
20 05 35	Bases, Hangers, and Supports (Outdoor)
20 05 49	Vibration Control Measures
20 05 53	Identification of Mechanical Services
	Testing, Adjusting, and Balancing
20 06 11	Testing, Adjusting, and Balancing (TAB) of Mechanical Systems
	Commissioning for Mechanical
20 08 11	Mechanical Contractor Commissioning Requirements

Division 22 Plumbing

	Plumbing Insulation
22 07 19	Plumbing Piping Insulation
	Facility Water Distribution
22 11 16	Domestic Water Piping – Copper
22 11 20	Backflow and Cross Connection Measures
	Facility Sanitary Sewerage
22 13 16	Sanitary Waste and Vent Piping – Cast Iron and Copper
22 13 17	Sanitary Waste and Vent Piping – Plastic
	Plumbing Auxiliary Equipment
22 36 13	Plumbing Auxiliary Equipment
	Plumbing Fixtures Combined With Drawing Schedule
22 44 13	Plumbing Fixtures Combined With Drawing Schedule

Division 23 Heating, Ventilating, and Air Conditioning (HVAC)

	Operation and Maintenance of HVAC Systems
23 01 31	HVAC System Cleaning
	HVAC Insulation
23 07 13	Duct Insulation
23 07 19	HVAC Piping Insulation
	Facility Fuel Piping
23 11 23	Facility Natural-Gas & Propane Piping

	Hydronic Piping and Pumps
23 21 11	Hydronic Accessories
23 21 13	Hydronic Piping - Screwed/Welded
	Refrigerant Piping
23 23 13	Refrigerant Piping and Specialties
	HVAC Water Treatment
23 25 13	Water Treatment for Closed-Loop Hydronic Systems
	HVAC Ducts and Casings
23 31 13	Metal Ducts
	Air Duct Accessories
23 33 13	Duct Accessories
23 33 14	Volume Control Dampers
23 33 16	Fire Dampers
23 33 17	Smoke Control Dampers
23 33 18	Operating Dampers
23 33 46	Flexible Ducts
23 33 53	Duct Liners
	Air Outlets and Inlets
23 37 13	Diffusers, Registers, and Grilles
23 37 23	Louvres and Vents for Intake and Exhaust
	Packaged Outdoor HVAC Equipment
23 74 45	Packaged Air Source Rooftop HVAC Units with Back-Up Gas Heat

Division 25 Integrated Automation

	Building Automation System
25 20 11	Building Control System

END OF SECTION

Part 1 General

1.1 GENERAL PROVISIONS

- .1 This section covers items common to all sections of Mechanical Division.
- .2 Conform to Division 1 General Conditions.
- .3 Furnish labour, materials, and equipment necessary for completion of work as described in contract documents.
- .4 Unless specifically indicated, all materials and equipment provided under this contract shall be new and shall be manufactured in the project year.

1.2 INTENT

- .1 Mention herein or indication on Drawings of articles, materials, operations or methods requires: supply of each item mentioned or indicated, of quality, or subject to qualifications noted; installation according to conditions stated: and, performance of each operation prescribed with furnishing of necessary labour, equipment, and incidentals for mechanical work.
- .2 Where used, words "Section" and "Division" shall also include other Subcontractors engaged on site to perform work to make building and site complete in all respects.
- .3 Where used, word "supply" shall mean furnishing to site in location required or directed complete with accessory parts.
- .4 Where used, word "install" shall mean secured in place and connected up for operation as noted or directed.
- .5 Where used, word "provide" shall mean supply and install as each is described above.

1.3 REGULATIONS, PERMITS, AND FEES

- .1 All materials and quality of work shall meet all current and latest Provincial, Municipal and Fire Marshall requirements, regulations, codes, and by-laws in force in the area of the project.
- .2 Each contractor shall give all necessary notices, obtain all necessary permits, and pay all fees in order that the work shown or specified may be carried out. Each contractor shall furnish any certificates necessary as evidence that the work installed conforms with the laws and regulations of all authorities having jurisdiction.
- .3 In the event that changes, or alterations are required on completed work by authorized inspectors, these changes shall be made at the contractor's expense.
- .4 Special equipment which does not have a standard CSA label shall be inspected by the local electrical authority having jurisdiction and the Approval Certificate shall be submitted to the Consultant as soon as possible. All costs and fees for inspections shall be borne by this contractor.

1.4 AFTER-HOURS WORK

- .1 This project is a renovation in nature. The months of July and August will allow the contractor daily access to the building within regular working hours. Due to the potential timing of equipment delivery (delivery after Summer months), this contractor shall include in their tender price for after-hours/weekend work upon the return of students to the building (early-September and on) in order to complete the construction project.

1.5 DRAWINGS

- .1 Mechanical Drawings do not show structural and related details. Take information involving accurate measurement of building from building drawings, or at building. Make, without additional charge, any necessary changes, or additions to runs of piping, conduits, and ducts to accommodate structural conditions. Location of pipes, ducts, conduits and other equipment may be altered by Consultant without extra charge provided change is made before installation and does not necessitate major additional material.
- .2 As work progresses and before installing piping, ductwork, heating units, registers, diffusers, fixtures and any other fittings and equipment which may interfere with interior treatment and use of building, provide detail drawings, or obtain directions for exact location of such equipment and fittings.
- .3 Mechanical Drawings indicate general location and route of pipes, ducts and conduits which are to be installed. Where required work is not shown or only shown diagrammatically, install same at maximum height in space to conserve head room (minimum 2200 mm (88") clear) and interfere as little as possible with free use of space through which they can pass. Follow building lines, conceal piping, conduits and ducts in furred spaces, ceilings and walls unless specifically shown otherwise. Install work close to structure so furring will be small as practical.
- .4 Install piping and ductwork to clear structural members and any fireproofing. Locate mechanical work to permit installation of specified insulation. Do not remove or damage structural fireproofing. Leave space to permit fireproofing and insulation to be inspected and repaired.
- .5 Before commencing work, check and verify all sizes, locations, grade and invert elevations, levels, and dimensions to ensure proper and correct installation. Verify existing/municipal services.
- .6 Locate all mechanical and electrical equipment in such a manner as to facilitate easy and safe access to and maintenance and replacement of any part.
- .7 In every place where there is indicated space reserved for future or other equipment, leave such space clear, and install piping and other work so that necessary installation and connections can be made for any such apparatus. Obtain instructions whenever necessary for this purpose.
- .8 Relocate equipment and/or material installed but not co-ordinated with work of other Sections and/or installed incorrectly as directed, without extra charge.

- .9 Where drawings are done in metric and product not available in metric, the corresponding imperial trade size shall be utilized.

1.6 INTERFERENCE AND COORDINATION DRAWINGS

- .1 Prepare interference and equipment placing drawings to ensure that all components will be properly accommodated within the constructed spaces provided.
- .2 Prepare drawings to indicate co-ordination and methods of installation of a system with other systems where their relationship is critical. Ensure that all details of equipment apparatus, and connections are coordinated.
- .3 Ensure that clearances required by jurisdictional authorities and clearances for proper maintenance are indicated on drawings.
- .4 Upon consultant's request submit copies of interference drawings to consultant.
- .5 Due to the nature of the building and the complexity of the building systems provide the following:
 - .1 Interference drawings, showing coordination of architectural, structural, mechanical, and electrical systems for the consultant's review prior to fabrication.
 - .2 Detailed layout drawings, clearly showing fasteners and hangers.
- .6 Provide CAD drawings (minimum file version AutoCAD 2013) in addition to hard copies.

1.7 QUALITY ASSURANCE

- .1 Perform work in accordance with applicable provisions of local Plumbing Code, Gas Ordinances, and adoptions thereof for all mechanical systems. Provide materials and labor necessary to comply with rules, regulations, and ordinances.
- .2 In case of differences between building codes, provincial laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Promptly notify Consultant in writing of such differences.

1.8 ALTERNATES AND SUBSTITUTIONS

- .1 Throughout Mechanical Division are lists of "Alternate Equipment" manufacturers acceptable to Consultant if their product meets characteristics of specified described equipment. Submitted Bids shall be based on the supply of named articles and or products as specified in the Bid Documents.
- .2 Each bidder may elect to use "Alternate Equipment" from lists of Alternates where listed. Include for any additional costs including all costs for revisions to electrical contract to suit Alternate used. Prices are not required in Tender for Alternates listed except where specifically noted as "Separate Price". Complete the Supplementary Tender Form.

- .3 When two or more suppliers/manufacturers are named in the Bid Documents, only one supplier/manufacturer of the products named will be acceptable; however, it is the responsibility of this Division to ensure "Alternate Equipment" fits space allocated and gives performance specified. If an "Alternate Equipment" nor "equal" specified product unit is proposed and does not fit space allotted in Consultant's opinion, supply of specified described equipment will be required without change in Contract amount. Should electrical characteristics for "alternate" or "equal" equipment differ from equipment specified it shall be the responsibility of the equipment manufacturer to pay all costs associated with the revisions to the electrical contract. Only manufacturers listed will be accepted for their product listing. All other manufacturers shall be quoted as substitution stating conditions and credit amount.
- .4 If item of material specified is unobtainable, state in Tender proposed substitute and amount added or deducted for its use. Extra monies will not be paid for substitutions after Contract has been awarded.
- .5 If pipe or item, of size or weight indicated, is unobtainable, supply next larger size or heavier weight without additional charge.

1.9 ALTERNATES AND SUBSTITUTIONS

- .1 Throughout Division 15 are lists of "Alternate and equal Equipment" manufacturers acceptable to Consultant if their product meets characteristics of specified described equipment.
- .2 Each bidder may elect to use "Alternate or equal Equipment" manufacturers from lists of Alternates where listed. Include for any additional costs including all costs for revisions to electrical contract to suit Alternate used. Prices are not required in Tender for Alternates listed except where specifically noted as "Separate Price" in which case contractor will complete the Supplementary Tender Form.
- .3 It is responsibility of this Division to ensure "Alternate Equipment" fits space allocated and gives performance specified. If an "Alternate Equipment" nor "equal" specified product unit is proposed and does not fit space allotted in Consultant's opinion, supply of specified described equipment will be required without change in Contract amount. Should electrical characteristics for "alternate" or "equal" equipment differ from equipment specified it shall be the responsibility of the equipment manufacturer to pay all costs associated with the revisions to the electrical contract. Only manufacturers listed will be accepted for their product listing. All other manufacturers shall be quoted as substitution stating conditions and credit amount.
- .4 If pipe or item, of size or weight indicated, is unobtainable, supply next larger size or heavier weight without additional charge.

1.10 EXAMINATION

- .1 Site Reviews
 - .1 Examine premises to understand conditions, which may affect performance of work of this Division before submitting proposals for this work.
 - .2 No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.

- .2 Drawings:
 - .1 Mechanical Drawings show general arrangement of piping, ductwork, equipment, etc. Follow as closely as actual building construction and work of other trades will permit.
 - .2 Consider Architectural and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over Plumbing, Mechanical, and Fire Protection Drawings.
 - .3 Because of small scale of Drawings, it is not possible to indicate 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 required to meet conditions.
- .3 Ensure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents. If approval is received by Addendum or Change Order to use other than originally specified items, be responsible for specified capacities and for ensuring that items to be furnished will fit space available.

1.11 SEQUENCING SCHEDULING AND COORDINATION

- .1 It is understood that while Drawings are to be followed as closely as circumstances permit, this Division will be held responsible for installation of systems according to the true intent and meaning of Contract Documents. Anything not clear or in conflict will be explained by making application to Consultant. Should conditions arise where certain changes would be advisable, secure Consultant's approval of these changes before proceeding with work.
- .2 Coordinate work of various trades in installing interrelated work. Before installation of mechanical items, make proper provision to avoid interferences in a manner approved by Consultant. Each Contractor shall refer to all sections of the specification for their responsibilities with other trades. Changes required in work specified in Mechanical Division caused by neglect to do so shall be made at no cost to Owner.
- .3 Arrange pipes, ducts, and equipment to permit ready access to valves, unions, traps, starters, motors, control components, and to clear openings of doors and access panels.
- .4 Furnish and install inserts and supports required by Mechanical Division unless otherwise noted. Furnish sleeves, inserts, supports, and equipment that are an integral part of other Divisions of the Work to Sections involved in sufficient time to be built into construction as the Work proceeds. Locate these items and see that they are properly installed. Expense resulting from improper location or installation of items above shall be borne by Mechanical Division.

- .5 Be responsible for required excavation, backfilling, cutting, and patching incident to work of this Division and make required repairs afterwards to satisfaction of Consultant. Cut carefully to minimize necessity for repairs to existing work. Do not cut beams, columns, or trusses.
 - .1 Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown. Surface finishes shall exactly match existing finishes of same materials.
 - .2 Each Section of this Division shall bear expense of cutting, patching, repairing, and replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it.
 - .3 Cutting, patching, repairing, and replacing pavements, sidewalks, roads, and curbs to permit installation of work of this Division is responsibility of Section installing work.
- .6 Adjust locations of pipes, ducts, equipment, fixtures, etc, to accommodate work from interferences anticipated and encountered. Determine exact route and location of each pipe and duct prior to fabrication.
 - .1 Make offsets, transitions, and changes in direction of pipes, ducts, and electrical raceways as required to maintain proper head room and pitch of sloping lines whether or not indicated on Drawings.
 - .2 Furnish and install traps, air vents, sanitary vents, pull boxes, etc, as required to effect these offsets, transitions, and changes in direction.
- .7 Slots and openings through floors, walls, ceilings, and roofs shall be provided by this contractor but performed by a trade specializing in this type of work. This Division shall see that they are properly located and do any cutting and patching caused by its neglect to do so.

1.12 REQUEST FOR INFORMATION (RFI) PROCEDURES

- .1 RFIs shall be submitted to the consultant minimum two (2) weeks prior to answer being required. Failure to submit an RFI in a timely manner will forfeit delay claims and schedule extension requests by the contractor.
- .2 All RFIs will be submitted with the following information:
 - .1 RFI number
 - .2 Name of project
 - .3 Date of initiation
 - .4 Date response required by (minimum two (2) weeks)
 - .5 Subject
 - .6 Submitter's name
 - .7 Drawing/specification reference
 - .8 Photograph of the issue (if applicable)
 - .9 Description of the issue
 - .10 Contractor's proposed resolution

1.13 CONTRACT BREAKDOWN

- .1 Provide breakdown of contract exclusive of HST to acceptance of consultants prior to first draw submission.
- .2 Provide labour and material cost for each item.
- .3 Breakdown shall indicate total contract amount.
- .4 Contract breakdown shall be as follows as a minimum.
 - Mobilization and shop drawings (max. \$2000.00)
 - Demolition
 - Inside buried plumbing and drainage
 - Above grade rough-in plumbing and drainage
 - Plumbing Fixtures
 - Unit ventilators
 - Louvered penthouses
 - Condensing units
 - HVAC units
 - Gas piping
 - Heating piping
 - Piping Insulation
 - Ductwork
 - Duct Insulation
 - Grilles & Diffusers
 - Fire Stopping
 - Building Automation Systems
 - Testing Adjusting and Balancing
 - HVAC system commissioning
 - Refrigeration Piping
 - Mechanical contractor closeout requirements (min. of 3% for the first \$500,000.00, 1% from \$500,000.00 to \$5,000,000.00, and 0.5% beyond. Shall not be less than \$5,000.00)
- .5 Progress claims, when submitted are to be itemized against each item of the contract breakdown, this shall be done in table form showing contract amount, work complete to date, previous draw, amount this draw and balance.
- .6 **Mobilization amount may only be drawn when all required shop drawings have been reviewed by the consultant.**

1.14 SHOP DRAWINGS AND PRODUCT DATA

- .1 Furnish complete catalog data for manufactured items of equipment to be used in the Work to Consultant for review within 14 days after award of Contract.
- .2 Upon receipt of reviewed shop drawing, product is to be ordered immediately.
- .3 Provide a complete list of shop drawings to be submitted prior to first submission.

- .4 Before submitting to the Consultant, review all shop drawings to verify that the products illustrated therein conform to the Contract Documents. By this review, the Contractor agrees that it has determined and verified all field dimensions, field construction criteria, materials, catalogue numbers, and similar data and that it has checked and coordinated each shop drawing with the requirements of the work and of the Contract Documents. The Contractor's review of each shop drawings shall be indicated by stamp, date and signature of a qualified and responsible person possessing by the appropriate authorization.
- .5 If material or equipment is not as specified or submittal is not complete, it will be rejected by Consultant.
- .6 Additional shop drawings required by the contractor for maintenance manuals, site copies etc., shall be photocopies of the "reviewed" shop drawings. All costs to provide additional copies of shop drawings shall be borne by the contractor.
- .7 Submit all shop drawings for the project as a package. Partial submittals will not be accepted.**
- .8 Catalog data or shop drawings for equipment, which are noted as being reviewed by Consultant or their Engineer shall not supersede Contract Documents.
- .9 Review comments of Consultant shall not relieve this Division from responsibility for deviations from Contract Documents unless Consultant's attention has been called to such deviations in writing at time of submission, nor shall they relieve this Division from responsibility for errors in items submitted.
- .10 Check work described by catalog data with Contract Documents for deviations and errors.
- .11 Shop drawings and product data shall show:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances. e.g., access door swing spaces.
- .12 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.
- .13 State sizes, capacities, brand names, motor HP, accessories, materials, gauges, dimensions, and other pertinent information. List on catalog covers page numbers of submitted items. Underline applicable data.
- .14 Shop drawings shall be submitted electronically as per the following directions:
 - .1 Electronic Submissions:
 - .1 Electronically submitted shop drawings shall be prepared as follows:
 - .1 Use latest software to generate PDF files of submission sheets.

- .2 Scanned legible PDF sheets are acceptable. Image files are not acceptable.
- .3 PDF format shall be of sufficient resolution to clearly show the finest detail.
- .4 PDF page size shall be standardized for printing to letter size (8.5"x11"), portrait with no additional formatting required by the consultant. Submissions requiring larger detail sheets shall not exceed 11"x17".
- .5 Submissions shall contain multiple files according to section names as they appear in Specification.
- .6 File names shall include consultant project number and description of shop drawing section submitted.
- .7 Each submission shall contain an index sheet listing the products submitted, indexed in the same order as they appear in the Specification. Include associated PDF file name for each section.
- .8 On the shop drawing use an "electronic mark" to indicate what is being provided.
- .9 **Each file shall bear an electronic representation of the "company stamp" of the contractor. If not stamped the file submission will not be reviewed.**
- .2 Email submissions shall include subject line to clearly identify the consultants project number and the description of the shop drawings submitted.
- .3 Electronic attachments via email shall not exceed 10MB. For submissions larger than 10MB, multiple email messages shall be used. Denote related email messages by indicating "1 of 2" and "2 of 2" in email subject line for the case of two messages.
- .4 Electronic attachments via web links (URL) shall directly reference PDF files. Provide necessary access credentials within link or as username/password clearly identified within body of email message.
- .5 On site provide one copy of the "reviewed" shop drawings in a binder as noted above.
- .6 Contractor to print copies of "reviewed" shop drawings and compile into maintenance manuals in accordance with requirements detailed in this section.

1.15 EQUIPMENT NAMEPLATE DATA

- .1 Between the manufactures design published literature, the shop drawing submission literature, and the nameplate data on the equipment, they can all read differently.
- .2 Most of the confusion and differences are coming out of the electrical power installation.

- .3 The contractors installing and connecting the equipment are responsible for the coordination of this data through the construction period.
- .4 The contractors shall share and/or request this information through out the project and monitor/make adjustments, provide recommendations accordingly based on any discrepancies.
- .5 The contractors are responsible for any cost associated with the changing data.
- .6 The final installation must meet the "Nameplate Data" on the equipment on site.

1.16 OPERATION AND MAINTENANCE MANUAL

- .1 Provide operation and maintenance data for incorporation into manual as in submittals' requirements.
- .2 Operation and maintenance manual to be approved by, and final copies deposited with, Consultant before final inspection.
- .3 Submit 1 copy of Operation and Maintenance Manual to Consultant for approval. Submission of individual data will not be accepted unless so directed by Consultant. Submission can be done electronically in pdf format or as a hardcopy.
 - .1 Electronic submission/pdf file is required to be bookmarked. Any submission received without bookmarking will be immediately returned as unacceptable.
 - .2 Hardcopy submission shall be in a three-ring binder (minimum 50 mm (2") ring) and labelled as 'Operation and Maintenance Manual' with project name and location. Dividers are to be used for binder organization.
- .4 Make changes as required and re-submit as directed by Consultant.
- .5 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 and flow diagram.
 - .7 Colour coding chart.
 - .8 Spare parts equipment list.
 - .9 Manufacturers standard or extended warranty information.
- .6 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.

- .7 Performance data to include:
 - .1 Equipment manufacturer's performance data sheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test results.
 - .3 Special performance data as specified elsewhere.
 - .4 Testing, adjusting and balancing reports as specified in Testing, Adjusting and Balancing Section.
 - .5 Copy of all substantial performance final certificates.
- .8 Miscellaneous data to include:
 - .1 Letter of contractor's warranty and guarantee.
 - .2 WRDSB Project Asset and Warranty Card for all assets replaced, newly installed, and removed.
 - .3 Index sheet.
 - .4 Tabbed format for each section.
 - .5 Manufacturers approved shop drawings.
 - .6 Spare parts list and source.
 - .7 List of Manufacturers and suppliers address for each piece of equipment.
- .9 Final Submittals:
 - .1 Upon acceptance of Operation and Maintenance Manual by the Consultant provide the following:
 - .1 Provide two (2) copies of final operation maintenance manuals, as well as a PDF file of the entire approved manual on a USB stick. Only one USB stick is to be provided containing both the approved manual and as-built drawings.

1.17 AS-BUILT DRAWINGS

- .1 Site records:
 - .1 Contractor shall provide 2 sets of reproducible mechanical drawings. 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 changes to existing mechanical systems, control systems and low voltage control wiring.
 - .2 On a weekly basis, transfer information to reproducibles, revising reproducibles to show all work as actually installed.
 - .3 Use different colour waterproof ink for each service.
 - .4 Make available for reference purposes and inspection at all times.
- .2 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 3 mm (1/8") high as follows: - "AS-BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (date).
- .3 TAB to be performed using as-built drawings.
 - .1 Submit hard copy to Consultant for approval. When returned, make corrections as directed.
 - .2 Once approved, submit completed reproducible paper as-built drawings as well as a scanned pdf file copy on USB stick with Operating and Maintenance Manuals.

1.18 WARRANTIES

- .1 In addition to guarantee specified in General Conditions, guarantee heating, cooling, and plumbing systems to be free from noise in operation that may develop from failure to construct system in accordance with Contract Documents.
- .2 Provide certificates of warranty for each piece of equipment made out in favor of Owner. Clearly record "start-up" date of each piece of equipment on certificate. Include certificates as part of Operation & Maintenance Manual.
- .3 Contractor shall rectify any installation deficiencies in the boiler or pressurized other systems identified by a TSSA Inspector for a period of three (3) years from ready for takeover.
- .4 Warranty period shall start from date of ready for takeover.

1.19 OCCUPANCY REQUIREMENTS

- .1 The contractor shall provide the following documentation to the consultant's satisfaction prior to receiving occupancy. Failure to provide the proper documentation will result in the occupancy not being granted. List of required documentation:
 - .1 Final Certificates (required prior to consultant's release of conformance letter).
 - .1 Potable Water Test (Refer to domestic water piping – Copper section – Part 3)
 - .2 Mandatory TSSA Gas Pressure Test (CSA B149.1)

1.20 READY FOR TAKEOVER

- .1 Complete the following to the satisfaction of the consultant prior to request for ready for takeover.
 - .1 As-Built Drawings.
 - .2 Maintenance Manuals
 - .3 System Start up
 - .4 TAB Reports
 - .5 HVAC System Commissioning
 - .6 Instructions to Owners

1.21 REVISION TO CONTRACT

- .1 Provide the following:
 - .1 Itemized list of material with associated costs.
 - .2 Labour rate and itemized list of labour for each item.
 - .3 Copy of manufacturers/supplier's invoice if requested.

1.22 DELIVERY, STORAGE, AND HANDLING

- .1 Follow Manufacturer's directions in delivery, storage, and protection, of equipment and materials. Contractor to include all costs associated with delivery storage and handling in tender price.
- .2 Deliver equipment and material to site and tightly cover and protect against dirt, water, and chemical or mechanical injury but have readily accessible for inspection. Store items subject to moisture damage (such as controls) in dry, heated space.

1.23 DESIGNATED SUBSTANCES AND HAZARDOUS MATERIALS

- .1 **If designated substances and/or hazardous materials are suspected or identified cease all work in the immediate area in accordance with OHSA and notify consultant.**
- .2 **Each contractor and on site employee of the contractor shall have "asbestos awareness training".**
- .3 The Contractor shall ensure that employees who may come into contact with designated substances and/or hazardous materials due to the nature of the work that they perform, have received training that enables them to recognize designated substances and/or hazardous materials and that enables them to react in accordance with the Occupational Health and Safety Act and regulations thereto should contact with designated substances and/or hazardous materials occur during the course of their work.
- .4 **It is the responsibility of the contractor to review the designated substances and/or hazardous materials book in the building prior to starting any work.**
- .5 **Existing occupied buildings (depending upon their age) may contain designated substances and/or hazardous materials in thermal insulating materials and some manufactured products, such as vinyl asbestos floor tile. Any insulating materials, on pipes, fittings, boilers, tanks, ductwork, etc. may contain designated substances and/or hazardous materials and shall not be disturbed.**
- .6 **A survey of each building documenting the location and condition of designated substances and/or hazardous materials -containing materials is available for your mandatory review prior to commencing any work on premises.**

1.24 TSSA INSPECTION

- .1 Prior to final completion of the project, this contractor shall make application, arrange, and pay for a TSSA inspection of all piping systems and equipment installations, including, but not limited to medical gasses, refrigeration, fuel piping, compressed air, heating plant, cooling plant, and associated equipment installed under the contract.

- .2 Provide a copy of the TSSA report in the maintenance manuals for each system.

1.25 CONFINED SPACES

- .1 Certain areas of the building may be defined as a “Confined Space”. Any personnel working in these areas must have confined space training, appropriate equipment and undertake all work in conformance with appropriate codes and standards.
- .2 Refer to building documentation for any spaces deemed “Confined Space”.

1.26 ENERGY EFFICIENCY

- .1 The mechanical systems of this building must achieve the energy efficiency levels by conforming to ANSI/ASHRAE/IESNA 90.1 “Energy Standard for Buildings Except Low-Rise Residential Buildings” and Chapter 2 of Division 3 of SB-10 prescriptive method from the Ontario Building Code.
- .2 All equipment, products, and installations must conform to the Codes and Standards.

END OF SECTION

Part 1 General

1.1 TESTS

- .1 Give 48 hours written notice of date for tests.
- .2 Insulate or conceal work only after testing and approval by Consultant.
- .3 Conduct tests in presence of Consultant.
- .4 Bear costs including retesting and making good.
- .5 Piping:
 - .1 General: maintain test pressure without loss for 4 h unless otherwise specified.
 - .2 Hydraulically test steam and hydronic piping systems at 1-1/2 times system operating pressure or minimum 860 kPa, whichever is greater.
 - .3 Test natural gas systems to CSA-B149.1-00, TSSA requirements and requirements of authorities having jurisdiction.
 - .4 Test drainage, waste and vent piping to Ontario Building Code and authorities having jurisdiction.
 - .5 Test domestic hot, cold and recirculation water piping at 1-1/2 times system operating pressure or minimum 860 kPa (124.8 psi), whichever is greater.
 - .6 Test fire systems in accordance with authorities having jurisdiction and as specified elsewhere.
- .6 Equipment: test as specified in relevant sections.
- .7 Prior to tests, isolate all equipment or other parts which are not designed to withstand test pressures or test medium.

1.2 SYSTEM START UP

- .1 **Provide adjusting testing and start up of all equipment prior to testing and balancing (TAB) specified elsewhere.**
- .2 **Provide consultant with written notice verifying all equipment operation and installation is complete.**
- .3 **Start up shall be in presence of the following: owner or representative, contractor, building automation systems (BAS) contractor, and manufacturer's representative. Each person shall witness and sign off each piece of equipment. Consultant's attendance will be determined by consultant.**
- .4 Simulate system start up and shut down and verify operation of each piece of equipment.
- .5 Arrange with all parties and provide 72 hours notice for start up procedure.
- .6 Arrange with building automation systems contractor to sequence all components and ensure system operation.

1.3 COMMISSIONING

- .1 Co-ordinate and direct each step of the commissioning process and recommend acceptance or non-acceptance to the Owner/Owner's Representative.**
- .2 Prepare, in writing, documentation of any deficiencies discovered during the commissioning process. Submit to consultant and Owner/Owner's Representative.**
- .3 The Commissioning Process is detailed in *ASHRAE Guideline 1-1996 HVAC Commissioning Process*. The commissioning plan may be modified to reflect the actual construction schedule and design.**
- .4 Provide a pre-functional test of all HVAC mechanical system and sub-system elements, including control devices, shall be checked for the following:**
 - .1 Verify that each element has been properly installed, properly identified, and that all connections (including electrical) have been made correctly.**
 - .2 Verify that each element has been checked for proper lubrication, drive rotation, belt tension, control sequence, flow direction, or other conditions which may cause damage or reduce system performance.**
 - .3 Verify that tests, meter readings, and specific mechanical/electrical performance characteristics agree with those required by equipment or system manufacturer.**
 - .4 Controls calibration to be completed in accordance with the specification.**
 - .5 The TAB shall be done in accordance with the specifications.**
- .5 A functional performance testing shall be done during two separate periods – one during the cooling season and one during the heating season. The first (cooling) testing period shall occur as soon after completion of installation as practical. The heating testing period shall occur as soon as weather conditions make it practical to test warm-up, zone heating and economizer functions. These tests ensure that all equipment and systems operate in accordance with design intent. The tests are dynamic tests, and test the systems through all possible modes of operation.**
- .6 Reports:**
 - .1 The contractor shall be responsible for recording, documenting, and maintaining detailed inspection and testing data on the test documentation reports. The data record shall be comprehensive and concise.**
 - .2 All data must be recorded as soon as possible during the course of the inspection and testing.**
 - .3 All documentation shall have the date, time, and names of persons participating in the inspection and testing.**
 - .4 All test instruments shall be documented for valid calibration.**
 - .5 The recording work sheets, inspection check lists, and Performance Testing plans must all be approved by the Engineer and the owner's representative prior to the start of the testing.**
 - .6 Include all commissioning documentation in the maintenance manuals.**

- .7 Mechanical System Execution:**
- .1** Operate equipment and systems shall be tested in the presence of the owner's representative and the consultant to demonstrate compliance with specified requirements. To minimize the time of Commissioning Team members, testing shall be done in four seasonal single blocks of time insofar as possible.
 - .2** Notify the consultant, in writing, fourteen (14) days prior to tests scheduled under requirements of this Section.
 - .3** Testing shall be conducted under specified design operating conditions as recommended or approved by the consultant.
 - .4** All elements of systems shall be tested to demonstrate that total systems satisfy all requirements of these Specifications. Testing shall be accomplished on hierarchical basis. Test each piece of equipment for proper operation, followed by each sub-system, followed by entire system, followed by any inter-ties of other major systems.
 - .5** All special testing materials and equipment shall be provided by the appropriate contractor.
 - .6** Provide three copies of all test reports and records to the consultant.
- .8** The verification testing procedures shall address all operating characteristics of all mechanical equipment and systems, including:

Equipment Checklist

Unit Ventilators

Rooftop Heating/Cooling Unit(s)

Controllers/Valves/Dampers

Relays/Sensors/Transducers

System Checklist

Unit Ventilators

Rooftop Heating/Cooling Unit(s)

1.4 DEMONSTRATION AND OPERATING AND MAINTENANCE INSTRUCTION

- .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** Mechanical contractor to schedule and coordinate the demonstration all on the same day, starting at a pre-approved time and continuing consequently until complete.
- .3** Where specified elsewhere in Mechanical Division, qualified manufacturers' representatives who are knowledgeable about the project to provide demonstrations and instructions.
- .4** Use operation and maintenance manual, as-built drawings, audio visual aids, etc. as part of instruction materials.
- .5** Instruction duration time requirements as specified in appropriate sections.
- .6** Where deemed necessary, Consultants may record these demonstrations on video tape for future reference.

1.5 TRIAL USAGE

- .1 Consultant or owner may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Trial usage to apply to following equipment and systems:
 - .1 HVAC
 - .2 Exhaust air
 - .3 Domestic water
 - .4 Plumbing and drainage.

1.6 DEFICIENCIES

- .1 During the course of construction, the consultants will monitor construction and provide written reports of work progress, discussions, and instruction to correct work.
- .2 Instruction to correct work shall be done within the work period before the next review.
- .3 The contractor shall not conceal any work until inspected.
- .4 The contractor shall expedite 100% complete rough-in work and have inspected prior to concealing services and equipment especially above ceiling.
- .5 Upon completion of the project the consultant will do a final review. Upon receiving the final inspection report, the contractor must correct and sign back the inspection report indicating the deficiencies are completed. A re-inspection will only be done once consultant receives this in writing.

1.7 EQUIPMENT INSTALLATIONS

- .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.

1.8 MOUNTING HEIGHTS

- .1 Mounting height of equipment is from finished floor to equipment unless specified or indicated otherwise. Coordinate with block coursing (if applicable).
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- .3 Install mechanical equipment at following heights unless indicated otherwise.
 - .1 Thermostats: Barrier Free (operable) 1200 mm (47.25")
Non Barrier Free 1500 mm (59")

Also follow direction of architectural drawings and where discrepancies occur clarify prior to rough-in.

1.9 ANCHOR BOLTS AND TEMPLATES

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

1.10 PROTECTION OF OPENINGS

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

1.11 ELECTRICAL

- .1 Electrical work to conform to Electrical Division including the following:
 - .1 Supplier and installer responsibility and related mechanical responsibility is indicated in Equipment Schedule on mechanical and/or electrical drawings
 - .2 Power wiring and conduit is specified in Electrical Division except for conduit, wiring and connections below 50 V which are related to control systems specified in Mechanical Division. Follow Electrical Division for quality of materials and workmanship.
 - .3 Electrically operated equipment shall be C.S.A. approved label. Special Inspection Label of Provincial Authority having jurisdiction will be accepted in lieu of C.S.A. approval. Each motor shall have an approved starter. Starter will be supplied and installed by Electrical Division unless otherwise indicated.

1.12 CONTROL WIRING

- .1 Furnish and install all components, devices, and control wiring for all plumbing, fire protection, HVAC equipment, HVAC systems, lighting, and other electrical loads to make all equipment operable to satisfaction of owner and consultant and to manufacturer's requirements and recommendations.
- .2 All electrical wiring, mechanical wiring and installations shall comply with local and national electrical and mechanical codes.
- .3 Supply and install wiring as required for all devices and systems. Install wiring in EMT conduit and otherwise comply with all requirements of the Electrical Division. Approved plenum wire may be used for sensor and network communication wiring where it complies with appropriate building codes and regulatory authorities.
- .4 All wiring concealed in walls and chases, and all exposed wiring shall be run in conduit.
- .5 Provide recessed conduit and backer boxes where controls are wall mounted. Surface mounted boxes and conduit are acceptable in mechanical or service rooms.
- .6 Free-run plenum rated cable shall be run in cable hangers where provided by electrical division or tied neatly to pipe and duct hangers in the ceiling. Avoid wiring that droops. Follow building lines and do not run wiring "as the crow flies".

1.13 MOTORS

- .1 Provide high efficiency 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 Motors under 373 W, (1/2 hp): speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, voltage as indicated.
- .4 Motors 373 W, (1/2 hp) and larger: EEMAC Class B, squirrel cage induction, speed as indicated, continuous duty, drip proof, ball bearing, maximum temperature rise 40°C (72°F), 3 phase, voltage as indicated.

1.14 BELT DRIVES

- .1 Fit reinforced belts in sheave 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 7.5 kW 10 hp: standard adjustable pitch drive sheaves, having plus or minus 10% range. Use mid-position of range for specified r/min.
- .4 For motors 7.5 kW 10 hp and over: sheave with split tapered bushing and keyway having fixed pitch unless specifically required for item concerned. Provide sheave of correct size to suit balancing.
- .5 Minimum drive rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.
- .6 Motor slide rail adjustment plates to allow for centre line adjustment.
- .7 Provide sheave changes as required for final air balancing.

1.15 GUARDS

- .1 Provide guards for unprotected devices.
- .2 Guards for belt drives:
 - .1 Expanded metal screen welded to steel frame.
 - .2 Minimum 1.2 mm (18 gauge) thick sheet metal tops and bottoms.
 - .3 40 mm (1 1/2") diameter holes on both shaft centres for insertion of tachometer.
 - .4 Removable for servicing.
- .3 Provide means to permit lubrication and use of test instruments with guards in place.
- .4 Install belt guards to allow movement of motors for adjusting belt tension.
- .5 Guard for flexible coupling:
 - .1 "U" shaped, minimum 1.6 mm (16 gauge) thick galvanized mild steel.
 - .2 Securely fasten in place.
 - .3 Removable for servicing.

- .6 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.
- .7 Duct Openings in Floor
 - .1 Provide reinforced expanded mesh grating, style 3 (3 lbs/sq.ft.) cover on accessible unprotected duct openings over 300 mm (12") wide and as indicated. This includes all ductwork terminating in air handling units and plenums.
 - .2 Securely Fasten in place.
 - .3 Removable for servicing.

1.16 PIPING AND EQUIPMENT SUPPORTS

- .1 Equipment supports supplied by equipment manufacturer: specified elsewhere in Mechanical Division.
- .2 Piping and equipment supports not supplied by equipment manufacturer: fabricate from structural grade steel meeting requirements of - Structural Steel Section. Submit structural calculations with shop drawings.
- .3 Mount base mounted equipment on chamfered edge housekeeping pads, minimum of 100 mm (4") high and 150 mm (6") larger than equipment dimensions all around. Concrete specified elsewhere.
- .4 Where housekeeping pads incorporate existing pads provide 10 mm dowels into existing pads. New pad height shall match existing.

1.17 SLEEVES

- .1 Pipe sleeves: at points where pipes pass through masonry, concrete or fire rated assemblies and as indicated. Grout sleeves in place.
- .2 Schedule 40 steel pipe.
- .3 Sleeves with annular fin continuously welded at midpoint:
 - .1 Through foundation walls.
 - .2 Where sleeve extends above finished floor.
 - .3 Through fire rated walls and floors.
- .4 Sizes: minimum 6 mm (1/4") clearance all around, between sleeve and uninsulated pipe or between sleeve and insulation.
- .5 Terminate sleeves flush with surface of concrete and masonry walls, concrete floors on grade and 25 mm (1") above other floors.
- .6 Fill voids around pipes:
 - .1 Caulk between sleeve and pipe in foundation walls and below grade floors with waterproof fire retardant non-hardening mastic.

- .2 Where sleeves pass through walls or floors, provide space for firestopping. Where pipes/ducts pass through fire rated walls, floors and partitions, maintain fire rating integrity.
- .3 Ensure no contact between copper tube or pipe and ferrous sleeve.
- .4 Fill future-use sleeves with lime plaster or other easily removable filler.
- .5 Coat exposed exterior surfaces of ferrous sleeves with heavy application of zinc rich paint to CGSB 1-GP-181M+Amdt-Mar-78.
- .7 Provide minimum 20 gauge duct sleeves where ducts pass through masonry concrete or fire rated assemblies. Maintain minimum 25 mm clearance all around or to the requirements of the authority having jurisdiction. Seal at wall as indicated.

1.18 FIRE STOPPING

- .1 This contractor shall work with all other contractors on the project in providing one common method of fire stopping all penetrations made in fire rated assemblies.
- .2 Approved fire stopping and smoke seal material in all fire separations and fire ratings within annular space between pipes, ducts, insulation and adjacent fire separation and/or fire rating.
- .3 Do not use cementitious or rigid seals around penetrations for pipe, ductwork, or other mechanical items.
- .4 Insulated pipes and ducts: ensure integrity of insulation and vapour barrier at fire separation.
- .5 Provide materials and systems capable of maintaining effective barrier against flame, smoke and gases. Ensure continuity and integrity of fire separation.
- .6 Comply with the requirements of CAN4-S115-M35, and do not exceed opening sized for which they have been tested.
- .7 Systems to have an F or FT rating (as applicable) not less than the fire protection rating required for closures in a fire separation. Provide "fire wrap" blanket around services penetrating fire walls. Extent of blanket must correspond to ULC recommendations.
- .8 The fire stopping materials are not to shrink, slump or sag and to be free of asbestos, halogens and volatile solvents.
- .9 Firestopping materials are to consist of a component sealant applied with a conventional caulking gun and trowel.
- .10 Fire stop materials are to be capable of receiving finish materials in those areas which are exposed and scheduled to receive finishes. Exposed surfaces are to be acceptable to consultant prior to application of finish.
- .11 Firestopping shall be inspected and approved by local authority prior to concealment or enclosure.
- .12 Install material and components in accordance with ULC certification, manufacturers instructions and local authority.

- .13 Submit product literature and installation material on fire stopping in shop drawing and product data manual. Maintain copies of these on site for viewing by installers and consultant.
- .14 Manufacturer of product shall provide certification of installation. Submit letter to the consultant.
- .15 Acceptable Alternate Manufacturers to approval of local authority:
 - .1 Minnesota Mining and Manufacturing.
 - .2 Fryesleeve Industries Inc.
 - .3 General Electric Pensil Firestop Systems
 - .4 International Protective Coatings Corp.
 - .5 Rectorseal Corporation (Metacaulk)
 - .6 Proset Systems
 - .7 3M
 - .8 AD Systems
 - .9 Hilti
- .16 Ensure firestop manufacturer representative performs on site inspections and certifies installation. Submit inspection reports/certification at time of substantial completion.

1.19 ESCUTCHEONS

- .1 On pipes and ductwork passing through walls, partitions, floors and ceilings in exposed finished areas and on water and drain pipes inside millwork and cabinets.
- .2 Chrome or nickel plated brass or Type 302 stainless steel, one piece type with set screws.
- .3 Outside diameter to cover opening or sleeve.
- .4 Inside diameter to fit around finished pipe.

1.20 PAINTING

- .1 Refer to Section Interior Painting and specified elsewhere.
- .2 Apply at least one coat of corrosion resistant primer paint to ferrous supports and site fabricated work.
- .3 Apply two coats of paint to exposed piping service in mechanical room, base colour as specified in Mechanical Identification Section.
- .4 Prime and touch up marred finished paintwork to match original.
- .5 Restore to new condition, or replace equipment at discretion of consultant, finishes which have been damaged too extensively to be merely primed and touched up.

1.21 SPARE PARTS

- .1 Furnish spare parts in accordance with general requirements and as follows:
 - .1 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.
- .2 Provide list of equipment in maintenance manuals indicating corresponding spare parts required. List of spare parts to be signed off by receiving personnel.

1.22 SPECIAL TOOLS

- .1 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Maintenance Materials Special Tools and Spare Parts.

1.23 ACCESS DOORS

- .1 Provide access doors to concealed mechanical equipment for operating, inspecting, adjusting and servicing.
- .2 Flush mounted 600 x 600 mm (24" x 24") for body entry and 300 x 300 mm (12" x 12") for hand entry unless otherwise noted. Doors to open 180°, have rounded safety corners, concealed hinges, screwdriver latches and anchor straps.
- .3 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.
 - .3 Fire rated areas: provide ULC listed access doors.
 - .4 Washrooms or high moisture area ceilings: Aluminum with mill finish suitable for painting.
- .4 Installation:
 - .1 Locate so that concealed items are accessible.
 - .2 Locate so that hand or body entry (as applicable) is achieved.
- .5 Acceptable materials:
 - .1 Le Hage
 - .2 Zurn
 - .3 Acudor
 - .4 Nailor Industries Inc.

1.24 DIELECTRIC COUPLINGS

- .1 General:
 - .1 To be compatible with and to suit pressure rating of piping system.
 - .2 Where pipes of dissimilar metals are joined.
- .2 Pipes NPS 50 mm (2") and under: isolating unions.
- .3 Pipes NPS 65 mm (2 1/2") and over: isolating flanges.

1.25 DRAIN VALVES

- .1 Locate at low points and at section isolating valves unless otherwise specified.
- .2 Minimum NPS 20 mm (3/4") unless otherwise specified: bronze, with hose end male thread and complete with cap and chain.
- .3 Drain valves on potable water systems shall be complete with vacuum breaker.

1.26 REPAIRS, CUTTING, AND RESTORATION

- .1 Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown. Surface finishes shall exactly match existing finishes of same materials.
- .2 Each Section of this Division shall bear expense of cutting, patching, and repairing to install their work and/or replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it.
- .3 Cutting, patching, repairing, and replacing pavements, sidewalks, roads, and curbs to permit installation of work of this Division is responsibility of Section installing work.
- .4 All patching, painting and making good of the existing walls, floors, ceilings, partitions and roof will be at the expense of this Contractor, but performed by the Contractor specializing in the type of work involved unless otherwise noted.

1.27 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.

1.28 CLEANING

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units prior to turn over to owner.
- .2 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.

1.29 DISCONNECTION AND REMOVAL

- .1 Disconnect and/or remove equipment, piping, ductwork, etc. as indicated.
- .2 Cap and conceal all redundant and obsolete connections.
- .3 Provide a list of equipment to be removed to the owner, for his acceptance of same. Remove all equipment from site, which the owner does not retain.
- .4 Store equipment to be retained by owner on site where directed by consultant.

1.30 OWNER SUPPLIED EQUIPMENT

- .1 Connect to equipment supplied by the owner and make operable.

1.31 LOCATION OF EXISTING UNDERGROUND SERVICES

- .1 This contractor shall locate existing services prior to starting any work in the affected area.**
- .2 This contractor shall use a video camera for the existing storm and/or sanitary drainage at the indicated connection point to confirm location, size and invert of the existing piping.**

1.32 EXISTING CONCRETE SLAB X-RAY/SCANNING

- .1 This contractor shall retain the services of a qualified company to provide and X-ray and/or scan of the existing buried services in wall and/or floors prior to starting any work in the affected area.**
- .2 Failure to locate existing piping, conduit rebar etc., shall not relieve this contractor of repair of same prior to installing his service.**
- .3 This contractor shall be responsible for all repairs and/or replacement of existing services caused by cutting the existing concrete slabs and/or walls.**

1.33 EXCAVATING AND BACKFILLING

- .1 Provide all excavating and backfilling inside and outside the building for plumbing pipes, drains and equipment. All backfilling shall be new clean granular 'A' fill brought in specifically for the purpose of backfilling to the underside of floor slab. All backfilling shall be compacted at intervals not more than 150 mm (6") layer to the satisfaction of the Consultant.**
- .2 Provide excavating and backfilling outside the building with granular A brought in specifically for backfilling to a minimum of 450 mm (18") over the pipe. Backfilling outside building over and above the 450 mm (18") backfill as previously specified herein shall be by the Mechanical Contractor as specified under Division 2. Where backfilling outside the building is not specified under Division 2 the mechanical contractor shall provide new clean granular 'A' fill to grade level.**
- .3 Bottoms of trenches shall be excavated so that the pipe will be supported on a 150 mm (6") compacted bed of clean granular 'A' fill. Provide all necessary pumping to maintain excavation free of water.**
- .4 Should water be encountered during excavation, the mechanical contractor shall provide all labour and material, including all equipment required for dewatering the excavation. After the water has been removed, this Contractor shall install a 300 mm (12") base of compacted 50 mm (2") clear stone covered with filter cloth before installing backfill as detailed and/or as specified.**
- .5 Be responsible for all weather protection required to install piping and/or equipment to the satisfaction of the Consultant.**
- .6 Be responsible for providing all clear stone or granular 'A' material suitable for application to replace existing soil not suitable for backfilling above the 450 mm (18") bedding material.**

1.34 CONFINED SPACES

- .1 Certain areas of the building may be defined as a “Confined Space”. Any personnel working in these areas must have confined space training, appropriate equipment and undertake all work in conformance with appropriate codes and standards.
- .2 Refer to building documentation for any spaces deemed “Confined Space”.

1.35 TSSA INSPECTION

- .1 Prior to final completion of the project, this contractor shall make application, arrange, and pay for a TSSA inspection of all piping systems and equipment installations, including, but not limited to medical gasses, refrigeration, fuel piping, compressed air, heating plant, cooling plant, and associated equipment installed under the contract.
- .2 Provide a copy of the TSSA report in the maintenance manuals for each system.

1.36 INTEGRATED LIFE SAFETY SYSTEMS TESTING

- .1 Mechanical systems in this building, including but not limited to smoke control dampers, smoke control fans, high speed low velocity ceiling fans, makeup air units, heat tracing for fire protection systems and fire protection system components may be subject to Integrated Life Safety Systems testing.
- .2 The Mechanical Contractor shall co-ordinate with the Integrated Life Safety Systems Testing Agent as follows:
 - .1 Confirm which mechanical systems are to be included as part of the testing process.
 - .2 Verify in writing to the Integrated Life Safety Systems Testing Agent that mechanical commissioning of the affected systems/devices is complete prior to the scheduled testing date(s).
 - .3 Participate in the Integrated Life Safety Systems Testing to confirm proper operation of all associated systems.
 - .4 This contractor shall work with the Integrated Life Safety Systems Testing Agent to reset all systems back to normal operating mode after the testing is complete.
- .3 Include all costs associated with Integrated Life Safety System Testing in the tender value.
- .4 Refer to Division 1/Division 26 Integrated Life Safety Systems Testing specifications for additional information/requirements.

1.37 REFRIGERANT CONTAINING EQUIPMENT

- .1 A2L refrigerants are classified as mildly flammable. CSA B52-2023 has specific safety clauses related to the use of refrigerants with this classification within buildings.
- .2 This Contractor shall be responsible to ensure that the installation requirements of CSA B52-2023 are met.

- .3 Throughout this specification various pieces of equipment have been specified with refrigerant leak detection systems. Field wiring of the alarm status of this system to various downstream system components is required under Annex P of the standard and is the responsibility of this Contractor. These devices include the following:
- .1 Open all zone dampers connected to the affected system.
 - .2 Disable electric reheat coils within the affected system.
 - .3 Activate field installed safety shut off valves on the affected refrigeration systems
 - .4 De energize any potential sources of ignition with the ductwork system of the affected system.
 - .5 Energize fans within the ductwork system.
 - .6 Activate any designated refrigeration leak ventilation systems.

END OF SECTION

Part 1 General

1.1 GENERAL PROVISIONS

- .1 Conform to the General Provisions of General Requirements Section.
- .2 This project is one of a retrofit nature in part, and which will require some demolition.
- .3 Allow for all remedial work in areas indicated on the drawings and as generally defined in the relevant sections of the specifications.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- .1 Electrical Division.

1.3 SCOPE OF WORK

- .1 The scope of work is essentially the selected disconnection and/or removal of services and/or equipment, piping ductwork etc. as indicated or required to complete the work.

Part 2 Products

2.1 GENERAL

- .1 This Division is to liaise with the Owners or Consultant for equipment being removed that may be suitable for reuse to that specified or handed over to the owner.
- .2 This Division to take full responsibility for any special tools or equipment required to disassemble or remove material from building.

Part 3 Execution

3.1 GENERAL

- .1 The general requirements are indicated on the drawings and on the outline specification in Division 1.
- .2 The general execution of the demolition is to be carried out in a clean and efficient manner.
- .3 Demolition of existing ceiling, walls etc., to facilitate removal of existing services or equipment or installation of new to be kept to a minimum and then restored to match existing.
- .4 All openings or holes created by removal of existing mechanical systems which are not being reused are to be patched with the same material surrounding surfaces.
- .5 All new holes and openings to facilitate mechanical systems are to be patched to match surrounding surfaces.

- .6 Protect all existing furnishings materials and equipment. Any damage occurring as a result of the work of this Division shall be repaired or replaced at the expense of this Division.
- .7 Where work involves breaking into or connecting to existing services, carry out work at times directed by the Owners in an expedient manner with minimum disruption to the facility and systems downtime.
- .8 Where unknown services are encountered, immediately advise Consultant and confirm findings in writing.
- .9 Where the location of any services has been shown on the plans, such information is not guaranteed. It is this Division's responsibility to verify locations, invert elevations, etc., immediately after moving on site. Should for any reason the information obtained necessitates changes in procedure or design, advise the Consultant at once. If verification of existing conditions is not done at the outset and any problems arise, the responsibility for same is entirely this Division's.
- .10 Disconnect and/or remove equipment piping, ductwork, etc. as indicated.
- .11 Cap and conceal all redundant and obsolete connections.
- .12 Provide a list of equipment to be removed to the owner, for his acceptance of same. Remove all equipment from site which the owner does not retain.
- .13 Maintain equipment to be retained by owner on site where directed by consultant.
- .14 Demolition of all parts of the work must be completed within the confines of the work area and in such a way as the dust produced and risk to injury of will not adversely affect the building users.
- .15 Demolished areas of the existing building will remain in their current use in some cases. Demolition in these areas must be kept to the minimum required to complete the work.
- .16 Demolition shall take place within areas isolated from all other areas with appropriate hoarding, scaffolding, netting, fencing or other means of security between building users and the work.
- .17 Co-ordinate making safe electrical devices, capping plumbing and removal of fixtures prior to commencement of demolition.
- .18 All piping and equipment to be removed and/or abandoned shall be drained prior to capping and/or abandoning. Disposal of all liquids shall be to the approval of authority of having jurisdiction and/or provincial regulations.

3.2 EXISTING SYSTEM DRAINAGE

- .1 Drain all existing piping and drainage systems including all related equipment as required to facilitate system renovations.
- .2 Disposal of existing system shall be to the requirements of the local and/or provincial regulations.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 American National Standards Institute/ American Society of Mechanical Engineers (ANSI/ASME)
 - .1 ANSI/ASME B31.1, Power Piping, (SI Edition).
- .3 American Society for Testing and Materials (ASTM)
 - .1 ASTM A 125, Specification for Steel Springs, Helical, Heat-Treated.
 - .2 ASTM A 307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .3 ASTM A 563, Specification for Carbon and Alloy Steel Nuts.
- .4 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
 - .1 MSS SP-58, Pipe Hangers and Supports - Materials, Design, Manufacture Selection, Application, and Installation.

1.2 DESIGN REQUIREMENTS

- .1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
- .2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP-58.
- .3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.
- .4 Design hangers and supports to support systems under all conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.
- .5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment to be in accordance with MSS SP-58.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with general requirements.
- .2 Submit shop drawings and product data for following items:
 - .1 All bases, hangers and supports.
 - .2 Connections to equipment and structure.
 - .3 Structural assemblies.

1.4 MAINTENANCE DATA

- .1 Provide maintenance data for incorporation into manual specified in general requirements.

Part 2 Products

2.1 GENERAL

- .1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1 and MSS-SP-58.
- .2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

2.2 PIPE HANGERS

- .1 Finishes:
 - .1 Pipe hangers and supports: to ANSI & ULC requirements
 - .2 Ensure steel hangers in contact with copper piping are copper plated.
- .2 Upper attachment structural: Suspension from upper flange of I-Beam or joist.
 - .1 Cold piping NPS 50 mm (2") maximum: Ductile iron C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip.
 - .1 Rod: 10 mm (3/8") UL listed
 - .2 Cold piping NPS 65 mm (2 1/2") or greater, all hot piping: Malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers, UL listed & FM approved.
- .3 Upper attachment structural: Suspension from upper flange of I-Beam.
 - .1 Cold piping NPS 50 mm (2") maximum: Ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, UL listed.
 - .2 Cold piping NPS 65 mm (2 1/2") or greater, all hot piping: Malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nuts.
- .4 Upper attachment to concrete.
 - .1 Ceiling: Carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye 6 mm (1/4") minimum greater than rod diameter.
 - .2 Concrete inserts: wedge shaped body with knockout protector plate ULC listed. Note: Rapidex and Siporex are not considered concrete. Should one of these systems be encountered, piping/ductwork and/or equipment shall be supported from adjacent walls or from supplemental steel provided by this contractor attached to the adjacent walls/structure.

- .5 Shop and field-fabricated assemblies.
 - .1 Trapeze hanger assemblies: ASME B31.1.
 - .2 Steel brackets: ASME B31.1.
- .6 Hanger rods: threaded rod material to MSS SP-58.
 - .1 Ensure that hanger rods are subject to tensile loading only.
 - .2 Provide linkages where lateral or axial movement of pipework is anticipated.
- .7 Pipe attachments: material to MSS SP-58.
 - .1 Attachments for steel piping: carbon steel.
 - .2 Attachments for copper piping: copper plated black steel.
 - .3 Use insulation shields for all piping.
 - .4 Oversize pipe hangers and supports to accommodate thermal insulation.
Provide 1.5 mm (16 gauge) saddles.
- .8 Adjustable clevis: material to MSS SP-58 UL listed, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.
 - .1 Ensure "U" has hole in bottom for rivetting to insulation shields.

2.3 INSULATION PROTECTION SHIELDS

- .1 Insulated cold piping:
 - .1 64 kg/m² (13.12 lbs/ft²) density insulation plus insulation protection shield to: MSS SP-69, galvanized sheet carbon steel. Length designed for maximum 3 m (10') span.
- .2 Insulated hot piping:
 - .1 Curved plate 300 mm (12") long, with edges turned up, welded-in centre plate for pipe sizes NPS 300 mm (12") and over, carbon steel to comply with MSS SP-58.

2.4 CONSTANT SUPPORT SPRING HANGERS

- .1 Springs: alloy steel to ASTM A 125, shot peened, magnetic particle inspected, with +/- 5% spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.
- .2 Load adjustability: [10]% minimum adjustability each side of calibrated load. Adjustment without special tools. Adjustments not to affect travel capabilities.
- .3 Provide upper and lower factory set travel stops.
- .4 Provide load adjustment scale for field adjustments.
- .5 Total travel to be actual travel + 20%. Difference between total travel and actual travel 25 mm (1") minimum.
- .6 Individually calibrated scales on each side of support calibrated prior to shipment, complete with calibration record.

2.5 EQUIPMENT SUPPORTS

- .1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel meeting requirements of miscellaneous metals, specified herein. Submit calculations with shop drawings.

2.6 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

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

2.7 OTHER EQUIPMENT SUPPORTS

- .1 From structural grade steel meeting requirements of structural steel section specified herein.
- .2 Submit structural calculations with shop drawings.

2.8 MANUFACTURER

- .1 Acceptable materials:
 - .1 Grinnell
 - .2 Anvil
 - .3 Myatt
 - .4 Taylor

Part 3 Execution

3.1 INSTALLATION

- .1 Install in accordance with:
 - .1 Manufacturer's instructions and recommendations.
- .2 Vibration Control Devices:
 - .1 Install on piping systems at pumps, boilers, chillers, cooling towers, elsewhere as indicated.
- .3 Clamps on riser piping:
 - .1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.
 - .2 Bolt-tightening torques to be to industry standards.
 - .3 Steel pipes: Install below coupling or shear lugs welded to pipe.
 - .4 Cast iron pipes: Install below joint.
- .4 Clevis plates:
 - .1 Attach to concrete with 4 minimum concrete inserts at each corner.
- .5 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.

3.2 HANGER SPACING

- .1 Plumbing piping: most stringent requirements of Canadian Plumbing Code, Provincial Code, or authority having jurisdiction.
- .2 Fire protection: to applicable fire code.
- .3 Gas and fuel oil piping: up to NPS 15 mm (1/2"): every 1.8 m (6').
- .4 Copper piping: up to NPS 15 mm (1/2"): every 1.5 m (5').
- .5 Within 300 mm (12") of each elbow and:

Maximum Pipe Size: NPS	Spacing Steel	Maximum Spacing Copper
up to 32 mm (1 1/4")	2.1 m (7')	1.8 m (6')
40 mm (1 1/2")	2.7 m (9')	2.4 m (8')
50 mm (2")	3.0 m (10')	2.7 m (9')
65 mm (2 1/2")	3.6 m (12')	3.0 m (10')
80 mm (3")	3.6 m (12')	3.0 m (10')
90 mm (3 1/2")	3.9 m (13')	3.3 m (11')
100 mm (4")	4.2 m (14')	3.6 m (12')
125 mm (5")	4.8 m (16')	
150 mm (6")	5.1 m (17')	
200 mm (8")	5.7 m (19')	
250 mm (10")	6.6 m (22')	
300 mm (12")	6.9 m (23')	

- .6 Pipework greater than NPS 300 mm (12"): to MSS SP-69.

3.3 HANGER INSTALLATION

- .1 Install hanger so that rod is vertical under operating conditions.
- .2 Adjust hangers to equalize load.
- .3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.
- .4 Do "NOT" support piping, ductwork and equipment from roof deck, on bottom chord of floor and/or roof joist and/or from OWSJ bridging. Provide structural member between joist.

3.4 HORIZONTAL MOVEMENT

- .1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4mm (5/32") from vertical.
- .2 Where horizontal pipe movement is less than 15 mm (1/2"), offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.5 FINAL ADJUSTMENT

- .1 Adjust hangers and supports:
 - .1 Ensure that rod is vertical under operating conditions.
 - .2 Equalize loads.
- .2 Adjustable clevis:
 - .1 Tighten hanger load nut securely to ensure proper hanger performance.
 - .2 Tighten upper nut after adjustment.
- .3 C-clamps:
 - .1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.
- .4 Beam clamps:
 - .1 Hammer jaw firmly against underside of beam.

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 American National Standards Institute/ American Society of Mechanical Engineers (ANSI/ASME)
 - .1 ANSI/ASME B31.1, Power Piping, (SI Edition).
- .3 American Society for Testing and Materials (ASTM)
 - .1 ASTM A 125, Specification for Steel Springs, Helical, Heat-Treated.
 - .2 ASTM A 307, Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .3 ASTM A 563, Specification for Carbon and Alloy Steel Nuts.
- .4 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
 - .1 MSS SP-58, Pipe Hangers and Supports - Materials, Design, Manufacture Selection, Application, and Installation.
- .5 CSA B272-93 – Prefabricated Self-Sealing Roof Vent Flashings
- .6 CRCA (Canadian Roofing Contractor's Association)
- .7 SPRI (Single Ply Roofing Institute)
- .8 CUFCA (Canadian Urethane Foam Contractor's Association) and CGSB-51-GP-46MP, Manual for "Installers of Spray Polyurethane Foam Thermal Insulation"
- .9 CSA G40.21-M1987, M350W, and M300W (Structural Quality Steels)
- .10 CSA W47.1-1983 (Certificate of Companies for Fusion Welding of Structural Steel)
- .11 CSA W59-M1989 (Welded Steel Construction – Metal Arc Welding)
- .12 CSA G164-M1981 (Hot Dip Galvanizing of Irregularly Shaped Articles)

1.2 RELATED SECTIONS

- .1 Section 03300 – Cast-in-place Concrete
- .2 Section 05210 – Steel Joists
- .3 Section 05300 – Metal Deck
- .4 Section 06100 – Rough Carpentry
- .5 Section 07200 – Thermal Protection
- .6 Section 07500 – Membrane Roofing
- .7 Section 07900 – Joint Sealers

1.3 DESIGN REQUIREMENTS

- .1 Construct support systems to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
- .2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP-58.
- .3 Design supports to support systems under all conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.
- .4 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment to be in accordance with MSS SP-58.

1.4 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with general requirements.
- .2 Submit shop drawings and product data for following items:
 - .1 All bases, hangers and supports.
 - .2 Connections to equipment and structure.
 - .3 Structural assemblies.
- .3 Manufacturer's installation instruction.

1.5 MAINTENANCE DATA

- .1 Provide maintenance data for incorporation into manual specified in general requirements.

1.6 QUALITY ASSURANCE

- .1 Roof accessories manufactures to have minimum five (5) years documented experience in the design and fabrication of roofing specialties and accessories.

1.7 SPECIAL WARRANTY

- .1 Warrant products installed under this section of work to be free of leaks, condensation, and defects in materials and/or manufacture for a period of twenty (20) years when installed in accordance with the manufacturer's written instructions.

Part 2 Products**2.1 PIPE/SUPPORT**

- .1 Pipe/Support:
 - .1 Adjustable height 6061-T6, hollow aluminum with mill finish, urethane insulated supports, 2" (51mm) diameter.

- .2 Stack Jack Flashing:
 - .1 Height to suit application.
 - .2 Fully urethane insulated.
 - .3 Aluminum construction.
 - .4 Complete with EPDM triple pressure grommet seal and EPDM base seal and other accessories as required to suit roof type.
- .3 Provide appropriate stainless steel mounting hardware to suit supported pipe/equipment.
- .4 Provide appropriate system support as specified in this section to suit application.
 - .1 Single Plain Pipe: Type 304 stainless steel pipe roller assembly to suite actual O.D pipe.
 - .2 Double Plain Pipe: Type 304 stainless steel pipe roller assemblies sized to suit actual O.D pipe.
 - .3 Single Insulated Pipe: Type 304 stainless steel pipe cradle assembly sized to suit actual O.D of insulated pipe.
 - .4 Double insulated Pipe: Type 304 stainless steel pipe cradle assemblies sized to suit actual O.D of insulated pipe.
- .5 Basis of design/Acceptable Manufacturer
 - .1 Thaler MERS 600 series.
 - .2 Acceptable equals if submitted during tender period.

2.2 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

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

2.3 ROOF CURB MOUNTED EQUIPMENT

- .1 Install as per manufacturer's instructions on roof curbs provided by manufacturer as indicated.
- .2 Provide all necessary continuous pressure treated wood blocking and 24 gauge metal liner on all exposed wood as required to install roof curb level.

2.4 MANUFACTURED ROOF SUPPORTS

- .1 Single piece injection moulded polypropylene support.
- .2 Type 3-20 psi extruded polystyrene UV protected base glued to the support.
- .3 Minimum base dimension of 300 x 225 (12" x 9") and be 140 mm (5.5") high.
- .4 Pull test of 1.4 KN (315 lbs) using two #14-10 screws on pipe strap.
- .5 Acceptable materials:
 - .1 Quick Block
 - .2 Erico

2.5 ALUMINUM ROOF SUPPORTS

- .1 450 mm high aluminum pipe support.
- .2 Adjustable leg assembly, base plate, roller assembly.
- .3 Acceptable material:
 - .1 Thaler Mers-600A Series.

2.6 PIPING THROUGH ROOF

- .1 Provide Thaler MEF-9 or equal gas piping flashing where pipe and/or relief vent penetrates roof.

2.7 ROOF MOUNTED PIPE SUPPORT

- .1 Provide zero penetration pipe support on roof where indicated.
- .2 Base shall be made of high density polypropylene with UV protection. Maximum loading shall be 50 lb/sq.ft.
- .3 Frames shall be galvanized. All fastenings, rods, nuts, washers, hangers, etc. shall be stainless steel.
- .4 Provide shop drawings as specified. Install to manufacturers recommendations.
- .5 Acceptable material:
 - .1 Portable pipe hanger
 - .2 Bigfoot systems
 - .3 Miro rooftop supports
 - .4 Walravin BIS Yeti
 - .5 Ecofoot

Part 3 Execution**3.1 INSTALLATION**

- .1 Roof support install in accordance with:
 - .1 Manufacturer's instructions and recommendations.
 - .2 Provide protection against deterioration due to contact of dissimilar metals.
- .2 Flashing Installation:
 - .1 Install roof support flashing in accordance with manufacturer's printed instructions.
- .3 Vibration Control Devices:
 - .1 Install as indicated and at all roof mounted mechanical equipment that is not internally isolated.

- .4 Clevis plates:
 - .1 Attach to concrete with 4 minimum concrete inserts at each corner.
- .5 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.

3.2 PIPE SUPPORT SPACING

- .1 Plumbing piping: most stringent requirements of Canadian Plumbing Code, Provincial Code, or authority having jurisdiction.
- .2 Gas and fuel oil piping: every 1.8 m (6').
- .3 Copper piping: up to NPS 15 mm (1/2"): every 1.5 m (5').
- .4 Within 300 mm (12") of each elbow and:

Maximum Pipe Size: NPS	Spacing Steel	Maximum Spacing Copper
up to 32 mm (1 1/4")	2.1 m (7')	1.8 m (6')
40 mm (1 1/2")	2.7 m (9')	2.4 m (8')
50 mm (2")	3.0 m (10')	2.7 m (9')
65 mm (2 1/2")	3.6 m (12')	3.0 m (10')
80 mm (3")	3.6 m (12')	3.0 m (10')
90 mm (3 1/2")	3.9 m (13')	3.3 m (11')
100 mm (4")	4.2 m (14')	3.6 m (12')
125 mm (5")	4.8 m (16')	
150 mm (6")	5.1 m (17')	
200 mm (8")	5.7 m (19')	
250 mm (10")	6.6 m (22')	
300 mm (12")	6.9 m (23')	

- .5 Pipework greater than NPS 300 mm (12"): to MSS SP-69.

3.3 EXAMINATION

- .1 Report to the contractor in writing, defects of work prepared by other trades and other unsatisfactory site conditions. Verify site dimensions. Commencement of work will imply acceptance of prepared work.

3.4 ADJUSTING

- .1 Verify that all manufactured units have been installed in accordance with specifications and details and will function as intended. Adjust any items where necessary to ensure proper operation.

3.5 CLEANING

- .1 Clean manufactured units using materials and methods approved by manufacturer. Do not use cleaning techniques which could impair performance of the roofing system.

END OF SECTION

Part 1 General

1.1 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with general requirements.
- .2 Provide separate shop drawings for each isolated system complete with performance and product data.

Part 2 Products

2.1 GENERAL

- .1 Size and shape of bases type and performance of vibration isolation to be as indicated.
- .2 To be of the same manufacturer for all isolation.
- .3 Acceptable materials:
 - .1 Korfund
 - .2 Vibro-Acoustics
 - .3 Vibron

2.2 ELASTOMERIC PADS

- .1 Type EP1 - neoprene waffle or ribbed; 10 mm (3/8") minimum thick; 50 durometer; maximum loading 350 kPa (50.8 psi).
- .2 Type EP2 - rubber waffle or ribbed; 10 mm (3/8") minimum thick; 30 durometer natural rubber; maximum loading 415 kPa (60.2 psi).
- .3 Type EP3 - neoprene-steel-neoprene; 10 mm (3/8") minimum thick neoprene bonded to 1.5 mm (16 gauge) steel plate; 50 durometer neoprene, waffle or ribbed; holes sleeved with isolation washers; maximum loading 350 kPa (50.8 psi).
- .4 Type EP4 - rubber-steel-rubber; 10 mm (3/8") minimum thick rubber bonded to 1.5 mm (16 gauge) steel plate; 30 durometer natural rubber, waffle or ribbed; holes sleeved with isolation washers; maximum loading 415 kPa (60.2 psi).
- .5 Acceptable materials:
 - .1 Korfund
 - .2 IAC Acoustics
 - .3 Vibro-Acoustics
 - .4 Vibron

2.3 ELASTOMERIC MOUNTS

- .1 Type M1 - colour coded; neoprene in shear; maximum durometer of [60]; threaded insert and two bolt-down holes; ribbed top and bottom surfaces.
 - .1 Acceptable materials:
 - .1 Vibro-Acoustics
 - .2 Korfund
 - .3 IAC Acoustics
 - .4 Vibron

2.4 HANGERS

- .1 Colour coded springs, rust resistant, painted box type hangers. Arrange to permit hanger box or rod to move through a 30° arc without metal to metal contact.
- .2 Type H1 - neoprene - in-shear, molded with rod isolation bushing, which passes through hanger box.
- .3 Type H2 - stable spring, elastomeric washer, cup with molded isolation bushing which passes through hanger box.
- .4 Type H3 - stable spring, elastomeric element with pre-compression washer and nut [with deflection indicator].
- .5 Performance as indicated.
- .6 Acceptable materials:
 - .1 Vibron
 - .2 IAC Acoustics
 - .3 Korfund
 - .4 Vibro-Acoustics

2.5 ROOF CURB ISOLATION RAIL

- .1 Provide if proposed unit is not internally isolated.
- .2 General: complete factory assembled without need for sub-base.
- .3 Lower member: continuous extruded aluminum channel.
- .4 Upper member: continuous extruded aluminum channel to provide continuous support for equipment, complete with all-directional neoprene rubber bushings 6 mm (1/4") thick to resist wind [and seismic] forces.
- .5 Springs: steel, adjustable, removable, selected for 25 mm (1") maximum static deflection plus 50% additional travel to solid, cadmium plated, sized and positioned to ensure uniform deflection.
- .6 High frequency isolation: 6 mm (1/4") minimum thick [continuous gasket on top and bottom of complete assembly] [or] [pads on top and bottom of each spring]. Material: closed cell neoprene.

- .7 Weatherproofing: continuous flexible counterflashing to curb and providing access to springs. Material: [aluminum] [neoprene].
- .8 Hardware: cadmium plated or galvanized.

Part 3 Execution

3.1 INSTALLATION

- .1 Install vibration isolation equipment in accordance with manufacturers instructions and adjust mountings to level equipment.
- .2 Ensure piping, ducting and electrical connections to isolated equipment do not reduce system flexibility and that piping, conduit and ducting passage through walls and floors do not transmit vibrations.
- .3 Unless indicated otherwise, support piping connected to isolated equipment with spring mounts or spring hangers with 25 mm (1") minimum static deflection as follows:
 - .1 Up to NPS 100 mm (4"): first 3 points of support. NPS 125 mm (5") to NPS 200 mm (8"): first 4 points of support. NPS 250 mm (10") and Over: first 6 points of support.
 - .2 First point of support shall have a static deflection of twice deflection of isolated equipment, but not more than 50 mm (2").
- .4 Where isolation is bolted to floor use vibration isolation rubber washers.
- .5 Block and shim level bases so that ductwork and piping connections can be made to a rigid system at the operating level, before isolator adjustment is made. Ensure that there is no physical contact between isolated equipment and building structure.

3.2 SITE VISIT

- .1 Manufacturer to visit site and provide written certification that installation is in accordance with manufacturer's instructions and submit report to Consultant.
- .2 Provide Consultant with notice 24 h in advance of visit.
- .3 Make adjustments and corrections in accordance with written report.

3.3 TESTING

- .1 Experienced and competent sound and vibration testing professional engineer to take vibration measurement for HVAC systems after start up and TAB of systems to Testing Adjusting and Balancing Section.
- .2 Vibration measurements shall be taken for equipment-listed below:
- .3 Provide Consultant with notice 48 h in advance of commencement of tests.

- .4 Establish adequacy of equipment isolation and acceptability of noise levels in occupied areas and where appropriate, remedial recommendations including sound curves.
- .5 Submit complete report of test results including sound curves.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 Canadian General Standards Board (CGSB).
 - .1 CAN/CGSB-1.60, Interior Alkyd Gloss Enamel.
 - .2 CAN/CGSB-24.3, Identification of Piping Systems.
- .3 Canadian Standards Association (CSA).
 - .1 Natural Gas and Propane Installation Code CSA B149.1.
- .4 National Fire Protection Association
 - .1 NFPA 13, Installation of Sprinkler Systems.
 - .2 NFPA 14, Standpipe and Systems.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with General Requirements.
- .2 Product data to include paint colour chips, all other products specified in this section.

1.3 PRODUCT LITERATURE

- .1 Submit product literature in accordance with General Requirements.
- .2 Product literature to include nameplates, labels, tags, lists of proposed legends.

Part 2 Products

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

- .1 Metal or plastic lamicoid nameplate mechanically fastened to each piece of equipment by manufacturer.
- .2 Lettering and numbers to be raised or recessed.
- .3 Information to include, as appropriate:
 - .1 Equipment: Manufacturer's name, model, size, serial number, capacity.
 - .2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.2 SYSTEM NAMEPLATES

- .1 Colours:
 - .1 Hazardous: red letters, white background.
 - .2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).

- .2 Construction:
- .1 3 mm (1/8") thick laminated plastic, matte finish, with square corners, letters accurately aligned and machine engraved into core.
- .3 Sizes:
- .1 Conform to following table:
- | Size | No. of
Sizes mm (") | Height of
Line mm (") | Letters mm (") |
|------|------------------------|--------------------------|----------------|
| 1 | 10 x 50 (3/8" x 2") | 1 (3/64") | 3 (1/8") |
| 2 | 15 x 75 (1/2" x 3") | 1 (3/64") | 6 (1/4") |
| 3 | 15 x 75 (1/2" x 3") | 2 (5/64") | 3 (1/8") |
| 4 | 20 x 100 (3/4" x 4") | 1 (3/64") | 10 (3/8") |
| 5 | 20 x 100 (3/4" x 4") | 2 (6/64") | 6 (1/4") |
| 6 | 20 x 200 (3/4" x 8") | 1 (3/64") | 10 (3/8") |
| 7 | 25 x 125 (1" x 5") | 1 (3/64") | 15 (1/2") |
| 8 | 25 x 125 (1" x 5") | 2 (5/64") | 10 (3/8") |
| 9 | 32 x 200 (1¼" x 8") | 1 (3/64") | 20 (3/4") |
- .2 Use maximum of 25 letters/numbers per line.
- .4 Locations:
- .1 Terminal cabinets, control panels: Use size #5.
- .2 Equipment in Mechanical Rooms: Use size #9.
- .3 Roof top equipment: use size #9.
- .4 Equipment above ceiling: use size #1 riveted to ceiling suspension system.

2.3 FIRE DAMPER/FIRE STOP FLAP NAMEPLATES/FIRE SMOKE DAMPER

- .1 Colours:
- .1 Black letters, yellow background.
- .2 Construction:
- .1 Self adhesive 50 mm x 25 mm, matte finish, with round corners.
- .3 Locations:
- .1 Install on adjacent ceiling grid. Where fire stop flap is installed in gypsum ceiling install on diffuser/grille frame. Where fire damper is installed above gypsum ceiling install on adjacent wall.

2.4 EXISTING IDENTIFICATION SYSTEMS

- .1 Apply existing identification system to new work.
- .2 Where existing identification system does not cover for new work, use identification system specified this section.
- .3 Before starting work, obtain written approval of identification system from Consultant.

- .4 Upon completion of this project all references to room names and numbering shall be to the Owner's requirements which may or may not be the numbering system used on the drawings. Each contractor shall verify the proper numbering scheme to be used prior to project completion.
- .5 All equipment shall be identified in sequence from the existing equipment and "NOT" duplicate numbering of equipment.

2.5 PIPING SYSTEMS GOVERNED BY CODE

- .1 Identification:
 - .1 Natural and propane gas: To CSA B149.1-00 and authority having jurisdiction and as indicated elsewhere.
 - .2 Sprinklers: To NFPA 13.
 - .3 Standpipe and hose systems: To NFPA 14.

2.6 IDENTIFICATION OF PIPING SYSTEMS

- .1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.
- .2 Legend:
 - .1 Block capitals to sizes and colours listed in CAN/CGSB-24.3.
- .3 Arrows showing direction of flow:
 - .1 Outside diameter of pipe or insulation less than 75 mm (3"): 100 mm (4") long x 50 mm (2") high.
 - .2 Outside diameter of pipe or insulation 75 mm (3") and greater: 150 mm (6") long x 50 mm (2") high.
 - .3 Use double-headed arrows where flow is reversible.
- .4 Extent of background colour marking:
 - .1 To full circumference of pipe or insulation.
 - .2 Length to accommodate pictogram, full length of legend and arrows.
- .5 Materials for background colour marking, legend, arrows:
 - .1 Pipes and tubing 20 mm (3/4") and smaller: Waterproof and heat-resistant pressure sensitive plastic marker tags.
 - .2 All other pipes: Pressure sensitive vinyl with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150°C (300°F) and intermittent temperature of 200°C (395°F).
- .6 Colours and Legends:
 - .1 Where not listed, obtain direction from Consultant.

- .2 Colours for legends, arrows: To following table:
- | | | |
|--------------------|---------|---------|
| Background colour: | Legend: | Arrows: |
| Yellow | White | Black |
| Green | White | Black |
| Red | White | Black |

- .7 Background colour marking and legends for piping systems:

CONTENTS	BACKGROUND COLOUR MARKING	LEGEND
Hot water heating supply	Yellow	HEATING SUPPLY
Hot water heating return	Yellow	HEATING RETURN
Drinking water return	Green	CH. DRINK WTR. CIRC
Domestic hot water supply	Green	DOM. HW SUPPLY
Dom. HW recirculation	Green	DOM. HW CIRC
Domestic cold water supply	Green	DOM. CWS
Domestic tempered supply	Green	DOM. TEMPERED
Trap Primer	Green	TRAP PRIMER
Sanitary	Green	SAN
Plumbing vent	Green	SAN. VENT
Condensate	Green	CONDENSATE
Refrigeration suction	Yellow	REF. SUCTION
Refrigeration liquid	Yellow	REF. LIQUID
Refrigeration hot gas	Yellow	REF. HOT GAS
Natural gas	Yellow	NATURAL GAS
Gas regulator vents		to Codes
Conduit for low voltage		
Control wiring	White	CONTROL WIRING___VOLTS

2.7 IDENTIFICATION DUCTWORK SYSTEMS

- .1 50 mm (2") high stencilled letters and directional arrows 150 mm (6") long x 50 mm (2") high.
- .2 Colours: Black, or co-ordinated with base colour to ensure strong contrast.

2.8 VALVES, CONTROLLERS

- .1 Brass tags with 15 mm (1/2") stamped identification data filled with black paint.

- .2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.
- .3 Provide adhesive coloured tab (max. size 15 mm) indication on ceiling to locate valves/equipment above. Same applies to grid. Colour to be approved by consultant.

2.9 CONTROLS COMPONENTS IDENTIFICATION

- .1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.
- .2 Inscriptions to include function and (where appropriate) fail-safe position.
- .3 Provide equipment identification and/or indication on ceiling to locate devices/equipment above ceiling. Install identification on grid. Colours to be approved by consultant.

2.10 LANGUAGE

- .1 Identification to be in English.

Part 3 Execution

3.1 TIMING

- .1 Provide identification only after all painting specified has been completed.

3.2 INSTALLATION

- .1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.
- .2 Provide ULC and/or CSA registration plates as required by respective agency.

3.3 NAMEPLATES

- .1 Locations:
 - .1 In conspicuous location to facilitate easy reading and identification from operating floor.
- .2 Standoffs:
 - .1 Provide for nameplates on hot and/or insulated surfaces.
- .3 Protection
 - .1 Do not paint, insulate or cover in any way.

3.4 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

- .1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels not more than 1.7 m (5'-8") intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.
- .2 Adjacent to each change in direction.

- .3 At least once in each small room through which piping or ductwork passes.
- .4 On both sides of visual obstruction or where run is difficult to follow.
- .5 On both sides of separations such as walls, floors, partitions.
- .6 Where system is installed in pipe chases, ceiling spaces, galleries, other confined spaces, at entry and exit points, and at each access opening.
- .7 At beginning and end points of each run and at each piece of equipment in run.
- .8 At point immediately upstream of major manually operated or automatically controlled valves, dampers, etc. Where this is not possible, place identification as close as possible, preferably on upstream side.
- .9 Identification to be easily and accurately readable from usual operating areas and from access points.
 - .1 Position of identification to be approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

3.5 VALVES, CONTROLLERS

- .1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.
- .2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by Consultant. Provide one copy (reduced in size if required) in each operating and maintenance manual.
- .3 Number valves in each system consecutively. Where existing numbering system is installed start new numbering system at 100.

END OF SECTION

Part 1 General

1.1 GENERAL

- .1 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do all other work as specified in this section including all air handling systems and equipment, all plumbing systems and equipment and all temperature controls system, building automation systems and equipment.
- .2 This contractor must co-ordinate their work with that of the TAB contractor.

1.2 QUALIFICATIONS OF TAB AGENCIES

- .1 Names of all personnel it is proposed to perform TAB to be submitted to and approved by Consultant within 30 days of start of work.
- .2 Provide documentation confirming qualifications, successful experience.
- .3 Only the following NEBB (National Environmental Balancing Bureau) TAB contractors may quote:
 - .1 Air Audit Inc.
110 Turnbull Court, Unit 11
Cambridge, Ontario
N1T 1K6
(519) 740-0871
 - .2 Air Velocities Control Ltd.
100 Premium Way
Mississauga, Ontario
L5B 1A2
(905) 279-4433
 - .3 Airwaso Canada Inc.
PO Box 9014 White Oaks
London, ON N6E 3P3
(519) 652-4040
 - .4 Dynamic Flow Balancing Ltd.
2064 Peak Place
Oakville, Ontario
L6H 5T1
(905) 338-0808
 - .5 Flowset Balancing Ltd.
431 Willis Dr.
Oakville, Ontario
L6L 4V6
(416) 410-9793

.6 Clark Balancing Ltd.
8094 Esquesing Line
Milton, Ontario
L9T 2X9
(905) 693-1518

1.3 PURPOSE OF TAB

- .1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average (95% design) and low (75% of design) loads using actual or simulated loads. TAB contractor to perform equipment evaluation upon start up and once during each season in the first year of operation.
- .2 Adjust and regulate equipment and systems so as to meet specified performance requirements and to achieve specified interaction with all other related systems under all normal and emergency loads and operating conditions. Confirm all equipment interlocks and functions of associated systems.
- .3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges and temperatures. Refer to BAS for system operating functions.

1.4 EXCEPTIONS

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

1.5 CO-ORDINATION

- .1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule so as to ensure completion before acceptance of project.
- .2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems. Co-ordinate with other trades to ensure all systems are interlocked as indicated elsewhere prior to TAB.

1.6 PRE-TAB REVIEW

- .1 Review contract documents before project construction is started and confirm in writing to Consultant adequacy of provisions for TAB and all other aspects of design and installation pertinent to success of TAB.
- .2 Review specified standards and report to Consultant in writing all proposed procedures which vary from standard.
- .3 During construction, co-ordinate location and installation of all TAB devices, equipment, accessories, measurement ports and fittings.
- .4 During construction indicate all tolerances of piping, ductwork etc conforms to specifications.

1.7 START-UP

- .1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.
- .2 Follow special start-up procedures specified elsewhere in the Mechanical Division.

1.8 OPERATION OF SYSTEMS DURING TAB

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

1.9 START OF TAB

- .1 Notify Consultant in writing 3 days prior to start of TAB.
- .2 Start TAB only when building is essentially completed, including:
 - .1 Installation of ceilings, doors, windows, other construction affecting TAB.
 - .2 Application of weather-stripping, sealing, caulking.
 - .3 All pressure, leakage, other tests specified elsewhere in the Mechanical Division.
 - .4 All provisions for TAB installed and operational.
 - .5 Start-up, verification for proper, normal and safe operation of all mechanical and associated electrical and control systems affecting TAB including but not limited to:
 - .1 Proper thermal overload protection in place for electrical equipment.
 - .2 Air systems:
 - .1 Filters in place, clean.
 - .2 Duct systems clean.
 - .3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.
 - .4 Correct fan rotation.
 - .5 Fire, smoke, volume control dampers installed and open.
 - .6 Coil fins combed, clean.
 - .7 Access doors, installed, closed.
 - .8 All outlets installed, volume control dampers open.
 - .3 Liquid systems:
 - .1 Flushed, filled, vented.
 - .2 Correct pump rotation.
 - .3 Strainers in place, baskets clean.
 - .4 Isolating and balancing valves installed, open.
 - .5 Calibrated balancing valves installed, at factory settings.
 - .6 Chemical treatment systems complete, operational.
 - .7 Control valves are properly piped.

- .8 Coils and radiation are properly piped.
- .9 BAS in operation.

1.10 APPLICATION TOLERANCES

- .1 Do TAB to following tolerances of design values:
 - .1 HVAC systems: plus 10%, minus 5%.
 - .2 Hydronic systems: plus or minus 10%.

1.11 ACCURACY TOLERANCES

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

1.12 INSTRUMENTS

- .1 Prior to TAB, submit to Consultant list of instruments to be used together with serial numbers.
- .2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.
- .3 Calibrate within 3 months of TAB. Provide certificate of calibration to Consultant.

1.13 SUBMITTALS

- .1 Submit, prior to commencement of TAB:
 - .1 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.14 PRELIMINARY TAB REPORT

- .1 Submit for checking and approval of Consultant, prior to submission of formal TAB report, sample of rough TAB sheets. Include:
 - .1 Details of instruments used.
 - .2 Details of TAB procedures employed.
 - .3 Calculations procedures.
 - .4 Summaries.

1.15 TAB REPORT

- .1 Format to be in accordance with NEBB, AABC, or SMACNA.
- .2 The following additional information shall be provided for all air systems:
 - .1 Minimum damper position (MAD/Economizer) and the corresponding BAS signal and the voltage to the actuator to meet the full ASHRAE occupied ventilation requirements.
 - .2 Minimum damper position (MAD/Economizer) and the corresponding BAS signal and the voltage to the actuator to meet the full ASHRAE unoccupied ventilation requirements.

- .3 Static pressure reading for each HVAC/AHU unit with VAV/VVT boxes open to 80% of design airflow and bypass damper closed to 0%. Provide reading at normal MAD/economizer damper position, dampers fully closed and dampers fully open.

- .3 TAB report to show all results in SI or imperial units as indicated on plans and to include:

- .1 Project as-built drawings.
- .2 System schematics.

1.16 VERIFICATION

- .1 All reported results subject to verification by Consultant.
- .2 Provide manpower and instrumentation to verify up to 30% of all reported results.
- .3 Number and location of verified results to be at discretion of Consultant.
- .4 Bear costs to repeat TAB as required to satisfaction of Consultant.

1.17 SETTINGS

- .1 After TAB is completed to satisfaction of Consultant, replace drive guards, close all access doors, lock all devices in set positions, ensure sensors are at required settings. Replace all ceiling tile etc.
- .2 Permanently mark all settings to allow restoration at any time during life of facility. Markings not to be eradicated or covered in any way.

1.18 COMPLETION OF TAB

- .1 TAB to be considered complete only when final TAB Report received and approved by Consultant.

1.19 AIR SYSTEMS

- .1 Standard: TAB to be to most stringent of TAB standards of NEBB, AABC, SMACNA, ASHRAE.
- .2 Do TAB of all systems, equipment, components, controls specified in the Mechanical Division including but not limited to following:
 - .1 Air handling systems and equipment
 - .2 Duct testing to SMACNA standards.
- .3 Qualifications: personnel performing TAB to be current member in good standing of NEBB.
- .4 Quality assurance: Perform TAB under direction of qualified supervisor.
- .5 Measurements: to include, but not limited to, following as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.

- .6 Locations of equipment measurements: To include, but not be limited to, following as appropriate:
 - .1 Inlet and outlet of each damper, filter, coil, humidifier, fan, and other equipment causing changes in conditions.
 - .2 At each controller, controlled device.
- .7 Locations of systems measurements to include, but not be limited to, following as appropriate: Each main duct, main branch, sub-branch, grille, register or diffuser.

1.20 HYDRONIC SYSTEMS

- .1 Definitions: for purposes of this section, to include low pressure hot water heating systems.
- .2 Standard: TAB to be the most stringent of TAB standards of NEBB, AABC, SMACNA, ASHRAE.
- .3 Do TAB of all systems, equipment, components, controls specified in Mechanical Division including but not limited to hydronic equipment testing.
- .4 Qualifications: personnel performing TAB to be current member in good standing of NEBB.
- .5 Quality assurance: perform TAB under direction of qualified supervisor.
- .6 Measurements: to include, but not limited to, following as appropriate for systems, equipment, components, controls: Flow rate, static pressure, pressure drop (or loss), temperature, specific gravity, density, RPM, electrical power voltage, noise, vibration.
- .7 Locations of equipment measurement: To include, but not be limited to, following as appropriate:
 - .1 Inlet and outlet of each heat exchanger (primary and secondary sides), boiler, chiller, coil, humidifier, cooling tower, condenser, pump, PRV, control valve, other equipment causing changes in conditions.
 - .2 At each controller, controlled device.
- .8 Locations of systems measurements to include, but not be limited to, following as appropriate: Supply and return of each primary and secondary loop (main, main branch, branch, sub-branch of all hydronic systems, inlet connection of make-up water.

1.21 DUCT LEAKAGE TESTING

- .1 Co-ordinate leakage testing with the sheet metal contractor. TAB contractor will be responsible for all duct testing.
- .2 Duct to be tested in accordance with SMACNA HVAC Duct Leakage Test Manual and as indicated.

1.22 OTHER TAB REQUIREMENTS

- .1 General requirements applicable to all work specified this paragraph:
 - .1 Qualifications of TAB personnel: as for air systems specified this section.

- .2 Quality assurance: as for air systems specified this section.
- .3 **Smoke management systems:**
 - .1 **Test for proper operation of all smoke and fire dampers installed as component parts of air systems specified.**
- .4 Provide duct testing as specified.

END OF SECTION

Part 1 General

1.1 GENERAL

- .1 The Mechanical Contractor shall provide the labour and material to conduct the closeout process as outlined in this specification section.
- .2 The mechanical contractor shall perform the closeout requirements specified in conjunction with the independent commissioning consultant (CC) retained by the owner.

Part 2 Products

2.1 GENERAL

- .1 The mechanical contractor and manufacturers shall provide all instrumentation and equipment necessary to conduct the tests specified. The Mechanical Contractor shall advise the Mechanical Consultant of instrumentation to be used and the dates the instruments were calibrated.

Part 3 Execution

3.1 THE CONTRACT CLOSE OUT PROCESS

- .1 The mechanical contractor close out process shall consist of:
 - Shop Drawings and As-built Drawings
 - Installation inspection and equipment verification
 - Plumbing and drainage system testing
 - Testing of piping systems
 - Independent contractor balancing of water systems
 - Testing of air systems
 - Independent contractor balancing of air systems
 - Testing of equipment and systems
 - BAS Commissioning
 - Verification of refrigeration leak detection systems
 - Operating and maintenance manuals
 - Training
 - Systems Demonstration and turnover
 - Testing forms
 - Warranties
 - Contractor to provide list of equipment maintenance including schedule of maintenance parts, quantities, and model fixtures, etc.

3.2 SHOP DRAWINGS AND AS-BUILT DRAWINGS

- .1 Conform to General Requirements Section for shop drawings and as-built drawings requirements.

3.3 INSTALLATION INSPECTION AND EQUIPMENT VERIFICATION

- .1 The Mechanical Contractor shall co-ordinate with the Consultant who will inspect the mechanical installation.
- .2 The Mechanical Contractor shall complete the equipment verification forms for each piece of equipment. The forms shall be included in the operating and maintenance manual. The equipment data shall include:
 - Manufacturers name, address and telephone number
 - Distributors name, address and telephone number
 - Make, model number and serial number
 - Pumps - RPM, impeller sizes, rated flow
 - Fans - belt type and size, shive type and size
 - Electrical - volts, amps, fuse size, overload size
 - Any other special characteristics.

3.4 PLUMBING AND DRAINAGE SYSTEM TESTING

- .1 The plumbing and drainage system shall be tested in accordance with the Plumbing Code under the Ontario Water Resources Act and the specification.
- .2 The Mechanical Contractor shall notify the Building Inspector when systems are available for testing. The Mechanical Contractor shall document all tests performed and shall arrange for the Building Inspector to sign for tests completed. The forms shall be forwarded to the Consultant.

3.5 THE CONTRACTOR'S TESTING OF PIPING SYSTEMS

- .1 Test all piping systems in accordance with all applicable plumbing codes and General Requirements section.
- .2 All tests for the systems shall be performed in the presence of the Consultant or Commissioning Consultant. Complete the testing forms and forward to the Consultant.

3.6 THE INDEPENDENT CONTRACTORS TESTING AND BALANCING OF WATER SYSTEMS

- .1 Conform with the specification section, Testing, Adjusting and Balancing.
- .2 The Independent Contractor shall be hired by The Mechanical Contractor and shall report to the Commissioning Consultant.

3.7 THE CONTRACTORS TESTING OF AIR SYSTEMS

- .1 Conform with the specification section, Testing, Adjusting and Balancing.
- .2 All tests shall be performed in the presence of the Mechanical Consultant or the Commissioning Consultant. Complete the testing forms and forward to the Consultant.

3.8 THE INDEPENDENT CONTRACTORS TESTING AND BALANCING OF AIR SYSTEMS

- .1 Conform with specification section, Testing, Adjusting and Balancing.
- .2 The Independent Contractor shall be hired by The Mechanical Contractor and shall report to the Commissioning Consultant.

3.9 TESTING OF EQUIPMENT AND SYSTEMS

- .1 General:
 - .1 The Mechanical Contractor shall hire the services of the manufacturers technicians to test the equipment and associated systems. The technician shall record the results of the tests on the testing forms. The tests shall be witnessed by the Consultant or Owners representative. When the tests have been completed satisfactorily the technician and witnessing authority shall sign the forms. A copy of the forms shall be forwarded to the Consultant. The original shall be inserted into the operating and maintenance manual.
 - .2 Should equipment or systems fail a test, the test shall be repeated after repairs or adjustments have been made. The additional tests shall be witnessed.
 - .3 Tests which have not been witnessed shall not be accepted and shall be repeated.
 - .4 The equipment and systems to be tested shall include:
 - Unit Ventilators
 - Condensing Units
 - HVAC Units
 - Life Safety and Fire Protection Systems
 - Water Treatment Systems
 - Building Automation Systems (BAS)
- .2 BAS Testing:
 - .1 The BAS Contractor shall test the system as described in General Requirements and/or Controls Sections.
 - .2 Co-ordinate with the Consultant and submit completed test forms monthly.
 - .3 Demonstrate to the Owner and Consultant the operation of the BAS when all tests have been completed.
- .3 Verification of Refrigeration Leak Detection System Operation:
 - .1 The commissioning process shall include the verification of the refrigeration leak detection system.
 - .2 All interlocks between leak detection systems installed and system components, as well as interlocks between field installed detection systems and associated safety system components shall be tested and verified to operate as per the requirements of CSA B52. Specifically, the following shall occur for each independent system on registration of a refrigerant leak:
 - .1 Open all zone dampers in the affected system.
 - .2 Disable all electric reheat coils within the affected system.
 - .3 Activate field installed safety shut off valves within the affected refrigeration system.
 - .4 Energize all fans within the affected ductwork system.
 - .5 Activate all refrigerant leak system specific ventilation systems.
 - .6 De-energize any other potential sources of ignition within the affected system.

3.10 CLOSEOUT SCHEDULE

- .1 The Mechanical Contractor shall include the schedule for all tests and equipment start-up tests in the construction schedule.
- .2 All testing forms and reports associated with the mechanical systems shall be directed to the Consultant with copies to the Owner and Consultant.
- .3 The forms and reports to be issued shall include:
 - Shop drawings, issued and accepted
 - Equipment verification forms
 - Testing forms
 - Reports resulting from tests
 - Testing schedule
 - Equipment Start-up Forms

3.11 OPERATION AND MAINTENANCE MANUAL

- .1 Conform to General Requirements section for the Operating and Maintenance Manual requirements.

3.12 OPERATOR TRAINING

- .1 Conform to General Requirements section for requirements for Instruction to Operating Staff.
- .2 The training shall be conducted in a classroom and at the equipment or system.
- .3 Training will begin when the operating and maintenance manuals have been delivered to The Owner and approved by the Consultant.
- .4 Each training session shall be structured to cover:

The operating and maintenance manual

 - Operating procedures
 - Maintenance procedures
 - Trouble-shooting procedures
 - Spare parts required
 - Submit a course outline to the Mechanical Consultant before training commences.

Provide course documentation for up to eight people.
- .5 The training sessions shall be scheduled and co-ordinated by the Mechanical Contractor.
- .6 Training shall be provided for the following systems:

<u>System</u>	<u>Minimum Training Times</u>
Condensing Units	2 hours
Unit Ventilators	2 hours
HVAC Units	2 hours
Water Treatment Systems	2 hours

- .7 The minimum training for the BAS shall be 16 hours. The training shall include:
- A walk through of the installation for the Building Owner to review the installation and equipment
 - Operation of the central computer
 - Operation of portable terminals
 - Control sequences
 - Report set-up and generation
 - Managing the system
 - Maintenance requirements
- Refer to Controls specification section for further information.
- .8 The training requirement for the mechanical system shall include a walk-through of the building by the Mechanical Contractor. During the walk through the Mechanical Contractor shall:
- Identify equipment
 - Identify starters associated with equipment
 - Identify valves and balancing dampers
 - Identify access doors
 - Review general maintenance of equipment
 - Review drain points in pipework systems
 - Identify maintenance items
- .9 When each training session has been completed The Owner shall sign the associated form to verify completion.

3.13 MECHANICAL SYSTEM DEMONSTRATION AND TURNOVER

- .1 Refer to General Requirements section, Mechanical Project Completion.
- .2 The system demonstration and turnover to The Owner shall occur when:
- The installation is complete
 - The acceptance test conducted by the Mechanical Consultant has been completed successfully
 - The Commissioning Consultant system performance testing has been completed successfully
 - Training has been completed
 - Operating and Maintenance Manuals have been accepted
 - Shop-drawings have been updated
 - As-built drawings have been completed
- .3 The systems demonstration shall be conducted by the Mechanical Contractor and the manufacturers. The demonstration shall cover a demonstration of equipment installation and operation.

3.14 TESTING FORMS

- .1 The Mechanical Contractor and manufacturers shall provide forms for testing. The forms must be approved by the Consultant and The Owner before they are used.

3.15 WARRANTIES

- .1 Equipment and system warranties shall not begin until the system demonstration and turnover has been conducted successfully and accepted by The Owner.
- .2 The Mechanical Contractor shall fill out the warranty form listing the equipment and systems and the start and finishing dates for warranty.
- .3 Refer to the general conditions specification section for the requirements during the warranty period.

3.16 CLOSEOUT PROCESS ALLOCATION

- .1 The mechanical contractor closeout process shall be as follows:
 - .1 3% for the first \$500,000 of contract value.
 - .2 1% of the contract value for value between \$500,000 to \$5,000,000.
 - .3 0.5% of contract value for the value in excess of \$5,000,000.
 - .4 Minimum Allocation for Close Out Documents is \$5,000.
- .2 The Mechanical Contractor shall submit all test and verification forms. The Consultant will use these forms to calculate percentage complete.
- .3 The monies shall not be paid out until the performance testing, O & M manuals, systems demonstration, and training including all required paperwork have been completed to the satisfaction of the consultant. Refer to General Requirements section for contract breakdown.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 Canadian General Standards Board (CGSB)
 - .1 ASTM C553, Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 - .2 CGSB 51-GP-52Ma, Vapour Barrier Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
 - .3 CAN/CGSB-51.53, Poly (Vinyl Chloride) Jacketing Sheet, for Insulating Pipes, Vessels and Round Ducts.
- .3 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
- .4 American Society for Testing and Materials (ASTM)
 - .1 ASTM C547, Type I and IV, Standard Specifications for Mineral Fibre Pipe Insulation.
 - .2 ASTM C 335, Test Method for Steady State Heat Transfer Properties of Pipe Insulation.
 - .3 ASTM C177, Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded Hot-Plate Apparatus.
 - .4 ASTM C518, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - .5 ASTM C 921, Practice for Determining the Properties Jacketing Materials for Thermal Insulation.
 - .6 ASTM C1695, Standard Specification for Fabrication of Flexible, Removable, and Reusable Blanket Insulation for Hot Service.
 - .7 ASTM C1729 Standard Specification for Aluminium Jacketing for Insulation.
- .5 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).
 - .1 ASHRAE Standard 90.1.
- .6 Manufacturer's Trade Associations
 - .1 Thermal Insulation Association of Canada (TIAC), North American Commercial and Industrial Insulation Standards.

1.2 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with general requirements.

- .2 Submit for approval manufacturer's catalogue literature related to installation, fabrication for pipe, fittings, valves, and jointing recommendations.
- .3 Submit properly completed detail plates from the North American Commercial and Industrial Insulation Standards manual, applicable to installation types required by this specific section.

1.3 INSTALLATION INSTRUCTIONS

- .1 Submit manufacturer's installation instructions in accordance with general requirements.
- .2 Installation instructions to include procedures to be used, installation standards to be achieved.

1.4 QUALIFICATIONS

- .1 Installer to have successfully completed apprenticeship program.
- .2 Installer to be specialist in performing work of this section and have at least three (3) years successful experience in this size and type of project, qualified to standards of TIAC.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .2 Protect from weather, construction traffic.
- .3 Protect against damage from any source.
- .4 Store at temperatures and conditions required by manufacturer.

1.6 DEFINITIONS

- .1 For purposes of this section:
 - .1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.
 - .2 "EXPOSED" - will mean "not concealed" as defined herein.
 - .3 "ASJ+" – All Service Jacket – vapor retarder laminate of aluminium foil inner layer, reinforced with fiberglass scrim, bonded to a bleached kraft paper, with outer poly film leaving no paper exposed.
 - .4 "ASJ" – All Service Jacket (no outer film) – vapor retarder laminate of aluminium foil inner layer, reinforced with fiberglass scrim, bonded to a bleached kraft paper outer layer.

Part 2 Products

2.1 MATERIAL LIMITATIONS

- .1 Products shall not contain formaldehyde, asbestos, lead, mercury or mercury compounds or PBDE fire retardants.

2.2 FIRE AND SMOKE RATING

- .1 In accordance with CAN/ULC-S102:
 - .1 Maximum flame spread rating: 25.
 - .2 Maximum smoke developed rating: 50.

2.3 INSULATION

- .1 Mineral fibre as specified herein includes glass fibre, rock wool, slag wool.
- .2 Thermal conductivity ("k" factor) not to exceed specified values at 24°C (75°F) mean temperature when tested in accordance with ASTM C335, ASTM C177 or ASTM C518.
- .3 Type A-1: Rigid moulded or wound mineral fibre with factory applied vapour retarder jacket.
 - .1 Mineral fibre: to ASTM C547 Type I and IV.
 - .2 Jacket: to ASTM C1136, Type I, II, III, IV, X.
 - .3 Maximum "k" factor: to ASTM C547.
 - .4 Maximum "k" value: 0.037W/M (or less) x C°@100°F (38°C) is 0.26BTU x IN/H FT² x °F
 - .5 Jacket: specified in 'Factory-Applied Jackets' Article
- .4 Materials:
 - .1 All materials must be supplied by the same manufacturer.
 - .2 Acceptable Materials:
 - .1 Johns Manville
 - .2 Knauf
 - .3 Manson
 - .4 Owens Corning

2.4 INSULATION SECUREMENT

- .1 Tape: Self-adhesive, aluminum, reinforced, 50 mm (2") wide minimum.
- .2 Contact adhesive: Quick setting.
- .3 Canvas adhesive: Washable.

2.5 CEMENT

- .1 Thermal insulating and finishing cement:
 - .1 Hydraulic setting or Air drying on mineral wool, to ASTM C 449M.

2.6 VAPOUR RETARDER LAP ADHESIVE

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

2.7 INDOOR VAPOUR RETARDER FINISH

- .1 Compatible with insulation.

2.8 JACKETS

- .1 Polyvinyl Chloride (PVC):
 - .1 Minimum thickness: 20 mm (0.020")
 - .2 One-piece moulded type [and sheet] to CAN/CGSB-51.53 with pre-formed shapes as required.
 - .3 Colours: white.
 - .4 Minimum service temperatures: -29°C (-20°F).
 - .5 Maximum service temperature: 65°C (150°F).
 - .6 Moisture vapour transmission: 0.05 perm.
 - .7 Fastenings:
 - .1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
 - .2 Tacks are not to be used below ambient temperature (cold) operating systems.
 - .3 Pressure sensitive vinyl tape of matching colour.

2.9 CAULKING FOR JACKETS

- .1 Caulking: Silicone clear caulking.

Part 3 Execution

3.1 PRE-INSTALLATION REQUIREMENT

- .1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed, and certified.
- .2 Surfaces to be clean, dry, free from foreign material.

3.2 INSTALLATION

- .1 Install in accordance with TIAC, North American Commercial and Industrial Insulation Standards.
- .2 Apply materials in accordance with manufacturers' instructions and this specification.
- .3 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
 - .1 Hangers, supports to be outside vapour retarder jacket.

- .4 Supports, Hangers:
 - .1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.
- .5 Below ambient/chilled water installation:
 - .1 All pipes, valves, strainers, flanges, unions, and other pipe system components and spec must be properly insulated with correctly completed vapor retarder applied.
 - .2 All insulation material must have properly installed and sealed vapor retarding jacket, including circumferential and longitudinal seams.
 - .3 All penetrations, tears, and punctures must be repaired and sealed with a vapor retarding material with a 0.02 or lower perm rating.
 - .4 Vapor stops must be installed at 18' intervals at all pipe insulation termination points including fittings, flanges, and other changes in direction or other types of piping specialties.
 - .5 All fitting insulation must be of the same type, thickness, and density of the pipe insulation, be premoulded insulation covers or fabricate from the same material as the pipe insulation. Full thickness must be maintained over all fitting surfaces. Blanket insulation with a factory applied vapor retarder facing is unacceptable.
 - .6 A complete vapor retarder must be installed on insulation over fittings before applying final finish. Vapor retarder must extend onto and be sealed to the vapor retarder of the pipe insulation.
 - .7 Additional fitting covers, PVC, or metal must have a vapor retarder seal applied to all longitudinal and circumferential seams in addition to the vapor retarder applied to the fitting insulation.
 - .8 Additional field applied to jackets must not use staples, screws, tacks, or rivets for attachment to avoid puncturing vapor retarder underneath.
 - .9 Insulating support inserts are to be high compressive strength insulation with a rigid shield. No calcium silicate is to be used for insulation on below-ambient operation piping.

3.3 REMOVABLE, PRE-FABRICATED, INSULATION AND ENCLOSURES

- .1 Application: At expansion joints, valves, primary flow measuring elements, flanges, and unions at equipment.
- .2 Flexible removable blanket insulation covers are not acceptable for below-ambient (cold) operation piping systems. Rigid removable insulation jackets that are vapor retarder exterior material, that can be vapor sealed at the seams, are acceptable on below-ambient (cold) operation piping systems.
- .3 Design: To permit movement of expansion joint and to permit periodic removal and replacement without damage to adjacent insulation.
- .4 Insulation:
 - .1 Insulation, fastenings and finishes: same as system.
 - .2 Jacket: As per adjacent insulation.

3.4 INSTALLATION OF ELASTOMERIC INSULATION

- .1 Insulation to remain dry at all times. Overlaps to manufacturers instructions. Ensure tight joints.
- .2 Provide vapour retarder as recommended by manufacturer.

3.5 PIPING INSULATION SCHEDULES

- .1 Includes valves, valve bonnets, strainers, flanges, and fittings unless otherwise specified.
- .2 Install insulator and jackets to applicable TIAC codes.
- .3 Insulate ends of capped piping with type and thickness indicated for capped service.
- .4 Thickness of insulation to be as listed in following table:
 - .1 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.
 - .2 All storm piping including all vertical and horizontal piping shall be insulated.

Application	Type	Pipe sizes through (NPS) and insulation thickness mm (")				
		to 25 (1")	32 (1¼") 40 (1½")	50 (2") 80 (3")	105 (4") 150 (6")	200 (8") & over
Domestic Water Piping	A-1	25 (1")	25 (1")	40 (1½")	40 (1½")	40 (1½")
Cooling Coil cond. Drain	A-1	25 (1")	25 (1")	25 (1")	25 (1")	25 (1")
Trap Primer Piping	A-1	15 (½")	15 (½")	25 (1")		

- .5 Finishes: Conform to the following table:

Application	Piping	Valves & Fittings
Exposed indoors	PVC	PVC
Exposed in mech. rooms	PVC	PVC
Concealed indoors	N/A	PVC

- .6 Connection: To appropriate TIAC code.
- .7 Finish attachments: SS bands, @ 150 mm (6") oc. seals: closed.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 ANSI/ASME B16.15, Cast Copper Alloy Threaded Fittings, Classes 125 and 250.
- .3 ANSI B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
- .4 ANSI/ASME B16.22, Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.
- .5 ANSI B16.24, Cast Copper Alloy, Pipe Flanges and Flanged Fittings: Classes 150, 300, 600, 900, 1500, and 2500.
- .6 ASTM B88M, Specification for Seamless Copper Water Tube (Metric).
- .7 MSS-SP-70, Cast Iron Gate Valves, Flanged and Threaded Ends.
- .8 MSS-SP-71, Cast Iron Swing Check Valves, Flanged and Threaded Ends.
- .9 MSS-SP-80, Bronze Gate, Globe, Angle and Check Valves.

1.2 SHOP DRAWINGS

- .1 Submit shop drawing data in accordance with general requirements.

1.3 MAINTENANCE DATA

- .1 Provide maintenance data for incorporation into manual specified in general requirements.

Part 2 Products

2.1 PIPING

- .1 Domestic hot, cold and recirculation systems, within building.
 - .1 Above ground: copper tube, hard drawn, type L: to ASTM B88M.

2.2 FITTINGS

- .1 Bronze pipe flanges and flanged fittings, Class 150 and 300: to ANSI B16.24.
- .2 Cast bronze threaded fittings, Class 125 and 250: to ANSI/ASME B16.15.
- .3 Cast copper, solder type: to ANSI B16.18.
- .4 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.
- .5 Tee drill NPS 25 mm (1") and larger.

2.3 JOINTS

- .1 Solder: 95/5.
- .2 Teflon tape: for threaded joints.
- .3 Dielectric connections between dissimilar metals: dielectric fitting to ASTM F1545, complete with thermoplastic liner.
- .4 Tee drill fittings shall be brazed with silver solder, 45% Ag - 15% Cu or copper phosphorous, 95% Cu, 5% P and non-corrosive flux.

2.4 VALVES

- .1 All valves shall be of commercial grade and of same manufacturer, Lead-Free.
- .2 Acceptable materials:
 - .1 Milwaukee
 - .2 Crane
 - .3 Kitz
 - .4 Apollo

2.5 BALL VALVES

- .1 All valves shall be of commercial grade and of same manufacturer.
- .2 NPS 80 mm (3") and under, soldered:
 - .1 To ANSI B16.18, Class 150.
 - .2 Bronze body, full port stainless steel ball, PTFE Teflon adjustable packing, brass gland and PTFE Teflon seat, steel lever handle, with NPT to copper adaptors.

Part 3 Execution

3.1 INSTALLATION

- .1 Install in accordance with Provincial Plumbing Code and local authority having jurisdiction.
- .2 Cut square, ream and clean tubing and tube ends, clean recesses of fittings and assemble without binding.
- .3 Assemble all piping using fittings manufactured to ANSI standards.
- .4 Install tubing close to building structure to minimize furring, conserve headroom and space. Group exposed piping and run parallel to walls.
- .5 Install CWS piping below and away from HWS and HWC and all other hot piping so as to maintain temperature of cold water as low as possible.
- .6 Connect to fixtures and equipment in accordance with manufacturers instructions unless otherwise indicated.
- .7 Bent tubing is not acceptable.

3.2 VALVES

- .1 Isolate equipment, fixtures and branches with ball valves.
- .2 Balance recirculation system using lockshield globe valves. Mark settings and record on as-built drawings on completion.

3.3 PRESSURE TESTS

- .1 Conform to requirements of general requirements.
- .2 Test pressure: greater of 1½ times maximum system operating pressure or 860 kPa (125 psi).

3.4 FLUSHING AND DISINFECTING

- .1 Maintain testable RP backflow preventor between municipal water and new plumbing system.
- .2 Ensure a minimum of 90% of plumbing fixtures are installed.
- .3 Flush water mains through available outlets with a sufficient flow of potable water to produce a velocity of 1.5 m/s, within pipe for 10 min, or until foreign materials have been removed and flushed water is clear with backflow protection.
- .4 Provide connections and pumps for flushing as required.
- .5 Open and close valves, and operate fixtures to ensure thorough flushing.
- .6 When flushing has been complete to satisfaction of Consultant introduce a strong solution of Chlorine into water system and ensure that it is distributed throughout entire system.
- .7 Rate of chlorine application to be proportional to rate of water entering pipe.
- .8 Chlorine injection to be close to point of filling water main or at building water service and to occur simultaneously.
- .9 Confirm adequate chlorine residual not less than 50 ppm has been obtained, leave system charged with chlorine solution for 24 h. After 24 h, further samples shall be taken to ensure that there is still not less than 10 ppm of chlorine residual remaining throughout system.
- .10 Upon 10 ppm confirmation and 24 hr elapsed time flush line to remove chlorine solution.
- .11 Measure chlorine residuals at extreme end of pipe-line being tested.
- .12 Perform bacteriological tests on water main, after chlorine solution has been flushed out. Take samples daily for minimum of two days. Should contamination remain or reoccur during this period, repeat disinfecting procedure. Specialist contractor shall submit certified copy of test results.
- .13 Take water samples at remote fixtures and service connections.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 CAN/CSA – B64.10/B64.10.1 – Selection and Installation of Backflow Preventers/Maintenance and Field Testing of Backflow Preventers.

1.2 SUBMITTALS

- .1 Complete the required cross connection survey form and submit to authority having jurisdiction. Provide a copy to the consultant.
- .2 Incorporate data into maintenance manual.

Part 2 Products

2.1 GENERAL

- .1 Provide backflow prevention devices in all new and existing fixtures and equipment as indicated and as required by the authority having jurisdiction.
- .2 Acceptable materials:
Watts
Wilkins

Part 3 Execution

3.1 INSTALLATION

- .1 Install devices in accordance with acceptable engineering practices, the requirements of the Ontario Building Code and the requirements of the authority having jurisdiction.

3.2 TESTING

- .1 Provide testing to requirements of authority having jurisdiction.
- .2 Provide copy of test report for each device in the maintenance manual.
- .3 Provide tag on each device.
- .4 Provide a list of devices complete with tag number on a framed chart. Locate chart in Water Entrance Room.
- .5 Provide additional testing on all devices at one year warranty period. Provide documentation to owner and consultant.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 ASTM B32, Specification for Solder Metal.
- .3 ASTM B306, Specification for Copper Drainage Tube (DWV).
- .4 ASTM C564, Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- .5 CAN/CSA-B70, Cast Iron Soil Pipe, Fittings and Means of Joining.
- .6 CAN/CSA-B125.3, Plumbing Fittings.

Part 2 Products

2.1 COPPER TUBE AND FITTINGS

- .1 Above ground sanitary, and vent, maximum 65 mm (2½") Type DWV copper to: ASTM B306.
 - .1 Fittings.
 - .1 Cast brass: to CAN/CSA B125.3.
 - .2 Wrought copper: to CAN/CSA B125.3.
 - .2 Solder: tin-lead, 50:50, to ASTM B32, type 50A.

2.2 CAST IRON PIPING AND FITTINGS

- .1 Above ground sanitary, and vent, minimum NPS 80 mm (3"), cast iron to: CAN/CSA-B70.
 - .1 Mechanical joints (vents)
 - .1 Neoprene or butyl rubber compression gaskets: to ASTM C564 or CAN/CSA-B70.
 - .2 Stainless steel clamps (2 band).
 - .2 Mechanical joints (sanitary)
 - .1 Heavy duty neoprene or butyl rubber compression gaskets to: ASTM C1540.
 - .2 Stainless steel clamps (4 band min).

2.3 VENT FLASHINGS

- .1 Thaler or equal spun aluminum complete with insulation, cap, and rubber gasket.

Part 3 Execution

3.1 INSTALLATION

- .1 Install in accordance with Provincial Plumbing Code and local authority having jurisdiction.
- .2 Install above ground piping parallel and close to walls and ceilings to conserve headroom and space, and to grade as indicated.
- .3 Place Cleanouts
 - .1 Where shown on Drawings and near bottom of each stack and riser.
 - .2 At every 90 degree change of direction for horizontal lines.
 - .3 Every 15 m (50') of horizontal run.
 - .4 Extend clean out to accessible surface. Do not place cleanouts in carpeted floors. In such locations, use wall type cleanouts.
- .4 Each fixture and appliance discharging water into sanitary sewer or building sewer lines shall have a seal trap in connection with a complete venting system so gases pass freely to atmosphere with no pressure or syphon condition on water seal.
- .5 Vent entire waste system to atmosphere.
 - .1 Discharge 500 mm (20") above roof. Join lines together in fewest practicable number before projecting above roof.
 - .2 Set back vent lines so they will not pierce roof near an edge or valley.
 - .3 Venting shall be 7.5 m (25'-0") from any outdoor air intakes.
 - .4 Provide copper vent piping through roof as per detail.
- .6 Use torque wrench to obtain proper tension in cinch bands when using hubless cast iron pipe. Butt ends of pipe against centering flange of coupling.
- .7 Flash pipes passing through roof with 453 g (16 oz) sheet copper flashing fitted snugly around pipes and caulk between flashing and pipe with flexible waterproof compound.
 - .1 Flashing base shall be at least 600 mm (24") square.
 - .2 Flashing may be a 24 kg/m² (5 lb/ft²) lead flashing fitted around pipes and turned down into pipe 15 mm (½") with turned edge hammered against pipe wall.
- .8 Before piping is covered, conduct tests in presence of Consultant and correct leaks or defective work. Conduct test prior to placing floor slab but after backfill is placed.
 - .1 Do not caulk threaded work.
 - .2 Fill waste and vent system to roof level [a minimum of 3,100 mm - (10')] with water and show no leaks for 2 hours.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 ASTM D2235, Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
- .3 ASTM D2564, Specification for Solvent Cements for Poly(Vinyl-Chloride) (PVC) Plastic Piping Systems.
- .4 CAN/CSA-B181.1, ABS Drain, Waste and Vent Pipe and Pipe Fittings.
- .5 CAN/CSA-B181.2, PVC and CPVC Drain, Waste and Vent Pipe and Pipe Fittings.
- .6 CAN/CSA-B182.1, Plastic Drain and Sewer Pipe and Pipe Fittings.

Part 2 Products

2.1 PIPING AND FITTINGS

- .1 Buried sanitary, and vent piping to:
 - .1 80 mm (3") and smaller: ABS drain waste and vent pipe to CAN/CSA-B181.1.
 - .2 100 mm (4") and larger: SDR-35 PVC drain waste and vent pipe to CAN/CSA-B181.2.
 - .3 Vent piping: any size, PVC-DWV plastic drain and sewer pipe and fittings CAN/CSA-B181.2.
- .2 Above grade sanitary and vent piping:
 - .1 80 mm (3") and smaller: IPEX: PVC-XFR drain waste and vent pipe to CAN/CSA-B181.2.
 - .2 100 mm (4") and larger: IPEX: PVC-XFR drain waste and vent pipe to CAN/CSA-B181.2.
 - .3 Vent piping: any size, IPEX: PVC-XFR plastic drain and sewer pipe and fittings CAN/CSA-B181.2.
- .3 Where piping pierces a fire separation an approved fire stop system to the approval of authority having jurisdiction shall be used.

2.2 JOINTS

- .1 Solvent weld for PVC: to ASTM D2564.
- .2 Solvent weld for ABS: to ASTM D2235.

2.3 EXPANSION

- .1 Provide solvent welded expansion joints as required by manufacturer's recommendations.

2.4 VENT FLASHINGS

- .1 Thaler Stack Jack spun aluminum complete with insulation, cap, and rubber gasket.

Part 3 Execution**3.1 INSTALLATION**

- .1 Install in accordance with Provincial Plumbing Code and local authority having jurisdiction. Install in accordance with manufacturer's instructions.
- .2 Installation of underground pipe
 - .1 Provide all excavation, bedding, backfill, and compaction.
 - .2 Install materials in accordance with Manufacturer's instructions.
 - .3 Use jacks to make-up gasketed joints.
 - .4 Stabilize unstable trench bottoms.
 - .5 Bed pipe true to line and grade with continuous support from firm base.
 - .1 Bedding depth - 100 mm to 150 mm (4" to 6").
 - .2 Material and compaction to meet ASTM standard noted above.
 - .6 Excavate bell holes into bedding material so pipe is uniformly supported along its entire length. Blocking to grade pipe is forbidden.
 - .7 Trench width at top of pipe -
 - .1 Minimum 450 mm (18") or diameter of pipe plus 300 mm (12"), whichever is greater.
 - .2 Maximum - Outside diameter of pipe plus 600 mm (24").
 - .8 Piping and joints shall be clean and installed according to manufacturer's recommendations. Break down contaminated joints, clean seats and gaskets and reinstall.
 - .9 Do not use back hoe or power equipment to assemble pipe.
 - .10 Initial backfill shall be 300 mm (12") above top of pipe with material specified in referenced ASTM standard.
- .3 Place Cleanouts
 - .1 Where shown on Drawings and near bottom of each stack and riser.
 - .2 At every 90 degree change of direction for horizontal lines.
 - .3 Every 15 m (50 ft) of horizontal run.
 - .4 Extend clean out to accessible surface. Do not place cleanouts in carpeted floors. In such locations, use wall type cleanouts
- .4 Each fixture and appliance discharging water into sanitary sewer or building sewer lines shall have a seal trap in connection with a complete venting system so gases pass freely to atmosphere with no pressure or syphon condition on water seal.

- .5 Before piping is covered, conduct tests in presence of Consultant and correct leaks or defective work. Conduct test prior to placing floor slab but after backfill is placed.
 - .1 Fill waste and vent system a minimum of 1.8 m (6 ft) above finished floor with water and show no leaks for 2 hours.
 - .2 Conduct ball test in presence of consultant to ensure proper grade and clear of obstructions.
- .6 Install solvent welded expansion joints as per manufacturer's recommendation. Care is to taken to accommodate ambient temperatures at time of install.
- .7 Vent entire waste system to atmosphere.
 - .1 Discharge 350 mm (14") above roof. Join lines together in fewest practicable number before projecting above roof.
 - .2 Set back vent lines so they will not pierce roof near an edge or valley.
 - .3 Venting shall be 7.5 m (25'-0") from any outdoor air intakes.
- .8 Flash pipes passing through roof with Thaler insulated Stack Jack flashing.
 - .1 Flashing base shall be at least 600 mm (24") square.
- .9 Install above ground piping parallel and close to walls and ceilings to conserve headroom and space, and to grade as indicated.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 CSA B51, Boiler, Pressure Vessel, and Pressure Piping Code.

1.2 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with general requirements.
- .2 Indicate:
 - .1 Equipment, including connections, fittings, control assemblies and ancillaries, identifying factory and field assembled.
 - .2 Wiring and schematic diagrams.
 - .3 Dimensions and recommended installation.
 - .4 Pump performance and efficiency curves.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance and engineering data for incorporation into manual specified in general requirements
- .2 Data to include:
 - .1 Manufacturer's name, type, model year, capacity, and serial number.
 - .2 Details of operation, servicing, and maintenance.
- .3 Recommended spare parts list with names and addresses.

Part 2 Products

2.1 THERMOSTATIC WATER CONTROLLER (3 Port)

- .1 1/2" inlets 1/2" outlets thermostatic controller with swivel action check stops, removable cartridge with strainer, stainless steel piston and liquid fill thermal motor with bellows mounted out of water. Volume control shut off valve, bimetal dial thermometer (3" face, range 20° – 240°F), brass pipe, fittings and unions. Standard valve and piping finish is rough bronze.
- .2 Acceptable materials:
 - .1 HAWS
 - .2 Bradley
 - .3 Guardian

Part 3 Execution

3.1 FIELD QUALITY CONTROL

- .1 Start up, check for proper and safe operation.
- .2 Check settings and operation of all hand-off-auto selector switch, operating, safety and limit controls, audible and visual alarms, over-temperature and other protective devices.
- .3 Adjust flow from water-cooled bearings.
- .4 Adjust impeller shaft stuffing boxes, packing glands.
- .5 Demonstrate equipment operation as directed by consultant.

3.2 WARRANTY

- .1 Warranty Start Date:
 - .1 Warranty period starts as of the date of Ready for Takeover.
 - .2 Warranty start dates based on shipment date, start up date, substantial completion date, etc. are not applicable.
- .2 Warranty Duration:
 - .1 One (1) year warranty period applies.
- .3 Warranty Coverage:
 - .1 Applies to parts and labour.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 CAN/CSA B45S1, Supplement #1 to CAN/CSA B-45 Series Plumbing Fixtures.
- .3 CAN/CSA-B45 Series, CSA Standards on Plumbing Fixtures.
- .4 CAN/CSA-B125.3, Plumbing Fittings.
- .5 CAN/CSA-B651, Accessible Design for the Built Environment.

1.2 SHOP DRAWINGS

- .1 Submit shop drawings and product data in accordance with general requirements.
- .2 Indicate, for all fixtures and trim:
 - .1 Dimensions, construction details, roughing-in dimensions.
 - .2 Factory-set water consumption per flush at recommended pressure.
 - .3 For water closets, urinals: minimum pressure required for flushing.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data including monitoring requirements for incorporation into manual specified in general requirements.
- .2 Include:
 - .1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.
 - .2 Details of operation, servicing, maintenance.
 - .3 List of recommended spare parts.

1.4 PRODUCTS INSTALLED BUT NOT SUPPLIED UNDER THIS SECTION

- .1 Install rough-in for equipment supplied by others, complete with valves on hot and cold water supplies, waste and vent.
- .2 Equipment installed by others.
 - .1 Connect with unions.
- .3 Equipment not installed.
 - .1 Capped with valves for future connection by others.

Part 2 Products

2.1 MANUFACTURED UNITS

- .1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.
- .2 Trim, fittings: manufacture in accordance with CAN/CSA-B125.3.
- .3 Exposed plumbing brass to be chrome plated.
- .4 Number, locations: Architectural drawings to govern.
- .5 Fixtures in any one location to be product of one manufacturer and of same type.
- .6 Trim in any one location to be product of one manufacturer and of same type.

2.2 FIXTURE CARRIERS

- .1 Provide factory manufactured floor-mounted carrier systems for all wall-mounted fixtures.
- .2 Acceptable materials:
 - .1 Zurn
 - .2 Smith
 - .3 Ancon

2.3 PLUMBING FIXTURES

- .1 Refer to plumbing fixture schedule on the drawings for fixture type, manufacturer, trim, drainage supply, and accessories.

2.4 FIXTURE PIPING

- .1 Hot and cold water supplies to each fixture/faucet:
Chrome plated flexible supply pipes each with screwdriver stop, reducers, escutcheon and chrome plated nipple.
 - .1 Acceptable materials:
 - .1 Delta 47T900 Series
 - .2 McGuire
- .2 Waste:
Open grid strainer, or pop up as indicated, offset open grid strainer on Barrier-Free fixtures, cast brass fittings with tubular piping, chrome plated, rubber gasket compression fitting, and overflow flange.
 - .1 Acceptable materials:
 - .1 Delta 33T200 Series
 - .2 McGuire

- .3 'P' Traps:
Cast brass P trap with cleanout on each fixture not having integral trap.
Chrome plated in all exposed places.
 - .1 Acceptable materials:
 - .1 Delta 33T300 Series
 - .2 McQuire

Part 3 Execution

3.1 INSTALLATION

- .1 Mounting heights:
 - .1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified. Confirm mounting height(s) with consultant prior to rough-in.
 - .2 Wall-hung fixtures: measured from finished floor.
 - .3 Physically Barrier-Free: to comply with most stringent of either NBCC or CAN/CSA B651.
- .2 Drinking fountains:
 - .1 In accordance with CAN/CSA B45S1.

3.2 ADJUSTING

- .1 Conform to water conservation requirements specified this section.
- .2 Adjustments.
 - .1 Adjust water flow rate to design flow rates.
 - .2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.
 - .3 Adjust flush valves to suit actual site conditions.
 - .4 Adjust urinal flush timing mechanisms.
 - .5 Adjust water cooler, drinking fountain flow stream to ensure no spillage.
 - .6 Automatic flush valves for water closets and urinals: set controls to prevent unnecessary flush cycles during silent hours.
- .3 Checks.
 - .1 Water closets, urinals: flushing action.
 - .2 Aerators: operation, cleanliness.
 - .3 Vacuum breakers, backflow preventors: operation under all conditions.
 - .4 Wash fountains: operation of flow-actuating devices.
 - .5 Refrigerated water coolers: operation, temperature settings.

- .4 Thermostatic controls.
 - .1 Verify temperature settings, operation of control, limit and safety controls.
- .5 Floor and wall mounted fixtures: caulk to floor or wall using silicone caulking to make water tight, colour to match fixture.
- .6 Counter mounted fixtures: lay fixtures into bead of caulking to ensure excess moisture does not reach the cut edge of the countertop. Clean excess caulking off outside the sink.

3.3 WARRANTY

- .1 Warranty Start Date:
 - .1 Warranty period starts as of the date of Ready for Takeover.
 - .2 Warranty start dates based on shipment date, start up date, substantial completion date, etc. are not applicable.
- .2 Warranty Duration:
 - .1 One (1) year warranty period applies.

END OF SECTION

Part 1 General

1.1 REFERENCE

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 National Air Duct Cleaners Association (NADCA): "Assessment, Cleaning & Restoration of HVAC Systems (ACR).
- .3 National Air Duct Cleaners Association (NADCA): "Understanding Microbial Contamination in HVAC Systems".
- .4 National Air Duct Cleaners Association (NADCA): "Introduction to HVAC System Cleaning Services".
- .5 National Air Duct Cleaners Association (NADCA): Standard 05 "Requirements for the Installation of Service Openings in HVAC Systems".
- .6 Underwriters' Laboratories (UL): UL Standard 181.
- .7 American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE): Standard 62, "Ventilation for Acceptable Indoor Air Quality".
- .8 Environmental Protection Agency (EPA): "Building Air Quality".
- .9 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA): "HVAC Duct Construction Standards - Metal and Flexible".
- .10 North American Insulation Manufacturers Association (NAIMA): "Cleaning Fibrous Glass Insulated Air Duct Systems".

1.2 SPECIAL PROVISIONS

- .1 Qualification of the HVAC System Cleaning Contractor
- .2 Membership: The HVAC system cleaning contractor shall be a certified member of the National Air Duct Cleaners Association (NADCA), or shall maintain membership in a nationally recognized non-profit industry organization dedicated to the cleaning of HVAC systems.
- .3 Certification: The HVAC system cleaning contractor shall have a minimum of one (1) Air System Cleaning Specialist (ASCS) certified by NADCA on a full time basis, or shall have staff certified by a nationally recognized certification program and organization dedicated to the cleaning of HVAC systems.
- .4 Supervisor Qualifications: A person certified as an ASCS by NADCA, or maintaining an equivalent certification by a nationally recognized program and organization, shall be responsible for the total work herein specified.
- .5 Experience: The HVAC system cleaning contractor shall submit records of experience in the field of HVAC system cleaning as requested by the owner. Bids shall only be considered from firms, which are regularly engaged in HVAC system maintenance with an emphasis on HVAC system cleaning and decontamination.

- .6 Equipment, Materials and Labor: The HVAC system cleaning contractor shall possess and furnish all necessary equipment, materials and labour to adequately perform the specified services.
 - .1 The contractor shall assure that its employees have received safety equipment training, medical surveillance programs, individual health protection measures, and manufacturer's product and material safety data sheets (MSDS) as required for the work by the U.S. Occupational Safety and Health Administration, and as described by this specification. For work performed in countries outside of the U.S.A., contractors should comply with applicable national safety codes and standards.
 - .2 The contractor shall maintain a copy of all current MSDS documentation and safety certifications at the site at all times, as well as comply with all other site documentation requirements of applicable OSHA programs and this specification
 - .3 Contractor shall submit to the owner all Material Safety Data Sheets (MSDS) for all chemical products proposed to be used in the cleaning process.
- .7 Licensing: The HVAC system cleaning contractor shall provide proof of maintaining the proper license(s), if any, as required to do work in this state. Contractor shall comply with all Federal, state and local rules, regulations, and licensing requirements.

1.3 STANDARDS

- .1 NADCA Standards: The HVAC system cleaning contractor shall perform the services specified here in accordance with the current published standards of the National Air Duct Cleaners Association (NADCA).
- .2 All terms in this specification shall have their meaning defined as stated in the NADCA Standards.
- .3 NADCA Standards must be followed with no modifications or deviations being allowed.

1.4 DOCUMENTS

- .1 Mechanical Drawings: The owner shall provide the HVAC system cleaning contractor with one copy of the following documents:
 - .2 Project drawings and specifications.
 - .3 Approved construction revisions pertaining to the HVAC system.
 - .4 Any existing indoor air quality (IAQ) assessments or environmental reports prepared for the facility.

Part 2 Products

2.1 SCOPE OF WORK

- .1 This section defines the minimum requirements necessary to render HVAC components clean, and to verify the cleanliness through inspection and/or testing in accordance with items specified herein and applicable NADCA Standards.
- .2 The Contractor shall be responsible for the removal of visible surface contaminants and deposits from within the HVAC system in strict accordance with these specifications.
- .3 The HVAC system includes any interior surface of the Multi-Purpose room's existing air distribution system for conditioned spaces and/or occupied zones. This includes the entire heating, air-conditioning and ventilation system from the points where the air enters the system to the points where the air is discharged from the system. The return air grilles, return air ducts to the air handling units (AHU), supply air ducts, turning vanes, are all considered part of the HVAC system. The HVAC system may also include other components such as dedicated exhaust and ventilation components and make-up air systems.

2.2 HVAC SYSTEM COMPONENT INSPECTIONS AND SITE PREPARATIONS

- .1 HVAC System Component Inspections: Prior to the commencement of any cleaning work, the HVAC system cleaning contractor shall perform a visual inspection of the HVAC system to determine appropriate methods, tools, and equipment required to satisfactorily complete this project. The cleanliness inspection should include air handling units and representative areas of the HVAC system components and ductwork. In HVAC systems that include multiple air-handling units, a representative sample of the units should be inspected.
- .2 The cleanliness inspection shall be conducted without negatively impacting the indoor environment through excessive disruption of settled dust, microbial amplification or other debris. In cases where contamination is suspected, and/or in sensitive environments where even small amounts of contaminant may be of concern, environmental engineering control measures should be implemented
- .3 Damaged system components found during the inspection shall be documented and brought to the attention of the consultant.
- .4 Site Evaluation and Preparations: Contractor shall conduct a site evaluation, and establish a specific, coordinated plan which details how each area of the building will be protected during the various phases of the project.
- .5 Inspector Qualifications: Qualified personnel should perform the HVAC cleanliness inspection to determine the need for cleaning. At minimum, such personnel should have an understanding of HVAC system design, and experience in utilizing accepted indoor environmental sampling practices, current industry HVAC cleaning procedures, and applicable industry standards.

2.3 GENERAL HVAC SYSTEM CLEANING REQUIREMENTS

- .1 Containment: Debris removed during cleaning shall be collected and precautions must be taken to ensure that Debris is not otherwise dispersed outside the HVAC system during the cleaning process.
- .2 Particulate Collection: Where the Particulate Collection Equipment is exhausting inside the building, HEPA filtration with 99.97% collection efficiency for 0.3-micron size (or greater) particles shall be used. When the Particulate Collection Equipment is exhausting outside the building, Mechanical Cleaning operations shall be undertaken only with Particulate Collection Equipment in place, including adequate filtration to contain Debris removed from the HVAC system. When the Particulate Collection Equipment is exhausting outside the building, precautions shall be taken to locate the equipment down wind and away from all air intakes and other points of entry into the building.
- .3 Controlling Odors: Measures shall be employed to control odors and/or mist vapors during the cleaning process.
- .4 Component Cleaning: Cleaning methods shall be employed such that all HVAC system components must be Visibly Clean as defined in applicable standards (see NADCA Standards). Upon completion, all components must be returned to those settings recorded just prior to cleaning operations.
- .5 Air-Volume Control Devices: Dampers and any air-directional mechanical devices inside the HVAC system must have their position marked prior to cleaning and, upon completion, must be restored to their marked position.
- .6 Service Openings: The contractor shall utilize service openings, as required for proper cleaning, at various points of the HVAC system for physical and mechanical entry, and inspection.
- .7 Contractor shall utilize the existing service openings already installed in the HVAC system where possible.
- .8 Other openings shall be created by this contractor where needed and they must be created so they can be sealed by this contractor in accordance with industry codes and standards.
- .9 Closures must not significantly hinder, restrict, or alter the airflow within the system.
- .10 Closures must be properly insulated to prevent heat loss/gain or condensation on surfaces within the system.
- .11 Openings must not compromise the structural integrity of the system.
- .12 Construction techniques used in the creation of openings should conform to requirements of applicable building and fire codes, and applicable NFPA, SMACNA and NADCA Standards.
- .13 Cutting service openings into flexible duct is not permitted. Flexible duct shall be disconnected at the ends as needed for proper cleaning and inspection.

- .14 Rigid fiberglass duct systems shall be resealed in accordance with NAIMA recommended practices. Only closure techniques that comply with UL Standard 181 or UL Standard 181a are suitable for fiberglass duct system closures.
- .15 All service openings capable of being re-opened for future inspection or remediation shall be clearly marked and shall have their location reported to the consultant in project report documents.
- .16 Ceiling sections (tile): The contractor may remove and reinstall ceiling sections to gain access to HVAC systems during the cleaning process.
- .17 Air distribution devices (registers, grilles & diffusers): The contractor shall clean all air distribution devices.
- .18 Air handling units, terminal units (VAV, Dual duct boxes, etc.), blowers and exhaust fan: The contractor shall ensure that supply, return, and exhaust fans and blowers are thoroughly cleaned. Areas to be cleaned include blowers, fan housings, plenums (except ceiling supply and return plenums), scrolls, blades, or vanes, shafts, baffles, dampers and drive assemblies. All visible surface contamination deposits shall be removed in accordance with NADCA Standards. Contractor shall:
- .19 Clean all air handling units (AHU) internal surfaces, components and condensate collectors and drains.
- .20 Assume that a suitable operative drainage system is in place prior to beginning wash down procedures.
- .21 Clean all coils and related components, including evaporator fins.
- .22 Duct Systems: This Contractor shall:
- .23 Create service openings in the system as necessary in order to accommodate cleaning of otherwise inaccessible areas. Provide access doors specified in duct accessories to replace openings.
- .24 Mechanically clean all duct systems to remove all visible contaminants, such that the systems are capable of passing Cleaning Verification Tests (see NADCA Standards).

2.4 HEALTH AND SAFETY

- .1 Safety Standards: Cleaning contractors shall comply with applicable federal, state, and local requirements for protecting the safety of the contractor's employees, building occupants, and the environment. In particular, all applicable standards of the Occupational Safety and Health Administration (OSHA) shall be followed when working in accordance with this specification.
- .2 Occupant Safety: No processes or materials shall be employed in such a manner that they will introduce additional hazards into occupied spaces.
- .3 Disposal of Debris: All Debris removed from the HVAC System shall be disposed of in accordance with applicable federal, state and local requirements.

2.5 MECHANICAL CLEANING METHODOLOGY

- .1 Source Removal Cleaning Methods:
- .2 The HVAC system shall be cleaned using Source Removal mechanical cleaning methods designed to extract contaminants from within the HVAC system and safely remove contaminants from the facility. It is the contractor's responsibility to select Source Removal methods that will render the HVAC system Visibly Clean and capable of passing cleaning verification methods (See applicable NADCA Standards) and other specified tests, in accordance with all general requirements. No cleaning method, or combination of methods, shall be used which could potentially damage components of the HVAC system or negatively alter the integrity of the system.
 - .1 All methods used shall incorporate the use of vacuum collection devices that are operated continuously during cleaning. A vacuum device shall be connected to the downstream end of the section being cleaned through a predetermined opening. The vacuum collection device must be of sufficient power to render all areas being cleaned under negative pressure, such that containment of debris and the protection of the indoor environment are assured.
 - .2 All vacuum devices exhausting air inside the building shall be equipped with HEPA filters (minimum efficiency), including hand-held vacuums and wet-vacuums.
 - .3 All vacuum devices exhausting air outside the facility shall be equipped with Particulate Collection including adequate filtration to contain Debris removed from the HVAC system. Such devices shall exhaust in a manner that will not allow contaminants to re-enter the facility. Release of debris outdoors must not violate any outdoor environmental standards, codes or regulations.
 - .4 All methods require mechanical agitation devices to dislodge debris adhered to interior HVAC system surfaces, such that debris may be safely conveyed to vacuum collection devices. Acceptable methods will include those which will not potentially damage the integrity of the ductwork, nor damage porous surface materials such as liners inside the ductwork or system components.
- .3 Methods of Cleaning Fibrous Glass Insulated Components:
- .4 Fibrous glass thermal or acoustical insulation elements present in any equipment or ductwork shall be thoroughly cleaned with HEPA vacuuming equipment, while the HVAC system is under constant negative pressure, and not permitted to get wet in accordance with applicable NADCA and NAIMA standards and recommendations.
- .5 Cleaning methods used shall not cause damage to fibrous glass components and will render the system capable of passing Cleaning Verification Tests (see NADCA Standards)

- .6 Damaged Fibrous Glass Material:
- .7 Evidence of damage: If there is any evidence of damage, deterioration, delaminating, friable material, mold or fungus growth, or moisture such that fibrous glass materials cannot be restored by cleaning or resurfacing with an acceptable insulation repair coating, they shall be identified for replacement.
- .8 Replacement: When requested or specified, Contractor must be capable of remediating exposed damaged insulation in air handlers and/or ductwork requiring replacement.
- .9 Replacement material: In the event fiber glass materials must be replaced, all materials shall conform to applicable industry codes and standards, including those of UL and SMACNA.
- .10 Replacement of damaged insulation is not covered by this specification.
- .11 Cleaning of Coils:
- .12 Any cleaning method may be used which will render the Coil Visibly Clean and capable of passing Coil Cleaning Verification (see applicable NADCA Standards). Coil drain pans shall be subject to Non-Porous Surfaces Cleaning Verification. The drain for the condensate drain pan shall be operational. Cleaning methods shall not cause any appreciable damage to, displacement of, inhibit heat transfer, or erosion of the coil surface or fins, and shall conform to coil manufacturer recommendations when available. Coils shall be thoroughly rinsed with clean water to remove any latent residues.
- .13 Antimicrobial Agents and Coatings:
- .14 Antimicrobial agents shall only be applied if active fungal growth is reasonably suspected, or where unacceptable levels of fungal contamination have been verified through testing.
- .15 Application of any antimicrobial agents used to control the growth of fungal or bacteriological contaminants shall be performed after the removal of surface deposits and debris.
- .16 When used, antimicrobial treatments and coatings shall be applied in strict accordance with the manufacturer's written recommendations and EPA registration listing.
- .17 Antimicrobial coatings shall be applied according to the manufacturer's written instructions. Coatings shall be sprayed directly onto interior ductwork surfaces, rather than "fogged" downstream onto surfaces.

2.6 CLEANLINESS VERIFICATION

- .1 General:
- .2 Verification of HVAC System cleanliness will be determined after mechanical cleaning and before the application of any treatment or introduction of any treatment-related substance to the HVAC system, including biocidal agents and coatings.

- .3 Visual Inspection:
- .4 The HVAC system shall be inspected visually to ensure that no visible contaminants are present.
 - .1 If no contaminants are evident through visual inspection, the HVAC system shall be considered clean; however, the consultant reserves the right to further verify system cleanliness through Surface Comparison Testing or the NADCA vacuum test specified in the NADCA standards.
 - .2 If visible contaminants are evident through visual inspection, those portions of the system where contaminants are visible shall be re-cleaned and subjected to re-inspection for cleanliness.
 - .3 NADCA vacuum test analysis shall be performed by a qualified third party experienced in testing of this nature through the HVAC commissioning contract.
- .5 Verification of Coil Cleaning:
- .6 Cleaning must restore the coil pressure drop to within 10 percent of the pressure drop measured when the coil was first installed. If the original pressure drop is not known, the coil will be considered clean only if the coil is free of foreign matter and chemical residue, based on a thorough visual inspection (see NADCA Standards).

2.7 PRE-EXISTING SYSTEM DAMAGE

- .1 Contractor is not responsible for problems resulting from prior inappropriate or careless cleaning techniques of others.

2.8 POST-PROJECT REPORT

- .1 At the conclusion of the project, the Contractor shall provide a report to the consultant indicating the following:
- .2 Success of the cleaning project, as verified through visual inspection and/or gravimetric analysis.
- .3 Areas of the system found to be damaged and/or in need of repair.

Part 3 Execution

- .1 Not Applicable

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 51-GP-52Ma-[89], Vapour Barrier Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
- .3 Underwriters Laboratories of Canada (ULC).
 - .1 CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.
- .4 American Society for Testing and Materials (ASTM).
 - .1 ASTM C177 Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Mean of the Guarded Hot-Plate Apparatus.
 - .2 ASTM C518 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - .3 ASTM C 449M, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - .4 ASTM C1729 Standard Specification for Aluminum Jacketing for Insulation.
 - .5 ASTM C1290 Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts.
 - .6 ASTM C1393 Standard Specification for Perpendicularly Oriented Mineral Fiber Roll and Sheet Thermal Insulation for Pipes And Tanks.
 - .7 ASTM C553, Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 - .8 ASTM C612, Mineral Fiber Block and Board Thermal Insulation.
- .5 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).
 - .1 ASHRAE Standard 90.1.
- .6 Manufacturer's Trade Associations.
 - .1 Thermal Insulation Association of Canada (TIAC)
 - .2 North American Commercial and Industrial Insulation Standards.

1.2 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with general requirements.
- .2 Submit for approval manufacturer's catalogue literature related to installation, fabrication for duct jointing recommendations.

- .3 Submit completed detail plates from the North American Commercial and Industrial Insulation Standards manual, applicable to installation types required by this specification section.

1.3 INSTALLATION INSTRUCTIONS

- .1 Submit manufacturer's installation instructions in accordance with general requirements.
- .2 Installation instructions to include procedures to be used, installation standards to be achieved.

1.4 QUALIFICATIONS

- .1 Installer to have successfully completed apprenticeship program.
- .2 Installer to be specialist in performing work of this section and have at least 3 years successful experience in this size and type of project, qualified to standards of TIAC.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver materials to site in original factory packaging, labeled with manufacturer's name, address.
- .2 Protect from weather and construction traffic.
- .3 Protect against damage from any source.
- .4 Store at temperatures and conditions required by manufacturer.

1.6 DEFINITIONS

- .1 For purposes of this section:
 - .1 "CONCEALED" - insulated mechanical services and equipment in suspended ceilings and non-accessible chases and furred-in spaces.
 - .2 "EXPOSED" - will mean "not concealed" as defined herein.
 - .3 "ASJ+" – All Service Jacket – vapor retarder laminate of aluminium foil inner layer, reinforced with fiberglass scrim, bonded to a bleached kraft paper, with outer poly film leaving no paper exposed.
 - .4 "ASJ" – All Service Jacket (no outer film) – vapor retarder laminate of aluminium foil inner layer, reinforced with fiberglass scrim, bonded to a bleached kraft paper outer layer.
 - .5 "FSK" – Foil Scrim Kraft – vapor retarder laminate of aluminium foil outer layer, reinforced with fiberglass scrim, bonded to a natural kraft paper inner layer.
- .2 Insulation systems - insulation material, fasteners, jackets, and other accessories.

1.7 QUALITY ASSURANCE

- .1 Products shall not contain formaldehyde, asbestos, lead, mercury or mercury compounds or PBDE fire retardants.

Part 2 Products

2.1 LIMITATION ON MATERIALS

- .1 Products shall not contain formaldehyde, asbestos, lead, mercury or mercury compounds or PBDE fire retardants.

2.2 FIRE AND SMOKE RATING

- .1 In accordance with CAN/ULC S102:
 - .1 Maximum flame spread rating: 25.
 - .2 Maximum smoke developed rating: 50.

2.3 INSULATION

- .1 Mineral fibre as specified herein includes glass fibre, rock wool, slag wool.
- .2 Thermal conductivity ("k" factor) not to exceed specified values at 24°C (75°F) mean temperature when tested in accordance with ASTM C177 or ASTM C518.
- .3 Type C-1: Rigid mineral fibre board to ASTM C612, with factory applied vapour retarder jacket meeting the requirement of ASTM C1136 Type II and IV (FSK):
 - .1 Jacket: to ASTM C1136 Type II and IV (FSK)
 - .2 Maximum "k" value: .033 W/M•°C (.23 BTU•IN/HR•FT²•°F)
- .4 Type C-2: Mineral fibre blanket to ASTM C553 Type I, II, and III, ASTM C1136 Type II and IV, and ASTM C1290 Type III:
 - .1 Jacket: to ASTM C1136, Type II and IV.
 - .2 Maximum "k" value: 042 W/M•°C (.29 BTU•IN/HR•FT²•°F)

2.4 JACKETS

- .1 Canvas:
 - .1 220 g/m² (6 oz/sq.yd.) cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C 921.
 - .2 Lagging adhesive: Compatible with insulation.

2.5 ACCESSORIES

- .1 Vapour retarder lap adhesive:
 - .1 Water based, fire retardant type, compatible with insulation.
- .2 Indoor Vapour Retarder Finish:
 - .1 Compatible with insulation.
- .3 Insulating Cement: hydraulic setting on mineral wool, to ASTM C 449.
- .4 ULC Listed Canvas Jacket:
 - .1 220 g/m² (6oz/yd²) cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C 921.

- .5 Tape: self-adhesive, aluminum, reinforced, 75 mm (3") wide minimum.
- .6 Contact adhesive: quick-setting Childers CP-82 or equal.
- .7 Canvas adhesive: washable.
- .8 Tie wire: 1.5 mm (16 gauge) stainless steel.
- .9 Facing: 25 mm (1") stainless steel hexagonal wire mesh stitched on one face of insulation
- .10 Fasteners: weld pins, length to suit insulation, with 40 mm (1½") diameter clips.

Part 3 Execution

3.1 PRE-INSTALLATION REQUIREMENTS

- .1 Pressure testing of ductwork systems to be complete, witnessed, and certified.
- .2 Surfaces to be clean, dry, free from foreign material.

3.2 INSTALLATION

- .1 Install in accordance with North American Commercial and Industrial Insulation Standards.
- .2 Apply materials in accordance with manufacturers instructions and this specification.
- .3 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
 - .1 Hangers, supports to be outside vapour retarder jacket.
- .4 Supports, Hangers in accordance with general requirements.
 - .1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.
- .5 Fasteners: At 300 mm (12") oc. in horizontal and vertical directions, minimum two rows each side.
- .6 Provide rigid insulation for exposed ductwork.

3.3 DUCTWORK INSULATION SCHEDULE

- .1 Insulation types and thicknesses conform to following table:

Application	Type	Thickness
Rectangular supply air ducts	C-1	25 mm (1")
Round supply air ducts	C-2	25 mm (1")
Supply, return and fan exhaust ducts exposed (visible) in space being served	none	
Exhaust Ducts		
Outdoor air ducts (exterior ductwork)	C-1	80 mm (3")
Outdoor air intake ductwork and plenums	C-1	50 mm (2")
Exhaust plenums dampers and louvres	C-1	25 mm (1")
Interior acoustically lined ducts	none	
Last 1.5m of Exhaust duct	C-1	25 mm (1")

- .2 Exposed round ducts 600 mm (24") and larger, smaller sizes where subject to abuse:
 - .1 Use TIAC code C-1 insulation, scored to suit diameter of duct.
- .3 Finishes: Conform to following table:

Application	Rectangular	Round
Indoor, concealed	none	none
Indoor, exposed	Canvas	Canvas

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.53, Poly (Vinyl Chloride) Jacketing Sheet, for Insulating Pipes, Vessels, and Round Ducts.
- .3 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
- .4 American Society for Testing and Materials (ASTM)
 - .1 ASTM C547, Type I and IV Standard Specification for Mineral Fiber Pipe Insulation.
 - .2 ASTM C177, Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
 - .3 ASTM C518, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus to recognize the correct thermal insulation performance testing for blanket.
 - .4 ASTM C1393, Standard Specification for Perpendicularly Oriented Mineral Fiber Roll and Sheet Thermal Insulation for Pipes and Tanks
 - .5 ASTM C1695, Standard Specification for Fabrication of Flexible Removable and Reusable Blanket Insulation for Hot Service.
 - .6 ASTM C 335, Test Method for Steady State Heat Transfer Properties of Pipe Insulation.
 - .7 ASTM C 921, Practice for Determining the Properties Jacketing Materials for Thermal Insulation.
 - .8 ASTM C1729 Standard Specification for Aluminium Jacketing for Insulation.
 - .9 ASTM C553, Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
 - .10 CGSB 51-GP-52Ma, Vapour Barrier Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
- .5 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE).
 - .1 ASHRAE Standard 90.1.
- .6 Manufacturer's Trade Associations
 - .1 Thermal Insulation Association of Canada (TIAC)
 - .2 North American Commercial and Industrial Insulation Standards

1.2 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with general requirements.
- .2 Submit properly completed detail plates from the North American Commercial and Industrial Insulation Standards manual, applicable to installation types required by this specific section.
- .3 Submit for approval manufacturer's catalogue literature related to installation, fabrication for pipe, fittings, valves, and jointing recommendations.

1.3 INSTALLATION INSTRUCTIONS

- .1 Submit manufacturer's installation instructions in accordance with general requirements.
- .2 Installation instructions to include procedures to be used, installation standards to be achieved.

1.4 QUALIFICATIONS

- .1 Installer to have successfully completed apprenticeship program.
- .2 Installer to be specialist in performing work of this section and have at least 3 years successful experience in this size and type of project, qualified to standards of TIAC.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .2 Protect from weather, construction traffic.
- .3 Protect against damage from any source.
- .4 Store at temperatures and conditions required by manufacturer.

1.6 DEFINITIONS

- .1 For purposes of this section:
 - .1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.
 - .2 "EXPOSED" - will mean "not concealed" as defined herein.
 - .3 "ASJ+" – All Service Jacket – vapor retarder laminate of aluminium foil inner layer, reinforced with fiberglass scrim, bonded to a bleached kraft paper, with outer poly film leaving no paper exposed.
 - .4 "ASJ" – All Service Jacket (no outer film) – vapor retarder laminate of aluminium foil inner layer, reinforced with fiberglass scrim, bonded to a bleached kraft paper outer layer.
 - .5 "FSK" – Foil Scrim Kraft – vapor retarder laminate of aluminum foil outer layer, reinforced with fiberglass scrim, bonded to a natural kraft paper inner liner.

- .6 "PSK" – Poly Scrim Kraft – vapor retarder laminate of polypropylene outer layer, reinforced with fiberglass scrim, bonded to a natural kraft paper inner layer.
- .7 "PVC" – Poly Vinyl Chloride – polymer used to manufacture a non-metallic final protective finish jacket over insulation systems.

1.7 QUALITY ASSURANCE

- .1 Products shall not contain formaldehyde, asbestos, lead, mercury or mercury compounds or PBDE fire retardants.

Part 2 Products

2.1 MATERIAL LIMITATIONS

- .1 Products shall not contain formaldehyde, asbestos, lead, mercury or mercury compounds or PBDE fire retardants.

2.2 FIRE AND SMOKE RATING

- .1 In accordance with CAN/ULC-S102:
 - .1 Maximum flame spread rating: 25.
 - .2 Maximum smoke developed rating: 50.

2.3 INSULATION

- .1 Mineral fibre as specified herein includes glass fibre, rock wool, slag wool.
- .2 Thermal conductivity ("k" factor) not to exceed specified values at 24°C (75°F) mean temperature when tested in accordance with ASTM C335, ASTM C177 or ASTM C518.
- .3 Type A-1: Rigid moulded or wound mineral fibre with factory applied vapour retarder jacket.
 - .1 Mineral fibre: to ASTM C547 Type I and IV.
 - .2 Jacket: to ASTM C1136, Type I, II, III, IV, X.
 - .3 Maximum "k" factor: to ASTM C547.
- .4 Type A-3: Tubular flexible elastomeric closed cell foam:
 - .1 Insulation to ASTM C534 Type I.
 - .2 Maximum "k" factor: to ASTM C534.
 - .3 To be certified by manufacturer to be free of potential stress corrosion cracking corrodents.
- .5 Materials:
 - .1 All materials must be supplied by the same manufacturer.
 - .2 Acceptable Materials:
 - .1 Knauf
 - .2 Manson
 - .3 Owens Corning

2.4 INSULATION SECUREMENT

- .1 Tape: Self-adhesive, aluminum, reinforced, 50 mm (2") wide minimum.
- .2 Contact adhesive: Quick setting.
- .3 Canvas adhesive: Washable.
- .4 **Tie wire: 1.5mm (16 gauge) diameter stainless steel.**
- .5 **Bands: Stainless steel, 20 mm (3/4") wide, 0.5 mm (0.020") thick.**

2.5 CEMENT

- .1 Thermal insulating and finishing cement:
 - .1 Air drying on mineral wool, to ASTM C 449M.
 - .2 Hydraulic setting on mineral wool, to ASTM C165

2.6 VAPOUR RETARDER LAP ADHESIVE

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

2.7 INDOOR VAPOUR RETARDER FINISH

- .1 Compatible with insulation.

2.8 OUTDOOR VAPOUR RETARDER FINISH

- .1 Compatible with insulation.
- .2 Reinforcing fabric: Open weave fibreglass fabric, with maximum weave of 10 x 10 squares per inch.

2.9 JACKETS

- .1 Polyvinyl Chloride (PVC):
 - .1 Minimum thickness: 20mil (0.020")
 - .2 One-piece moulded type [and sheet] to CAN/CGSB-51.53 with pre-formed shapes as required.
 - .3 Colours: white.
 - .4 Minimum service temperatures: -29°C (-20°F).
 - .5 Maximum service temperature: 65°C (150°F).
 - .6 Moisture vapour transmission: 0.05 perm.
 - .7 Fastenings:
 - .1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
 - .2 Tacks (not to be used on below-ambient temperature systems)
 - .3 Pressure sensitive vinyl tape of matching colour.

- .2 Aluminum:
 - .1 To ASTM C1729.
 - .2 Thickness: 0.50 mm (0.020") sheet.
 - .3 Finish: Smooth.
 - .4 Joining: Longitudinal and circumferential slip joints with 50 mm (2") laps.
 - .5 Fittings: 0.50 mm (0.020") thick die-shaped fitting covers with factory-attached protective liner.
 - .6 Metal jacket banding and mechanical seals: stainless steel, 20 mm (3/4") wide, 0.50 mm (0.020") thick at 300 mm (12") spacing.

2.10 CAULKING FOR JACKETS

- .1 Caulking: Silicone clear caulking.

Part 3 Execution

3.1 PRE-INSTALLATION REQUIREMENT

- .1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed, and certified.
- .2 Surfaces to be clean, dry, free from foreign material.

3.2 INSTALLATION

- .1 Install in accordance with North American Commercial and Industrial Insulation Standards.
- .2 Provide continuous insulation for complete systems including all valves, air separators, fittings, and other equipment.
- .3 Apply materials in accordance with manufacturers' instructions and this specification.
- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
 - .1 Hangers, supports to be outside vapour retarder jacket.
- .5 Supports, Hangers:
 - .1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.
- .6 Below ambient/chilled water installation:
 - .1 All pipes, fittings, valves, strainers, flanges, unions, and other pipe system components and specialties must be properly insulated with correctly completed vapor retarded applied.
 - .2 All insulation material must have properly installed and sealed vapor retarding jacket, including circumferential and longitudinal seams.
 - .3 All penetrations, tears, and punctures must be repaired and sealed with a vapor retarding material with a .02 or lower perm rating.

- .4 Vapor stops must be installed at 18' intervals, at all pipe insulation termination points, including fittings, flanges, and other changes in direction or other types of piping specialties.
- .5 All fitting insulation must be of the same type, thickness, and density of the pipe insulation, be premoulded insulation covers or fabricated from the same material as the pipe insulation. Full thickness must be factory-applied, vapor-retarder facing is unacceptable.
- .6 A complete vapor retarder must be installed on insulation over fittings before applying final finish. Vapor retarder must extend onto and be sealed to the vapor retarder or pipe insulation.
- .7 Additional fitting covers, PVC or metal, must have a vapor retarder seal applied to all longitudinal and circumferential seams in addition to the vapor retarder applied to the fitting insulation.
- .8 Additional field applied jackets must not use staples, screws, tacks or rivets for attachment, to avoid puncturing vapor retarder underneath.
- .9 Insulating support inserts are to be high compressive strength insulation with a rigid shield. No calcium silicate is to be used for insulation on below-ambient operation piping.

3.3 REMOVABLE, PREFABRICATED, INSULATION AND ENCLOSURES

- .1 Application: At expansion joints, valves, primary flow measuring elements, flanges, and unions at equipment.
- .2 Flexible removable insulation covers are not acceptable for below-ambient (cold) operation piping systems. Rigid removable insulation jackets that are vapor retarder exterior material that can be vapor sealed at the seams, are acceptable on below-ambient (cold) operation piping systems.
- .3 Insulation:
 - .1 Insulation, fastenings, and finishes: same as system.
 - .2 Jacket: As per adjacent insulation.

3.4 PIPING INSULATION SCHEDULES

- .1 Includes valves, valve bonnets, strainers, flanges, air separators, and fittings unless otherwise specified.
- .2 Install insulator and jackets to applicable TIAC codes.
- .3 Insulate ends of capped piping with type and thickness indicated for capped service.

.4 Thickness of insulation to be as listed in following table.

.1 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

Application	Type	Pipe sizes through (NPS) and insulation thickness mm (")				
		to	32 (1¼")	50 (2")	105 (4")	200 (8")
		25 (1")	40 (1½")	80 (3")	150 (6")	& over
Condensate	A-1	40 (1½")	40 (1½")	50 (2")	50 (2")	50 (2")
Hot Water Heating	A-1	40 (1½")	50 (2")	50 (2")	50 (2")	50 (2")
Refrigerant piping	A-3	25 (1")	25 (1")	25 (1")	25 (1")	25 (1")
Cooling Coil cond. Drain	A-1	25 (1")	25 (1")	25 (1")	25 (1")	25 (1")

.5 Finishes: Conform to the following table:

Application	Piping	Valves & Fittings
Exposed indoors	PVC	PVC
Exposed in mech. rooms	PVC	PVC
Concealed indoors	N/A	PVC
Exterior refrigerant piping	Aluminum	Aluminum

.6 Connection: To appropriate TIAC code.

.7 Finish attachments: SS bands, @ 150 mm (6") oc. seals: closed.

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 ANSI/ASME B16.5, Pipe Flanges and Flanged Fittings: NPS ½ through NPS 24 Metric/Inch.
- .3 ANSI B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
- .4 ANSI/ASME B16.22, Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.
- .5 ANSI B18.2.1, Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series).
- .6 ASTM A47/A47M, Specification for Ferritic Malleable Iron Castings.
- .7 ASTM A53/A53M, and A106, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded ERW and Seamless.
- .8 ASTM B32, Specification for Solder Metal.
- .9 ASTM B75M, Specification for Seamless Copper Tube [Metric].
- .10 CSA B149.1, Natural Gas and Propane Installation Code.
- .11 CSA W47.1, Certification of Companies for Fusion Welding of Steel.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings product data in accordance with general requirements.
- .2 Indicate on manufacturers catalogue literature.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual specified in general requirements.

Part 2 Products**2.1 GAS SERVICE**

- .1 Arrange with the local utility to provide a meter suitable for additional gas load.
- .2 Fees and charges requested by the local utility to provide the gas service and meter.
- .3 Submit all plans as requested by the local utility.
- .4 Utility supplied gas meter shall be complete with pulse signal for connection to BAS system (co-ordinate pulse representation in m³ of gas used on meter specifications.
- .5 Provide approved pulse gas meter in all locations where indicated on the drawings.

2.2 PIPE

- .1 Steel pipe: to ASTM A106, Schedule 40, seamless as follows:
 - .1 NPS 15 mm to 50 mm (1/2" to 2"), screwed.
 - .2 NPS 65 mm (2 1/2") and over, plain end.
- .2 Buried pipe: CGA approved polypropylene complete with tracer wire and marker.
- .3 Copper tube: to ASTM B75M.

2.3 JOINTING MATERIAL

- .1 Screwed fittings: pulverized lead paste.
- .2 Welded fittings: to CSA W47.1.
- .3 Flange gaskets: nonmetallic flat.
- .4 Soldered: to ASTM B32, tin antimony 95/5.
- .5 Screwed brass fittings: Teflon Tape.

2.4 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 A47/A47M.
 - .5 Bolts and nuts: to ANSI B18.2.1.
 - .6 Nipples: schedule 40, to ASTM A53/A53M/A106.
- .2 Copper pipe fittings, screwed, flanged or soldered:
 - .1 Cast copper fittings: to ANSI B16.18.
- .3 Brass fittings: To ASTM B16.

2.5 BALL VALVES

- .1 NPS 50 mm (2") and under:
 - .1 Body and cap: cast high tensile bronze to ASTM B62.
 - .2 Pressure rating: Class 125, 860 kPa (125 psi) steam, WP = 1.4 MPa (203 psi) WOG.
 - .3 Connections: Screwed ends to ANSI B1.20.1 and with hex. shoulders.
 - .4 Stem: tamperproof ball drive.
 - .5 Stem packing nut: external to body.
 - .6 Ball and seat: replaceable stainless steel solid ball and teflon seats.
 - .7 Stem seal: TFE with external packing nut.
 - .8 Operator: removable lever handle.

2.6 LUBRICATED PLUG VALVES

- .1 All sizes
 - .1 Provincial Code approved, lubricated plug type.
 - .2 Body: cast iron to ASTM A 126 Class B semi-steel.
 - .1 Rating: Class 125 psig.
 - .3 Plug: tapered, with regular pattern port – 90 from full open to fully closed.
 - .4 Ends: 50 mm (2") and smaller with hexagon shoulders, ends screwed to ANSI B1.20.1. Flanged to ANSI B16.1.
 - .5 Lubrication system, nickel-plated.
 - .6 Lubricant: to suit type, temperature and pressure of contained fluid.
 - .7 Feeding system: lubricant forced into lubrication grooves between seating surfaces of plug and body to form positive seal, leakproof operation, and corrosion preventing film.
 - .8 Lubricant screw for lubrication.
 - .9 O-rings between body and plug.
 - .10 Operator: removable manual lever handle.
 - .11 Acceptable materials:
 - .1 Newman Hattersley
 - .2 Crane
 - .3 Jenkins
 - .4 Milwaukee
 - .5 Toya

2.7 GAS REGULATOR

- .1 Reduce pressure from 34.5 kPa (5 psi) to 1.74 kPa (7" WC) capacity as indicated.
- .2 Acceptable products:
 - .1 Singer
 - .2 Schlumberger
- .3 Vent interior relief valve to outdoors with gooseneck and stainless steel insect screen. Vent piping shall be sized as per manufacturers' requirements and recommendations.
- .4 Isolate with lubricated plug valve and union connection.

2.8 MANUFACTURED ROOF SUPPORTS

- .1 Single piece injection moulded polypropylene support.
- .2 Type 3-20 psi extruded polystyrene UV protected base glued to the support.
- .3 Minimum base dimension of 300 x 225 (12" x 9") and be 140 mm (5.5") high.
- .4 Pull test of 1.4 kN (315 lbs) using two #14-10 screws on pipe strap.

.5 Acceptable materials:

.1 Quick Block

.2 Erico

2.9 PIPING THROUGH ROOF

.1 Provide Thaler MEF-9 or equal gas piping flashing where pipe and/or relief vent penetrates roof.

Part 3 Execution

3.1 PIPING

- .1 Install in accordance with applicable Provincial/Territorial Codes.
- .2 Install in accordance with CAN/CSA B149.
- .3 Assemble piping using fittings manufactured to ANSI standards.
- .4 Connect to equipment in accordance with manufacturer's instruction unless otherwise indicated.
- .5 Slope piping down in direction of flow to low points.
- .6 Install drip points:
 - .1 At low points in piping system.
 - .2 At each connection to equipment.
- .7 Use eccentric reducers at pipe size change installed to provide positive drainage.
- .8 Provide clearance for access and for maintenance.
- .9 Ream pipes, clean scale and dirt, inside and out.
- .10 Install piping to minimize pipe dismantling for equipment removal.
- .11 Install regulator vents to code. Terminate in open air with Gooseneck fitting complete with stainless steel screen.
- .12 Paint gas piping with two (2) coats yellow paint. Banding of gas will not be accepted.

3.2 PIPING ON ROOF

- .1 Support piping as follows or as per seismic requirements (1.8 M (6' - 0") O.C.) whichever is more stringent:
 - ≤ 40 mm (1½") 2.4 M (8' - 0") O.C.
 - ≥ 50 mm (2") 3.0 M (10' - 0") O.C.
- .2 Provide support at each elbow and fitting.
- .3 Provide support at each regular and/or isolating valve.
- .4 Provide support within 600 mm (24") of each piece of equipment.

3.3 VALVES

- .1 Install valves with stems upright or horizontal unless otherwise approved by Consultant.
- .2 Install valves at branch take-offs to isolate each piece of equipment, and as indicated.
- .3 Provide lubricated plug type when gas line is exterior of building or 65 mm (2½") and larger.
- .4 Provide ball valve when gas line is interior of building and 50 mm (2") or smaller.

3.4 FIELD QUALITY CONTROL

- .1 Test system in accordance with CAN/CSA B149. Requirements of authorities having jurisdiction.
- .2 Provide copy of TSSA tag to the consultant.

3.5 PURGING

- .1 Purge after pressure test in accordance with CAN/CSA B149.

3.6 GAS SERVICE

- .1 Arrange with local gas distributor to install gas meter. Pay all fees and charges to provide the gas service and gas meter.
- .2 Install all the gas meters where indicated.

3.7 GAS FIRED EQUIPMENT START-UP

- .1 Start-up of all new and existing gas fired equipment shall be by this contractor to the requirements of the equipment manufacturer.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 Canadian Standards Association (CSA).
 - .1 CSA B51, Boiler, Pressure Vessel, and Pressure Piping Code.
- .3 American Society for Testing and Materials (ASTM).
 - .1 ASTM A47/A47M, Specification for Ferritic Malleable Iron Castings.
 - .2 ASTM A278/A278M, Specification for Gray Iron Castings for Pressure-Containing Parts for Temperatures up to 650°F (350°C).
 - .3 ASTM A516/A516M, Specification for Pressure Vessel Plates, Carbon Steel, for Moderate - and Lower - Temperature Service.
 - .4 ASTM A536, Specification for Ductile Iron Castings.
 - .5 ASTM B62, Specification for Composition Bronze or Ounce Metal Castings.
- .4 American Society of Mechanical Engineers (ASME).
 - .1 ANSI/ASME, Boiler and Pressure Vessels Code (BPVC).

1.2 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with general requirements.
- .2 Indicate on manufacturers' catalogue literature the following:
 - .1 Sizes, orientation, capacities, performance, etc.
 - .2 Accessories

1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual specified in general requirements.

Part 2 Products

2.1 PIPELINE STRAINER

- .1 Pipeline strainer shall provide a means of mechanically removing solids from a flowing fluid. This is accomplished by utilizing a perforated metal mesh.
- .2 Strainers shall be installed in pipelines to protect downstream mechanical equipment such as condensers, heat exchangers, pumps, compressors, meters, spray nozzles, turbines, and steam traps from the detrimental effect of sediment, rust, pipe scale, or other extraneous debris.
- .3 Types of strainers: Provide strainers that are Y strainer and/or basket strainer.

- .4 Strainer end connections shall match the piping specification.
 - .1 NPS 15 mm to 50 mm (1/2" to 2"): bronze body to ASTM B62, screwed connections.
 - .2 NPS 65 mm to 300 mm (2 1/2" to 12"): cast steel body to ASTM A278M, Class 30, flanged connections.
 - .3 NPS 50 mm to 300 mm (2" to 12"): T type with malleable iron body to ASTM A47M, grooved ends.
- .5 Strainer components shall include a cover, perforated plate, mesh, wedge wire, gasket, and cover fasteners.
 - .1 Perforated Plate/Mesh/Wedge Wire: Stainless steel (various grades available).
 - .2 Gaskets: to suite fluid application.
 - .3 Fasteners: to match body material.
- .6 Mesh sizing: An extremely important consideration in the selection of a strainer is the size of the perforations, mesh or wire opening used in the fabrication of the straining element. Select holes that are actually needed for the application and specified by the equipment manufacturer's request that is being protected. The following tables illustrate mesh and their respective straining capability. The main criteria for choosing hole and mesh size is the size and quantity of particles which can pass through downstream equipment without causing damage.

Mesh (Openings/In.)	Wire Diameter (In.)	Opening		Percent Open Area
		Inches	Micron	
10	0.032	0.068	727	56.3
16	0.018	0.045	1130	50.7
18	0.017	0.036	979	48.3
20	0.015	0.035	889.0	49.0
30	0.011	0.0223	566.4	44.8
40	0.009	0.0156	396.2	40.2
50	0.009	0.011	279	30.3
60	0.0065	0.0102	259.1	37.3
80	0.005	0.0075	190.5	36.0
100	0.0045	0.0055	139.7	30.3
120	0.0035	0.0048	123	30.1
150	0.0026	0.0041	103	37.2
170	0.0024	0.0035	79	35.1
200	0.0020	0.0030	76.2	33.6
250	0.0016	0.0024	61	36.0
300	0.0012	0.0021	54.2	29.7
325	0.0012	0.0019	47.7	30.0
400	0.0011	0.0014	35.6	36.0

- .7 Capacity: The capacity ratio or open area ratio (OAR) of a strainer influences such operating characteristics as the length of time it can operate without cleaning and the created pressure loss. The OAR is the relationship between internal cross sectional area (flow area) of the pipe and the open flow area of the material which makes up the straining element.
The OAR for wye strainers shall not be less than 2.5:1.
The OAR for basket strainers shall not be less than 7:1.
When considering the OAR of a straining element, there are two accepted methods of analysis used by various specifying agencies and manufacturers. One method maintains "line of sight" reasoning and uses the multiple of the open areas for elements in series. In this method, a 60% open area material in series with a 40% open area material has a resultant combined open area of 24% (i.e. as in accordance with Military Standards). An alternative method allows the open area of the more restrictive element in series to be used. This would be 40% for the example above (i.e. as in accordance with Underwriter Laboratories' Standards). The method used influences the estimated operating pressure drop, as well as design decisions such as sizing.
- .8 Strainers are made with various dimensions and configurations, manufacturers have tested and published pressure drop results.
Provide strainers designed for reasonable velocities that permit approximately 2 psi pressure drop across the strainer.
Provide basket strainers designed for reasonable velocities that permit approximately 0.5 psi pressure drop across the strainer.
- .9 To allow the manufacturer to make selection or recommendations for a particular strainer, as much as possible, the following information should be provided by the Contractor to the Supplier:
 - .1 Physical Characteristics
 - .1 Pipe size and schedule
 - .2 Strainer type required.
 - .3 End connections.
 - .4 Material (body, screen, bolting, gaskets).
 - .5 Pressure rating (design/operating — including shock).
 - .6 Temperature rating (design, operating, minimum).
 - .7 Straining element opening size.
 - .8 Capacity:
 - .1 Net effective open area required.
 - .2 Method of net open area calculation.
 - .9 Special requirements (hinged cover, vent tapping, jacketed, etc.).
 - .10 Applicable specifications (military specifications, special nondestructive tests or other quality control requirements).

- .2 Flow Data
 - .1 Liquid:
 - .1 Description of fluid.
 - .2 Rate of flow – gallons per minute (gpm) or pounds per hour (lbs/hr).
 - .3 Viscosity – SSU.
 - .4 Specific gravity or density.
 - .5 Temperature.
 - .6 Concentration (if acid or other corrosive).
 - .2 Gas:
 - .1 Description of Gas.
 - .2 Rate of flow – standard cubic feet per minute (scfm) or actual cubic feet per minute (cfm).
 - .3 Specific gravity.
 - .4 Temperature and pressure.
 - .5 Molecular weight.
 - .3 Steam:
 - .1 Rate of flow-pounds per hour (lbs/hr).
 - .2 Temperature.
 - .3 Pressure.
 - .4 Density.
 - .5 State of flow.
- .10 Blowdown connection: NPS 25 mm (1").
- .11 Screens at pumps: stainless steel with 1.19 mm (50 mil) perforations (16 mesh).
- .12 Working pressure: 860 kPa (125 psi).

Part 3 Execution

3.1 GENERAL

- .1 Install as indicated and to manufacturer's recommendations.
- .2 Run drain lines (and blow off connections) to terminate above nearest drain.
- .3 Maintain proper clearance to permit service and maintenance.
- .4 Should deviations beyond allowable clearances arise, request, and follow Consultant's directive.
- .5 Check shop drawings for conformance of all tappings for ancillaries and for equipment operating weights.

3.2 STRAINERS

- .1 Install in horizontal or down flow lines.
- .2 Ensure clearance for removal of basket.
- .3 Install ahead each of the following components:
 - .1 Temperature control valves
 - .2 Additional locations where indicated on the drawings.
- .4 Provide proper mesh strainers for the proper application.
- .5 Provide proper mesh strainers as recommended by the manufacturer's product being protected.
- .6 Provide basket strainers ahead of all plate heat exchanger or equipment with plate heat exchanger when piping is 100 mm (4") and larger.
- .7 The strainer must be installed such that the debris chamber is located at the lowest possible position. A Y strainer in vertical piping must be placed with its screen in the downward position to trap the sediment in the debris collection chamber.
- .8 Provide with a blowdown so the element can be flushed out by opening and closing the blowdown valve. This shall be accomplished without flow stoppage or disassembling any piping.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 Canadian Standards Association (CSA).
 - .1 CSA W47.1, Certification of Companies for Fusion Welding of Steel.
- .3 American National Standards Institute (ANSI).
 - .1 ANSI/ASME B16.1, Gray Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250 and 800.
 - .2 ANSI/ASME B16.3, Malleable-Iron Threaded Fittings, Classes 150 and 300.
- .4 American Society for Testing and Materials (ASTM).
 - .1 ASTM A47/A47M, Specification for Ferritic Malleable Iron Castings.
 - .2 ASTM A53/A53M, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
 - .3 ASTM A536, Specification for Ductile Iron Castings.
 - .4 ASTM B61, Specification for Steam or Valve Bronze Castings.
 - .5 ASTM B62, Specification for Composition Bronze or Ounce Metal Castings.
- .5 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS).
 - .1 MSS-SP-67, Butterfly Valves.
 - .2 MSS-SP-70, Cast Iron Gate Valves, Flanged and Threaded Ends.
 - .3 MSS-SP-71, Cast Iron Swing Check Valves, Flanged and Threaded Ends.
 - .4 MSS-SP-80, Bronze Gate, Globe, Angle and Check Valves.
 - .5 MSS-SP-85, Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.

1.2 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with general requirements.
- .2 Indicate on manufacturers' catalogue literature the following:
 - .1 Piping
 - .2 Valves
 - .3 Accessories

1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual specified in general requirements.

Part 2 Products

2.1 STEEL PIPE

- .1 Steel pipe: to ASTM A53/A53M, Grade B, as follows:
 - .1 NPS 32 mm (1 1/4") and smaller: Schedule 40.
- .2 Final connection to copper heating elements.
 - .1 Type "L" copper with 95/5 solder joints and dielectric couplings. Maximum length 600 mm (24").
- .3 Pipe Joints
 - .1 NPS 32 mm (1 1/4") and under: screwed fittings with pulverized lead paste.
 - .2 Flanges: plain or raised face, slip-on.
 - .3 Flange gaskets: suitable for hydronic heating up to 110°C (220°F).
 - .4 Pipe thread: taper.
 - .5 Bolts and nuts: to ANSI B18.2.1 and ANSI/ASME B18.2.2.
- .4 Fittings
 - .1 Screwed fittings: malleable iron, to ANSI/ASME B16.3, Class 150.
 - .2 Pipe flanges and flanged fittings:
 - .1 Cast iron: to ANSI/ASME B16.1, Class 125.
 - .2 Steel: to ANSI/ASME B16.5.
 - .3 Butt-welding fittings: steel, to ANSI/ASME B16.9.
 - .4 Unions: malleable iron, to ASTM A47/A47M and ANSI/ASME B16.3.

2.2 VALVES

- .1 Connections:
 - .1 NPS 32 mm (1 1/4") and smaller: screwed ends.
- .2 Gate valves: Application: Isolating equipment, control valves, pipelines:
 - .1 NPS 50 mm (2") and under:
 - .1 Mechanical Rooms: Class 125, rising stem, solid wedge disc.
 - .2 Elsewhere: Class 125, non-rising stem, solid wedge disc.
 - .2 NPS 65 mm (2 1/2") and over:
 - .1 Mechanical Rooms:
 - .1 Rising stem, solid wedge disc, bronze trim.
 - .1 Operators: handwheel.
 - .2 Non-rising stem, solid wedge disc, bronze trim.
 - .1 Operators: handwheel.

- .3 Globe valves: Application: Throttling, flow control, emergency bypass:
 - .1 NPS 32 mm (1 1/4") and under:
 - .1 With PTFE disc, as specified. Bronze.
- .4 Drain valves: Gate, Class 125, non-rising stem, solid wedge disc, with chain and cap.
- .5 Swing check valves:
 - .1 NPS 32 mm (1 1/4") and under:
 - .1 Class 150, swing, with PTFE disc, as specified. Bronze. Jenkins 4475TJ.
- .6 Ball valves:
 - .1 NPS 80 mm (3") and under:
 - .1 Body and cap: cast high tensile bronze to ASTM B62.
 - .2 Pressure rating: Class 125, 860 kPa (125 psi) steam, WP = 1.4 MPa (203 psi) WOG.
 - .3 Connections:
 - .1 NPS 32 mm (1 1/4") and under screwed ends to ANSI B1.20.1 and with hex. shoulders.
 - .4 Stem: stainless steel tamperproof ball drive.
 - .5 Ball and seat: replaceable stainless steel solid ball and teflon seats.
 - .6 Operator: removable lever handle.
 - .7 Extended handles on chilled water valves.
 - .8 Full port.
- .7 All valves shall be of commercial grade and of same manufacturer.
- .8 Acceptable Manufacturers:
 - .1 Newman Hattersley Canada Ltd.
 - .2 Jenkins/Crane
 - .3 Milwaukee
 - .4 Toyo
 - .5 Kitz

2.3 BALANCING VALVES

- .1 Size 15 mm (1/2") to 32 mm (1 1/4"): Bronze body, brass ball, NPT connections and variable orifice.
- .2 Size 65 mm (2 1/2") to larger: Cast iron body, raised flange connections, glove style with brass plug.
- .3 Differential pressure readout ports with internal EPT inserts and check valves, 6 mm (1/4") NPT tapped drain/purge ports, memory stop and calibrated nameplate.

- .4 Acceptable materials:
 - .1 Bell & Gossett Circuit Setters
 - .2 Armstrong
 - .3 Taco
 - .4 Tour & Anderson
 - .5 Oventrop

2.4 AUTOMATIC AIR VENT

- .1 Industrial float vent: cast iron body and NPS 15 mm (1/2") connection and rated at 860 kpa (125 psi) working pressure.
- .2 Float: solid material suitable for 115°C (240°F) working temperature.
- .3 Plastic vents are not acceptable.
- .4 Acceptable materials:
 - .1 Maid-O-Mist No. 67
 - .2 Spirax Sarco

Part 3 Execution

3.1 PIPING INSTALLATION

- .1 Installation shall be by a licensed pipe fitter.
- .2 Connect to equipment in accordance with manufacturer's instruction unless otherwise indicated.
- .3 Install concealed pipes close to building structure to keep furring space to minimum. Install to conserve headroom and space. Run exposed piping parallel to walls. Group piping wherever practical.
- .4 Slope piping in direction of drainage and for positive venting.
- .5 Use eccentric reducers at pipe size change installed to provide positive drainage or positive venting.
- .6 Provide clearance for installation of insulation and access for maintenance of equipment, valves and fittings.
- .7 Ream pipes, clean scale and dirt, inside and outside, before and after assembly.
- .8 Assemble piping using fittings manufactured to ANSI standards.
- .9 Saddle type branch fittings may be used on mains if branch line is no larger than half the size of main. Hole saw or drill and ream main to maintain full inside diameter of branch line prior to welding saddle.

3.2 VALVE INSTALLATION

- .1 Install rising stem valves in upright position with stem above horizontal.
- .2 Install butterfly valves on chilled water and condenser water lines only.
- .3 Install gate or ball valves at branch take-offs and to isolate each piece of equipment, and as indicated.
- .4 Install globe valves for balancing and in by-pass around control valves as indicated.
- .5 Provide silent check valves on discharge of pumps and in vertical pipes with downward flow and as indicated.
- .6 Provide swing check valves in horizontal lines as indicated.
- .7 Install chain operators on valves NPS 65 mm (2½") and over where installed more than 2400 mm (96") above floor in Boiler Rooms and Mechanical Equipment Rooms.
- .8 Provide ball valves for glycol service.

3.3 AIR VENTS

- .1 Install at high points of systems.
- .2 Install ball valve on automatic air vent inlet.
- .3 Extend vent lines in Mechanical Room with screwdriver stop at 1.8 m AFF.

3.4 CIRCUIT BALANCING VALVES

- .1 Install flow measuring stations and flow balancing valves as indicated.
 - .1 On return side of all heating devices (convectors, panels, force flows, radiation, coils, etc.).
 - .2 On return side of all water or glycol cooling coils.
 - .3 On return side of all reverse return piping loops and/or branch circuits.
- .2 Install to manufacturers requirements.
- .3 Minimum valve size shall be one pipe size smaller than piping or 20 mm (¾"), whichever is larger.
- .4 Refer to Testing Adjusting and Balancing Section for applicable procedures.

3.5 FILLING OF SYSTEM

- .1 Refill system with clean water adding water treatment as specified.
- .2 Co-ordinate filling of system with HVAC water treatment contractor.

3.6 TESTING

- .1 Test system in accordance with Mechanical General Requirements Section.
- .2 For glycol systems, retest with propylene glycol to ASTM E202, inhibited, for use in building system after cleaning. Repair any leaking joints, fittings or valves.

3.7 FLUSHING AND CLEANING

- .1 Scope:
 - .1 **Flush new piping only.**
- .2 Refer to Water Treatment Section

3.8 EXISTING SYSTEM DISPOSAL

- .1 Disposal of existing system shall be to the requirements of the local and/or provincial regulations.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 ANSI/ASME B16.22, Wrought Copper Alloy and Copper Alloy Solder - Joint Pressure Fittings: Classes 150, 300, 600, 900, 1500, and 2500.
- .3 ANSI/ASME B16.24, Cast Copper Pipe Flanges and Flanged Fittings.
- .4 ANSI/ASME B16.26, Cast Copper Alloy Fittings for Flared Copper Tubes.
- .5 ANSI/ASME B31.5, Refrigeration Piping and Heating Transfer Components.
- .6 ASTM A307, Specification for Carbon Steel Bolts and Studs, 413.5 mPa (60,000 psi) Tensile Strength.
- .7 ASTM B280, Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
- .8 CSA B52, Mechanical Refrigeration Code.
- .9 EPS 1/RA/2, Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.

Part 2 Products

2.1 TUBING

- .1 Processed for refrigeration installations, deoxidized, dehydrated and sealed.
 - .1 Hard copper: to ASTM B280, Type ACR-B.
 - .2 Soft copper: to ASTM B280, Type ACR
 - .3 Refer to Part 3 for allowed applications.

2.2 FITTINGS

- .1 Service: design pressure 2070 kPa (300 psi) and temperature 121°C (250°F).
- .2 Brazed:
 - .1 Fittings: wrought copper to ANSI/ASME B16.22.
 - .2 Joints: silver solder, 45% Ag-15% Cu or copper-phosphorous, 95% Cu-5%P and non-corrosive flux.
- .3 Flanged:
 - .1 Bronze or brass, to ANSI/ASME B16.24, Class 150 and Class 300.
 - .2 Gaskets: suitable for service.
 - .3 Bolts, nuts and washers: to ASTM A307, heavy series.

- .4 Flared:
 - .1 Bronze or brass, for refrigeration, to ANSI/ASME 16.26.

2.3 PIPE SLEEVES

- .1 Hard copper or steel, sized to provide 6 mm (1/4") clearance all around between sleeve and uninsulated pipe or between sleeve and insulation.

2.4 VALVES

- .1 22 mm (7/8") and under: Class 500, 3.5 MPa (500 psi), globe or angle non-directional type, diaphragm, packless type, with forged brass body and bonnet, moisture proof seal for below freezing applications, brazed connections.
- .2 Over 22 mm (7/8"): Class 375, 2.5 MPa (375 psi), globe or angle type, diaphragm, packless type, back-seating, cap seal, with cast bronze body and bonnet, moisture proof seal for below freezing applications, brazed connections.

2.5 FILTER-DRIER

- .1 On lines 20 mm (3/4") outside diameter and larger, filter-drier shall be replaceable core type with Schraeder type valve.
- .2 On lines smaller than 20 mm (3/4") outside diameter, filter-drier shall be sealed type using flared copper fittings.
- .3 Size shall be full line size.
- .4 Approved manufacturers:
 - .1 Mueller
 - .2 Parker
 - .3 Sporlan
 - .4 Virginia

2.6 SIGHT GLASS

- .1 Combination moisture and liquid indicator with protection cap.
- .2 Sight glass shall be full line size.
- .3 Sight glass connections shall be solid copper or brass, no copper-coated steel sight glasses allowed.
- .4 Approved manufacturers:
 - .1 Mueller
 - .2 Henry
 - .3 Parker
 - .4 Superior

2.7 SUCTION LINE TRAP

- .1 Manufactured standard one-piece traps.

2.8 EXPANSION VALVES

- .1 For pressure type distributors, externally equalized with stainless steel diaphragm, and same refrigerant in thermostatic elements as in system.
- .2 Size valves to provide full rated capacity of cooling coil served. Co-ordinate selection with evaporator coil and condensing unit.
- .3 Approved manufacturers:
 - .1 Henry
 - .2 Mueller
 - .3 Parker
 - .4 Sporlan

2.9 FLEXIBLE CONNECTORS

- .1 Designed for refrigerant service with bronze seamless corrugated hose and bronze braiding.
- .2 Approved manufacturers:
 - .1 Anaconda "Vibration Eliminators" by Anamet
 - .2 Vibration Absorber Model VAF by Packless Industries
 - .3 Vibration Absorbers by Superior Valve Co
 - .4 Style "BF" Spring-flex freon connectors by Vibration Mountings.

2.10 ROOF FLASHING

- .1 Thaler or equal spun aluminum complete with insulation, cap, and rubber gasket.

2.11 PREFABRICATED PIPE ENTRY DOGHOUSE

- .1 Dog House and cover shall be fabricated from 2mm thick aluminum with UV protected powder coated finish is also acceptable.
- .2 Cover shall be gasketed to ensure air and water tightness.
- .3 Mount in curb shall be full insulated and supplied with Doghouse.
- .4 Curb shall be 610 mm (24") high with 89 mm (3.5") wide flange pre-punched for securement to roof deck.
- .5 Curb shall be insulated with 50 mm (2") thick glass fibre insulation.
- .6 Pipe entry openings shall be provided by the pipe entry chase manufacturer and be specifically made for the application. Minimum acceptable standard:
 - .1 Sigrist Exit Seal
 - .2 Vault Exit Seal
- .7 Cover shall be removable and be fastened to the curb/body with vandal resistant fasteners. Hardware shall be zinc plated or stainless steel.
- .8 Size: To suite required penetrations.

- .9 Acceptable Manufacturers
 - .1 Sigrist Alta Pipe Chase Housing
 - .2 Vault Roof Penetration Housing
 - .3 Other Acceptable Manufacturers if approved by Consultant prior to tender close.

2.12 PIPING SUPPORT ASSEMBLY

- .1 All channel members shall be fabricated from structural grade steel conforming to one of the following ASTM specifications: A1011/A1011M, A653/A653M.
- .2 All fittings shall be fabricated from steel conforming to one of the following ASTM specifications: A575, A36/A36M or A635/A635M.
- .3 Electro galvanized cush clamps with shoulder bolt and molded thermoplastic cushion, size to suit pipe.
- .4 Acceptable materials:
 - .1 Unistrut
 - .2 Or equal

Part 3 Execution

3.1 GENERAL

- .1 Install in accordance with CSA B52, EPS 1/RA/2 and ANSI/ASME B31.5.
- .2 Connect to equipment with isolating valves and unions.
- .3 Provide space for servicing, disassemble, and removal of equipment and components all as recommended by manufacturer.
- .4 Protect all openings in piping against entry of foreign material.
- .5 Provide all necessary equipment including thermal expansion valve, sight glass, solenoid valve, filter dryer, etc., for a complete installed system. Pipe system as per manufacturer's recommendation and requirements.
- .6 Provide number of refrigerant circuits and appropriate corresponding piping as per manufacturer's recommendations and requirements.

3.2 PIPING THROUGH FLOORS

- .1 Refrigerant piping systems containing refrigerants that pass through floors not served by the system shall be installed as per the requirements of CSA B23-2023:
 - .1 Refrigerant piping shall be installed through a rigid and tight, continuous fire-resisting pipe (stainless steel, cast iron or similar) without openings into any floors not served by the system.

- .2 The pipe shall be vented to the floor served by the system.
- .3 Soft copper may be used when the shaft extends beyond two (2) storeys in length.

3.3 BRAZING PROCEDURES

- .1 Bleed inert gas into pipe during brazing.
- .2 Remove valve internal parts, solenoid valve coils, sight glass.
- .3 Do not apply heat near expansion valve and bulb.

3.4 PIPING INSTALLATION

- .1 General:
 - .1 Hard drawn copper tubing: do not bend. Minimize use of fittings.
 - .2 Soft drawn copper: install in a neat manner without excessive bends or twists. Minimize use of fittings.
 - .3 Fittings, joints and other connections to equipment shall be minimized in all inaccessible areas, including but not limited to areas above drywall ceilings, shafts etc.
 - .4 Pitch at least 1:240 down in direction of flow to prevent oil return to compressor during operation.
 - .5 Provide trap at base of risers greater than 2.4m (8') high and at each 7.6m (25'-0") thereafter.
 - .6 Provide inverted deep trap at top of each riser.
 - .7 Provide double risers for compressors having capacity modulation.
 - .1 Large riser: install traps as specified above.
 - .2 Small riser: size for 5.1 m/s (1000 ft/min) at minimum load. Connect upstream of traps on large riser.

3.5 PRESSURE AND LEAK TESTING

- .1 Close valves on factory charged equipment and other equipment not designed for test pressures.
- .2 Leak test to CSA B52 before evacuation to 2 MPa (290 psi) and 1 MPa (145 psi) on high and low sides respectively.
- .3 Test Procedure: Build pressure up to 35 kPa (5 psi) with refrigerant gas on high and low sides. Supplement with nitrogen to required test pressure. Test for leaks with electronic or halide detector. Repair leaks and repeat tests.
- .4 Testing shall be completed to the standards of CSA B52, section 5.10 so that the exemption contained in Annex N (N.1.2) allowing areas (such as those above fully enclosed drywall ceilings) to have joints and connections installed within them is met.

3.6 DEHYDRATION AND CHARGING

- .1 Close service valves on factory charged equipment.
- .2 Ambient temperatures to be at least 13°C (55°F) for at least 12 h before and during dehydration.
- .3 Use copper lines of largest practical size to reduce evacuation time.
- .4 Use 2-stage vacuum pump with gas ballast on 2nd stage capable of pulling 5 Pa (0.02" WC) absolute and filled with dehydrated oil.
- .5 Measure system pressure with vacuum gauge. Take readings with valve between vacuum pump and system closed.
- .6 Triple evacuate all system components containing gases other than correct refrigerant or having lost holding charge as follows:
 - .1 Twice to 14 Pa (0.056" WC) absolute and hold for 4 h.
 - .2 Break vacuum with refrigerant to 14 kPa (0.056" WC).
 - .3 Final to 5 Pa (0.02" WC) absolute and hold for at least 12 h.
 - .4 Isolate pump from system, record vacuum and time readings until stabilization of vacuum.
 - .5 Submit all test results to Consultant.
- .7 Charging:
 - .1 Charge system through filter-drier and charging valve on high side. Low side charging not permitted.
 - .2 With compressors off, charge only amount necessary for proper operation of system. If system pressures equalize before system is fully charged, close charging valve and start up. With unit operating, add remainder of charge to system.
 - .3 Re-purge charging line if refrigerant container is changed during charging process.
- .8 Checks:
 - .1 Make all checks and measurements as per manufacturer's operation and maintenance instructions.
 - .2 Record and report all measurements to Consultant.

3.7 INSTRUCTIONS

- .1 Post instructions in frame with glass cover in accordance with Operation and Maintenance Manual Section and CSA B52.

3.8 PREFABRICATED PIPE CHASE

- .1 Install on prefabricated, insulated roof curb.
- .2 Install pipe chase and pipe entry to manufacturers installation instructions.
- .3 Provide field installed insulation on roof deck to match roof insulation thickness.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Plumbing Specialties and Accessories.
- .2 Hydronic Systems – Steel.

1.2 REFERENCES

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 American Society of Mechanical Engineers (ASME).
- .3 ANSI/ASME Boiler and Pressure Vessel Code, Section VI.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with general requirements.

1.4 CLOSEOUT SUBMITTALS

- .1 Submit operation and maintenance data for incorporation into manual specified in general requirements
- .2 Include following:
 - .1 Log sheets as recommended by manufacturer.
 - .2 Test reports.

Part 2 Products

2.1 MANUFACTURER

- .1 Equipment, chemicals, service by one supplier.
- .2 Acceptable manufacturer:
 - .1 **Aquarian Chemicals (905-825-3711) No alternates.**

2.2 POT FEEDER

- .1 Welded steel, pressure rating 1200 kPa (175 psi). Temperature rating: 90°C (194°F).

2.3 SHIPPING/ FEEDING CHEMICAL CONTAINERS

- .1 High density moulded polyethylene, with liquid level graduations, cover.
- .2 Agitators: as required by manufacturer.

2.4 WATER TREATMENT FOR HYDRONIC SYSTEMS

- .1 Hot water heating system: Renovation to existing.

2.5 WATER TREATMENT FOR STEAM SYSTEMS

2.6 CHEMICALS

- .1 Provide 1 year's supply.

2.7 TEST EQUIPMENT

- .1 Provide one set of test equipment for each system to verify performance.
- .2 Complete with carrying case, reagents for chemicals, all specialized or supplementary equipment.

2.8 CLEANING CHEMICALS

- .1 Provide as required to make system clean.
- .2 Cleaner chemical: compatible and of the same manufacturer of the water treatment supplier.

2.9 RECORD MANAGEMENT

- .1 Provide cards and card holder mounted on wall adjacent to each pot feeder.

Part 3 Execution

3.1 INSTALLATION

- .1 Install HVAC water treatment systems in accordance with ASME Boiler Code Section VII, and requirements and standards of authorities having jurisdiction, except where specified otherwise.
- .2 Ensure adequate clearances to permit performance of servicing and maintenance of equipment.

3.2 CHEMICAL FEED PIPING

- .1 Install crosses at all changes in direction. Install plugs in all unused connections.

3.3 WATER TREATMENT SERVICES

- .1 After entire new and existing system is cleaned as specified elsewhere, provide monthly water treatment monitoring and consulting services for period of one year after system start-up. Provide written report to consultant after each visit. Service to include:
 - .1 Initial water analysis and treatment recommendations.
 - .2 System start-up assistance.
 - .3 On site system testing and recording of treated hydronic system.
 - .4 Operating staff training.
 - .5 Visit plant every 7 days during first month of operation and as required until system stabilizes, and advise consultant in writing on treatment system performance.

- .6 Provide monthly visits with reports after system has stabilized to the satisfaction of the owner.
- .7 Provide necessary monthly recording charts and log sheets for one year operation.
- .8 Provide necessary laboratory and technical assistance.
- .9 Instructions and advice to operating staff to be clear, concise and in writing.

3.4 START-UP

- .1 Start up water treatment systems in accordance with manufacturer's instructions.

3.5 SYSTEM COMMISSIONING AND TRAINING

- .1 Commissioning and training shall be provided by installing water treatment sub-contractor and water treatment supplier.
- .2 Timing:
 - .1 After start-up deficiencies rectified.
 - .2 After start-up and before TAB of connected systems.
- .3 Pre-commissioning Inspections:
 - .1 Verify:
 - .1 Presence of test equipment, reagents, chemicals, details of specific tests to be performed, operating instructions.
 - .2 Suitability of log book.
 - .3 Currency and accuracy of initial water analysis.
 - .4 Required quality of treated water.
- .4 Commissioning procedures - applicable to all Water Treatment Systems:
 - .1 Establish, adjust as necessary and record all automatic controls and chemical feed rates.
 - .2 Monitor performance continuously during commissioning of all connected systems and until acceptance of project.
 - .3 Establish test intervals, regeneration intervals.
 - .4 Record on approved report forms all commissioning procedures, test procedures, dates, times, quantities of chemicals added, raw water analysis, treated water analysis, test results, instrument readings, adjustments made, results obtained.
 - .5 Establish, monitor and adjust automatic controls and chemical feed rates as necessary.
 - .6 Visit project at monthly intervals after commissioning is satisfactorily completed to verify that performance remains as set during commissioning (more often as required until system stabilizes at required level of performance).
 - .7 Advise Engineer in writing on all matters regarding installed water treatment systems.

- .5 **Commissioning procedures - Closed Circuit Hydronic Systems:**
 - .1 **Analyse water in system.**
 - .2 **Based upon an assumed rate of loss approved by Engineer, establish rate of chemical feed.**
 - .3 **Record types, quantities of chemicals applied.**
 - .4 **Provide written verification of glycol solution concentration.**
- .6 **Training:**
 - .1 Commission systems, perform tests in presence of, and using assistance of, assigned O&M personnel.
 - .2 Train O&M personnel in softener regeneration procedures.
- .7 **Certificates:**
 - .1 Upon completion, furnish certificates confirming satisfactory installation and performance.
- .8 **Commissioning Reports:**
 - .1 To include system schematics, test results, test certificates, raw and treated water analyses, design criteria, all other data required by Consultant.
- .9 **Commissioning activities during Warranty Period:**
 - .1 Check out water treatment systems on regular basis and submit written report to Consultant.

3.6 CLEANING OF MECHANICAL SYSTEM

- .1 Coordinate cleaning of mechanical systems with mechanical contractor.
- .2 Provide copy of recommended cleaning procedures and chemicals for approval by Consultant.
- .3 **Procedure:**
 - .1 Flushing and cleaning should only take place after successful piping pressure testing.
 - .2 Terminal device (reheat coils, heat pumps, perimeter radiation, heat exchangers etc.), air handling unit coils and their associated control and balancing valves should be bypassed during the preliminary flushing and cleaning process.
 - .3 Instruments such as flow meters, flow metering valves and orifice plates should only be installed after flushing and cleaning.
- .4 **Timing:**
 - .1 The overall construction schedule identifies piping flushing and cleaning with realistic time allotments.

- .2 The mechanical contractor is required to provide a detailed report outlining the processes and procedures for flushing and cleaning per piping system at least 4 to 6 weeks in advance of work.
- .3 As a minimum, at least one piping flushing and cleaning procedure shall be witnessed, by the consultant and/or commissioning agent.
- .5 The mechanical contractor shall to utilize a qualified water treatment specialist to supervise the flushing and cleaning process and provide the certified water analysis report certifying that the piping systems are clean.
- .6 Coordinate flushing and cleaning of mechanical systems with HVAC water treatment contractor.
- .7 Flush and clean new piping system in presence of Owner
- .8 Flush after pressure test for a minimum of 4 hrs.
- .9 Fill system with solution of water and non-foaming, phosphate-free detergent 3% solution by weight. Circulate for minimum of 8 hrs.
- .10 Thoroughly flush all new mechanical systems and equipment with approved cleaning chemicals designed to remove deposition from construction such as pipe dope, oils, loose mill scale and other extraneous materials. Chemicals to inhibit corrosion of various system materials and be safe to handle and use.
- .11 During circulation of cleaning solution, periodically examine and clean filters and screens and monitor changes in pressure drop across equipment.
- .12 Refill system with clean water. Circulate for at least 2 hours. Clean out strainer screens/baskets regularly. Then drain.
- .13 Drainage to include drain valves, dirt pockets, strainers, every low point in system.
- .14 Drain and flush systems until alkalinity of rinse water is equal to make-up water. Refill with clean water treated to prevent scale and corrosion during system operation.
- .15 Reinstall strainer screens/baskets only after obtaining Owner's approval and approval from HVAC water treatment contractor and board chemical treatment technician.
- .16 Repeat system drain and flush as often as necessary to have a clean system.
- .17 Disposal of cleaning solutions to be approved by authority having jurisdiction.
- .18 Isolate new piping system from existing system as required for system cleaning.

3.7 WARRANTY

- .1 Warranty Start Date:
 - .1 Warranty period starts as of the date of Ready for Takeover.
 - .2 Warranty start dates based on shipment date, start up date, substantial completion date, etc. are not applicable.

- .2 Warranty Duration:
 - One (1) year warranty period applies.
- .3 Warranty Coverage:
 - .1 Applies to parts and labour.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 SMACNA HVAC Duct Construction Standards, Metal and Flexible.
- .3 SMACNA HVAC Duct Leakage Test Manual.
- .4 ASTM A480/A480M, Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
- .5 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process. (Metric).
- .6 ANSI/NFPA 90A, Installation of Air Conditioning and Ventilating Systems.
- .7 ANSI/NFPA 90B, Installation of Warm Air Heating and Air Conditioning Systems.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section general requirements.
- .2 Indicate following:
 - .1 Sealants
 - .2 Tape
 - .3 Proprietary Joints
 - .4 Fittings

1.3 CERTIFICATION OF RATINGS

- .1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

Part 2 Products

2.1 DUCTWORK

- .1 Galvanized Steel:
 - .1 Galvanized steel with Z90 designation zinc coating lock forming quality: to ASTM A653/A653M.

.2 Thickness:

Size Type	Class A Gauge	Class B Gauge	Class C Gauge
Square and Rectangular			
Up to 600 mm (24")	22	24	24
625 mm to 1000 mm (25" to 40")	20	22	24
1025 mm to 1800 mm (41" to 72")	18	20	22
1825 mm to 2400 mm (73" to 96")	16	18	20
2450 mm and over (97")	16	16	16
Round and Oval			
Up to 300 mm (12")	24	24	24
325 mm to 600 mm (13" to 24")	22	24	24
625 mm to 900 mm (25" to 36")	20	22	24
925 mm to 1200 mm (37" to 48")	18	20	22
1225 mm (49") and over	18	18	20
Residential Suite Ductwork:			
Square and Rectangular			
Up to 300 mm (12") *	26	26	26
Round and Oval Snap Lock *			
Up to 200mm (8") *	30	30	30

*Following SMACNA for low pressure ductwork.

- .3 All ductwork between HVAC unit connections and 3.0 m (10'-0") downstream or to silencers shall be 1.4 mm (18 gauge).

2.2 DUCT CONSTRUCTION

.1 Round and oval:

- .1 Ducts: factory fabricated, spiral wound, with matching fittings and specials to SMACNA.
- .2 Transverse joints up to 900 mm (36"): slip type with tape and sealants.
- .3 Transverse joints over 900 mm (36"): Ductmate or Exanno Nexus Duct System.

.2 Square and rectangular:

- .1 Ducts: to SMACNA.
- .2 Transverse joints, longest side:
up to and including 750 mm (30"): SMACNA proprietary duct joints.

- .3 Ducts with sides over 750 mm (30") to 1200 mm (48"), transverse duct joint system by Ductmate/25, Nexus, or WDCI (Lite) (SMACNA "E" or "G" Type connection). Weld all corners.
 - .1 Acceptable materials:
 - .1 Ductmate Canada Ltd.
 - .2 Nexus, Exanno Corp.
 - .3 WDCI
- .4 Ducts 1200 mm (48") and larger, Ductmate/35, Nexus, or WDCI (heavy) (SMACNA "J" Type connection). Weld all corners.
 - .1 Acceptable materials:
 - .1 Ductmate Canada Ltd.
 - .2 Nexus, Exanno Corp.
 - .3 WDCI.

2.3 FITTINGS

- .1 Fabrication: to SMACNA.
- .2 Radiused elbows:
 - .1 Rectangular: standard radius and or short radius with single thickness turning vanes Centreline radius: 1.5 times width of duct.
 - .2 Round:
 - .1 In exposed areas one-piece smooth radius, 1.5 times diameter.
 - .2 In concealed areas 3-piece adjustable, 1.5 times diameter.
- .3 Mitred elbows, rectangular:
 - .1 To 400 mm (16"): with double thickness turning vanes.
 - .2 Over 400 mm (16"): with double thickness turning vanes.
- .4 Branches:
 - .1 Rectangular main and branch: with 45° entry on branch.
 - .2 Round main and branch: enter main duct at 45° with conical connection.
 - .3 Provide volume control damper in branch duct near connection to main duct.
 - .4 Main duct branches: with splitter damper.
- .5 Diffuser connection to main:
 - .1 90° round spin in collars with balancing damper and locking quadrant.
- .6 Transitions:
 - .1 Diverging: 20° maximum included angle.
 - .2 Converging: 30° maximum included angle.
- .7 Offsets:
 - .1 Full short radiused elbows.

- .8 Obstruction deflectors: maintain full cross-sectional area.

2.4 SEAL CLASSIFICATION

- .1 Classification as follows:

Maximum Pressure Pa (" w.c.)	SMACNA Seal Class	Acceptable Leakage Classification (Rectangular)	Acceptable Leakage Classification (Round)
2500 (10")	A	4	2
1500 (6")	A	4	2
1000 (4")	A	4	2
750 (3")	A	8	4
500 (2")	B	16	8
250 (1")	B	16	8
125 (0.5")	C	16	8

- .2 Seal classification:

- .1 Class A: longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with sealant and tape.
- .2 Class B: longitudinal seams, transverse joints and connections made airtight with sealant.
- .3 Class C: transverse joints and connections made air tight with gaskets, or sealant or combination thereof. Longitudinal seams sealed with foil tape or sealant.

2.5 SEALANT

- .1 Sealant: oil resistant, polymer type flame resistant duct sealant. Temperature range of -30°C (-22°F) to plus 93°C (199°F).
- .2 Flame-spread rating not more than 25.
- .3 Smoke developed classification not more than 50.
- .4 Acceptable materials:
 - .1 Duro Dyne S-2
 - .2 Foster

2.6 TAPE

- .1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm (2") wide.
 - .1 Acceptable material:
 - .1 Duro Dyne FT-2

2.7 DUCT LEAKAGE

- .1 In accordance with SMACNA HVAC Duct Leakage Test Manual.

2.8 FIRESTOPPING

- .1 40 mm x 40 mm x 3 mm (1½" x 1½" x 16ga) retaining angles all around duct, on both sides of fire separation.
- .2 Firestopping material and installation must not distort duct.
- .3 All ductwork passing through partition walls shall be firestopped.

2.9 HANGERS AND SUPPORTS

- .1 Band hangers: use on round and oval ducts only up to 500 mm (20") diameter, of same material as duct but next sheet metal thickness heavier than duct.
- .2 Trapeze hangers: ducts over 500 mm (20") diameter or longest side, to ASHRAE and SMACNA.
- .3 Hangers: galvanized steel angle with black steel rods to ASHRAE and SMACNA following table:

Duct Size mm (")	Angle Size mm (")	Rod Size mm (")
up to 750 (30)	25 x 25 x 3 (1 x 1 x 1/8)	6 (1/4)
>750 to 1050 (>30 to 42)	40 x 40 x 3 (1½ x 1½ x 1/8)	6 (1/4)
>1050 to 1500 (>42 to 60)	40 x 40 x 3 (1½ x 1½ x 1/8)	10 (3/8)
>1500 to 2100 (>60 x 84)	50 x 50 x 3 (2 x 2 x 1/8)	10 (3/8)
>2100 to 2400 (>84 x 96)	50 x 50 x 5 (2 x 2 x 1/8)	10 (3/8)
>2400 (96) and over	50 x 50 x 6 (2 x 2 x ¼)	10 (3/8)

- .4 Upper hanger attachments:
 - .1 For concrete: manufactured concrete inserts.
 - .1 Acceptable material:
 - .1 Myatt fig. 485
 - .2 For steel joist: manufactured joist clamp or steel plate washer.
 - .1 Acceptable material:
 - .1 Grinnell fig. 61 or 60
 - .3 For steel beams: manufactured beam clamps:
 - .1 Acceptable material:
 - .1 Grinnell Fig. 60

Part 3 Execution

3.1 GENERAL

- .1 The following systems shall conform to these requirements:

System	Class	Material
HVAC Supply and Return	B	Galvanized steel
Exhaust Plenum	B	Galvanized steel

- .2 Do work in accordance with ASHRAE and SMACNA.
- .3 Do not break continuity of insulation vapour barrier with hangers or rods.
- .4 Support risers in accordance with ASHRAE and SMACNA.
- .5 Install breakaway joints in ductwork on each side of fire separation.
- .6 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.
- .7 Manufacture duct in lengths to accommodate installation of acoustic duct lining.

3.2 HANGERS

- .1 Strap hangers: install in accordance with SMACNA.
- .2 Angle hangers: complete with locking nuts and washers.
- .3 Hanger spacing: in accordance with ASHRAE, SMACNA and as follows:

Duct Size	Spacing
mm (")	mm (")
to 1500 (60")	3000 (120")
over 1500 (60")	2500 (100")

- .4 Do not support ductwork over 250 mm x 250 mm (10" x 10") from roof deck.

3.3 SEALING

- .1 Apply sealant to outside of joint to manufacturer's recommendations.
- .2 Bed tape in sealant and recoat with minimum of 1 coat of sealant to manufacturers recommendations.

3.4 LEAKAGE TESTS

- .1 Co-ordinate leakage testing with TAB contractor. TAB contractor will be responsible for all duct testing.
- .2 Duct to be tested in accordance with SMACNA HVAC Duct Leakage Test Manual.
- .3 Leakage tests to be done in sections.
- .4 Trial leakage tests to be performed as instructed to demonstrate workmanship.
- .5 Install no additional ductwork until trial test has been passed.
- .6 Test section to be minimum of 15 m (50'-0") long with not less than 3 branch takeoffs and two 90° elbows. Maximum test length and area to be determined by BAS testing equipment. Allow for twelve (12) tests.
- .7 Complete test before insulation or concealment.
- .8 Provide all necessary end caps and fittings as required for the TAB contractor. Remove same after successful completion of duct test.
- .9 Pressure test ductwork to 1½ times operating pressure (minimum pressure 500 Pa (2" wc) all systems).

3.5 CLEANING

- .1 Keep ducts clear from dust and debris
- .2 Keep duct liner clean from dust, debris, and moisture.
- .3 At completion of project vacuum ducts if dirt or dust is present.
- .4 Where new systems connect into existing systems the existing systems shall be cleaned and vacuumed prior to reconnection.
- .5 Ensure all systems are clean prior to start up.

3.6 INSTALLATION REQUIREMENTS

- .1 All ductwork is to be protected from the weather and precipitation. The top and sides of all ductwork are to be completely covered with 6mil poly to the satisfaction of the consultant. Maintain protection of the ductwork until the building is made watertight and hollow cores drained. Tape all joints.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 SMACNA HVAC Duct Construction Standards, Metal and Flexible.
- .3 ANSI/NFPA 90B, Installation of Warm Air Heating and Air Conditioning Systems.
- .4 ANSI/NFPA 96, Ventilation Control and Fire Protection of Commercial Cooking Operations.
- .5 CSA B228.1, Pipes, Ducts and Fittings for Residential Type Air Conditioning.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with general requirements.
- .2 Indicate the following:
 - .1 Flexible connections.
 - .2 Duct access doors.
 - .3 Turning vanes.
 - .4 Instrument test ports.

1.3 CERTIFICATION OF RATINGS

- .1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

Part 2 Products

2.1 GENERAL

- .1 Manufacture in accordance with CSA B228.1.

2.2 FLEXIBLE CONNECTIONS

- .1 Frame: galvanized sheet metal frame with fabric clenched by means of double locked seams.
- .2 Material:
 - .1 Fire resistant, self extinguishing, neoprene coated glass fabric, temperature rated at -40°C (-40°F) to plus 90°C (194°F), density of 1.3 kg/m.

2.3 ACCESS DOORS IN DUCTS

- .1 Non-insulated ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm (25 gauge) thick complete with sheet metal angle frame.
- .2 Insulated ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm (24 gauge) thick complete with sheet metal angle frame and 25 mm (1") thick rigid glass fibre insulation.
- .3 Gaskets: neoprene
- .4 Hardware:
 - .1 Up to 300 mm (12"): 2 sash locks
 - .2 301 mm to 450 mm (13" to 18"): 4 sash locks Complete with safety chain.
 - .3 451 mm to 1000 mm (19" to 40"): piano hinge and minimum 2 sash locks.
 - .4 Doors over 1000 mm (40"): piano hinge and 2 handles operable from both sides.
 - .5 Hold open devices.
- .5 Acceptable materials:
 - .1 Nailor
 - .2 E. H. Price
 - .3 Titus

2.4 TURNING VANES

- .1 Factory or shop fabricated double thickness, to recommendations of SMACNA and as indicated.
- .2 Acceptable materials:
 - .1 Duro Dyne
 - .2 Ductmate

2.5 INSTRUMENT TEST PORTS

- .1 1.6 mm (16 gauge) thick steel zinc plated after manufacture.
- .2 Cam lock handles with neoprene expansion plug and handle chain.
- .3 28 mm (1 1/8") minimum inside diameter. Length to suit insulation thickness.
- .4 Neoprene mounting gasket.
- .5 Acceptable material:
 - .1 Duro Dyne IP1 or IP2
 - .2 Duct mate

2.6 PREFABRICATED ROOF CURB

- .1 Construction: welded with exposed joints ground flush and smooth.
- .2 Material: 1.3 mm (18 gauge) galvanized steel with raised cant and wood nailer.

- .3 25 mm (1") insulation 3 lb density.
- .4 Acceptable materials:
 - .1 Greenheck GPR – 600 mm (24") high
 - .2 Penn

2.7 SPIN-IN COLLAR

- .1 Construction: galvanized straight or conical spin-in collar complete with spin-in bead and crimped collar connection.
- .2 Provide balancing damper where indicated.
- .3 Acceptable materials:
 - .1 Ecco Manufacturing
 - .2 Flex Master

Part 3 Execution

3.1 INSTALLATION

- .1 Flexible connections:
 - .1 Install in following locations:
 - .1 Inlets and outlets to supply air units and fans. (Unless internally isolated)
 - .2 Inlets and outlets of exhaust and return air fans.
 - .3 As indicated.
 - .2 Length of connection: 100 mm (4").
 - .3 Minimum distance between metal parts when system in operation: 75 mm (3").
 - .4 Install in accordance with recommendations of SMACNA.
 - .5 When fan is running:
 - .1 Ducting on each side of flexible connection to be in alignment.
 - .2 Ensure slack material in flexible connection.
- .2 Access doors and viewing panels:
 - .1 Size:
 - .1 600 mm x 600 mm (24" x 24") for person size entry.
 - .2 600 mm x 1000 mm (24" x 40") for servicing entry.
 - .3 300 mm x 300 mm (12" x 12") for viewing.
 - .4 As indicated.
 - .2 Location:
 - .1 At fire and smoke dampers.
 - .2 At control dampers.
 - .3 At devices requiring maintenance.

- .4 At locations required by code.
 - .5 At inlet and outlet of reheat coils.
 - .6 Elsewhere as indicated.
 - .7 Inlet and outlet of duct mounted coils.
- .3 Instrument test ports.
 - .1 General:
 - .1 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
 - .2 Locate to permit easy manipulation of instruments
 - .3 Install insulation port extensions as required.
 - .4 Locations.
 - .1 For traverse readings:
 - .1 At ducted inlets to roof and wall exhausters.
 - .2 At inlets and outlets of other fan systems.
 - .3 At main and sub-main ducts.
 - .4 And as indicated.
 - .2 For temperature readings:
 - .1 At outside air intakes.
 - .2 In mixed air applications in locations as approved by Consultant.
 - .3 At inlet and outlet of coils.
 - .4 Downstream of junctions of two converging air streams of different temperatures.
 - .5 And as indicated.
- .4 Turning vanes:
 - .1 Install in accordance with recommendations of SMACNA and as indicated.
 - .2 Install on supply ducts only.

3.2 WARRANTY

- .1 Warranty Start Date:
 - .1 Warranty period starts as of the date of Ready for Takeover.
 - .2 Warranty start dates based on shipment date, start up date, substantial completion date, etc. are not applicable.
- .2 Warranty Duration:
 - .1 One (1) year warranty period applies.
- .3 Warranty Coverage:
 - .1 Applies to parts and labour.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 SMACNA HVAC Duct Construction Standards, Metal and Flexible.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with general requirements
- .2 Indicate the following: performance data.

Part 2 Products

2.1 GENERAL

- .1 Manufacture to SMACNA standards.

2.2 SINGLE BLADE DAMPERS

- .1 Of same material as duct, but one sheet metal thickness heavier. V-groove stiffened, minimum 1.6 mm (16 gauge).
- .2 Size and configuration to recommendations of SMACNA, except maximum height 100 mm (4").
- .3 Shaft extension to accommodate insulation thickness and locking quadrant.
- .4 Inside and outside nylon end bearings.
- .5 Channel frame of same material as adjacent duct, complete with angle stop.

2.3 MULTI-BLADED DAMPERS

- .1 Factory manufactured of material compatible with duct.
- .2 Opposed blade: configuration, metal thickness and construction to recommendations of SMACNA.
- .3 Maximum blade height:
 - .1 50 mm (2") up to 375 mm (15") high duct.
 - .2 100 mm (4") max 400 mm (16") high duct and over.
- .4 Bearings: self-lubricating nylon.
- .5 Linkage: shaft extension with locking quadrant.
- .6 Channel frame of same material as adjacent duct, complete with angle stop.
- .7 **Shaft extension to accommodate insulation thickness and locking quadrants.**

- .8 Acceptable materials:
 - .1 Duro Dyne
 - .2 E.H. Price
 - .3 Nailor
 - .4 T.A. Morrison
 - .5 Tamco
 - .6 Ruskin
 - .7 Ventex/Alumavent
 - .8 United Enertech

2.4 LOCKING QUADRANTS

- .1 6 mm (1/4") dial regulator with square bearing shaft.
 - .1 18 gauge oval frame, cadmium plated, clearly shows damper position.
 - .2 18 gauge formed handle for easy adjustment.
 - .3 Bolt and wing nut lock damper securely.
 - .4 Offset mounting holes avoid interference with damper movement and mechanical fastening to duct.
- .2 9 mm (3/8") and larger: clamp quadrant with square bearing shaft.
 - .1 Accommodates and securely locks square rod, bearing fitting and adaptor pins.
 - .2 Heavily ribbed 16 gauge steel frame, 3 mm (1/8") thick formed steel handle, cadmium-plated.
 - .3 By tightening nut, bearing is securely locked in handle, preventing slippage and rattle.
 - .4 Neoprene and steel washer assembly seals bearing opening to eliminate air-leakage.
 - .5 Screw holes for mechanically fastening to ductwork.
- .3 High pressure system locking quadrant:
 - .1 Airtight, rattle-proof regulator, designed for ZERO leakage at high pressure. Use for applications up to 500°F constant temperature.
 - .2 Handle design for easy recognition of damper position.
 - .3 Heavy-gauge, zinc-plated steel, 2 high temperature rubber seals and washers, end bearing support, and 2 end bearings. Pressure loss and damper rattle in ductwork has been a constant annoyance for as long as HVAC ductwork has been installed. Now, a truly air-tight, rattle-proof regulator is available. The SPEC-SEAL regulator utilizes a special high-temperature rubber seal to eliminate leakage and rattle even at many times the pressure found in high pressure.
 - .4 Soft, comfortable grip handle with a highly-visible, plastic cover which indicates the damper position.
 - .5 Handle to accommodate 9 mm (3/8") or 12 mm (1/2") to match damper shaft size, square and round bearing shafts.

- .4 Acceptable manufacturers:
 - .1 Duro Dyne
 - .2 Ductmate
 - .3 Pottorff

Part 3 Execution

3.1 INSTALLATION

- .1 Install where indicated.
- .2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
- .3 For supply, return and exhaust systems, locate balancing dampers in each branch duct.
 - .1 Single blade dampers up to 200 mm (8").
 - .2 Multi-blade dampers over 200 mm (8").
- .4 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.
- .5 All dampers to be vibration free.
- .6 Leave all dampers in open position for T.A.B.
- .7 Fasten locking quadrants to ductwork and shaft.
- .8 Place locking quadrants on standoffs where ductwork insulated.
- .9 Lock down quadrant arm in the open position.

3.2 WARRANTY

- .1 Warranty Start Date:
 - .1 Warranty period starts as of the date of Ready for Takeover.
 - .2 Warranty start dates based on shipment date, start up date, substantial completion date, etc. are not applicable.
- .2 Warranty Duration:
 - .1 One (1) year warranty period applies.
- .3 Warranty Coverage:
 - .1 Applies to parts and labour.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 ANSI/NFPA 90A, Installation of Air Conditioning and Ventilating Systems.
- .3 CAN/ULC-S112, Standard Method of Fire Test of Fire Damper Assemblies.
- .4 CAN/ULC-S112.1, Standard Method of Fire Test of Ceiling Firestop Flap Assemblies.
- .5 ULC-S505, Fusible Links for Fire Protection Service.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with general requirements.
- .2 Indicate the following:
 - .1 Fire dampers.
 - .2 Operators.
 - .3 Firestop flaps.
 - .4 Fusible links.

1.3 MAINTENANCE DATA

- .1 Provide maintenance data for incorporation into manual specified in general requirements.

1.4 MAINTENANCE MATERIALS

- .1 Provide following:
 - .1 Six (6) fusible links of each type.

1.5 CERTIFICATION OF RATINGS

- .1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards.

Part 2 Products

2.1 FIRE DAMPERS (STATIC)

- .1 Fire dampers: arrangement as indicated, listed and bear label of ULC, meet requirements of provincial fire authority and authorities having jurisdiction. Fire damper assemblies to be fire tested in accordance with CAN/ULC-S112.
- .2 Mild steel, factory fabricated for fire rating requirement to maintain integrity of fire wall and/or fire separation.

- .3 Top hinged: offset single damper, round or square; multi-blade hinged or interlocking type; guillotine type; sized to maintain full duct cross section.
- .4 Fusible link actuated, weighted to close and lock in closed position when released or having negator-spring-closing operator for multi-leaf type or roll door type in horizontal position with vertical air flow.
- .5 40 mm x 40 mm x 3 mm (1½" x 1½" x 16ga) retaining angle iron frame, on full perimeter of fire damper, on both sides of fire separation being pierced.
- .6 Acceptable materials:
 - .1 Ruskin
 - .2 Nailor
 - .3 E.H. Price
 - .4 T.A. Morrison
 - .5 Tamco
 - .6 Ventex/Alumavent
 - .7 United Enertech
 - .8 Safeair-Dowco (stainless steel)
 - .9 Greenheck
 - .10 Pottorff

2.2 FIRE DAMPERS (DYNAMIC)

- .1 Multi blade or roll type, fire damper suitable for HVAC system velocities up to 2000 fpm (610 m/min), dual direction air flow, max 4" wg pressure.
- .2 Mild steel, factory fabricated for fire rating requirement to maintain integrity of fire wall and/or fire separation.
- .3 Top hinged: offset single damper, round or square; multi-blade hinged or interlocking type; guillotine type; sized to maintain full duct cross section.
- .4 Stainless closure spring to positively close damper upon fusible link release, for horizontal or vertical orientations.
- .5 Linkage concealed in frame.
- .6 40 mm x 40 mm x 3 mm (1½" x 1½" x 16ga) retaining angle iron frame, on full perimeter of fire damper, on both sides of fire separation being pierced.
- .7 Fire damper assemblies and type to meet requirements of provincial fire authority and authority having jurisdiction.
- .8 Acceptable materials:
 - .1 Ruskin
 - .2 Nailor
 - .3 E.H. Price
 - .4 T.A. Morrison
 - .5 Tamco

- .6 Greenheck
- .7 Ventex/Alumavent
- .8 Pottorff

2.3 FIRE STOP FLAPS

- .1 To be ULC listed and labelled and fire tested in accordance with CAN/ULC-S112.1.
- .2 Construct of minimum 1.5 mm (16 gauge) thick sheet steel with 1.5 mm (16 gauge) thick non-asbestos ULC listed insulation and corrosion-resistant pins and hinges.
- .3 Flaps to be held open with fusible link conforming to ULC-S505 and close at 74°C (165°F).

Part 3 Execution

3.1 INSTALLATION

- .1 Provide where indicated and at all fire rated partitions indicated, on architectural drawing.
- .2 Install in accordance with ANSI/NFPA 90A and in accordance with conditions of ULC listing.
- .3 Maintain integrity of fire separation.
- .4 After completion and prior to concealment obtain approvals of complete installation from authority having jurisdiction.
- .5 Install access door adjacent to each damper.
- .6 Coordinate with installer of firestopping.
- .7 Static fire dampers: Only on transfer air ducts where ductwork is not connected to a fan/blower.
- .8 Dynamic fire dampers: In all duct work where air is moved by a fan/blower.

3.2 WARRANTY

- .1 Warranty Start Date:
 - .1 Warranty period starts as of the date of Ready for Takeover.
 - .2 Warranty start dates based on shipment date, start up date, substantial completion date, etc. are not applicable.
- .2 Warranty Duration:
 - .1 One (1) year warranty period applies.
- .3 Warranty Coverage:
 - .1 Applies to parts and labour.

END OF SECTION

Part 1 General

1.1 CODES AND STANDARDS

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 ANSI/NFPA 90A, Installation of Air Conditioning and Ventilating Systems.
- .3 CAN/ULC-S112, Standard Method of Fire Test of Fire Damper Assemblies.
- .4 CAN/ULC-S112.1, Standard Method of Fire Test of Ceiling Firestop Flap Assemblies.
- .5 ULC-S505, Fusible Links for Fire Protection Service.
- .6 CAN/ULC-S524, Installation of Fire Alarm Systems
- .7 CAN/ULC-S1001.11, Integrated Systems Testing of Fire Protection and Life Safety Systems.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with general requirements indicating the following:
 - .1 Damper type
 - .2 Operators
 - .3 Fusible links
 - .4 Smoke detectors
 - .5 Power requirements
 - .6 Size, orientation, construction

1.3 MAINTENANCE DATA

- .1 Provide maintenance data for incorporation into manual specified in general requirements.

1.4 MAINTENANCE MATERIALS

- .1 Provide following:
 - .1 Six (6) fusible links of each type.

1.5 CERTIFICATION OF RATINGS

- .1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards.

Part 2 Products

2.1 SMOKE DAMPERS

- .1 Provide a complete system, consisting of the damper, damper actuator, smoke detector with duct sample tube, sleeve and all other components necessary for a complete and operable system. **The assembly shall be factory assembled as a single unit.** Field assembly shall be permitted at contractor discretion provided all listings are maintained and the installation follows all manufacturer installation guidelines.
- .2 Damper
 - .1 Damper shall be ULC listed and labelled
 - .2 Both damper and damper actuator to be ULC listed and labelled.
 - .3 Normally closed smoke/seal: folding blade type. Blade edge seals of flexible stainless steel shall provide required constant sealing pressure. Stainless steel negator springs with locking devices shall ensure positive closure for units.
 - .4 Damper shall have Class I leakage rating.
 - .5 Suitable for horizontal or vertical installations.
 - .6 Damper Material: Damper material shall match ductwork it is installed in (i.e., stainless steel in laboratory). Refer to specification section 23 31 13 Metal Ducts.
- .3 Actuator
 - .1 Actuator shall be ULC listed and labelled
 - .2 Motorized actuator: 2-position, spring return, normally open with power on. When power is interrupted damper shall close automatically. Upon return of power, damper shall automatically reset open. Actuators are to be located outside of airstream, unless otherwise specified or shown on drawings.
 - .3 Exterior visualization of damper position.
 - .4 Damper actuator end switches for monitoring damper position by the BAS.
 - .5 Provide modulating actuator where damper is operating as part of a VVT system.
- .4 Factory sleeve.
 - .1 Type and style: matching application.
- .5 Operating Temperature: 0° Celsius to 99° Celsius ambient temperature rating for 300 fpm to 4000 fpm air velocity.
- .6 Smoke Detector:
 - .1 ULC approved photoelectric duct smoke detector;
 - .2 Operates from 300 to 3000 ft/min air velocity (fan system), -4 to 158°F temperature, and 0 to 95% non-condensing humidity;
 - .3 Operates from 100 to 4000 ft/min air velocity, -4 to 158°F temperature and 0 – 95% non-condensing humidity (transfer ducts)
 - .4 test/reset button with LED display;

- .5 The detector housing shall be ULC listed specifically for use in air handling systems; capable of local testing via magnetic switch and test button; duct mounted smoke detector with sampling tube, housing.
- .6 The detector shall incorporate separate 2.0A 30VDC Alarm and Supervisory contacts. Alarm contacts shall be normally open (N.O.) in which closed contacts will indicate an alarm condition to the fire alarm panel. Supervisory contacts shall be normally closed (N.C.) in which open contacts will indicate a trouble condition to the fire alarm panel.
- .7 Damper assembly to operate at 120V with single point power connection.
- .8 Large damper sizes can be provided in multiple sections. Field assembly is acceptable following manufacturer's installation guidelines.
- .9 Size: as indicated on drawings.
- .10 Detectors and electrical components within the airstream shall be classified for use in a Class I, Zone 2 system (as defined by the Electrical Safety Code).
- .11 Acceptable materials:
 - .1 E H Price
 - .2 NCA Ltd.
 - .3 Nailor Industries Inc.
 - .4 Ruskin
 - .5 Alumavent
 - .6 United Enertech
 - .7 Safeair-Dowco (stainless steel)
 - .8 Pottorff

2.2 COMBINATION FIRE AND SMOKE DAMPERS

- .1 Provide a complete system, consisting of the damper, damper actuator, smoke detector with duct sampling tube, sleeve and all other components necessary for a complete and operable system. **The assembly shall be factory assembled as a single unit.** Field assembly shall be permitted at contractor discretion provided all listings are maintained and the installation follows all manufacturer installation guidelines.
- .2 Damper
 - .1 Damper shall be ULC listed and labelled
 - .2 Both damper and damper actuator to be ULC listed and labelled.
 - .3 Normally closed smoke/seal: folding blade type. Blade edge seals of flexible stainless steel shall provide required constant sealing pressure. Stainless steel negator springs with locking devices shall ensure positive closure for units.
 - .4 Damper shall have Class I leakage rating.
 - .5 Suitable for horizontal or vertical installations.
 - .6 Damper Material: Damper material shall match ductwork it is installed in (i.e., stainless steel in laboratory). Refer to specification section 23 31 13 Metal Ducts.

- .3 Actuator/Link
 - .1 Actuator shall be ULC listed and labelled
 - .2 Motorized actuator: 2-position, spring return, normally open with power on. When power is interrupted damper shall close automatically. Upon return of power, damper shall automatically reset open. Actuators are to be located outside of airstream, unless otherwise specified or shown on drawings.
 - .3 Exterior visualization of damper position.
 - .4 Damper actuator end switches for monitoring damper position by the BAS.
 - .5 Combined actuator: electrical control system actuated from smoke sensor or smoke detection system and from fusible link.
 - .6 Fusible link, or electric re-settable link (ERL).
 - .7 Electric fire sensor capable of remote openable control is to be provided in place of fusible link where specifically indicated in project documents.
 - .8 Where ERL or electric fire sensor is used in place of fusible link, this device shall fail closed upon power failure.
 - .9 Provide modulating actuator where damper is operating as part of a VVT system.
- .4 Factory sleeve.
 - .1 Type and style: matching application.
- .5 Operating Temperature: 0° Celsius to 99° Celsius ambient temperature rating for 300 fpm to 4000 fpm air velocity.
- .6 Smoke Detector:
 - .1 ULC approved photoelectric duct smoke detector;
 - .2 Operates from 300 to 3000 ft/min air velocity (fan systems), -4 to 158°F temperature, and 0 to 95% non-condensing humidity;
 - .3 Operates from 100 to 4000 ft/min air velocity, -4 to 158°F temperature and 0 – 95% non-condensing humidity (transfer ducts)
 - .4 Test/reset button with LED display;
 - .5 The detector housing shall be ULC listed specifically for use in air handling systems; capable of local testing via magnetic switch and test button; duct mounted smoke detector with sampling tube, housing
 - .6 The detector shall incorporate separate 2.0A 30VDC Alarm and Supervisory contacts. Alarm contacts shall be normally open (N.O.) in which closed contacts will indicate an alarm condition to the fire alarm panel. Supervisory contacts shall be normally closed (N.C.) in which open contacts will indicate a trouble condition to the fire alarm panel.
- .7 Damper assembly to operate at 120V with single point power connection.
- .8 Large damper sizes can be provided in multiple sections. Field assembly is acceptable following manufacturer's installation guidelines.
- .9 Fire rating to match wall assembly i.e. 1 hour/1 ½ hour/2 hour/ 3 hour.

- .10 Size: as indicated on drawings.
- .11 Detectors and electrical components within the airstream shall be classified for use in a Class I, Zone 2 system (as defined by the Electrical Safety Code).
- .12 Acceptable materials:
 - .1 E H Price
 - .2 NCA Ltd.
 - .3 Nailor Industries Inc.
 - .4 Ruskin
 - .5 Alumavent
 - .6 United Enertech
 - .7 Pottorff
 - .8 Safeair-Dowco (stainless steel)
 - .9 Pottorff

2.3 NUMBER OF AIR TYPE SMOKE DETECTORS

- .1 Where air velocities are greater than 1.5 m/s (300 feet per second), one air duct type detector shall be installed for every 1.5 meters square (16 square feet) of cross-sectional duct area.
- .2 Where air velocities are less than 1.5 m/s (300 feet per second), one duct type smoke detector shall be installed for every 0.5 meters square (5.3 square feet) or cross-sectional duct area.

2.4 PRESSURE RELIEF DOORS

- .1 Frames shall be Z-shape, 12 gage (2.8) galvanized steel.
- .2 Door shall be 12 gage (2.8) galvanized steel, hinged on one side.
- .3 Seal shall be around the door perimeter allowing no more than 7 cfm/ft² at 1.0 inch w.g..
- .4 Door shall include stainless steel springs to close door upon pressure relief and system shutdown.
- .5 All release mechanisms, springs and parts shall be completely out of airstream.
- .6 Pressure relief settings available from 2" (0.5 kPa) to 10" (2.49 kPa) increments of 1" w.g. (0.25 kPa). Supplier shall examine plans to provide appropriate pressure relief based on associated air handling system.
- .7 Pressure relief mechanism shall be factory calibrated in an AMCA Registered Laboratory.
- .8 Pressure Relief Doors shall be provided as indicated in the execution section.

Part 3 Execution

3.1 INSTALLATION

- .1 Provide smoke dampers where indicated and at all duct penetrations through smoke barrier partitions indicated on architectural drawings.
- .2 Provide combination fire and smoke dampers where indicated and at all duct penetrations through fire rated smoke barrier partitions indicated on architectural drawings. To provide separated fire dampers and smoke dampers, obtain approval from the consultant for the alternate arrangement.
- .3 Provide pressure relief doors (both positive and negative as applicable) as follows:
 - .1 For all systems with a combination fire smoke or smoke damper in the duct main of the system when:
 - .1 The system operates at static pressure of 1.0 inches w.g. or higher; and
 - .2 More than 50% of the system airflow passes through the combination fire/smoke or smoke damper.
 - .2 Where/as indicated on the plans.
- .4 Install in accordance with ANSI/NFPA 90A, in accordance with conditions of ULC listing and manufacturer's recommendation.
- .5 Maintain integrity of smoke separation and fire rating.
- .6 After completion and prior to concealment obtain approvals of complete installation from authority having jurisdiction.
- .7 Install access door adjacent to each damper and smoke detector.
- .8 Front grille access for through wall dampers that terminate in a grille is acceptable.
- .9 Provide proper firestopping and duct seal to fire barrier wall.
- .10 Confirm proper operation and test sheets.
- .11 Should contractor provide separated devices mount smoke detector downstream of damper and within 1.5 m (5 ft) of damper.
- .12 Ensure access doors/panels, fusible links, damper actuators and sensors are easily observed and accessible.

3.2 PROTECTION

- .1 Contractor is to ensure all fire smoke dampers detectors are protected from dust, dirt, humidity, and water at all times during construction. This applies to detectors installed, stored on site or stored in storage containers. Contractor shall seal all open-ended ductwork on site at all times. Failure to properly protect dampers, ductwork and detectors will result in the Contractor cleaning all dampers and ductwork. Any detectors that are damaged or dirty shall be replaced at the contractor's expense.

3.3 WIRING

- .1 All fire alarm wiring shall be 1 hour rated and in conduit or as per electrical fire alarm wiring requirement.

3.4 CLEANING

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

3.5 INTEGRATED LIFE SAFETY SYSTEMS TESTING

- .1 Prior to the building Integrated Life Safety Systems Testing the mechanical contractor shall commission/verify the operation of all installed smoke dampers.
- .2 Participate in the Integrated Life Safety Systems Testing to confirm proper operation of all operating smoke dampers and associated Life Safety Systems (i.e. fire alarm).
- .3 This contractor shall work with the Integrated Life Safety Contractor and reset all systems back into proper operation.
- .4 Include all costs associated with participation Integrated Life Safety System Testing in the tender value.

3.6 WARRANTY

- .1 Warranty Start Date:
 - .1 Warranty period starts as of the date of Ready for Takeover.
 - .2 Warranty start dates based on shipment date, start up date, substantial completion date, etc. are not applicable.
- .2 Warranty Duration:
 - .1 One (1) year warranty period applies.
- .3 Warranty Coverage:
 - .1 Applies to parts and labour.

END OF SECTION

Part 1 General

1.1 GENERAL

- .1 This section applies to operating dampers not specified in Controls Section.

1.2 REFERENCES

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

1.3 PRODUCT DATA

- .1 Submit product data in accordance with general requirements.
- .2 Indicate the following:
 - .1 Performance data.

1.4 MAINTENANCE DATA

- .1 Provide maintenance data for incorporation into manual specified in general requirements.

1.5 CERTIFICATION OF RATINGS

- .1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency.

Part 2 Products

2.1 MOTORIZED DAMPERS

- .1 Opposed blade type.
- .2 Extruded aluminum, interlocking blades, complete with extruded vinyl seals, spring stainless steel side seals, extruded aluminum frame.
- .3 Pressure fit self-lubricated bronze bearings.
- .4 Linkage: plated steel tie rods, brass pivots and plated steel brackets, complete with plated steel control rod.
- .5 Operator: Refer to BAS Section.
- .6 Performance:
 - .1 Leakage: in closed position to be less than 2% of rated air flow at 250 Pa (1" w.c.) differential across damper.
 - .2 Pressure drop: at full open position to be less than 10 Pa (0.04" w.c.) differential across damper.

- .7 Insulated aluminum dampers:
 - .1 Frames: insulated with extruded polystyrene foam with R factor of 5.0.
 - .2 Blades: constructed from aluminum extrusions with internal hollows insulated with polyurethane or polystyrene foam, R factor of 5.0.
 - .3 Use on services to the exterior.
- .8 Acceptable materials:
 - .1 Honeywell
 - .2 Johnson
 - .3 T. A. Morrison
 - .4 E.H. Price
 - .5 Tamco
 - .6 Ruskin
 - .7 Nailor
 - .8 Henderson Industrial
 - .9 Ventex/Alumavent
 - .10 Pottorff

2.2 DISC TYPE DAMPERS

- .1 Frame: brake formed, welded, 1.6 mm (16 gauge) thick, Type Z90 galvanized steel to ASTM A653/A653M.
- .2 Disc: spin formed, 1.6 mm (16 gauge) thick, Type Z90 galvanized steel to ASTM A653/A653M.
- .3 Gasket: extruded neoprene, field replaceable.
- .4 Bearings: roller self lubricated and sealed.
- .5 Operator: compatible with damper, linear stroke operator, spring loaded actuator, zinc-aluminum foundry alloy casting cam follower.
- .6 Performance:
 - .1 Leakage: in closed position to be less than 0.001% of rated air flow at 100 kPa (15 psi) pressure differential across damper.
 - .2 Pressure drop: at full open position to be less than 100 kPa (15 psi) differential across damper.
- .7 Acceptable material:
 - .1 Duro Dyne
 - .2 Henderson Industrial
 - .3 Pottorff

2.3 BACK DRAFT DAMPERS

- .1 Automatic gravity operated, multi leaf, aluminum construction with nylon bearings, centre pivoted or counterweighted, as indicated.

- .2 Acceptable materials:
 - .1 T.A. Morrison
 - .2 Tamco Series 7000
 - .3 Ruskin
 - .4 Nailor
 - .5 E.H. Price
 - .6 Henderson Industrial
 - .7 Ventex/Alumavent
 - .8 Pottorff

Part 3 Execution

3.1 INSTALLATION

- .1 Install where indicated.
- .2 Install in accordance with recommendations of SMACNA and manufacturer's instructions.
- .3 Seal multiple damper modules with silicon sealant.
- .4 Install access door adjacent to each damper. See Duct Accessories Section.
- .5 Insulated dampers on all outside air intake and exhaust damper.
- .6 Non-insulated dampers on all interior motorized dampers not exposed to outside air.

3.2 WARRANTY

- .1 Warranty Start Date:
 - .1 Warranty period starts as of the date of Ready for Takeover.
 - .2 Warranty start dates based on shipment date, start up date, substantial completion date, etc. are not applicable.
- .2 Warranty Duration:
 - .1 One (1) year warranty period applies.
 - .2 Disk type dampers gasket: Ten (10) years warranty.
- .3 Warranty Coverage:
 - .1 Applies to parts and labour.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 CAN/ULC-S110, Standard Methods of Test for Air Ducts.
- .3 UL 181, Factory Made Air Ducts and Air Connectors.
- .4 ANSI/NFPA 90A, Installation of Air Conditioning and Ventilating Systems.
- .5 ANSI/NFPA 90B, Installation of Warm Air Heating and Air Conditioning Systems.
- .6 SMACNA HVAC Duct Construction Standards - Metal and Flexible.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with general requirements.
- .2 Indicate the following:
 - .1 Thermal properties.
 - .2 Friction loss.
 - .3 Acoustical loss.
 - .4 Leakage.
 - .5 Fire rating.

1.3 CERTIFICATION OF RATINGS

- .1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

Part 2 Products

2.1 GENERAL

- .1 Factory fabricated to CAN/ULC S110.
- .2 Pressure drop coefficients listed below are based on relative sheet metal duct pressure drop coefficient of 1.00.
- .3 Flame spread rating not to exceed 25. Smoke developed rating not to exceed 50.

2.2 METALLIC –INSULATED

- .1 Spiral wound flexible aluminum with factory applied, 25 mm (1") thick flexible glass fibre thermal insulation with vapour barrier and vinyl jacket, Class 1 duct material.

- .2 Performance:
 - .1 Factory tested to 2.5 kPa (10" w.c.) without leakage.
 - .2 Maximum relative pressure drop coefficient: 3.
 - .3 Operating pressure: 300 mm (12").
- .3 Acceptable materials:
 - .1 Flexmaster T/L – VT
 - .2 Ductmate

Part 3 Execution

3.1 DUCT INSTALLATION

- .1 Install in accordance with: SMACNA.
- .2 Maximum length of flexible duct: 1.8 m (6' 0").
- .3 Minimum length of acoustical ductwork; 1.5 m (5' 0") with minimum of 1 bend.
- .4 Provide support at centre of flexible duct with 25 mm (1") wide galvanized hanger.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 SMACNA HVAC Duct Construction Standards, Metal and Flexible.
- .3 ASTM C1071 Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).
- .4 ASTM C916 Standard Specification for Adhesive for Duct Thermal Insulation.
- .5 ANSI/NFPA 90A, Installation of Air Conditioning and Ventilating Systems.
- .6 ANSI/NFPA 90B, Installation of Warm Air Heating and Air Conditioning Systems.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with general requirements.

Part 2 Products

2.1 RECTANGULAR/SQUARE DUCT LINER

- .1 General:
 - .1 Acoustical duct liner to be fibreglass duct liner meeting or exceeding requirements of ASTM C1071, Type I, Flexible or Type II, Rigid, and NFPA 90A/90B.
 - .2 Bonded with formaldehyde free bio-based binder
 - .3 Mat faced airstream surface
 - .4 Factory applied edge coating
 - .5 Shall not contain formaldehyde, PBDE's, asbestos, mercury, mercury compounds, lead, contain 50% or greater recycled glass content.
 - .6 Thermal conductivity, ASTM C177/C518/C1114 .24BTU (sf•hr•°F) @ 75°F mean temp).
 - .7 Noise Reduction Coefficient (NRC) 1.5 PCF 1" = .70, 1 ½ " = .80, 2" =.95 ASTM C423, Type A mounting.
 - .8 Noise Reduction Coefficient (NRC) 2.0 PCF 1/2" = .50, 1" = .70, 1 ½ " = .85 ASTM C423, Type A mounting
 - .9 Corrosiveness/corrosion, ASTM C665/C1617. Does not accelerate/pass.
 - .10 Mold and mildew growth/fungi resistance, ASTM C1338, ASTM G21/G22, UL2824. Pass/resistant to mold.
 - .11 Maximum service temperature, ASTM C411, 250°F (121°C).
 - .12 Maximum rate air velocity, ASTM C1071, 6,000 ft./min. (30.5 m/sec.)
 - .13 Water vapor sorption, ASTM C1104, less than 3%.

- .14 Surface burning characteristics, ASTM E84, UL 273, CAN/ULC S102, 20/50 flame spread/smoke development.
- .15 Acceptable material:
 - .1 Knauf Atmosphere Duct Liner
 - .2 Manson
 - .3 Johns Manville
 - .4 Owen Corning
- .2 Rigid:
 - .1 Use on flat surfaces.
 - .2 25 mm (1") thick, to CGSB 51-GP-10M, fibrous glass rigid board duct liner.
 - .3 Density: 96 kg/m³ (6 lb/ft³).

2.2 ADHESIVE

- .1 Meet requirements of ASTM C916.
- .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50. Temperature range -29°C (-20°F) to 93°C (200°F).
- .3 Acceptable material:
 - .1 Duro Dyne 1A-22
 - .2 Ductmate

2.3 FASTENERS

- .1 Weld pins 2.0 mm (14 gauge) diameter, length to suit thickness of insulation. Metal retaining clips, 32 mm (1¼") square.
- .2 Acceptable material:
 - .1 Duro Dyne
 - .2 Ductmate

2.4 JOINT TAPE

- .1 Poly-Vinyl treated open weave fiberglass membrane 50 mm (2") wide.
- .2 Acceptable materials:
 - .1 Duro Dyne FT2
 - .2 Ductmate

2.5 SEALER

- .1 Meet requirements of ANSI/NFPA 90A and ANSI/NFPA 90B.
- .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50. Temperature range -68°C (-90°F) to 93°C (200°F).

- .3 Acceptable materials:
 - .1 Duro Dyne 1A-94
 - .2 Ductmate

Part 3 Execution

3.1 GENERAL

- .1 Do work in accordance with recommendations of MAIMA Fibrous Glass Duct Liner Standards (FGDLS) or SMACNA duct liner standards.
- .2 Line inside of ducts where indicated.
- .3 Duct dimensions, as indicated, are clear inside duct lining.
- .4 Provide an interior of ductwork from fans from minimum distance of 3 m (10'-0").

3.2 DUCT LINER

- .1 Install in accordance with manufacturer's recommendations, and as follows:
 - .1 Fasten to interior sheet metal surface with 100% coverage of adhesive.
 - .2 In addition to adhesive, install weld pins not less than 2 rows per surface and not more than 300 mm (12") on centres.
- .2 Weld pins are to have cupped or beveled heads to prevent damage to lining surface.
- .3 Store foam liners away from sunlight.

3.3 JOINTS

- .1 Seal all butt joints, exposed edges, weld pin and clip penetrations and all damaged areas of liner with joint tape and sealer. Install joint tape in accordance with manufacturer's recommendations, and as follows:
 - .1 Bed tape in sealer.
 - .2 Apply 2 coats of sealer over tape.
- .2 Replace damaged areas of liner at discretion of Consultant.
- .3 Protect leading and trailing edges of each duct section with sheet metal nosing having 15 mm (1/2") overlap and fastened to duct.

END OF SECTION

Part 1 General

1.1 PRODUCT DATA

- .1 Submit product data in accordance with general requirements.
- .2 Indicate the following:
 - .1 Capacity.
 - .2 Throw and terminal velocity.
 - .3 Noise criteria.
 - .4 Pressure drop.
 - .5 Neck velocity.

1.2 MAINTENANCE MATERIALS

- .1 Include:
 - .1 Keys for volume control adjustment.
 - .2 Keys for air flow pattern adjustment.

1.3 MANUFACTURED ITEMS

- .1 Grilles, registers, and diffusers of same generic type to be product of one manufacturer.

1.4 CERTIFICATION OF RATINGS

- .1 Catalogued or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by them from independent testing agency signifying adherence to codes and standards.

Part 2 Products

2.1 GENERAL

- .1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity as indicated.
- .2 Frames:
 - .1 Full perimeter gaskets.
 - .2 Plaster frames where set into plaster or gypsum board and as specified.
 - .3 Concealed fasteners.
- .3 Concealed operators.
- .4 Colour and Finish: standard as directed by Consultant.

- .5 Acceptable materials:
 - .1 E.H. Price
 - .2 Nailor
 - .3 Krueger
 - .4 Titus
 - .5 Carnes
 - .6 Seiho
 - .7 Metalaire
 - .8 Tuttle and Bailey

2.2 RETURN AND EXHAUST GRILLES

- .1 General: with opposed blade dampers as indicated, concealed manual operator and gaskets
- .2 Type, size, and capacity: Refer to schedule.

2.3 DIFFUSERS

- .1 General: volume control dampers with blank-off quadrants, as indicated and gaskets
- .2 Type, size, and capacity: Refer to schedule.

2.4 OPEN MESH SCREEN

- .1 15 mm x 15 mm (½" x ½") open mesh screen fastened on 25 mm (1") border, screw fasten.
- .2 On all open ends of ductwork and where indicated.
- .3 Size: To match ductwork size.

Part 3 Execution

3.1 INSTALLATION

- .1 Install in accordance with manufacturer's instructions.
- .2 Install with flat head screws in countersunk holes where fastenings are visible.
- .3 Bolt grilles, registers and diffusers, in place
- .4 Provide concealed safety chain on each grille, register and diffuser in gymnasium, similar game rooms, and on exposed diffusers, and elsewhere as indicated.
- .5 Clean grilles upon completion.
- .6 Paint ductwork beyond grilles, matte black where visible.
- .7 Ensure all grilles, diffusers, etc. match opening sizes as indicated on the drawings and as fabricated on site by the contractor.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 ASTM E90, Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions, and Elements.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with general requirements.
- .2 Indicate the following:
 - .1 Pressure drop.
 - .2 Face area.
 - .3 Free area.
 - .4 Colour and finish.

1.3 CERTIFICATION OF RATINGS

- .1 Catalogued or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards.

1.4 TEST REPORTS

- .1 Submit certified data from independent laboratory substantiating acoustic and aerodynamic performance to ASTM E90.

Part 2 Products

2.1 GRAVITY ROOF OUTSIDE AIR INTAKES AND RELIEF VENTS

- .1 Factory manufactured louvred penthouse.
 - .1 3 mm (1/8") thick stormproof extruded aluminum louvers with mitred corners. Brace and support louvres at 1500 mm (5') intervals.
 - .2 2 mm (0.081") thick insulated aluminum sheet roof.
 - .3 Constructed of 50 mm x 50 mm x 6 mm (2" x 2" x ¼") aluminum angles for roof support and corner angle.
 - .4 15 mm x 15 mm x 0.063 diameter (½" x ½" x 1.6" diameter) intercrimp aluminum screen on back of all sides.
- .2 Provide roof curb sized to suit penthouse or flat or sloped roof as required or indicated. Curb to place bottom louvre minimum 250 mm (10") above roof.
- .3 Maximum throat velocity 3.3 m/s (11 ft/s) intake.

- .4 Maximum loss through unit: 15 Pa (0.06" in w.c.) static pressure.
- .5 Finish: Powder Coated. Color selected by Consultant.
- .6 Shape and size as indicated.
- .7 Acceptable manufacturers:
 - .1 Greenheck WRH
 - .2 Nailor 1720
 - .3 Carnes GLAB
 - .4 Penn Barry
 - .5 Ventex
 - .6 Pottorff

Part 3 Execution

3.1 INSTALLATION

- .1 In accordance with manufacturers and SMACNA recommendations.
- .2 Reinforce and brace air vents, intakes and goosenecks as indicated.
- .3 Anchor securely into opening.
- .4 Seal with caulking all around to ensure weather tightness.

END OF SECTION

Part 1 General**1.1 REFERENCES**

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 ANSI/ARI 210/240, Unitary Air-Conditioning, and Air-Source Heat Pump Equipment.
- .3 ARI 270, Standard for Sound Rating of Outdoor Unitary Equipment.
- .4 CSA C22.1, Canadian Electrical Code, Part 1.
- .5 ANSI/NFPA 90A, Installation of Air Conditioning and Ventilating Systems.
- .6 ANSI/UL 1995, Central Cooling Air Conditioning.
- .7 AFBMA 9 – Load Ratings and Fatigue Life for Ball Bearings.
- .8 AMCA 99 – Standards Handbook
- .9 AMCA 500 – Test Methods for Louver, Dampers, and Shutters.
- .10 AHRI 340/360 – Unitary Large Equipment.
- .11 NEMA MG1 – Motors and Generators.
- .12 National Electrical Code.
- .13 NFPA 70 – National Fire Protection Agency.
- .14 SMACNA – HVAC Duct Construction Standards – Metal and Flexible.
- .15 UL 900 – Test Performance of Air Filter Units.
- .16 C.1 CSA B52-2023, Mechanical Refrigeration Code
- .17 C.2 CAN/CSA-C22.2 No 60335 Safety of Household and similar electrical appliances – Heat Pumps, Air-conditioners and dehumidifiers

1.2 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with general requirements.
- .2 Indicate:
 - .1 Equipment, and connections, together with control assemblies, auxiliaries and hardware, and recommended ancillaries which are mounted, wired and piped ready for final connection to building system, its size and recommended bypass connections.
 - .2 Piping, valves, fitting shipped loose showing final location in assembly.
 - .3 Control equipment shipped loose, showing final location in assembly.
 - .4 Dimensions, internal and external construction details, recommended method of installation with proposed structural steel support, mounting curb details, sizes and location of mounting bolt holes; include mass distribution drawings showing point loads.

- .5 Detailed composite wiring diagrams for control systems showing factory installed wiring and equipment on packaged equipment or required for controlling devices or ancillaries, accessories, controllers.
- .6 Details of vibration isolation.
- .7 Estimate of sound levels to be expected across each individual octave band in dB referred to A rating.
- .8 Type of refrigerant used (A1 or A2L type only).

1.3 MAINTENANCE DATA

- .1 Provide maintenance data for incorporation into manual specified in general requirements.
- .2 Indicate:
 - .1 Brief description of unit, indexed, with details of function, operation, control, and service for each component.
- .3 Manufacturer's installation instructions shall govern and unless otherwise noted, operation, maintenance, and service of items. Include names and addresses of spare part suppliers.
- .4 Include following:
 - .1 Provide for each unit, manufacturer's name, type, year, number of units, and capacity.

Part 2 Products

2.1 MANUFACTURERS

- .1 Lennox
- .2 Valent
- .3 Daikin

2.2 GENERAL DESCRIPTION

- .1 Furnish as shown on plans, Single zone Heating and Cooling Unit(s). Unit performance and electrical characteristics shall be per the job schedule
- .2 Configuration: Fabricate as detailed on prints and drawings:
 - .1 Return plenum/economizer section complete with power exhaust
 - .2 Filter section
 - .3 Cooling coil section
 - .4 Supply fan section
 - .5 Condensing unit section

- .3 The complete unit shall be cETLus listed.
- .4 The unit shall be ASHRAE 90.1-2016 compliant and labeled.
- .5 Each unit shall be specifically designed for outdoor rooftop application and include a weatherproof cabinet. Each unit shall be completely factory assembled and shipped in one piece. Packaged units shall be shipped fully charged with R-410 Refrigerant and oil.
- .6 The unit shall undergo a complete factory run test prior to shipment. The factory test shall include a refrigeration circuit run test, a unit control system operations checkout, a unit refrigerant leak test and a final unit inspection.
- .7 All units shall have decals and tags to indicate caution areas and aid unit service. Unit nameplates shall be fixed to the main control panel door. Electrical wiring diagrams shall be attached to the control panels. Installation, operating and maintenance bulletins and start-up report forms shall be supplied with each unit.
- .8 Efficiency:
 - .1 Units 6 tons of cooling and larger meeting an EER rating of 12.0 (9.6 for 12 ½ ton unit).
 - .2 Electronic controls with data link and diagnostic operation.
 - .3 Energy Star rated.

2.3 CABINET, CASING, AND FRAME

- .1 Panel construction shall be double-wall construction for all panels. All floor panels shall have a solid galvanized steel inner liner on the air stream side of the unit to protect insulation during service and maintenance. Insulation shall be a minimum of 2" thick with an R-value of 13.0 and shall be 2-part injected foam. Panel design shall include no exposed insulation edges. Unit cabinet shall be designed to operate at total static pressures up to 5.0 inches w.g.
- .2 Exterior surfaces shall be constructed of painted galvanized steel, for aesthetics and long-term durability. Paint finish will include a base primer with a high-quality polyester resin topcoat
- .3 Service doors shall be provided on the fan section, filter section, control panel section, and heating vestibule in order to provide user access to unit components. All service access doors shall be mounted on multiple, stainless-steel hinges and shall be secured by a latch system. Removable service panels secured by multiple mechanical fasteners are not acceptable.
- .4 The unit base shall overhang the roof curb for positive water runoff and shall seat on the roof curb gasket to provide a positive, weathertight seal. Lifting brackets shall be provided on the unit base to accept cable or chain hooks for rigging the equipment.

2.4 OUTDOOR/RETURN AIR SECTION

- .1 Unit shall be provided with an outdoor air economizer section. The economizer section shall be fully integral to the mechanical cooling and allow up to 100% of mechanical cooling if needed to maintain the cooling discharge air temperature. The outdoor air hood shall be factory installed and constructed from galvanized steel finished with the same durable paint finish as the main unit. The hood shall include moisture eliminator filters to drain water away from the entering air stream. The outside and return air dampers shall be sized to handle 100% of the supply air volume. The dampers shall be parallel blade design. Damper blades shall be gasketed with side seals to provide an air leakage rate of 1.5 cfm / square foot of damper area at 1" differential pressure in accordance with testing defined in AMCA 500. A barometric exhaust damper shall be provided to exhaust air out of the back of the unit. A bird screen shall be provided to prevent infiltration of rain and foreign materials. Exhaust damper blades shall be lined with vinyl gasketing on contact edges.
- .2 Control of the dampers shall be by a factory installed direct coupled actuator. Damper actuator shall be of the modulating, spring return type. A comparative enthalpy control shall be provided to sense and compare enthalpy in both the outdoor and return air streams to determine if outdoor air is suitable for "free" cooling. If outdoor air is suitable for "free" cooling, the outdoor air dampers shall modulate in response to the unit's temperature control system.
- .3 Unit shall be provided with a 100% outdoor air hood. The 100% outdoor air hood shall allow outdoor air to enter from the back of the unit, at the draw-through filter section. The outdoor air hood shall be factory installed and constructed from galvanized steel finished with the same durable paint finish as the main unit. The hood shall include a bird screen to prevent infiltration of foreign materials and a rain lip to drain water away from the entering air stream.

2.5 FILTERS

- .1 Unit shall be provided with a draw-through filter section. The filter rack shall be designed to accept a 2" prefilter and a 4" post filter. The unit design shall have a hinged access door for the filter section. The manufacturer shall ship the rooftop unit with 2" MERV 8 construction filters. The contractor shall furnish and install, at building occupancy, the final set of filters per the contract documents.
- .2 Provide two (2) sets of final filters.

2.6 COOLING COIL

- .1 The indoor coil section shall be installed in a draw through configuration, upstream of the supply air fan. The coil section shall be complete with a factory piped cooling coil and an ASHRAE 62.1 compliant double sloped drain pan.
- .2 The direct expansion (DX) cooling coils shall be fabricated of seamless high efficiency copper tubing that is mechanically expanded into high efficiency aluminum plate fins. Coils shall be a multi-row, staggered tube design with a minimum of 3 rows. All cooling coils shall have an interlaced coil circuiting that keeps the full coil face active at all load conditions. All coils shall be factory leak tested with high pressure air under water.

- .3 The cooling coil shall have an electronic controlled expansion valve. The unit controller shall control the expansion valve to maintain liquid subcooling and the superheat of the refrigerant system.
- .4 The refrigerant suction lines shall be fully insulated from the expansion valve to the compressors.
- .5 The drain pan shall be stainless steel and positively sloped. The slope of the drain pan shall be in two directions and comply with ASHRAE Standard 62.1. The drain pan shall have a minimum slope of 1/8" per foot to provide positive draining. The drain pan shall extend beyond the leaving side of the coil. The drain pan shall have a threaded drain connection extending through the unit base.

2.7 SUPPLY FAN

- .1 Supply fan shall be a single width, single inlet (SWSI) airfoil centrifugal fan. The fan wheel shall be Class II construction with fan blades that are continuously welded to the hub plate and end rim. The supply fan shall be a direct drive fan mounted to the motor shaft. Belts and sheaves are not acceptable due to the additional maintenance.
- .2 All fan assemblies shall be statically and dynamically balanced at the factory, including a final trim balance, prior to shipment.
- .3 Supply fan and motor assembly combinations larger than 8 hp or 22" diameter shall be internally isolated on 1" deflection, spring isolators and include removable shipping tie downs.
- .4 **Units 15 tons and under:** the fan motor shall be a totally enclosed EC motor that is speed controlled by the rooftop unit controller. The motor shall include thermal overload protection and protect the motor in the case of excessive motor temperatures. The motor shall have phase failure protection and prevent the motor from operation in the event of a loss of phase. Motors shall be premium efficiency.
- .5 The supply fan shall be capable of airflow modulation from 30% to 100% of the scheduled designed airflow. The fan shall not operate in a state of surge at any point within the modulation range.

2.8 VARIABLE AIR VOLUME CONTROL

- .1 The unit manufacturer shall install all power and control wiring.
- .2 **Units 15 tons and under:** the unit controller shall proportionally control the ECM motors on the supply fan based on space temperature. The unit controller shall increase/decrease the speed of the supply fan in order to maintain the space temperature within its setpoint and deadband. The unit controller shall provide discharge air temperature control with the compressor modulation.

2.9 HEAT PUMP HEATING

- .1 The evaporator coil, condenser coil, compressors and refrigerant circuit shall be designed for heat pump operation. The refrigerant circuit shall contain a 4-way reversing valve for the heat pump operation. The outdoor coil shall have an electronic expansion valve to control the refrigerant flow. The unit controller shall modulate the expansion valve to maintain compressor operation within the compressor operational envelope.
- .2 The refrigerant system shall have a pump-down cycle.
- .3 The unit shall have a natural gas furnace for hybrid heating. When the heat pump operation cannot maintain the discharge air temperature setpoint the natural gas furnace shall temper the airstream to the discharge air temperature setpoint.

2.10 CONDENSING SECTION

- .1 Outdoor coils shall be cast aluminum, micro-channel coils. Plate fins shall be protected and brazed between adjoining flat tubes such that they shall not extend outside the tubes. A sub-cooling coil shall be an integral part of the main outdoor air coil. Each outdoor air coil shall be factory leak tested with high-pressure air under water.
- .2 Fan motors shall be an ECM type motor for proportional control. The unit controller shall proportionally control the speed of the condenser fan motors to maintain the head pressure of the refrigerant circuit from ambient condition of (0,25)-120°F. Mechanical cooling shall be provided to (0, 25) ° F. The motor shall include thermal overload protection and protect the motor in the case of excessive motor temperatures. The motor shall have phase failure protection and prevent the motor from operation in the event of a loss of phase.
- .3 The condenser fan shall be low noise blade design. Fan blade design shall be a dynamic profile for low tip speed. Fan blade shall be of a composite material
- .4 The unit shall have scroll compressors. One of the compressors shall be an inverter compressor providing proportional control. The unit controller shall control the speed of the compressor to maintain the discharge air temperature. The inverter compressor shall have a separate oil pump and low oil safety protection.
- .5 Pressure transducers shall be provided for the suction pressure and head pressure. Temperature sensor shall be provided for the suction temperature and the refrigerant discharge temperature of the compressors. All of the above devices shall be an input to the unit controller and the values be displayed at the unit controller.
- .6 Each circuit shall be dehydrated, and factory charged with refrigerant and oil.
- .7 Refrigerant to be A1 or A2L classification.

2.11 REFRIGERATION DETECTION SYSTEM:

- .1 The Refrigerant detection system shall meet the requirements of CSA B52 and have the following functionality:
 - .1 Utilize a set point, nonadjustable in the field, to generate a digital output signal to initiate mitigation actions to both internal safeties and external components in the ductwork (dampers, electric coils etc.). Signal shall be generated in not more than 30 seconds from sensor exposure to refrigerant concentration of 25% LFL (+0\$, -1%)
 - .2 Sensor within the equipment, near potential source of leaks.
 - .3 Field calibration of the system is not allowed.
 - .4 Be capable of detecting the refrigerant used in the system.
 - .5 Have self diagnostics
 - .6 Energize fans upon failure of a self-diagnostic check
 - .7 Activate refrigerant safety shut off valves in the event of a leak being detected.

2.12 ELECTRICAL

- .1 Unit wiring shall comply with NEC requirements and with all applicable UL standards. All electrical components shall be UL recognized where applicable. All wiring and electrical components provided with the unit shall be number and color- coded and labeled according to the electrical diagram provided for easy identification. The unit shall be provided with a factory wired weatherproof control panel. Unit shall have a single point power terminal block for main power connection. A terminal board shall be provided for low voltage control wiring. Branch short circuit protection, 120- volt control circuit transformer and fuse, system switches, and a high temperature sensor shall also be provided with the unit. Each compressor and condenser fan motor shall be furnished with contactors and inherent thermal overload protection. Supply fan motors shall have contactors and external overload protection. Knockouts shall be provided in the bottom of the main control panels for field wiring entrance.
- .2 **Kilo Ampere Interrupting Capacity (kAIC) Rating**
 - .1 **Equipment shall be rated a interrupting capacity rating of 25 kAIC.**
 - .2 **All products supplied to the site shall meet or exceed this kAIC rating.**
 - .3 **The kAIC rating may be lowered to match or exceed the available fault current indicated on the Short Circuit Co-ordination Study completed by the electrical trade.**

2.13 SYSTEM CONTROL

- .1 Equipment control will be by the unit manufacturer and integral economizer controls.
- .2 System controls will be by Building Automation System Contractor.

2.14 CAPACITY

- .1 As indicated.

2.15 ACCESSORIES

- .1 600 mm (24") high roof curb.
- .2 Vibration rail (if not internally isolated).
- .3 Opposed blade economizer dampers.
- .4 Condenser coil hail guard.
- .5 Stainless steel vertical extension on flue gas discharge.
- .6 Stainless steel heat exchanger.
- .7 **Commission low speed fan setting to 57 Hz on two speed VFD systems.**

Part 3 Execution**3.1 INSTALLATION**

- .1 Install as per manufacturers' instructions on roof curbs provided by manufacturer as indicated. Provide all necessary continuous wolmanized wood blocking to install roof curb level complete with 20 gauge liner to ensure combustible wood blocking is not exposed in the building.
- .2 Manufacturer to certify installation, supervise start-up and commission unit.
- .3 Run drain line from cooling coil condensate drain pan to discharge over roof drain.

3.2 START-UP/COMMISSIONING

- .1 Unit manufacturer shall perform start-up and commissioning.

3.3 ELECTRICAL REQUIREMENTS

- .1 Field installed devices.
 - .1 Provide all field installed wiring required for all units that are equipped with power exhaust. Provide transformers as required.
- .2 Mount all accessories shipped loose onto the units.

3.4 REFRIGERANT LEAK DETECTION SYSTEM

- .1 This contractor shall provide all wiring between leak detection systems installed within the provided equipment and system components in the spaces served and ductwork system.
- .2 Specifically, the following shall occur for each independent system on registration of a refrigerant leak:
 - .1 Open all zone dampers in the affected system.
 - .2 Disable all electric reheat coils within the affected system.
 - .3 Activate field installed safety shut off valves within the affected refrigeration system.

- .4 Energize all fans within the affected ductwork system.
 - .5 Activate and refrigerant leak system specific ventilation systems.
 - .6 De-energize any other potential sources of ignition within the affected system.
- .3 All interlocks between field installed detection systems and associated safety system components shall be tested and verified to operate as per the requirements of CSA B52.

3.5 TRAINING

- .1 Provide 2 hours training to owner's staff on the care, maintenance and operation of the equipment. Dedicated visit to site is required as it will not be paired with equipment startup.

3.6 SPARE PARTS

- .1 Two (2) complete sets of filters.
- .2 One (1) set of spare belts.

3.7 WARRANTY

- .1 Warranty Start Date:
- .1 Warranty period starts as of the date of Ready for Takeover.
 - .2 Warranty start dates based on shipment date, start up date, substantial completion date, etc. are not applicable.
- .2 Warranty Duration:
- .1 One (1) year on parts and labour on all components.
 - .2 Five (5) years on compressor.
 - .3 Ten (10) years on stainless steel heat exchanger.
 - .4 Manufacturer hereby warrants refrigeration compressors in accordance with GC 24, but for five (5) years.
 - .5 Manufacturer hereby warrants the gas heat sections for a minimum of ten (10) years.

END OF SECTION

PART 1 General

1.1 GENERAL REQUIREMENTS

- .1 Conform to General Conditions for Mechanical Trades.
- .2 Related Work Specified Elsewhere.
 - .1 General Conditions for Mechanical Trades
 - .2 Plumbing & Drainage
 - .3 Heating, Ventilation & Air Conditioning
 - .4 Heating, Ventilation & Air Conditioning Equipment
 - .5 Electrical

1.2 DESCRIPTION OF SYSTEM

- .1 Furnish and install all components, devices and control wiring for a fully integrated Energy Management and Environmental Control System incorporating Direct Digital Control (DDC), and equipment monitoring. The system shall control/monitor HVAC and plumbing equipment and systems as specified in this section. The work shall include but is not limited to the following:
 - .1 All necessary hardware, software, control panels, control wiring, field devices, installation, documentation, and owner training as specified.
 - .2 The installed system shall incorporate electronic and digital control devices to perform the control sequences and monitoring outlined herein. Specific control sequence requirements are as detailed elsewhere in this Section of the specification.
 - .3 Control and monitoring of the equipment and systems shown on the drawings (refer also to 'Sequence of Operation' for additional details).
 - .4 Control valves shall be supplied by this Trade but installed in the piping system by the Mechanical Trade complete with transitions and unions as required.
 - .5 Testing, debugging, calibrating, adjustment, programming, and confirmation of total system operation.

1.3 MANUFACTURER AND INSTALLING CONTRACTOR

- .1 The temperature control/programmable device manufacturer shall be Distech, integrated to the WRDSB TAC Vista server/BAS system automation.
- .2 Energy Controls, the local Distech integrator is available at phone 519-893-2638.
- .3 Any new building must be a seamless extension of the current Energy Management and Building Control System.
 - .1 The existing TAC Vista software is, and shall continue to be, the only head-end BAS server for the entire School Board.

- .2 The head-end server contains the secure Energy Management Settings (i.e. Master Setpoints & Schedules) that are sent to all schools in real-time. The control system must be an extension of the head-end server and be able to be managed exclusively through the Vista head-end server.
- .3 Monitoring of all school board control systems are done in real-time and must be presented at the exclusive Vista head-end server as first-priority data.
- .4 The Vista head-end server has all the required controller databases and software to be able to centrally maintain and modify network configuration and controller software for the entire School Board. The Vista head-end server is the only system that can access the LacNet programming variables inside the controllers for real-time configuration of setpoint and time scheduling parameters.
- .5 The graphics and controller database must be presented inside the Vista head-end server in its native format in order to preserve the real-time speed, integrity and multi-site administration of the entire system.

1.4 SCOPE OF WORK

- .1 Refer to drawings and specification for complete scope.
- .2 New dual fuel heat pump RTU for multi-purpose room with VVT control dampers. New RTU is dual fuel heat pump & backup gas heat.
- .3 Removal of existing pneumatic and/or electric thermostats and TCV's with new DDC thermostats and TCV's in renovation spaces.
- .4 Remove any redundant or obsolete pneumatic tubing in the area of construction.
- .5 Upgrade existing controls in the area of construction.
- .6 RTU economizer control.
- .7 Heat loss alarm.
- .8 Thermostats rough-in by Electrical Contractor.
- .9 Ventilation lockout.
- .10 Minimum outside air schedule.
- .11 CO2 controls
- .12 Mechanical cooling 24.5degC (+/- 1degC).
- .13 Trending.
- .14 Summary page in graphics (fan status, MAT, SAT, CO2, Schedule).
- .15 Revision summary control drawings.
- .16 Controller locations shown on graphics.
- .17 Standby schedule for all systems.
- .18 Global humidity used on economizers. Humidity reset of outside air high limit shall be done based on closest three (3) RH sensors.

QUALITY ASSURANCE

- .1 The system components shall be listed by Underwriters Laboratories Inc. and Canadian Standards Association.
- .2 The system control products shall be stored and handled according to manufacturer' recommendations.

- .3 The work shall be performed by skilled technicians all of whom shall be properly trained and qualified for this work.

1.6 SUBMITTALS

- .1 Prior to the installation of any equipment, the Contractor shall provide the Consultant with shop drawings and specifications for all devices and equipment used for the complete system installation. Shop drawings shall include the following:
 - .1 Identified schematic control diagrams for all systems, each diagram indicating or referencing input / output connection points, control components, component catalogue numbers, operation sequence, interlocking and RPU's to which they are connected.
 - .2 Complete network schematic indicating all programmable controllers and data connections.
 - .3 Detailed listing of inputs and outputs of each programmable controller.
 - .4 Control damper schedule indicating damper size, required torque and blade type.
 - .5 Technical data sheets / manufacturer application manuals of each system component.
- .2 Upon completion of the installation and prior to acceptance and Owner training, the Contractor shall furnish the Consultant with three copies of installation and operation manuals for the system. Each manual shall include:
 - .1 Record drawings, including plan layout indicating major device locations and wiring diagrams as finally installed.
 - .2 All shop drawings, incorporating all required revisions to reflect as-built conditions.
 - .3 The Contractor shall also keep one copy of backup programs for the system archived in a software storage vault at their business location.

Part 2 Products

2.1 GENERAL

- .1 The control system shall be a Tour Andover (TAC) Xenta/Distech building automation system (BAS).
- .2 The system shall integrate the operation of intelligent building management controllers distributed into the network.
- .3 The DDC System shall be generally comprised of the following devices to achieve the control functions described in this section:
 - .1 Xenta/Distech programmable controllers
 - .2 Distech input/ output programmable I/O modules.

- .3 Control relays.
- .4 Control dampers and valves.
- .5 Sensors, actuators and other input/output devices.
- .4 Controllers shall execute the application programs, calculations, and commands to provide the control function specified for that unit. Each controller shall include its own micro-computer controller, power supply, input/output modules, termination modules and real time clock.
- .5 Controllers shall be capable of full control functionality and alarm reporting independently or as a part of the DDC network.
- .6 The system shall be stored in flash ram so no batteries are required.
- .7 Each control device shall be modular and expandable to provide additional inputs and outputs and control functionality for that device.
- .8 Each controller shall be able to transfer and receive data via the network for performance of control functions.
- .9 The system shall be modular, permitting expansion by adding hardware and software without changes in communication or processing equipment.
- .10 The complete system shall be capable of communication over a LonWorks network.
- .11 The controllers shall monitor the status of all overrides and include this information in logs and summaries to inform the operator that automatic control has been inhibited.
- .12 Controllers shall continuously perform self-diagnostics, communication diagnosis and diagnosis of all subsidiary equipment and provide both local and remote annunciation of any component failures.
- .13 Controllers shall activate an orderly shutdown of their operation in the event of loss of normal electrical power. Non-volatile memory shall be incorporated for all controller configuration data. The controllers shall automatically resume full operation without manual intervention.
- .14 The controllers shall have sufficient memory to support their own operating system and data bases including:
 - .1 control processes
 - .2 energy management applications
 - .3 alarm management
 - .4 trend data
 - .5 operator input/output
 - .6 remote communications
 - .7 manual override monitoring

- .15 Controllers shall incorporate the following software features:
 - .1 Energy management:
 - .1 Time of Day Scheduling
 - .2 Calendar Based Scheduling
 - .3 Holiday Scheduling
 - .4 Optimal Start and Stop
 - .5 Demand Limiting
 - .6 Heating/Cooling Interlock
 - .2 Alarm Management:
 - .1 Alarm Management shall be provided to monitor, buffer and direct alarm reports to operator devices and memory files. The controllers shall perform alarm analysis and filtering to minimize operator interruptions due to non-critical alarms, minimize network traffic and prevent alarms from being lost.
 - .2 All alarm or point change report shall include the points English language description and the time and date of occurrence.
 - .3 The user shall be able to define the specific reaction for each point, the priority level (3 in total) and ability to inhibit alarm reporting for each point.
 - .4 The user shall be able to define conditions under which point changes need to be acknowledged by an operator and logged for analysis at a later date.
 - .5 The user shall be able to print, display or store a unique 60 character alarm message to more fully describe the alarm condition or direct operator response. The message shall be customizable to describe each individual alarm.
 - .6 In web access applications only critical alarms shall initiate a call to a remote operator device, otherwise call activity shall be minimized by time stamping and saving reports until a manual request is received or until the buffer space (minimum 50 alarms) is full.
 - .3 Trend Logs:
 - .1 Controllers shall provide an automatic roll-over trend log, which stores records up to an operator-selected number at an operator-selected sampling rate and then overwrites the oldest record with each new record.
 - .2 Sample intervals shall be from 1 minute to 24 hours.
 - .3 Provide graphical and tabular displays.
 - .4 Runtime Totalization:
 - .1 The controllers shall automatically accumulate and store runtime hours for binary points with a sampling resolution of 1 minute. The user shall have the ability to define a warning limit to trigger maintenance or user-defined messages.

- .5 Custom Programming:
 - .1 The controllers shall permit user defined custom control processes based on:
 - .1 any system measured data or status
 - .2 any calculated data
 - .3 any results from other processes
 - .4 Boolean logic
 - .2 The custom processes may be triggered by:
 - .1 Time-of-day
 - .2 calendar date
 - .3 events (point alarm etc.)
- .16 The control strategy for each control loop shall be performed by software within the controller. The sequence of events required for each control loop is described for each system in the control sequence.
- .17 Outdoor air temperature indication shall be available at each controller as an integral part of the control strategies for that controller. Should the network transmission of the common outdoor air temperature (or any other common value) fail, then each controller shall use the last good value received.
- .18 Controls and Requirements for VVT Systems
 - .1 Where VVT controls are specified, units are to operate as part of a Variable Volume/Variable Temperature System complete with all necessary controls including zone dampers, temperature sensors, static pressure sensor probes and bypass damper.

2.2 NETWORK ARCHITECTURE

- .1 The controllers on the local network shall communicate via a two wire LonTalk TP/FT-10 network.

2.3 CONTROL PANELS

- .1 Control panels shall be fully enclosed cabinets with all steel construction. Cabinets shall have a hinged door with locking latch or bolt-on cover plate. All cabinet locks shall be common keyed. Cabinets shall be finished with two coats of paint.

2.4 TEMPERATURE SENSORS

- .1 Provide thermistor temperature sensors, not requiring transmitters, to measure temperature.
- .2 Accuracy shall be +/-0.2°C from 0 to 70°C.

- .3 Temperature sensors shall be Greystone EC200 series.
- .4 Space sensors in occupied areas shall be type AE or equal having an integral push button for unoccupied override and an integral slider to adjust set point (LED display not required).
- .5 In corridors and where noted on the drawings, provide stainless steel plate type sensors (push button override and LED display not required), type AS.
- .6 Duct temperature sensors shall be type B having a stainless steel probe length to suit application and ABS enclosure. Duct averaging temperature sensors shall be type FD having an element length to suit application, copper probe and ABS enclosure.
- .7 Immersion temperature sensors shall be type C having a ¼" OD stainless steel probe, 4" long and ABS enclosure. Immersion sensors shall be complete with thermowells. Thermal conductive compound shall be added inside the thermowell to provide optimum thermal transfer from the fluid to sensor. Stainless steel thermowells shall be used for steel pipe and brass thermowells shall be used in copper pipe.

2.5 CARBON DIOXIDE SENSORS

- .1 Sensors shall Greystone CDD series or equal having the following features:
 - .1 0-2000 ppm factory default detection range, field adjustable.
 - .2 Non-dispersive infrared sensing element with self-calibration algorithm.
 - .3 Guaranteed 5 year calibration interval.
 - .4 Powered by either AC or DC source.
 - .5 Accuracy: within 50 ppm or 3% of reading (whichever is greater).
 - .6 Operating humidity range: 0-95% RH.
 - .7 Operating temperature range: 0 to 50°C or greater.
 - .8 Stability: less than 2% full scale in 15 years
 - .9 Response time: less than 2 minutes for 90% step change.
- .2 Duct mounted sensors shall be complete with ABS enclosure complete with sampling tube.
- .3 Space mounted sensors shall be executive space type without LCD display.

2.6 MOTORIZED CONTROL DAMPERS (PROVIDED BY BAS, INSTALLED BY MECH.)

- .1 Control dampers shall be the parallel or opposed blade type as below or as scheduled on drawings.
 - .1 Outdoor and/or return air mixing dampers and face and bypass (F & BP) dampers shall be parallel blade, arranged to direct air-streams toward each other.
 - .2 Other modulating dampers shall be the opposed blade type.
 - .3 Two-position shutoff dampers may be parallel or opposed blade type with blade and side seals.

- .2 Damper frames shall be 13 gauge galvanized steel channel or 1/8 in. extruded aluminum with reinforced corner bracing.
- .3 Damper blades shall not exceed 20 cm (8 in.) in width or 125 cm (48 in.) in length. Blades are to be suitable for medium velocity performance (10 m/s [2000 fpm]). Blades shall be not less than 16 gauge.
- .4 Damper shaft bearings shall be as recommended by manufacturer for application, oil impregnated sintered bronze or better.
- .5 All blade edges and top and bottom of the frame shall be provided with replaceable butyl rubber or neoprene seals. Side seals shall be spring-loaded stainless steel. The blade seals shall provide for a maximum leakage rate of 50 L/s m² (10 cfm per ft²) at 1000 Pa (4 in. w.g.) differential pressure. Provide air foil blades suitable for a wide-open face velocity of 7.5 m/s (1500 fpm).
- .6 Individual damper sections shall not be larger than 125 cm x 150 cm (48 in. x 60 in.). Provide a minimum of one damper actuator per section.
- .7 Modulating dampers shall provide a linear flow characteristic where possible.
- .8 Dampers shall have exposed linkages.

2.7 WATER CONTROL VALVES

- .1 Heating and cooling control valves shall be Belimo CCV series characterized ball valves, complete with chrome plated brass trim and NPT female pipe connections. Radiation valves shall be complete with non-spring return modulating actuators. Control valves for coils heating a portion of outdoor air shall have spring return modulating actuators.
- .2 Control valves shall be sized to provide approximately one half the circuit branch pressure drop to obtain good modulation control but they shall be no smaller than two pipe sizes less than the pipe they are installed in.

Part 3 Execution

3.1 INSTALLATION

- .1 Installation
 - .1 All controllers and components in the system and on the network shall be installed according to manufacturer recommendations, general installation standards for digital controls and in accordance with the approved shop drawings.
 - .2 Locate room sensors in the locations shown on the mechanical drawings. All sensors shall be mounted at barrier free height (3'-11" (1175 mm) above finished floor).

- .3 All control components for off site system access shall be located where noted on the drawings. The Electrical Contractor shall provide all required connections / cabling for off site access to the web access components.
 - .4 All programmable controllers, web access components, relays and other control components shall be located within control panels. Control Panels shall be wall mounted and shall be located within suspended ceiling spaces or other locations approved by the Consultant.
 - .5 The Electrical Contractor will provide hand-off-auto switches in all starters controlled by the BAS.
-
- .2 Generally duct mount carbon dioxide sensors shall be used where specified for air handling units; but, for gyms and single zone libraries, a wall mount carbon dioxide sensor shall be mounted next to the room temperature sensor.
 - .3 All carbon dioxide levels which are measured by the carbon dioxide sensors shall be made available to the Owner in the form of trend logs. Record readings at 10 minute intervals and keep them for at least 30 days.
 - .4 Freeze-stats shall be installed so that their sensing element runs horizontally across the coil face (not diagonally) with no more than 12" vertical drops at the outside coil frame. The full face of the coil shall be covered with no horizontal runs being more than 12" apart. The top and bottom horizontal run shall be within 6" of the coil frame. If more than one freezestat is required they shall be wired in series in order to detect a low temperature in portion of the coil. The sensing elements shall be firmly secured in place to avoid vibration without added air restriction.

3.2 SYSTEM START-UP AND ACCEPTANCE

- .1 Upon completion of installation, test, adjust and calibrate controls provided under this Section.
- .2 On system completion, a demonstration of complete system operation shall be made to the Owner's authorized representative and Consultant.
- .3 The Consultant shall verify through the Owners representatives that the entire system is complete and operating to the satisfaction of the Owner before final acceptance is approved.

3.3 TRAINING

- .1 The Contractor shall provide competent instructors to give full instruction to designated personnel in the adjustment, operation and maintenance of the system installed rather than a general training course. Instructors shall be thoroughly familiar with all aspects of the subject matter they are to teach. All training shall be held during normal work hours of 8:00 a.m. to 4:30 p.m. weekdays as follows:

- .2 Provide 4 hours of training for Owner's operating personnel. Training shall include:
 - .1 Explanation of drawings, operations, and maintenance manuals
 - .2 Explanation of web access program
 - .3 Explanation of adjustment procedures
 - .4 Trend Analysis

3.4 WARRANTY

- .1 Warranty Start Date:
 - .1 Warranty period starts as of the date of Ready for Takeover.
 - .2 Warranty start dates based on shipment date, start up date, substantial completion date, etc. are not applicable.
- .2 Warranty Duration:
 - .1 Warrant in writing, all provided equipment, accessories, installations, software and firmware against defects in workmanship and materials for a period of one (1) year commencing from the date of Ready for Takeover.
 - .2 Maintain the affected parts operational during repair of defective equipment covered by the warranty.
 - .3 Provide warranty service at no cost to the owner for the guarantee period, this shall include, but not limited to the following:
 - .1 Emergency repair service on regular working hour basis during warranty.
 - .2 Replacing defective parts and components as required.
 - .3 Servicing by factory trained and employed service representatives of system manufacture.
 - .4 System software support.
 - .4 Supplier shall have an in-place support facility within 32 km (20 miles) of the site with technical staff, spare parts inventory and all necessary test and diagnostic equipment.
- .3 Warranty Coverage:
 - Applies to parts and labour.

3.5 IDENTIFICATION

- .1 Provide system identification and provide nameplates identifying the following (nameplates shall be keyed to the wiring diagrams):
 - .1 Duct mounted sensors.
 - .2 Control panels (identify as to equipment / systems controlled). Each panel shall include an as-built drawing showing all the connected control points.

3.6 TESTING AND BALANCING

- .1 During the system testing and balancing by the Testing and Balancing Agency, demonstrate the operation of all controls. During balancing procedures, set controls to a fixed mode (bypass damper locked fully closed and all zone dampers locked fully open) to prevent any changes during the balancing procedure.

3.7 ELECTRICAL WIRING

- .1 All wiring shall be installed to the standards specified in the Electrical Division.
- .2 Use Echelon recommended jacket cable for all network wiring, colour-coded to WRDSB standards.
- .3 Run all wiring in EMT conduit where exposed, where running within new concrete block walls and where required by the Ontario Electrical Code. Plenum rated cable shall be used in return air ceiling plenums.
- .4 Control relays necessary for BAS operation shall be provided by the Temperature Control Contractor but all contactors and their power supplies handling power wiring to the equipment shall be by the Electrical Contractor.

Part 4 Sequence of Operation

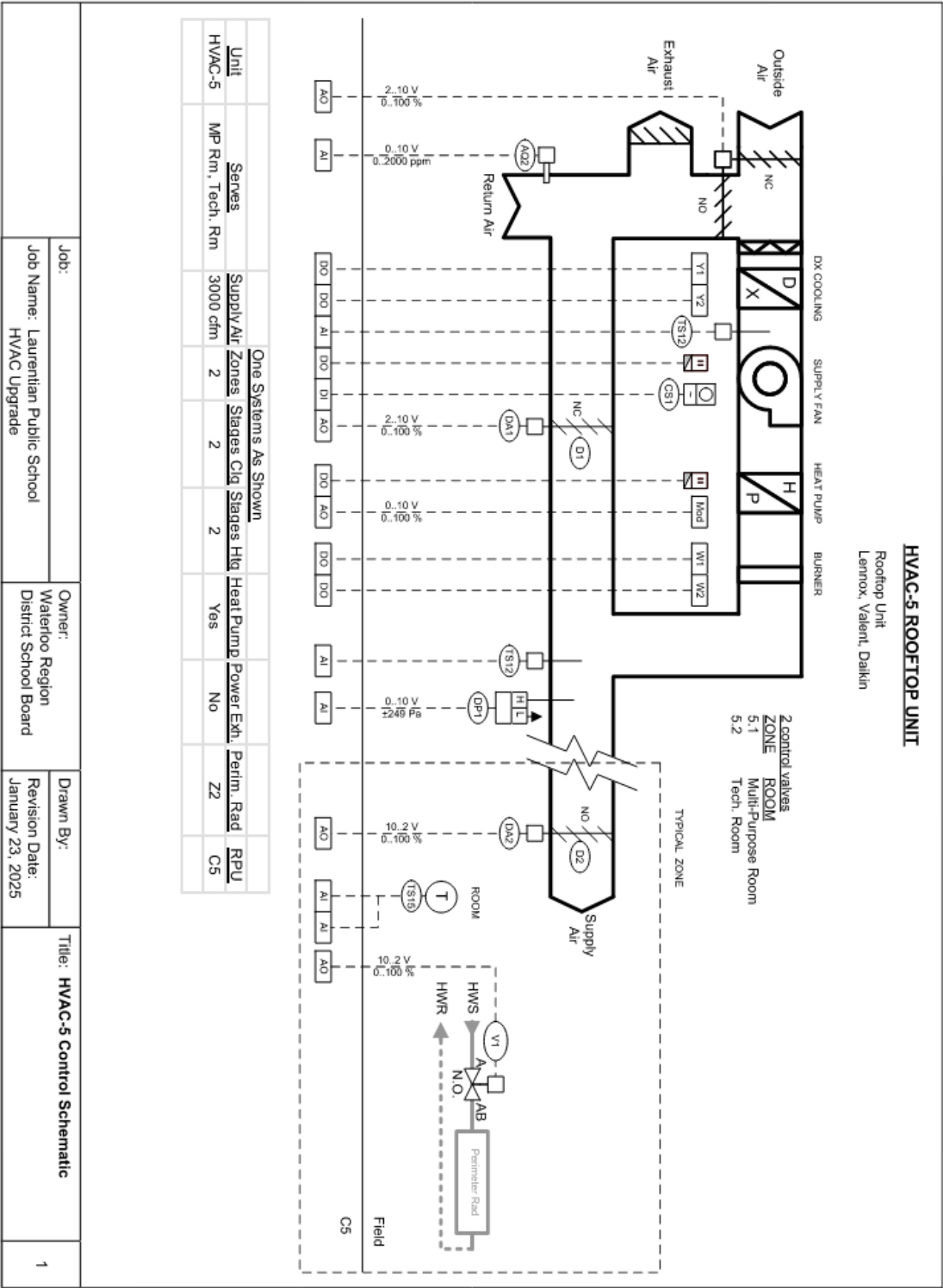
4.1 GENERAL

- .1 All setpoints shall be adjustable.
- .2 Outdoor air temperature shall be broadcasted to all controllers.
- .3 Heating mode: Heating is enabled between October 15 and April 15 or if the outdoor air temperature is below 10°C. This heating mode is used in all controllers for the building.
- .4 Cooling Mode: Mechanical cooling is enabled if the outdoor air temperature is above 18°C.
- .5 Occupancy mode shall be determined by a weekly schedule with an annual holiday schedule. Each system shall have this schedule but there shall be provision for operating under a general (to the building) schedule as well. An adjustable parameter shall be available to select the local or general schedule for each system.
- .6 Lead/lag: Devices designed for lead lag operation shall operate in automatic lead/lag mode to equalize run time. If the lead unit fails the lag shall automatically start and an alarm shall be generated. The lead unit shall be advanced through the series of devices in sequence every Tuesday at noon.
- .7 Guidance Office heating:
 - First stage heat: perimeter radiation
 - First stage heating through RTU: supply air discharge temperature set to 20degC (lock out on cooling)
 - heat provided from heatpump down to 5 deg C
 - below 5 deg C heat is provided by 2 stages of gas heat.

4.2 EQUIPMENT SERVICES

- .1 See the graphical sequence of operations attached (for reference only) at the end of this specification for equipment and systems. Please note that this is not a complete representation of all equipment and systems. Controls contractor to review all drawings and specifications and provide complete controls and sequence.

END OF SECTION



SEQUENCE OF OPERATION

UNOCCUPIED MODE

The supply fan is off, the power exhaust fan is off (where applicable), the mixing dampers are in the 0% outside air position, the heating is off and the cooling is off. The bypass damper is in the 100% open position. The zone dampers are in the 50% open position. The system cycles on a call for unoccupied heating, with the supply air static pressure setpoint increased by 20%. If the override pushbutton is pressed, the system will switch to the occupied mode for 2 hours (adjustable).

OCCUPIED MODE

Fan Operation

The supply fan operates continuously. An optimized start routine is provided for heating and cooling.

Zone Damper

The room sensor modulates the zone damper between min. and max. settings to maintain setpoint. The setpoint is adjustable +/-1°C at the sensor. The control is reverse acting when the supply air temperature is more than 1°C above room temperature and direct acting when the supply air temperature is more than 1°C below room temperature. If the system mode is different from the zone mode (e.g. system is in heating mode but zone requires cooling), the zone damper closes to a reduced minimum position to minimize overheating/overcooling.

System Heating/Cooling Decision Process

The system mode is determined by the number of zones that deviate from their respective zone heating/cooling setpoints. If the total number of zones requesting heating outnumber (or are equal to) the total number of zones requesting cooling, the system will go to heating mode. The first stage of heating is provided by the rads. If the total number of zones requesting cooling outnumber the total number of zones requesting heating, the system will go to cooling mode. Once in the heating or cooling mode, the reference zone becomes the zone with the greatest call. The system will lock-in the selected mode until all zones are satisfied. If any zone is deprived of ventilation air for more than 20 minutes, the system will "unlock", go into forced ventilation mode for 5 minutes, and then reselect the required mode of operation. Zones designated as "slave zones" (typically corridors) cannot request heating or cooling, but will utilize heating/cooling when it is available.

Ventilation Mode

The system operates in ventilation mode (no heating or cooling) under the following conditions:

- 1) No zones are calling for heating or cooling.
- 2) System is switching between heating and cooling (system operates in ventilation mode for 5 minutes).
- 3) One or more zones have been operating at a reduced min. position for more than 20 minutes (system operates in forced ventilation mode for 5 minutes).

System Heating Control

The perimeter heating is the first stage of heating.

Stage 1 and stage 2 heating are controlled from the reference zone as follows:

Reference Zone Call for Heat

Stage 1 On	1.0°C
Stage 1 Off	0.5°C
Stage 2 On	1.5°C
Stage 2 Off	1.0°C

System Cooling Control

Stage 1 and stage 2 cooling are controlled from the reference zone as follows:

Reference Zone Call for Cooling

Stage 1 On	1.2°C
Stage 1 Off	0.5°C
Stage 2 On	1.5°C
Stage 2 Off	0.9°C

Job:	Owner:	Drawn By:	Title:
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SEQUENCE OF OPERATION (CONTINUED)

Economizer Operation

Economizer operation will be substituted for first stage cooling when the outside air temperature is suitable. For units with power exhaust, the exhaust fan runs when the outside air damper is more than 50% open. The CO₂ sensor acts as a high limit and will increase the amount of minimum outside air as the CO₂ level increases from 1000 ppm to 1200 ppm. During morning warm-up or cool-down the outside air minimum position is set to zero.

Bypass Operation

The supply air static pressure sensor modulates the bypass damper between minimum and maximum settings to maintain setpoint.

Limits & Safeties (VVT ver. 3)

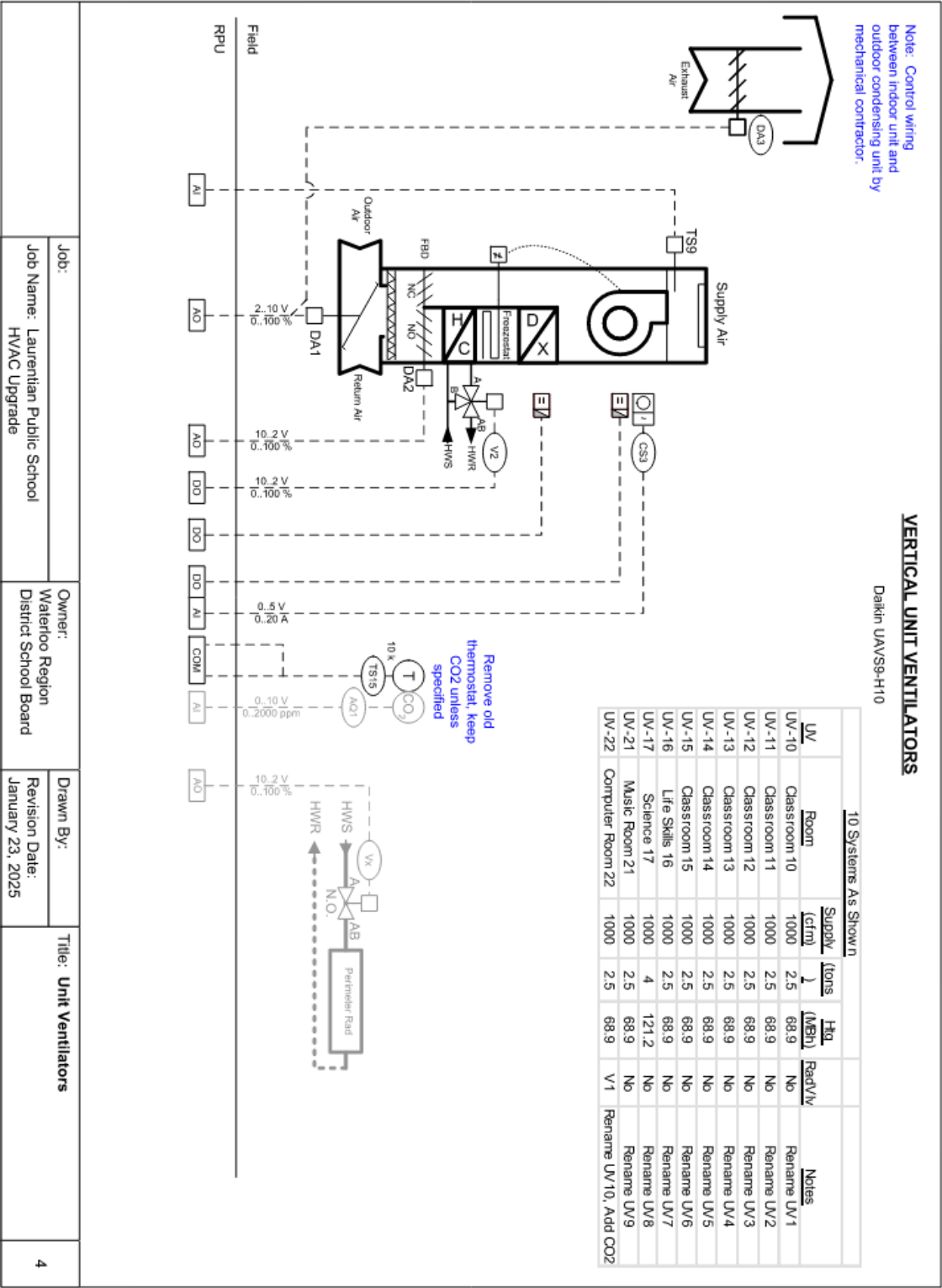
- 1) If the outside air temperature exceeds the average zone temperature, the mixing dampers return to minimum outside air position.
- 2) The maximum amount of outside air is limited based on the outside air temperature to prevent excessively low supply air temperatures during startup.
- 3) The mixed air temperature sensor acts as a low limit to ensure temperature does not fall below setpoint. In applications where the mixed air sensor is located after the DX coil, the setpoint is reduced when DX cooling is enabled.
- 4) The supply air temp. sensor acts as a high limit for heating (48/35°C, 45/30°C) and a low limit for cooling (5/10°C, 8/13°C).
- 5) The supply air temperature sensor acts as a software freeze-stat (1/5°C, 3 min. delay, auto reset after 5 minute delay).
- 6) The supply fan has a delay-off time of 90 seconds.
- 7) DX cooling has a minimum-off time of 5 minutes.
- 8) DX cooling is disabled when the outside air temperature is below the global DX disable setpoint or when the fan is off.
- 9) Gas heating is disabled when the outside air temperature is above the global heating disable setpoint or when the fan is off.
- 10) Stage 1 gas heating has a minimum run time of 3 minutes.
- 11) During ventilation mode, if the supply air temperature falls below 15°C for more than two minutes, stage 1 heating will turn on until the temperature exceeds 25°C (to improve comfort).
- 12) The default zone setpoint is increased by 1°C when mechanical cooling is enabled (providing heating is disabled).
- 13) When the ventilation lockout switch is engaged, the outside air dampers close, and the system switches to unoccupied mode of operation.
- 14) Minimum outside air is set to zero when the global ventilation schedule is off (stand-by occupancy).

Alarms

An alarm will be generated upon the following conditions:

- 1) Fan status does not match start/stop signal.
- 2) Mixed air temperature too high (50/48°C) or too low (5/7°C).
- 3) Supply air temperature too high (60/58°C) or too low (5/7°C).
- 4) Space temperature too high (42/40°C) or too low (14/16°C).
- 5) Supply air static pressure too low (10/20 Pa) or too high (240/230 Pa).
- 6) Weekly fan runtime limit exceeded.
- 7) Return air CO₂ too high (1700/1650 ppm) or too low (250/300 ppm).
- 8) Software freeze-stat tripped.

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Job Name: Laurentian Public School HVAC Upgrade	Waterloo Region District School Board	Revision Date: January 23, 2025	HVAC-5 Control Schematic
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SEQUENCE OF OPERATION

Unoccupied Mode

The fan is off, the heating valve is open, the face & bypass damper is in the bypass position, the DX cooling is off and the mixing dampers are in the 0% outside air position. The fan cycles with full heating to maintain the unoccupied heating setpoint (initially 17.5°C). If the pushbutton on the room sensor is pressed, the system will revert to occupied mode for a period of 2 hours.

Occupied Mode

An optimized start routine for heating advances the system start time when morning warm-up is required. The room temperature sensor modulates the mixing dampers in sequence with DX cooling to maintain the cooling setpoint, and modulates the heating valve and face & bypass dampers in sequence to maintain the heating setpoint. The setpoint can be adjusted +/-2°C at the room sensor. Fan status is monitored by a current switch.

Limits and Safeties

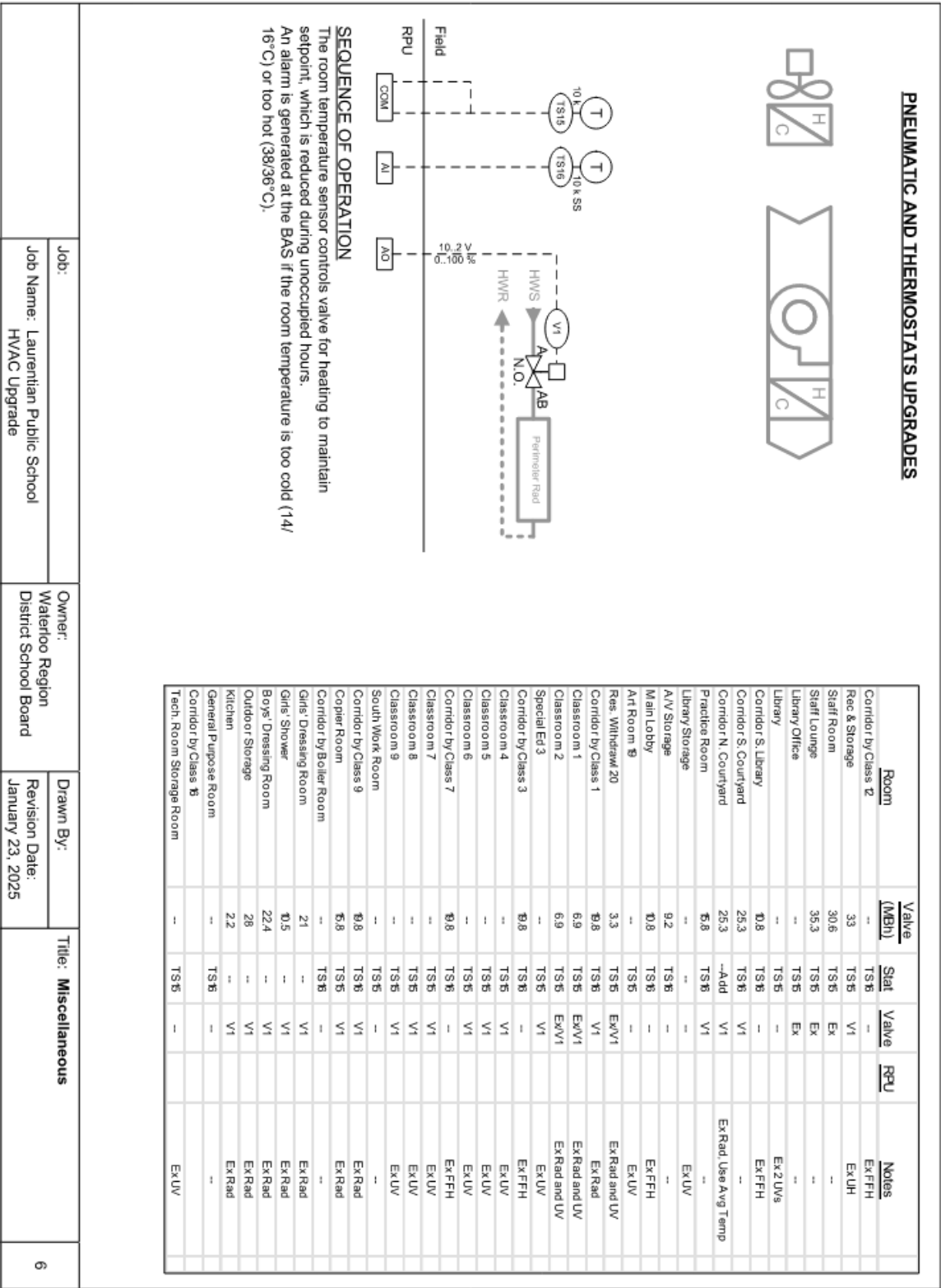
- 1) If the outside air temperature exceeds the free cooling setpoint based on outdoor temperature and humidity, the mixing dampers return to minimum position.
- 2) Mixed air damper minimum position control is provided during occupied periods (initially 10% OA).
- 3) Air quality sensor AQ1 increases the amount of minimum outside air as the space CO₂ reading increases from 1000 ppm to 1200 ppm.
- 4) The fan must be running before the mixing dampers and DX cooling will operate.
- 5) The supply air sensor acts as a low limit to ensure temperature does not fall below setpoint (initially 16°C, reset to 13°C on a call for free cooling).
- 6) A software freeze/stop on the supply air temperature shuts the fan down and closes the outdoor air damper when the supply air temperature is below 3°C for 30 seconds (resets at 6°C with 5 minute delay before restart).
- 7) Heating valve V2 opens as the outside air temperature drops from 1°C to -5°C.
- 8) If the hard-wired freeze/stop trips, the fan shuts down, outside air damper closes and heating valve opens.
- 9) DX cooling is disabled when the outside air temperature falls below the global mechanical cooling disable setpoint (initially 14°C).
- 10) DX cooling has a minimum off time of 5 minutes.
- 11) DX cooling has a supply air temperature low limit (6/12°C).
- 12) The face & bypass damper is in the face position when DX cooling is operating.

Alarms

An alarm is indicated at the operator's terminal if any of the following occur:

- 1) Fan status does not match fan start/stop signal.
- 2) Room temperature too high (36/34°C) or too low (14/16°C).
- 3) Supply air temperature too high (65/60°C) or too low (5/10°C).
- 4) Room CO₂ level too high (1700/1600 ppm) or too low (250/300 ppm).
- 5) Software freeze/stop tripped.
- 6) Fan runtime exceeded weekly runtime setpoint.

Job:	Owner:	Drawn By:	Title:
Job Name: Laurentian Public School HVAC Upgrade	Waterloo Region District School Board	Revision Date: January 23, 2025	Unit Ventilators Sequence
			5



Division 26 Common Requirements for Electrical

26 00 11	Electrical Specification Index
	Common Contract Requirements for Electrical
26 01 13	Electrical Supplemental Tender Form
26 01 15	Electrical Allowances and Fees
26 01 16	Electrical Contract General Requirements
26 01 17	Demolition and Renovation
26 01 20	Commissioning and Integrated Testing of Life Safety and Fire Protection System
	Common Work Results for Electrical
26 05 19	Wires and Cables
26 05 20	Splitter, Junction, and Pull Boxes
26 05 21	Outlet Boxes, Conduit Boxes, and Fittings
26 05 22	Wire and Box Connectors – 0 –1000 V
26 05 26	Grounding Secondary
26 05 33	Conduits, Conduit Fastenings, and Conduit Fittings
26 05 75	Auxiliary Systems
	Low-Voltage Transformers
26 22 13	Dry Type Transformers
	Switchboard and Panelboards
26 24 16	Panelboards
	Low-Voltage Distribution Equipment
26 27 26	Wiring Devices
	Low-Voltage Circuit Protective Devices
26 28 16	Disconnect Switches
	Low-Voltage Controllers
26 29 13	Starters and Contactors
	Lighting
26 51 13	Lighting Equipment

Division 28 Electronic Safety and Security

	Fire Detection and Alarm
28 31 25	Fire Alarm System (Addressable)

END OF SECTION

Part 1 General

1.1 INSTRUCTIONS TO BIDDERS

- .1 The Electrical Supplemental Tender Form must be submitted to the architect and consultant (admin@deiassociates.ca) within 2 hours of tender closing. Electrical contractors shall identify all sub-contractors he/she intends to use and must complete all information requested. The requisite information shall be given at the office of the Consultant. Contractor shall sign and date this page and initial and date each page thereafter.
- .2 Should the Electrical Supplemental Form not be submitted then the contractor shall use Basis of Design manufacturers as listed.
- .3 CONTRACTOR
I/We certify that I/We have the authority to bind the company.

COMPANY NAME

AUTHORIZED SIGNATURE

ADDRESS

PRINTED SIGNATURE

CITY

TITLE

TELEPHONE NUMBER

DATE

CONTRACTOR'S NAME: _____ DATE: _____

.4 SUB-CONTRACTORS

The Contractor shall state below the name of the Public Address, Security, Co-ordination Study, Computer Network, Life Safety Systems Commissioning Agent Sub-contractor he intends to use, which shall not be changed without the consent of the Consultant.

Life Safety Systems Commissioning Agent _____

.5 The Stipulated Bid Sum shall be for the basis of design manufacturer or supplier equipment only, unless otherwise indicated. Where a choice of this equipment is given, this Contractor shall indicate the supplier or manufacturer he intends to use. Where no choice is indicated, the basis of design supplier or equipment shall be used.

.6 Equipment or materials manufactured by firms named in the following listing only shall be deemed equal to the equipment or material specified, provided the equipment or material will have capacity, performance, rating, construction, physical dimensions, accessories and features which, in the opinion of the Consultant, are equal to those of the specified equipment or material. The Electrical Contractor shall not indicate equipment, materials or suppliers which are not listed.

.7 Where modifications to the work of other trades are required as a result or part of the alternative offered, include the cost of said modifications in the work.

.8 Submit the following list of basis of design and alternative suppliers in accordance with the bid requirements:

Spec. Reference Section	Equipment	Basis of Design	Acceptable Alternate Manufacturer	Indicate Manufacturer Or Supplier
26 29 13.13	Starters and Contactors	Schneider Electric	Allen Bradley Siemens Eaton Klockner-Moeller	
26 22 13.13	Dry –Type Transformers	Hammond	Rex Acme Delta Bemag	
26 28 16	Disconnect Switches	Schneider Electric	Siemens Eaton	
26 24 16	Panelboards	Schneider Electric	Siemens Eaton	

CONTRACTOR'S NAME: _____ DATE: _____

26 28 13	Fuses – Low Voltage	Mersen	GEC Littlefuse	
26 51 13	LED Interior	Cooper	Lithonia Vioneering Signify	
26 51 13	Exit Lighting	Aimlite	Lumacell Stanpro	
28 31 25	Fire Alarm System (Addressable)	Existing Edwards EST3X Panel		

.9 LABOUR RATES

- .1 The following labour rates shall apply for calculating the cost of credit or extras on Change Notices. The rates shall include any employee benefits. The labour rates do not include overhead and profit.

Apprentice Electrician \$ _____/hr
Journeyman Electrician \$ _____/hr

END OF SECTION

CONTRACTOR'S NAME: _____ DATE: _____

Part 1 General

1.1 GENERAL INSTRUCTIONS

- .1 Comply with the General Conditions, Supplementary Conditions, and all of General Requirements, Mechanical and Electrical Divisions.

1.2 FEES

- .1 The contractor is to determine general inspection fees with Electrical Safety Authority and include as part of tender.

1.3 ADDITIONAL INSTALLED EQUIPMENT

- .1 The electrical contractor is to review all specification sections forming part of the electrical bid documents and include additional equipment or components, as well as all associated installation costs and testing costs as noted, in the electrical bid price.

END OF SECTION

Part 1 General

1.1 GENERAL

- .1 This Section covers items common to Electrical Divisions.**
- .2 This section supplements requirements of Division 1.
- .3 Furnish labour, materials, and equipment necessary for completion of work as described in contract documents.

1.2 INTENT

- .1 Mention herein or indication on Drawings of articles, materials, operations, or methods requires: supply of each item mentioned or indicated, of quality, or subject to qualifications noted; installation according to conditions stated: and, performance of each operation prescribed with furnishing of necessary labour, equipment, and incidentals for electrical work.
- .2 Where used, words "Section" and "Division" shall also include other Subcontractors engaged on site to perform work to make building and site complete in all respects.
- .3 Where used, word "supply" shall mean furnishing to site in location required or directed complete with accessory parts.
- .4 Where used, word "install" shall mean secured in place and connected up for operation as noted or directed.
- .5 Where used, word "provide" shall mean supply and install as each is described above.

1.3 TENDERS

- .1 Complete Supplemental Tender Form including list of equipment and materials to be used on this project and forming part of tender documents.
- .2 Submit Supplemental Tender Form as noted.
- .3 Submit tender based on specified described equipment or Alternates listed.
- .4 State in Tender, names of all Subcontractors proposed for work under this Division.

1.4 LIABILITY INSURANCE

- .1 This contractor must maintain and produce at the request of the consultant proof of proper insurance to fully protect the Owner, the Consultant and the Contractor from any and all claims due to accidents, misfortunes, acts of God, etc.

1.5 DRAWINGS

- .1 Electrical Drawings do not show structural and related details. Take information involving accurate measurement of building from building drawings, or at building. Make, without additional charge, any necessary changes or additions to runs of conduits and ducts to accommodate structural conditions. Location of conduits and other equipment may be altered by the Consultant without extra charge provided change is made before installation and does not necessitate major additional material.
- .2 As work progresses and before installing fixtures and other fittings and equipment which may interfere with interior treatment and use of building, provide detail drawings or obtain directions for exact location of such equipment and fitments.
- .3 Electrical drawings are diagrammatic. Where required work is not shown or only shown diagrammatically, install same at maximum height in space to conserve head room (minimum 2200 mm (88") clear) and interfere as little as possible with free use of space through which they can pass. Conceal wiring, conduits and ducts in furred spaces, ceilings and walls unless specifically shown otherwise. Install work close to structure so furring will be small as practical.
- .4 Before commencing work, check and verify all sizes, locations, grades, elevations, levels and dimensions to ensure proper and correct installation. Verify existing/municipal services.
- .5 Locate all electrical equipment in such a manner as to facilitate easy and safe access to and maintenance and replacement of any part.
- .6 In every place where there is indicated space reserved for future or other equipment, leave such space clear, and install services so that necessary installation and connections can be made for any such apparatus. Obtain instructions whenever necessary for this purpose.
- .7 Relocate equipment and/or material installed but not co-ordinated with work of other Sections as directed, without extra charge.
- .8 Where drawings are done in metric and product not available in metric, the corresponding imperial trade size shall be utilized.

1.6 INTERFERENCE AND CO-ORDINATION DRAWINGS

- .1 Prepare interference and equipment placing drawings to ensure that all components will be properly accommodated within the constructed spaces provided.
- .2 Prepare drawings to indicate co-ordination and methods of installation of a system with other systems where their relationship is critical. Ensure that all details of equipment apparatus, and connections are co-ordinated.
- .3 Ensure that clearances required by jurisdictional authorities and clearances for proper maintenance are indicated on drawings.
- .4 Upon consultant's request submit copies of interference drawings to the consultant.

- .5 Due to the nature of the building and the complexity of the building systems provide the following:
 - .1 Interference drawings, showing coordination of architectural, structural, mechanical, and electrical systems for the consultant's review prior to fabrication.
 - .2 Detailed equipment room drawings clearly showing all distribution equipment.
 - .3 Detailed layout drawings clearly showing conduit/feeder runs 78mm diameter or larger, including hangers or tray.
- .6 Provide CAD drawings (minimum file version AutoCAD 2013) in addition to hard copies.

1.7 QUALITY ASSURANCE

- .1 The installations of the division must conform to the latest edition of the Electrical Safety Code as well as its supplemental bulletins and instructions. Provide materials and labour necessary to comply with rules, regulations, and ordinances.
- .2 Complete underground systems in accordance with CSA C22.3 No. 7-94 except where specified otherwise.
- .3 Abbreviations for electrical terms: to CSA Z85-1983.
- .4 In case of differences between building codes, provincial laws, local ordinances, utility company regulations, and Contract Documents, the most stringent shall govern. Promptly notify Consultant in writing of such differences.

1.8 ALTERNATES AND SUBSTITUTIONS

- .1 Throughout these sections are lists of "Alternate Equipment" manufacturers acceptable to Consultant if their product meets characteristics of specified described equipment.
- .2 Each bidder may elect to use "Alternate Equipment" from lists of Alternates where listed. Include for any additional costs to suit Alternated used. Prices are not required in Tender for Alternates listed except where specifically noted as "Separate Price". Complete the Supplementary Tender Form.
- .3 When two or more suppliers/manufacturers are named in the Bid Documents, only one supplier/manufacturer of the products named will be acceptable; however, it is the responsibility of this Division to ensure "Alternate Equipment" fits space allocated and gives performance specified. If an "Alternate Equipment" unit is proposed and does not fit space allotted nor equal specified product in Consultant's opinion, supply of specified described equipment will be required without change in Contract amount. Only manufacturers listed will be accepted for their product listing. All other manufacturers shall be quoted as substitution stating conditions and credit amount.
- .4 If item of material specified is unobtainable, state in Tender proposed substitute and amount added or deducted for its use. Extra monies will not be paid for substitutions after Contract has been awarded.

1.9 EXAMINATION

- .1 Site Reviews
 - .1 Examine premises to understand conditions, which may affect performance of work of this Division before submitting proposals for this work.
 - .2 No subsequent allowance for time or money will be considered for any consequence related to failure to examine site conditions.
- .2 Drawings:
 - .1 Electrical Drawings show general arrangement of fixtures, power devices, equipment, etc. Follow as closely as actual building construction and work of other trades will permit.
 - .2 Consider Architectural, Mechanical, and Structural Drawings part of this work insofar as these drawings furnish information relating to design and construction of building. These drawings take precedence over Electrical Drawings.
 - .3 Because of small scale of Drawings, it is not possible to indicate 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 required to meet conditions.
- .3 Ensure that items to be furnished fit space available. Make necessary field measurements to ascertain space requirements including those for connections and furnish and install equipment of size and shape so final installation shall suit true intent and meaning of Contract Documents. If approval is received by Addendum or Change Order to use other than originally specified items, be responsible for specified capacities and for ensuring that items to be furnished will fit space available.

1.10 SEQUENCING AND SCHEDULING

- .1 It is understood that while Drawings are to be followed as closely as circumstances permit, this Division will be held responsible for installation of systems according to the true intent and meaning of Contract Documents. Anything not clear or in conflict will be explained by making application to Consultant. Should conditions arise where certain changes would be advisable, secure Consultant's approval of these changes before proceeding with work.
- .2 Coordinate work of various trades in installing interrelated work. Before installation of electrical items, make proper provision to avoid interferences in a manner approved by Consultant. Changes required in work specified in these sections caused by neglect to do so shall be made at no cost to Owner.
- .3 Arrange fixtures, conduit, and equipment to permit ready access to junction boxes, starters, motors, control components, and to clear openings of doors and access panels.

- .4 Furnish and install inserts and supports required by these sections unless otherwise noted. Furnish sleeves, inserts, supports, and equipment that are an integral part of other Divisions of the Work to Sections involved in sufficient time to be built into construction as the Work proceeds. Locate these items and see that they are properly installed. Expense resulting from improper location or installation of items above shall be borne by the electrical trade.
- .5 Adjust locations of conduits, equipment, fixtures, etc, to accommodate work from interferences anticipated and encountered. Determine exact route and location of each conduit prior to installation.
 - .1 Make offsets, transitions, and changes in direction of electrical raceways as required to maintain proper head room and pitch of sloping lines whether or not indicated on Drawings.
 - .2 Supply and install pull boxes, etc., as required to effect these offsets, transitions, and changes in direction.

1.11 REQUEST FOR INFORMATION (RFI) PROCEDURES

- .1 RFIs shall be submitted to the consultant minimum two (2) weeks prior to answer being required. Failure to submit and RFI in a timely manner will forfeit delay claims and schedule extension requests by the contractor.
- .2 All RFIs will be submitted with the following information:
 - .1 RFI number
 - .2 Name of project
 - .3 Date of initiation
 - .4 Date response required by (minimum two (2) weeks)
 - .5 Subject
 - .6 Submitter's name
 - .7 Drawing/specification reference
 - .8 Photograph of the issue (if applicable)
 - .9 Description of the issue
 - .10 Contractor's proposed resolution

1.12 DRAW BREAKDOWN

- .1 This Contractor **MUST** submit a breakdown of the tender price into classifications to the satisfaction of the Consultant, with the aggregate of the breakdown totaling the total contract amount. **Each item must be broken out into material and labour costs.** Progress claims, when submitted are to be itemized against each item of the draw breakdown. This shall be done in table form showing contract amount, amount this draw, total to date, % complete and balance.
- .2 Breakdown shall be as follows:
 - .1 Permits and fees

- .2 Mobilization (maximum 1%)
- .3 Demolition
- .4 Panelboards and miscellaneous distribution equipment
- .5 Branch wiring
- .6 Lighting fixtures (interior)
- .7 Emergency lighting
- .8 Fire alarm system
- .9 Starters, contactors, and control devices
- .10 Wiring for mechanical equipment
- .11 Commissioning and Integrated System Testing**
- .12 Electrical contractor closeout requirements (minimum of 3% but not less than \$5,000.00)
- .3 The breakdown must be approved by the Consultant prior to submission of the first draw.
- .4 Breakdowns not complying to the above will not be approved.
- .5 Breakdown must indicate total contract amount.
- .6 Mobilization amount may only be drawn when all required shop drawings have been reviewed by the consultant.**

1.13 SHOP DRAWINGS AND PRODUCT DATA

- .1 General
 - .1 Furnish complete catalog data for manufactured items of equipment to be used in the Work to Consultant for review within 14 days after award of Contract.
 - .2 Upon receipt of reviewed shop drawing, product is to be ordered immediately.
 - .3 Provide a complete list of shop drawings to be submitted prior to first submission.
 - .4 Before submitting to the Consultant, review all shop drawings to verify that the products illustrated therein conform to the Contract Documents. By this review, the Contractor agrees that it has determined and verified all field dimensions, field construction criteria, materials, catalogue numbers, and similar data and that it has checked and coordinated each shop drawing with the requirements of the work and of the Contract Documents. The Contractor's review of each shop drawings shall be indicated by stamp, date and signature of a qualified and responsible person possessing by the appropriate authorization.
 - .5 If material or equipment is not as specified or submittal is not complete, it will be rejected by Consultant.
 - .6 Additional shop drawings required by the contractor for maintenance manuals, site copies etc., shall be photocopies of the "reviewed" shop drawings. All costs to provide additional copies of shop drawings shall be borne by the contractor.

- .7 **Submit all shop drawings for the project as a package. Partial submittals will not be accepted.**
- .8 Catalog data or shop drawings for equipment, which are noted as being reviewed by Consultant or his Engineer shall not supersede Contract Documents.
- .9 Review comments of Consultant shall not relieve this Division from responsibility for deviations from Contract Documents unless Consultant's attention has been called to such deviations in writing at time of submission, nor shall they relieve this Division from responsibility for errors in items submitted.
- .10 Check work described by catalog data with Contract Documents for deviations and errors.
- .11 Shop drawings and product data shall show:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances. e.g. access door swing spaces.
- .12 Shop drawings and product data shall be accompanied by:
 - .1 Manufacturer test data where requested.
 - .2 Manufacturer to certify as to current model production.
 - .3 Certification of compliance to applicable codes.
- .13 State sizes, capacities, brand names, motor HP, accessories, materials, gauges, dimensions, and other pertinent information. List on catalog covers page numbers of submitted items. Underline applicable data.
- .14 **If a shop drawing is returned "reviewed as noted" this Contractor must provide written indication that the comments have been complied with.**
- .15 A partial list of shop drawings includes:
 - .1 Panelboards and transformer
 - .2 Fire alarm devices
 - .3 Luminaires
 - .4 Exit lighting
 - .5 Starters, contactors and control devices
 - .6 Firestopping materials
 - .7 Wiring devices
 - .8 Occupancy sensors
 - .9 Surface raceway
 - .10 Roof cone
 - .11 Integrated Life Safety System Testing Plan (ITP)
- .2 Submissions shall be submitted electronically as per the following directions:
 - .1 Electronic Submissions:
 - .1 Electronically submitted shop drawings shall be prepared as follows:
 - .1 Use latest software to generate PDF files of submission sheets.

- .2 Scanned legible PDF sheets are acceptable. Image files are not acceptable.
- .3 PDF format shall be of sufficient resolution to clearly show the finest detail.
- .4 PDF page size shall be standardized for printing to letter size (8.5"x11"), portrait with no additional formatting required by the consultant. Submissions requiring larger detail sheets shall not exceed 11"x17".
- .5 Submissions shall contain multiple files according to section names as they appear in Specification.
- .6 File names shall include consultant project number and description of shop drawing section submitted.
- .7 Each submission shall contain an index sheet listing the products submitted, indexed in the same order as they appear in the Specification. Include associated PDF file name for each section.
- .8 On the shop drawing use an "electronic mark" to indicate what is being provided.
- .9 **Each file shall bear an electronic representation of the "company stamp" of the contractor. If not stamped the file submission will not be reviewed.**
- .2 Email submissions shall include subject line to clearly identify the consultants' project number and the description of the shop drawings submitted.
- .3 Electronic attachments via email shall not exceed 10MB. For submissions larger than 10MB, multiple email messages shall be used. Denote related email messages by indicating "1 of 2" and "2 of 2" in email subject line for the case of two messages.
- .4 Electronic attachments via web links (URL) shall directly reference PDF files. Provide necessary access credentials within link or as username/password clearly identified within body of email message.
- .5 On site provide one copy of the "reviewed" shop drawings in a binder as noted above.
- .6 Contractor to print copy of "reviewed" shop drawings and compile into maintenance manuals in accordance with requirements detailed in this section.

1.14 CARE, OPERATION, AND START-UP

- .1 Instruct Consultant and operating personnel in the operation, care and maintenance of equipment.
- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components.

- .3 Provide these services for such period, and for as many visits as necessary to put equipment in operation and ensure that operating personnel are conversant with all aspects of its care and operation.

1.15 VOLTAGE RATINGS

- .1 Operating voltages: to CAN3-C235-83.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.16 PERMITS, FEES, AND INSPECTION

- .1 A submission has been made (if required by this scope of project) by the consultant to the Electrical Safety Authority for review of this project. The payment of the required review costs will be co-ordinated by the consultant. A copy of the Electrical Safety Authority review report will be forwarded to the successful contractor for information and action.
- .2 The contractor is required to include in his tender all required inspection costs by the Electrical Safety Authority. Permit application is the responsibility of the contractor.
- .3 Reproduce drawings and specifications required by Electrical Safety Authority at no cost.
- .4 Notify Consultant of changes required by Electrical Safety Authority prior to making changes.
- .5 Furnish Certificates of Acceptance to Engineer from Electrical Safety Authority and other authorities having jurisdiction upon completion of work.
- .6 This contractor must furnish any certificates required to indicate that the work completed conforms with laws and regulations of authorities having jurisdiction.

1.17 MATERIALS AND EQUIPMENT

- .1 Equipment and material to be CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Safety Authority.

1.18 ELECTRIC MOTORS, EQUIPMENT, AND CONTROLS

- .1 Supplier and installer responsibility is indicated in the Equipment Wiring Schedule on electrical drawings.
- .2 Control wiring and conduit is specified in the Electrical specifications except for conduit, wiring and connections below 50 V, which are related to control systems specified in the Mechanical specifications.

1.19 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
 - .1 Paint indoor switchgear and distribution enclosures light grey.
- .2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .3 Clean and prime exposed non-galvanized hangers, racks, fastenings, and conduits etc. to prevent rusting.

1.20 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates as follows:
- .2 Nameplates:
 - .1 Lamicoid 3 mm (1/8") thick plastic engraving sheet, black face, white core, mechanically attached with self tapping screws.

NAMEPLATE SIZES

Size 1	9 mm x 50 mm (3/8" x 2")	1 line	3 mm (1/8") high letters
Size 2	12 mm x 70 mm (1/2" x 2 1/2")	1 line	5 mm (3/16") high letters
Size 3	12 mm x 70 mm (1/2" x 2 1/2")	2 lines	3 mm (1/8") high letters
Size 4	20 mm x 90 mm (3/4" x 3 1/2")	1 line	9 mm (3/8") high letters
Size 5	20 mm x 90 mm (3/4" x 3 1/2")	2 lines	5 mm (3/16") high letters
Size 6	25 mm x 100 mm (1" x 4")	1 line	12 mm (1/2") high letters
Size 7	25 mm x 100 mm (1" x 4")	2 lines	6 mm (1/4") high letters

- .3 Wording on nameplates labels to be approved by Consultant prior to manufacture.
- .4 Allow for average of twenty-five (25) letters per nameplate.
- .5 Identification to be English.
- .6 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .7 Nameplates for disconnects, starters and contactors must indicate equipment being controlled and voltage.
- .8 Nameplates for transformers must indicate transformer label as indicated and capacity, primary, and secondary voltages.

1.21 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour code: to CSA C22.1.

1.22 CONDUIT AND CABLE IDENTIFICATION

- .1 Colour code conduits, boxes and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m (45') intervals.
- .3 Colour bands must be 25 mm (1") wide.

	<u>Prime</u>
up to 208 V	yellow
209 to 600 V	white
Fire alarm	red
Emergency lighting	pink
- .4 This contractor must paint all system junction boxes and covers in conformance with the above schedule.

1.23 PROTECTION OF OPENINGS

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

1.24 WIRING TERMINATIONS

- .1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

1.25 MANUFACTURERS AND CSA LABELS

- .1 All labels must be visible and legible after equipment is installed.

1.26 WARNING SIGNS

- .1 To meet requirements of Electrical Safety Authority and Consultant.
- .2 Provide porcelain enamel signs, with a minimum size of 175 mm x 250 mm (7" x 10").

1.27 LOCATION OF OUTLETS

- .1 Do not install outlets back-to-back in wall; allow minimum 150 mm (6") horizontal clearance between boxes.
- .2 Change location of outlets at no extra cost or credit, providing distance does not exceed 3 m (10'), and information is given before installation.
- .3 Locate light switches on latch side of doors. Locate disconnect devices in mechanical and elevator machine rooms on latch side of door.

1.28 MOUNTING HEIGHTS

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise. Coordinate with block coursing (if applicable).

- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- .3 Install electrical equipment at following heights unless indicated otherwise.
 - .1 Local switches: 1100 mm (43.3").
 - .2 Wall receptacles:
 - .1 General: 400 mm (16").
 - .2 Above top of continuous baseboard heater: 200 mm (8").
 - .3 Above top of counters or counter splash backs: 100 mm (4").
 - .4 In mechanical rooms: 1200 mm (48").
 - .3 Panelboards: as required by Code or 1400 mm (56").

1.29 LOAD BALANCE

- .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
- .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
- .3 Submit, at completion of work, report listing phase and neutral currents on panelboards and dry-core transformers operating under normal load. State hour and date on which each load was measured, and voltage at time of test.

1.30 FIELD QUALITY CONTROL

- .1 Conduct and pay for following tests:
 - .1 Power distribution system including phasing, voltage, grounding, and load balancing.
 - .2 Circuits originating from branch distribution panels.
 - .3 Lighting and its control.
 - .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
 - .5 Systems: fire alarm system.
- .2 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.
- .3 Insulation resistance testing.
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
 - .3 Check resistance to ground before energizing.
- .4 Carry out tests in presence of Consultant.

- .5 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .6 Submit test results for Consultant's review.

1.31 GUARANTEE AND WARRANTY

- .1 At ready for takeover of this project this Contractor must provide a written guarantee indicating that any defects, not due to ordinary wear and tear or improper use which occur within the first year from the date of ready for takeover will be corrected at the contractor's expense.
- .2 **If the electrical sub-contractor's office is 50 kilometers (30 miles) or more from the project site, the sub-contractor is to provide a service/warranty work agreement for warranty period with a local electrical sub-contractor approved by Consultant. Include copy of service/warranty agreement in warranty section of operation and maintenance manual.**
- .3 Warranty period shall start from date of ready for takeover completion.
- .4 Refer to individual specification sections for information on any special manufacturer's equipment warranties.

1.32 SYSTEM START UP

- .1 Provide consultant with written notice verifying all equipment operation and installation is complete prior to scheduled start-up period.
- .2 Start up shall be in presence of the following: owner or representative, contractor, and manufacturer's representative. Each person shall witness and sign off each piece of equipment. Consultant's attendance will be determined by consultant.
- .3 Arrange with all parties and provide 72 hours notice for start up procedure.
- .4 Simulate system start up and shut down and verify operation of each piece of equipment.
- .5 These tests are to demonstrate that the systems and equipment installed are operational as specified.
- .6 The contractor must describe during the start up session the required maintenance for each piece of equipment according to the manufacturer.
- .7 The contractor must provide all necessary tools (including a digital multimeter) to successfully complete the start up procedure.

1.33 OPERATION AND MAINTENANCE MANUAL

- .1 Provide operation and maintenance data for incorporation into manual as specified in other Sections of this Division.

- .2 Operation and maintenance manual to be approved by, and final copies deposited with, Consultant before final inspection.
 - .1 Submit one (1) copy of Operation and Maintenance Manual to Consultant for review and approval. Submission of individual data will not be accepted unless so directed by Consultant. Submission can be done electronically in PDF format or as a hardcopy.
 - .1 Electronic submission/PDF file is required to be bookmarked. Any submission received without bookmarking will be immediately returned as unacceptable.
 - .2 Hardcopy submission shall be in a three-ring binder (minimum 50 mm (2") ring) and labelled as 'Operation and Maintenance Manual' with project name and location. Dividers are to be used for binder organization.
 - .2 Make changes as required and re-submit as directed by Consultant.
- .3 Each manual must include (in "tabbed" sections) the following:
 - .1 Index
 - .2 List of General, Mechanical, Electrical Contractors and all associated sub-contractor names, addresses and contact numbers.
 - .3 List of suppliers and equipment wholesalers local to the project.
 - .4 Letter of contractor's warranty and guarantee for all parts, equipment and workmanship.
 - .5 WRDSB Project Asset and Warranty Card for all assets replaced, newly installed, and removed.
 - .6 List of manufacturers, spare parts list and source.
 - .7 Copy of typewritten schedules for all new and renovated panels.
 - .8 Copy of all substantial performance final certificates.
 - .9 Copy of electrical shop drawings which have been stamped and reviewed by Consultant.
 - .10 Electrical As-built drawings including contractor company's as built stamp.
 - .11 Any special warranties on equipment required (i.e. LED lighting, digital lighting control, SPDs, power generation).
 - .12 System commissioning certificate and report.
- .4 Final Submittals:
 - .1 Upon acceptance of Operation and Maintenance Manual by the Consultant provide the following:
 - .1 Provide two (2) copies of final operation maintenance manuals, as well as a PDF file of the entire approved manual on a USB stick. Only one (1) USB stick is to be provided containing both the approved manual and as-built drawings.

1.34 AS-BUILT DRAWINGS

- .1 Site records:
 - .1 Contractor shall provide two (2) sets of reproducible electrical drawings. 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 field and contract changes to electrical systems.
 - .2 On a weekly basis, transfer information to reproducibles, revising reproducibles to show all work as actually installed.
 - .3 Use different colour waterproof ink for each service.
 - .4 Make available for reference purposes and inspection at all times.
- .2 As-built drawings:
 - .1 Identify each drawing in lower right hand corner in letters at least 3 mm (1/8") high as follows: - "AS-BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW ELECTRICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (date).
 - .2 Submit copy to Consultant for approval. When returned, make corrections (if any) as directed.
 - .3 Once approved, submit completed reproducible paper as-built drawings as well as a scanned PDF file copy on USB stick with Operating and Maintenance Manuals.

1.35 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 Manufacturers or their representatives are to provide demonstrations and instructions.
- .3 Use operation and maintenance manual, As-built drawings, audio visual aids, etc. as part of instruction materials.
- .4 Instruction duration time requirements as specified in appropriate sections.
- .5 Where deemed necessary, Consultants may record these demonstrations on video tape for future reference.

1.36 OCCUPANCY REQUIREMENTS

- .1 The contractor shall provide the following documentation to the consultant's satisfaction prior to receiving occupancy. Failure to provide the proper documentation will result in the occupancy not being granted. List of required documentation:
 - .1 Final Certificates (required prior to consultant's release of conformance letter).
 - .1 Electrical Safety Authority.
 - .2 Emergency Lighting.
 - .3 Integrated Life Safety Systems Commissioning.
 - .4 Testing of Integrated Fire Protection and Life Safety Systems Certificate.

- .5 Fire Alarm Verification Certificate.

1.37 READY FOR TAKEOVER

- .1 Complete the following to the satisfaction of the consultant prior to request for ready for takeover.
 - .1 As-built Drawings.
 - .2 Maintenance Manuals.
 - .3 System Start up.
 - .4 Instructions to Owners.
 - .5 **Outlet Cover Circuit Labels.**

1.38 TRIAL USAGE

- .1 Consultant or owner may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

1.39 REVISION TO CONTRACT

- .1 Provide the following for each item in a given change notice:
 - .1 Itemized list of material with associated costs.
 - .2 Labour rate and itemized list of labour for each item.
 - .3 Copy of manufacturers/suppliers invoice if requested.

1.40 EQUIPMENT SUPPORTS

- .1 Equipment supports supplied by equipment manufacturer: shall be installed by the electrical contractor.
- .2 Equipment supports not supplied by equipment manufacturer: fabricate from structural grade steel meeting requirements of - Structural Steel Section. Submit structural calculations with shop drawings if necessary.
- .3 Mount base mounted equipment on chamfered edge housekeeping pads, minimum of 100 mm (4") high and 150 mm (6") larger than equipment dimensions all around. This installation of this pad shall be the responsibility of the electrical contractor.

1.41 SLEEVES

- .1 Pipe sleeves: at points where pipes pass through masonry, concrete, or fire rated assemblies and as indicated.
- .2 Schedule 40 steel pipe.
- .3 Sleeves with annular fin continuously welded at midpoint:
 - .1 Through foundation walls.
 - .2 Where sleeve extends above finished floor.
- .4 Sizes: minimum 6 mm (1/4") clearance all around, between sleeve and conduit.

- .5 Terminate sleeves flush with surface of concrete and masonry walls, concrete floors on grade and 25 mm (1") above other floors.
- .6 Fill voids around pipes:
 - .1 Caulk between sleeve and pipe in foundation walls and below grade floors with waterproof fire retardant non-hardening mastic.
 - .2 Where sleeves pass through walls or floors, provide space for firestopping. Where pipes/ducts pass through fire rated walls, floors and partitions, maintain fire rating integrity.
 - .3 Fill future-use sleeves with easily removable filler.

1.42 FIRESTOPPING

- .1 Firestopping material and installation within annular space between conduits, ducts, and adjacent fire separation.
- .2 Provide materials and systems capable of maintaining effective barrier against flame, smoke, and gases.
- .3 Comply with the requirements of CAN4-S115-M35, and do not exceed opening sized for which they have been tested.
- .4 Systems to have an F or FT rating (as applicable) not less than the fire protection rating required for closures in a fire separation.
- .5 Provide "firewrap" blanket around services penetrating firewalls. Extent of blanket must correspond to ULC recommendations. In general wrap individual conduits with approved firewrap materials on each side of firewall. Refer to architectural drawings for FT ratings. Provide 1 and/or 2 layers of firewrap with transverse and longitudinal seams overlapped and/or butted (second layer offset from first layer). Cut edges are to be sealed with aluminum foil tape. Provide 50 mm stainless steel banding at 200 mm intervals. Install firewrap to manufacturers' recommendations for proper FT rating. Acceptable manufacturers are 3M Firemaster ductwrap or approved equal.
- .6 The firestopping materials are not to shrink, slump or sag and be free of asbestos, halogens and volatile solvents.
- .7 Firestopping materials are to consist of a component sealant applied with a conventional caulking gun and trowel.
- .8 Firestop materials are to be capable of receiving finish materials in those areas, which are exposed and scheduled to receive finishes.
- .9 Firestopping shall be inspected and approved by local authority prior to concealment or enclosure.
- .10 Install material and components in accordance with ULC certification, manufacturers instructions and local authority.
- .11 **Submit product literature and installation material on firestopping in shop drawing and product data manual.**

- .12 Acceptable manufacturers:
 - .1 Rectorseal Corporation (Metacaulk)
 - .2 Proset Systems
 - .3 3M
 - .4 Hilti
 - .5 STI Firestop

Note: Fire stop material must conform to requirements of local authorities having jurisdiction. Contractor to confirm prior to application and ensure material used is compatible with that used by other trades on site.

- .13 Ensure firestop manufacturer representative performs on site inspections and certifies installation. Submit inspection reports/certification at time of ready for takeover.

1.43 PAINTING

- .1 Refer to Section Interior Painting and specified elsewhere.
- .2 Apply at least one coat of corrosion resistant primer paint to ferrous supports and site fabricated work.
- .3 Prime and touch up marred finished paintwork to match original.
- .4 Restore to new condition, or replace equipment at discretion of consultant, finishes which have been damaged too extensively to be merely primed and touched up.

1.44 ACCESS DOORS

- .1 Supply access doors to concealed electrical equipment for operating, inspecting, adjusting and servicing.
- .2 Flush mounted 600 mm x 600 mm (24" x 24") for body entry and 300 mm x 300 mm (12" x 12") for hand entry unless otherwise noted. Doors to open 180°, have rounded safety corners, concealed hinges, screwdriver latches and anchor straps.
- .3 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.
 - .3 Fire rated areas: provide ULC listed access doors
- .4 Installation:
 - .1 Locate so that concealed items are accessible.
 - .2 Locate so that hand or body entry (as applicable) is achieved.
 - .3 Installation is specified in applicable sections.
- .5 Acceptable materials:
 - .1 Le Hage
 - .2 Zurn

- .3 Acudor
- .4 Nailor Industries Inc.

1.45 DELIVERY STORAGE & HANDLING

- .1 Follow Manufacturer's directions in delivery, storage, and protection, of equipment and materials. Contractor to include all costs associated with delivery storage and handling in tender price.
- .2 Deliver equipment and material to site and tightly cover and protect against dirt, water, and chemical or mechanical injury, but have readily accessible for inspection. Store items subject to moisture damage (such as controls) in dry, heated space.

1.46 REPAIR, CUTTING, CORING AND RESTORATION

- .1 Be responsible for required digging, cutting, and patching incident to work of this Division and make required repairs afterwards to satisfaction of Consultant. Cut carefully to minimize necessity for repairs to existing work. Do not cut beams, columns, or trusses.
- .2 Patch and repair walls, floors, ceilings, and roofs with materials of same quality and appearance as adjacent surfaces unless otherwise shown. Surface finishes shall exactly match existing finishes of same materials.
- .3 Each Section of this Division shall bear expense of cutting, patching, repairing, and replacing of work of other Sections required because of its fault, error, tardiness, or because of damage done by it.
- .4 Cutting, patching, repairing, and replacing pavements, sidewalks, roads, and curbs to permit installation of work of this Division is responsibility of Section installing work.
- .5 Slots, cores and openings through floors, walls, ceilings, and roofs shall be provided by this contractor but performed by a trade specializing in this type of work. This Division shall see that they are properly located and do any cutting and patching caused by its neglect to do so.

1.47 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.

1.48 CLEANING

- .1 Clean interior and exterior of all electrical equipment provided including light fixture lenses.
- .2 In preparation for final acceptance, clean and refurbish all equipment and leave in operating condition.

1.49 ASBESTOS

- .1 If asbestos is suspected or identified cease all work in the immediate area in accordance with OHSA and notify consultant.
- .2 Each contractor and on site employee of the contractor shall have “asbestos awareness training”.
- .3 The Contractor shall ensure that employees who may come into contact with asbestos due to the nature of the work that they perform, have received training that enables them to recognize asbestos and that enables them to react in accordance with the Occupational Health and Safety Act and regulations thereto should contact with asbestos occur during the course of their work.
- .4 **It is the responsibility of the contractor to review the asbestos book in the building prior to starting any work.**
- .5 Existing occupied buildings (depending upon their age) may contain asbestos in thermal insulating materials and some manufactured products, such as vinyl asbestos floor tile. Any insulating materials, on pipes, fittings, boilers, tanks, ductwork, etc. may contain asbestos and shall not be disturbed.
- .6 **A survey of each building documenting the location and condition of asbestos-containing materials is available for your mandatory review prior to commencing any work on premises.**

1.50 DISCONNECTION AND REMOVAL

- .1 Disconnect and/or remove equipment as indicated.
- .2 Cap and conceal all redundant and obsolete connections.
- .3 Provide a list of equipment to be removed to the owner, for his acceptance of same. Remove all equipment from site, which the owner does not retain.
- .4 Store equipment to be retained by owner on site where directed by consultant.

1.51 EXISTING CONCRETE SLAB X-RAY/SCANNING

- .1 This contractor shall retain the services of a qualified company to provide and X-ray and/or scan of the existing buried services in walls and/or floors prior to starting any work in the affected area.
- .2 Failure to locate existing piping, conduit, rebar etc., shall not relieve this contractor of repair of same prior to installing his service.
- .3 This contractor shall be responsible for all repairs and/or replacement of existing services caused by cutting the existing concrete slabs and/or walls.

END OF SECTION

Part 1 General

1.1 GENERAL PROVISIONS

- .1 Conform to the General Provisions of Division 1 and Electrical General Requirements Section.
- .2 This project is one of a retrofit nature in part, and which will require extensive demolition.
- .3 Allow for all remedial work in areas indicated on the drawings and as generally defined in the relevant sections of the specifications.

1.2 SCOPE OF WORK

- .1 The scope of work is essentially the selected disconnection and/or removal of services and/or equipment, devices etc. as indicated or required to complete the work.
- .2 The reference drawings indicate some of the services which shall remain, and some may have to be retained through construction and a phased changeover to help construction i.e. electrical service, phone service, winter heat, and temporary construction services i.e. washroom facility. This co-ordination remains the responsibility of the contractors.

Part 2 Products

2.1 GENERAL

- .1 This Division is to liaise with the Owners or Consultant for equipment being removed that may be suitable for reuse to that specified or handed over to the owner.
- .2 This Division to take full responsibility for any special tools or equipment required to disassemble or remove material from building.

Part 3 Execution

3.1 GENERAL

- .1 The general requirements are indicated on the drawings and on the outline specification in Division 1.
- .2 The general execution of the demolition is to be carried out in a clean and efficient manner.
- .3 Demolition of existing ceiling to facilitate removal of existing services or equipment or installation of new to be kept to a minimum and then restored to match existing.
- .4 All openings or holes created by removal of existing electrical systems which are not being reused are to be patched with the same material surrounding surfaces.

- .5 All new holes and openings to facilitate electrical systems are to be patched to match surrounding surfaces.
- .6 Protect all existing furnishings materials and equipment. Any damage occurring as a result of the work of this Division shall be repaired or replaced at the expense of this Division.
- .7 Where work involves breaking into or connecting to existing services, carry out work at times directed by the Owners in an expedient manner with minimum disruption to the facility and systems downtime.
- .8 Where unknown services are encountered immediately advise Consultant and confirm findings in writing.
- .9 Where the location of any services has been shown on the plans, such information is not guaranteed. It is this Division's responsibility to verify locations, etc., immediately after moving on site. Should for any reason the information obtained necessitates changes in procedure or design, advise the Consultant at once. If verification of existing conditions is not done at the outset and any problems arise, the responsibility for same is entirely this Division's.
- .10 Disconnect and/or remove equipment, devices, cabling, services, etc. as indicated.
- .11 Remove all redundant and obsolete systems, connections, and wiring.
- .12 Provide a list of equipment to be removed to the owner, for their acceptance of same. Remove all equipment from site that the owner does not retain.
- .13 Maintain equipment to be retained by owner on site where directed by consultant.
- .14 Demolition of all parts of the work must be completed within the confines of the work area and in such a way as the dust produced and risk to injury of will not adversely affect the building users.

END OF SECTION

Part 1 General

1.1 INTENT

- .1 Life safety and fire protection systems are to be installed to comply with the provisions of the current Ontario Building and Fire Codes. As a result, testing of these integrated systems must be performed as a whole to ensure the proper operation and inter-relationship between systems (functional testing).
- .2 The testing is to provide functional verification and documented confirmation that these building systems satisfy the intent of the Building Code.
- .3 These systems as applicable to any given project include but are not limited to fire alarm, fire smoke dampers and emergency lighting.

1.2 GENERAL

- .1 This testing process is the responsibility of the Integrated Testing Firm as a sub-contractor to the electrical trade. Electrical trade to include all costs associated with the Integrated Testing Coordinator in contract.
- .2 This process must be co-ordinated with suppliers and sub-contractors associated with these systems (mechanical and/or electrical).
- .3 This process must be co-ordinated with the project construction schedule and be completed, including all associated documentation, prior to the consultant's certification of the project for occupancy.
- .4 All applicable contractors, sub-contractors, and suppliers are to include all required costs in their respective tender costs.
- .5 All work is to be performed in accordance with CAN/ULC S1001-2011. Special consideration is to be given to the Sample Integrated Testing Plan (ITP), the review of life safety system design documents, and the provision of test plans and reports.
- .6 The work to be performed by this contractor is also described in CAN/ULC S1001-2011.
- .7 Refer to CAN/ULC S1001-11 Rev1-2019 Informative Annex (C) for Sample Integrated Testing Plan (ITP).

1.3 QUALITY ASSURANCE

- .1 The following criteria must be met in order to be considered an acceptable Integrated Testing Coordinator for this project:
 - .1 Manufacturers: Firms regularly engaged in functional testing and implementation of life safety and fire protection systems for not less than five years.

- .2 Qualifications: Firms with at least five years of successful experience in facility construction, inspection, acceptance testing or commissioning as it relates to fire protection and life safety and equipment similar to that required for this project.
 - .3 The Contractor shall be an established commissioning contractor that has had and currently maintains a locally run and operated business for at least five years.
 - .4 The Contractor shall show satisfactory evidence, upon request, that he maintains a fully equipped service organization capable of furnishing adequate inspection and service to the systems.
- .2 For bidder information only, experienced Life Safety Systems Testing Firms include these listed below or local branches of the companies noted in the vicinity of this project:
- .1 ITC Solutions
20 Hanson Ave, Unit 3
Kitchener, ON N2C 2E2
 - .2 Troy Life and Fire Safety
805 Boxwood Dr, Unit #201
Cambridge, ON N3E 1A4
 - .3 Control Tech Systems
31 Regal Rd
Guelph, ON N1K 1B6
 - .4 Lonergan Engineering
4 Industrial Pkwy South
Aurora, ON L4G 3W1
 - .5 Guardian Fire Consulting Group
55-346 Northfield Dr
Waterloo, ON N2K 3T6
- NOTE: This agent must be a third party firm NOT associated with this project in any way and be under contract with the electrical sub-contractor not the fire alarm supplier.**
- .3 Other firms to these listed above, who feel they are capable, must submit in writing, to the Consultant's office confirmation of the items listed in the criteria above, a minimum of one week prior to tender close in order to be considered as a bidder.

1.4 GENERAL REQUIREMENTS

- .1 The Commissioning Process shall generally encompass and co-ordinate the following key areas:
 - .1 Integrated systems testing planning.
 - .2 Integrated systems testing implementation (functional testing).
 - .3 Integrated systems testing documentation

1.5 RESPONSIBILITIES

.1 General Contractor:

- .1 The general contractor shall verify completeness of the building envelope, perimeter and interior items which affect proper operation of the noted systems.
- .2 The general contractor will assure participation and co-operation of Sub-Contractors and Specialty Contractors (mechanical, electrical, building management, etc.) under the General Contractor's jurisdiction as required for the commissioning process.

.2 Mechanical Contractor:

- .1 Verify Functional performance of associated mechanical systems for compliance with design intent as specified in the appropriate Specification sections.
- .2 Provide the documentation with standard Functional performance reports on completion of the testing.
- .3 Verify submissions for system operation and maintenance manuals, as-built documents, spare parts listing, special tools listing, and other items as may be specified.

.3 Electrical Contractor:

- .1 The Integrated Life Safety Systems Testing Coordinator (ITC) is being retained by the electrical contractor, however; this contractor's work to satisfy the ITC requirements shall be included in the tender price.
- .2 Verify Functional performance of electrical systems for compliance with design intent as specified in the appropriate Specification sections.
- .3 Provide the documentation with standard Functional performance reports on completion of the testing.
- .4 Verify submissions for electrical system operation and maintenance manuals, as-built documents, spare parts listing, special tools listing, and other items as may be specified.
- .5 As a minimum this contractor must include for:
 - .1 Providing the ITC with documentation of design and shop drawings.
 - .2 Provide documents for sequence of operation and maintenance of system.
 - .3 Testing of all components and accessories to confirm Alarm/Supervisory/Trouble at the fire panel.
 - .4 Other items that may be requested by the ITC.
 - .5 Re-commissioning of any items that may have failed.
 - .6 Re-setting of the system to proper operation after tests are completed.
 - .7 **Provide documentation of compliance with OBC 3.2.7.3 'Emergency Lighting' and 3.2.7.4 'Emergency Power for lighting'.**

- .8 Provide written confirmation that life safety systems are installed in accordance with applicable codes and standards, as well as the scope of the project engineering documents.
- .4 Equipment Manufacturers:
 - .1 The equipment manufacturers shall be responsible for providing labour, material, equipment, etc., required within the scope of the respective equipment to facilitate the commissioning process.
 - .2 The equipment manufacturers will perform Pre-Functional and Functional Performance Tests required by the commissioning process.
- .5 Design Engineer:
 - .1 The design engineer shall review and provide written confirmation of acceptance of the Integrated Testing Plan (ITP).
 - .2 The design engineer shall observe Functional Performance Testing, at his discretion.
 - .3 The design engineer shall provide technical capabilities for resolution of deficiencies, where required.
 - .4 The design engineer shall provide necessary information to assist Integrated Test Coordinator including written confirmation of life safety systems installation in accordance with project engineering documents and are ready for integrated testing.

Part 2 Commissioning Process

2.1 OPERATIONS AND MAINTENANCE MANUALS

- .1 Furnish Final, reviewed Operation and Maintenance Manuals to the Consultant fourteen (14) days prior to scheduled Functional Performance Tests.

2.2 FUNCTIONAL PERFORMANCE TEST

- .1 The contractor shall be responsible for the Functional Performance Tests. These tests ensure that all equipment and systems are installed in accordance with the Specifications, Drawings and manufacturers' requirements.
- .2 The contractor shall be responsible for co-ordinating schedule for Functional tests of various equipment and systems.
- .3 In the Functional Test, all noted systems and sub-systems shall be checked for the following:
 - .1 Verify that each element has been properly installed, properly identified, and that all connections have been made correctly.
 - .2 Verify that tests, meter readings, and specific mechanical/electrical performance characteristics agree with those required by equipment or system manufacturer.

- .3 Re-commission any item(s) that may have failed.
- .4 Notify the consultant in writing, at least fourteen (14) days prior to the date of Functional Performance Testing. Schedule the Functional performance tests over a period of consecutive business days.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 CSA C22.2 No.0.3-92, Test Methods for Electrical Wires and Cables.
- .2 CAN/CSA-C22.2 No.131-M89(R1994), Type TECK 90 Cable.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with Electrical General Requirements Section.

Part 2 Products

2.1 BUILDING WIRES

- .1 Conductors: stranded for 10 AWG and larger.
- .2 Minimum size: 12 AWG.
- .3 Copper conductors: size as indicated, with 600 V insulation of chemically cross-linked thermosetting polyethylene material 90°C (194°F) rated T90 for indoor above grade installations.

2.2 TECK CABLE

- .1 Cable: to CAN/CSA-C22.2 No.131.
- .2 Conductors:
 - .1 Grounding conductor: copper.
 - .2 Circuit conductors: copper, size as indicated.
- .3 Inner jacket: polyvinyl chloride material.
- .4 Armour: aluminum.
- .5 Overall covering: polyvinyl chloride material.
- .6 Fastenings:
 - .1 One hole steel zinc straps to secure surface cables 50 mm (2") and smaller. Two hole steel straps for cables larger than 50 mm (2").
 - .2 Channel type supports for two or more cables at 1500 mm (60") centres.
 - .3 Threaded rods: 6 mm (1/4") diameter to support suspended channels.
- .7 Connectors must be suitable for:
 - .1 Installed environment and approved for use with TECK cable.

2.3 ARMoured CABLES

- .1 Conductors: insulated, copper minimum size as indicated above.
- .2 Type: AC90 (minimum size 12 AWG).
- .3 Armour: interlocking type fabricated from aluminum strip.
- .4 Connectors must be suitable for installed environment and approved for use with armoured cable.

Part 3 Execution

3.1 INSTALLATION OF BUILDING WIRES

- .1 Install wiring from source to load through raceways as specified.
- .2 Provide separate neutral conductors for all lighting circuits. Size raceways accordingly.

3.2 INSTALLATION OF TECK CABLE 0 - 1000 V

- .1 Group cables wherever possible on channels.
- .2 Terminate cables in accordance with Wire and Box Connectors - 0 - 1000 V Section.

3.3 INSTALLATION OF ARMoured CABLES

- .1 Group cables wherever possible.
- .2 Terminate cables in accordance with Wire and Box Connectors - 0 - 1000 V Section.
- .3 These cables are to be installed in concealed locations only. These concealed locations are considered to be stud walls and “drops” to stud walls, lighting fixtures, and ceiling mounted devices.
- .4 **These “drops” shall not be permitted to exceed 2.4 m (8'-0"). To limit these “drops” to lengths noted above provide additional branch wiring in conduit.**

END OF SECTION

Part 1 General

1.1 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data for cabinets in accordance with Electrical General Requirements Section.

Part 2 Products

2.1 MATERIALS

- .1 Junction and pull boxes must conform to CSA C22.2 No. 40 (latest edition)

2.2 JUNCTION AND PULL BOXES

- .1 Welded steel construction with screw-on flat covers for surface mounting.
- .2 Covers with 25 mm (1") minimum extension all around, for flush-mounted pull and junction boxes.

Part 3 Execution

3.1 JUNCTION AND PULL BOXES INSTALLATION

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Install junction and pull boxes so as not to exceed 30 m (100') of conduit run between pull boxes and in conformance with the Electrical Safety Code.

3.2 IDENTIFICATION

- .1 Provide equipment identification in accordance with General Electrical Requirements Section.
- .2 Install size 2 identification labels indicating system name, voltage and phase.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Outlet boxes, conduit boxes, and fittings must conform to CSA C22.2 No. 18 (latest edition).

Part 2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm (4") square or larger outlet boxes as required for special devices.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 SHEET STEEL OUTLET BOXES

- .1 Electro-galvanized steel single and multi gang flush device boxes for flush installation, minimum size 76 mm x 50 mm x 64 mm (3" x 2" x 2½") or as indicated. 102 mm (4") square outlet boxes when more than one conduit enters one side with extension and plaster rings as required. Iberville 1104 Series.
- .2 Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit **in utility rooms**, minimum size 102 mm x 57 mm x 38 mm (4" x 2¼" x 1½"). Iberville 1110 Series.
- .3 102 mm (4") square or octagonal outlet boxes for lighting fixture outlets.
- .4 102 mm (4") square outlet boxes with extension and plaster rings for flush mounting devices in finished tile walls.

2.3 MASONRY BOXES

- .1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.

2.4 CONCRETE BOXES

- .1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

2.5 CONDUIT BOXES

- .1 Cast FS or FD ferrous boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle **in areas (other than utility rooms) where surface conduit is used.**

2.6 FITTINGS- GENERAL

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 32 mm (1- 1/4") and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

Part 3 Execution

3.1 INSTALLATION

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm (1/4") of opening.
- .4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not allowed.
- .5 Outlets if unwired are to be provided with blank coverplates to suit related sections of this specification.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 CSA C22.2 No.65-1956(R1965) Wire Connectors.

Part 2 Products

2.1 MATERIALS

- .1 Pressure type wire connectors: with current carrying parts of copper sized to fit copper conductors as indicated.
- .2 Fixture type splicing connectors: with current carrying parts of copper sized to fit copper conductors 10 AWG or less.
- .3 Clamps or connectors for armoured cable, mineral insulated cable, and flexible conduit, as required.

Part 3 Execution

3.1 INSTALLATION

- .1 Remove insulation carefully from ends of conductors and:
 - .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
 - .2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65.
 - .3 Install fixture type connectors and tighten. Replace insulating cap.

END OF SECTION

Part 1 General

1.1 Not Applicable.

Part 2 Products

2.1 MATERIALS

- .1 Grounding equipment must conform to CSA C22.2 No 41 (latest edition).

2.2 EQUIPMENT

- .1 Clamps for grounding of conductor: size as required to electrically conductive underground water pipe and electrically conductive metal gas piping.
- .2 Insulated grounding conductors: green with insulation type that matches specified phase conductors. Gauge shall be in conformance with the latest edition of the Electrical Safety Code to suit required installation conditions.
- .3 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
 - .1 Grounding and bonding bushings.
 - .2 Protective type clamps.
 - .3 Bolted type conductor connectors.
 - .4 Bonding jumpers, straps.
 - .5 Pressure wire connectors.

Part 3 Execution

3.1 INSTALLATION GENERAL

- .1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. **Where EMT is used, run ground wire in conduit.**
- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .5 Soldered joints not permitted.
- .6 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

3.2 EQUIPMENT GROUNDING

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, frames of motors, starters, control panels, distribution panels.

3.3 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Electrical General Requirements Section.
- .2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.
- .4 Disconnect ground fault indicator during tests.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA C22.2 No.18-92, Outlet Boxes, Conduit Boxes, and Fittings.
 - .2 CSA C22.2 No.56-1977(R1977), Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .3 CSA C22.2 No.83-M1985(R1992), Electrical Metallic Tubing.
 - .4 CSA C22.2 No.211.2-M1984(R1992), Rigid PVC (Unplasticized) Conduit.
 - .5 CAN/CSA C22.2 No.227.3-M91, Flexible Nonmetallic Tubing.

Part 2 Products

2.1 CONDUITS

- .1 Epoxy coated conduit: to CSA C22.2 No.45, with zinc coating and corrosion resistant epoxy finish inside and outside.
- .2 Electrical metallic tubing (EMT) with couplings: to CSA C22.2 No.83.
- .3 Rigid PVC conduit: to CSA C22.2 No.211.2.
- .4 Flexible metal conduit: to CSA C22.2 No.56, aluminum and liquid-tight flexible metal.
- .5 Flexible PVC conduit: to CAN/CSA C22.2 No.227.3, ENT.

2.2 CONDUIT FASTENINGS

- .1 One hole steel straps to secure surface conduits 53 mm (2") and smaller. Two hole steel straps for conduits larger than 53 mm (2").
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at 1.5 m (5'0") oc.
- .4 Threaded rods, 6 mm (1/4") diameter, to support suspended channels.

2.3 CONDUIT FITTINGS

- .1 EMT fittings shall be set screw style (zinc alloy).
- .2 Flexible metal conduit fittings shall be screw-in type.
- .3 Liquid type flexible metal conduit fittings shall be sealtite type.
- .4 PVC fittings shall be PVC type complete with PVC adaptors at all boxes.
- .5 Coating: same as conduit.
- .6 Factory "ells" where 90° bends are required for 27 mm (1") and larger conduits.

- .7 Where bushings are noted to be provided they must be “screwed” type fastened to a conduit connector. Push-fit or glued in place bushings will NOT be accepted.

2.4 FISH CORD

- .1 Nylon twine.

Part 3 Execution

3.1 INSTALLATION

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in mechanical/ electrical service rooms and in unfinished areas. Where devices are to be installed on existing walls in finished area, which cannot be “fished”, install feeds in a surface metal raceway equal to Wiremold V700 series. Co-ordinate surface installations with consultant prior to rough-in.
- .3 **Use electrical metallic tubing (EMT) for all branch circuits unless specified otherwise.**
- .4 Use rigid aluminum threaded conduit where specified and up to 2.1 m (7'0") above finish floor where exposed to mechanical injury.
- .5 Use rigid PVC conduit underground and in kitchen areas.
- .6 Use flexible metal conduit for connection to motors in dry areas, connection to recessed fixtures without a prewired outlet box, connection to surface or recessed fixtures, work in movable metal partitions.
- .7 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations and for connections to kitchen equipment.
- .8 **Minimum conduit size for branch circuits shall be 21 mm (3/4").** Single drops from ceiling mounted junction boxes down to a light switch or duplex receptacle may be reduced to 16 mm (½").
- .9 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .10 Mechanically bend steel conduit over 27 mm (1") diameter.
- .11 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .12 Install fish cord in empty conduits.
- .13 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- .14 Dry conduits out before installing wire.

3.2 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with 1.5 m (5') clearance.

- .3 Run conduits in flanged portion of structural steel.
- .4 Group conduits wherever possible on suspended or surface channels.
- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 75 mm (3") parallel to steam or hot water lines with minimum of 25 mm (1") at crossovers.
- .7 Do not fasten surface conduit to roof deck. Provide standoffs or supports as manufactured by Caddy or use unistrut trapeze fastened to structure.**

3.3 CONCEALED CONDUITS

- .1 Do not install horizontal runs in masonry walls.
- .2 Do not install conduits in terrazzo or concrete toppings.

END OF SECTION

Part 1 General

1.1 SHOP DRAWINGS

- .1 Submit shop drawings for each system in Conformance with The Electrical General Requirements Section.

1.2 PRODUCT/MAINTENANCE DATA

- .1 Submit product/maintenance data for each system for inclusion in maintenance manual conforming to The General Electrical Requirements Section.

1.3 SCOPE

- .1 The scope of this Section will include the following systems.
 - .1 Cable management hangers.
 - .2 Assistive Hearing System
 - .3 Line voltage power packs and low voltage occupancy sensors.

Part 2 Products

2.1 CABLE MANAGEMENT HANGERS

- .1 Hangers where noted are to be complete with the following features:
 - .1 Approximately 150 mm (6") high by 80 mm (3¼") protrusion.
 - .2 Constructed from 5 mm (3/16") x 20 mm (3/4") flat steel bar and formed to resemble the letter "G".
 - .3 Seven 6 mm (1/4") diameter mounting holes are to be provided around the hanger perimeter.
 - .4 Matte black finish.
 - .5 Suitable for wall or suspended mounting.
 - .6 Acceptable Manufacturers:
 - .1 EMF Cat. #H-533-S
 - .7 Manufacturer Contact:
Electron Metal Fabricators Inc.
2160 Dagenais Boulevard West
Laval, Quebec
H7L 5X9
Phone: 450-625-8064 or 1-800-267-8064
Fax: 450-625-8004
 - .8 Acceptable Alternate:
Wiremold Cat. #GH030406

Mono System Cat. # The Hook H-433

Cablofil Cat. #CSGH-3-4-6

Eaton Cat. #B-Line

- .2 As an alternate to the hanger system detailed the contractor may**
- a) Use as an equal one run of 50 mm (2") x 150 mm (6") wire mesh cable management system equal to Cablofil Cat. #CF 54/150 EZ complete with Cat. #FAS L 150 universal wall bracket where noted to be wall mounted and Cat. # FAS C 200 where noted to be hung. The hangers are to be installed at intervals as recommended by the manufacturer but no greater than 2.4 m (8' - 0") on centre.**

2.2 ASSISTIVE HEARING SYSTEM

- .1** Outlets where noted shall be single gang boxes unless specified otherwise.
- .2** Outlets if unwired are to be provided with blank coverplates to suit related sections of this specification.
- .3** Coordinate final outlet locations, quantities, etc. with respective system vendor and owner's representative.
- .4 Assistive hearing system is supply under cash allowance under Section 1.** Rough-in and installation of the system shall be included in the electrical bid price.

2.3 LINE VOLTAGE POWER PACKS AND LOW VOLTAGE OCCUPANCY SENSORS

- .1** Line voltage power packs and occupancy sensors shall be one manufacturer throughout the project.
- .2** Line Voltage Power packs shall be provided to match the room lighting load, control requirements, and lighting voltage. Power packs shall have the following features:
- .1** Mount to standard junction box.
 - .2** Simple replacement. It shall be capable to replace the unit without requiring any configuration or set-up.
 - .3** Plenum rated
 - .4** 120VAC or 347V, 60HZ operation.
 - .5** Acceptable materials:
 - .1** Sensorswitch Cat. #PP20 Series
 - .2** Legrand Cat. #BZ-250 Series
 - .3** Greengate Cat. #SP15 Series
 - .4** Catalog numbers as referenced within lighting control sequences on drawings.
- .3** Low voltage / analog occupancy sensors shall be complete with the following features:
- .1** Coverage pattern to suit room ceiling height.
 - .2** Suitable to detect minor and medium motion patterns within rooms less than 2000 sq. ft.

- .3 Mount to standard junction box.
- .4 Simple replacement. It shall be capable to replace the unit without requiring any configuration or set-up.
- .5 Relays shall not be integrated within the occupancy sensor. Relays shall be provided within separate power pack.
- .6 Acceptable materials
 - .1 Sensorswitch Cat. #CM-PDT Series
 - .2 Legrand Cat. #CI-205
 - .3 Greengate Cat. #OAC-DT-2000

Part 3 Execution

3.1 CABLE MANAGEMENT HANGERS

- .1 Install hangers as per details in configuration noted.
- .2 Prior to installation co-ordinate location with other services within the ceiling space.
- .3 Co-ordinate with noted sub-contractors to install cables noted to be utilizing these hangers. Cables are to be installed such that the maximum sag between hangers does not exceed 25 mm (1"). This electrical contractor is to coordinate.
- .4 **Attaching cable to any T-bar support rods is not acceptable.**

3.2 ASSISTIVE HEARING SYSTEM ROUGH-IN

- .1 Outlets are to be provided for devices with surface mounted raceway as detailed on drawings.
- .2 Surface mounted raceway terminated into ceiling spaces.

3.3 LINE VOLTAGE POWER PACKS AND LOW VOLTAGE OCCUPANCY SENSORS

- .1 Install power packs in accessible maintenance areas or as indicated on drawings.
- .2 Provide access doors if power packs are installed above drywall ceilings.
- .3 Install sensors in gym where noted on plan at mid height of wall.
- .4 Sensors installed in areas of high abuse shall be complete with wire guards.
- .5 It shall be the contractor's responsibility to locate and aim sensors in the correct location required for complete and proper coverage within the range of coverage as per the manufacturer's recommendations. The locations and quantities of sensors shown on the drawings are diagrammatic and indicate only the rooms which are to be provided with sensors. The contractor shall provide additional sensors if required to properly and completely cover the respective rooms.
- .6 It is the contractor's responsibility to arrange a pre-installation meeting with the manufacturer's factory authorized representative, at the facility, to verify placement to sensors and installation criteria.

- .7 The contractor shall also provide the on-site training necessary to familiarize the owner's personnel with the operation, use, adjustment and problem solving diagnosis of the occupancy sensing devices systems.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Dry type transformers must conform to CSA C22.2 No.47 and C9 (latest edition).
- .2 **Dry type transformers must conform to CSA C802 (latest edition).**
- .3 **Dry type transformers must be in accordance with Ontario Green Energy Act 2018 (NRCan 2018) DOE 2016.**

1.2 PRODUCT DATA

- .1 Submit product data in accordance with Electrical General Requirements Section.

Part 2 Products

2.1 TRANSFORMERS

- .1 Transformers to be of one manufacturer throughout project.
- .2 Ratings and characteristics shall be as indicated on riser diagrams.
- .3 Aluminum winding.
- .4 Transformers are to be ventilated dry type style with 4-2½% taps (2 F.C.B.N. and 2 F.C.A.N.)
- .5 Maximum permissible sound levels shall be as follows:

Transformer Rating (KVA)	Sound Level (dBA)
≤50	45
51 to 150	50
151 to 300	55
301 to 500	60

- .6 **All transformers with a K factor of 4 or above must be electro-static shielded.**
- .7 **Transformers with a K-factor of 4 or above must include a secondary neutral bus that is sized at twice the rated secondary phase current.**
- .8 Transformer enclosure shall be EEMAC/NEMA 3R ventilated complete with removable front panel.

- .9 Provide vibration isolators equal to Korfund R series, Mason ND-B, or approved equal. "Colour" of vibration isolators shall be based on weight of transformers.

Transformer Weight (lbs)	Approximate Rating	Colour (Korfund)
540	15 – 75 kVA	Blue (RD2)
680	112.5 kVA	Black (RD2)
960	150 kVA	Red (RD2)
1,520	300 kVA	Green (RD2)
2,200	500 kVA	Gray (RD3)

2.2 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Electrical General Requirements Section.
- .2 Label must indicate:
- .1 transformer "tag" as per riser diagram
 - .2 primary and secondary voltage and phase.

2.3 ACCEPTABLE MANUFACTURERS:

- .1 Acceptable manufacturers are as follows:
- .1 Hammond
 - .2 Rex
 - .3 Delta
 - .4 Acme
 - .5 Bemag

Part 3 Execution

3.1 INSTALLATION

- .1 Primary and secondary feeders are to be connected using flexible conduit.
- .2 Transformers with a rating up to and including 75 KVA are permitted to be wall mounted provided mounting method is a suitably sized angle iron frame secured to structure (i.e. masonry wall, steel columns, etc. NOT metal siding).
- .3 The above rating of transformers may also be suspended from **structure only** on a unistrut trapeze as detailed.
- .4 Transformers above 75 KVA must be floor mounted.

- .5 Floor mounted transformers are to be mounted/secured to a concrete pad suitably sized to suit the transformer. This pad is the responsibility of this contractor and must be provided in conformance with the standard of Division 1 specifications for poured in place concrete.
- .6 All transformers must be mounted on vibration isolators selected based on transformer weight.
- .7 Ensure adequate clearance around transformer for ventilation as per the Electrical Safety Code.
- .8 Loosen isolation pad bolts until no compression is visible.
- .9 Install transformers in level upright position.
- .10 Remove shipping supports only after transformer is installed and just before putting into service.
- .11 Make primary and secondary connections in accordance with wiring diagram.
- .12 Energize transformers after installation is complete.

END OF SECTION

Part 1 General

1.1 PRODUCT DATA

- .1 Submit product data in accordance with Electrical General Requirements Section.
- .2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

Part 2 Products

2.1 PANELBOARDS

- .1 Panel boards must conform to CSA C22.2 No. 29 (latest edition).
- .2 Panelboards: product of one manufacturer.
- .3 Install circuit breakers in panelboards before shipment.
- .4 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.
- .5 Bus and breakers must be rated for [10,000] A (symmetrical) interrupting capacity or as indicated.
- .6 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.
- .7 Panelboard mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .8 Two keys for each panelboard and key panelboards alike.
- .9 Aluminum bus with neutral of same ampere rating as mains.
- .10 Mains must be suitable for bolt-on breakers. Provide main (if applicable) and branch breakers as bolt-on style.
- .11 Trim with concealed front bolts and hinges.
- .12 Trim and door finish must be baked grey enamel.
- .13 All panels regardless of voltage and amperage must be provided with a lockable door.
- .14 Branch circuit panelboards (250 AMP or smaller) must be one of the following:
 - .1 Eaton Cat # POW-R-LINE-C PRL-1 or PRL-2
 - .2 Schneider Electric Cat # NQ Series for up to 240V or NF Series for up to 600V
 - .3 Siemens Cat #Sentron P1 Series

- .15 Power distribution circuit breaker panelboards (400 AMP or larger) must be one of the following:

- .1 Eaton CAT# POW-R-Line-C PRL-3A or PRL-4A
- .2 Schneider Electric CAT# I-Line Series (Bolt-On)

2.2 BREAKERS

- .1 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.
- .2 Lock-on devices for fire alarm, stairway, exit and night light circuits.

2.3 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Electrical General Requirements Section.
- .2 Nameplate for each panelboard size 4 engraved description as indicated. In finished areas install label on inside of panel, and in service areas install label on exterior of panel.
- .3 Nameplate for each circuit in distribution panelboards size 2 engraved "name of load" as indicated.
- .4 Complete circuit directory with typewritten legend showing location of each circuit.
Include a copy of the directories in the maintenance manuals.

Part 3 Execution

3.1 INSTALLATION

- .1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.
- .2 Install surface mounted panelboards on plywood backboards. Where practical, group panelboards on common backboard. Plywood shall be 21mm (3/4") fire rated or painted with intumescent fire block paint having a minimum of 1h rating, unless noted otherwise.
- .3 Mount panelboards to height specified in Electrical General Requirements Section or as indicated.
- .4 Connect loads to circuits.
- .5 Connect neutral conductors to common neutral bus.

END OF SECTION

Part 1 General

1.1 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Electrical General Requirements Section.

Part 2 Products

2.1 SWITCHES

- .1 Line Voltage Wall Switches
 - .1 AC switches must conform to CSA C22.2 No. 111 (latest edition).
 - .2 AC switches with following features:
 - .1 Terminal holes approved for No. 10 AWG wire.
 - .2 Silver alloy contacts.
 - .3 Urea or melamine molding for parts subject to carbon tracking.
 - .4 Suitable for back and side wiring.
 - .5 Toggle style (Rocker style) (architect to select colour).
 - .3 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.
 - .4 AC Switches of one manufacturer throughout project.
 - .5 Provide 2 keys per keyed switch.
 - .6 Occupancy sensor switches shall be dual technology style (PIR and Ultrasonic) where noted on the drawings.
 - .7 Acceptable Materials:
 - .1 Single Pole : Hubbell Cat #HBL1201
 - .2 Motor Rated: Hubbell Cat. #HBL1221PL
 - .3 Single Relay ON/OFF Occupancy Sensor includes:
 - .1 Legrand Cat. #DW-100
 - .2 Greengate Cat. #ONW-D-1001
 - .3 Sensorswitch Cat. #WSXA PDT Series
 - .8 Acceptable toggle switch alternate manufacturers include:
 - .1 Pass & Seymour
 - .2 Leviton

2.2 RECEPTACLES

- .1 Receptacles, plugs, and other similar wiring devices must conform to CSA 22.2 No 42 (latest edition).

- .2 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, with following features (20A where noted):
 - .1 Urea molded housing (Colour by architect).
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Break-off links for use as split receptacles.
 - .4 Eight back wired entrances, four side wiring screws.
 - .5 Triple wipe contacts and rivetted grounding contacts.
- .3 Other receptacles with ampacity and voltage as indicated.
- .4 Receptacles of one manufacturer throughout project.
- .5 Acceptable materials:
 - .1 Standard Devices
 - .1 Standard duplex receptacle: Hubbell Cat # HBL5252CN
 - .2 T-slot receptacles: Hubbell Cat. #HBL5352
 - .3 Tamper resistant receptacle: Hubbell Cat # BR15TR
 - .4 Tamper resistant T-slot receptacle: Hubbell Cat. #BR20TR
 - .2 Tamper resistant
 - .1 Tamper resistant ground fault protected receptacle: Hubbell Cat. #GFTR15
 - .2 Tamper resistant ground fault protected T-slot receptacle: Hubbell Cat. #GFTR20
- .6 Acceptable alternate manufacturers include:
 - .1 Pass & Seymour
 - .2 Leviton

2.3 COVER PLATES

- .1 Cover plates from one manufacturer throughout project.
- .2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
- .3 Stainless steel, brushed, 1 mm (1/32") thick cover plates for wiring devices mounted in flush-mounted outlet box.
- .4 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.
- .5 Weatherproof cover plates complete with gaskets and "heavy-duty in use" covers in conformance with the Electrical Safety Authority. Provide product equal to Intermatic Cat. #WP5100C.
- .6 Provide p-touch labels on cover plates for all receptacles. Labels shall include source panel and branch circuit.

Part 3 Execution

3.1 INSTALLATION

- .1 Switches:
 - .1 Install single throw switches with handle in "UP" position when switch closed.
 - .2 Install switches in gang type outlet box when more than one switch is required in one location.
 - .3 Mount toggle switches at height specified in Electrical General Requirements Section or as indicated.
- .2 Receptacles:
 - .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
 - .2 Mount receptacles at height specified in Electrical General Requirements Section or as indicated.
- .3 Occupancy sensors:
 - .1 Occupancy sensors shall be set to 5 minutes "delay to off" unless otherwise noted.
- .4 Cover plates:
 - .1 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
 - .2 Install suitable common cover plates where wiring devices are grouped.
 - .3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

END OF SECTION

Part 1 General

1.1 PRODUCT DATA

- .1 Submit product data in accordance with Electrical General Requirements Section.

Part 2 Products

2.1 DISCONNECT SWITCHES

- .1 Enclosed manual air break switches must conform to CSA C22.1 No.4 (latest edition).
.2 Fuseholder assemblies must conform to CSA C22.2 No.39 (latest edition).
.3 Fusible, and/or non-fusible, horsepower rated disconnect switches, size as indicated.
.4 Provision for padlocking in off switch position by three locks.
.5 Mechanically interlocked door to prevent opening when handle in ON position.
.6 Fuses: size as indicated, to Fuses - Low Voltage Section.
.7 Fuseholders: relocatable and suitable without adaptors, for type and size of fuse indicated.
.8 Quick-make, quick-break action.
.9 ON-OFF switch position indication on switch enclosure cover.

2.2 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Electrical General Requirements Section.
.2 Indicate name of load controlled on size 4 nameplate.

2.3 ACCEPTABLE MANUFACTURERS

<u>Manufacturer</u>	<u>General Purpose</u>	<u>Weather Proof</u>
Eaton	IHD Series	3HD Series
Schneider Electric	Type A Series	Type R Series
Siemens	ID Series	NFR/FR Series

Part 3 Execution

3.1 INSTALLATION

- .1 Install disconnect switches complete with fuses if applicable.

END OF SECTION

Part 1 General

1.1 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings in accordance with Electrical General Requirements Section.
- .2 Indicate:
 - .1 Mounting method and dimensions.
 - .2 Starter/contacter size and type.
 - .3 Layout of identified internal and front panel components.
 - .4 Enclosure types.
 - .5 Wiring diagram for each type of starter.
 - .6 Interconnection diagrams.

1.2 OPERATION AND MAINTENANCE DATA

- .1 Provide operation and maintenance data for incorporation into manual specified in Electrical General Requirements Section.
- .2 Include operation and maintenance data for each type and style of starter/contacter.

1.3 MAINTENANCE MATERIALS

- .1 Provide maintenance materials in accordance with Electrical General Requirements Section.
- .2 Provide listed spare parts for each different size and type of starter:
 - .1 1 operating coil.
 - .2 3 fuses.
 - .3 10% indicating lamp bulbs used.

Part 2 Products

2.1 MATERIALS

- .1 Starters: must conform to CSAC22.2 No. 14 (latest edition) and EEMAC E14-1.
- .2 Control transformers must conform to CSAC22.2 No. 66 (latest edition).
- .3 Auto-transformers must conform to CSAC22.2 No 47 (latest edition).
- .4 Contactors must conform to CSA C22.2 No. 14 (latest edition).
- .5 Half size starters will not be accepted. NEMA and IEC rated starters are acceptable.

2.2 MANUAL MOTOR STARTERS

- .1 Single and three phase manual motor starters of size, type, rating, and enclosure type as indicated, with components as follows:
 - .1 Switching mechanism, quick make and break.
 - .2 One or Three overload heaters, manual reset, trip indicating handle.
 - .3 Toggle switch: standard duty labeled "on"/"off".
 - .4 Indicating light: standard duty type and red colour.
 - .5 Locking tab to permit padlocking in "ON" or "OFF" position.

2.3 FULL VOLTAGE MAGNETIC STARTERS

- .1 Magnetic and combination magnetic starters of size, type, rating and enclosure type as indicated with components as follows:
 - .1 Contactor solenoid operated, rapid action type.
 - .2 Motor overload protective device in each phase, manually reset from outside enclosure.
 - .3 Wiring and schematic diagram inside starter enclosure in visible location.
 - .4 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.
- .2 Combination type starters to include fused disconnect switch with operating lever on outside of enclosure to control disconnect, and provision for:
 - .1 Locking in "OFF" position with up to 3 padlocks.
 - .2 Independent locking of enclosure door.
 - .3 Provision for preventing switching to "ON" position while enclosure door open.
- .3 Accessories:
 - .1 Pushbuttons Selector switches standard duty labeled as indicated.
 - .2 Indicating lights: standard duty type and color as indicated.
 - .3 1-N/O and 1-N/C spare auxiliary contacts unless otherwise indicated.
 - .4 1 red pilot light for "stop" or "off" and 1 green light for "start" or "on".

2.4 CONTROL TRANSFORMER

- .1 Single phase, dry type, control transformer with primary voltage as indicated and secondary voltage to suit remote control device, complete with secondary fuse, installed in with starter as indicated.
- .2 Size control transformer for control circuit load plus 20% spare capacity.

2.5 CONTACTORS

- .1 Electrically held and controlled by pilot devices as indicated and rated for type of load controlled.
- .2 Complete with 2 normally open and 2 normally closed auxiliary contacts unless indicated otherwise.
- .3 Mount in CSA Enclosure 1 unless otherwise indicated.
- .4 Include following options in cover:
 - .1 Red indicating lamp.
 - .2 Hand - Off - Auto selector switch.
- .5 Control transformer: mounted in contactor enclosure.
- .6 Contactors must be definite purpose.

2.6 FINISHES

- .1 Apply finishes to enclosure in accordance with Electrical General Requirements Section.

2.7 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Electrical General Requirements Section.
- .2 Manual starter designation label: black plate, white letters, size 1, engraved as indicated.
- .3 Magnetic starter designation label: black plate, white letters, size 2, engraved as indicated.
- .4 Contactor designation label:
black plate, white letters, size 4, indicating name of load controlled.

2.8 ACCEPTABLE MANUFACTURERS

- .1 The acceptable manufacturers are as follows:
 - .1 Allen Bradley
 - .2 Eaton
 - .3 Siemens
 - .4 Group Schneider
 - .5 Klockner Moeller

Part 3 Execution

3.1 INSTALLATION

- .1 Install starters, connect power and control as indicated.
- .2 Ensure correct fuses and overload devices elements installed.

3.2 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Electrical General Requirements Section.
- .2 Operate switches, contactors to verify correct functioning.
- .3 Perform starting and stopping sequences of contactors and relays.
- .4 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.
- .5 Install contactors and connect auxiliary control devices.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
 - .1 ANSI/IEEE C62.41- 1991, Recommended Practices for Surge Voltages in Low-Voltage AC Power Circuits.
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM F1137- 88 (1993), Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.
- .3 United States of America, Federal Communications Commission (FCC)
 - .1 FCC (CFR47) EM and RF Interference Suppression.
- .4 IESNA LM-79-08, IES Electrical Method for the Electrical and Photometric Measurements of Solid State Lighting Products.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings in accordance with Electrical General Requirements Section for all light fixtures supplied under this contract.
- .2 Submit complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Consultant.
- .3 Photometric data to include: VCP Table spacing criterion.

1.3 SCOPE

- .1 This contractor is responsible to supply and install all lighting fixtures as scheduled and/or indicated including lamp and those accessories required for a complete lighting system. This contractor must coordinate lighting installations with all other Divisions of this project.
- .2 All fixtures must be CSA approved or approved at this contractor's expense by the Special Inspection Division of the Electrical Safety Authority.

1.4 GUARANTEE

- .1 Guarantees for materials replacement shall be as follows from date of substantial completion.
 - .1 LED lamps: 3 months.
 - .2 LED fixtures, and driver: 5 years.
- .2 The labour required to replace these ballasts, lamps or drivers must be included in the above guarantee, however only for the extent of the contract guarantee and warranty period as noted in Electrical General Requirements.

1.5 EXISTING FIXTURE BALLAST REMOVAL AND DESTRUCTION

.1 Scope

.1 This Contractor is responsible for contracting with an approved company for the dismantling, disposal and removal of all existing fluorescent ballasts and lamps from this project. This process must include but is not limited to the following:

- .1 Removal of existing ballasts from fixtures by this contractor.
- .2 This contractor is to compare the ballast number to the PCB ballast identification booklet provided by the disposal company.
- .3 If the ballast is not contaminated it is to be disposed of by normal means.
- .4 If the ballast is contaminated provide:
 - .1 Approved interm on site storage area.
 - .2 Approved interm on site storage containers.
 - .3 Any and all necessary on site inspections.
 - .4 All necessary approval certificates (include copies in maintenance manuals).
 - .5 Full dismantling, complete destruction and disposal of all ballasts components.

.2 Approved Disposal Companies

.1 PCB Containment Technology Inc.
75 Wanless Court
Ayr, ON
N0B 1E0
Phone: (519) 740-1333
Fax: (519) 740-2320

.3 Payment Procedures

.1 Cost of complete services of this sub-contractor shall be paid for by this Section.

Part 2 Products

2.1 FIXTURE CONSTRUCTION

- .1 Fixtures must be constructed of 20 gauge (minimum) cold rolled steel. All metal edges require smooth finish.
- .2 Light leaks must be prevented by providing gasketting, stops, and barriers.
- .3 Fixtures must be finished in high reflective baked white enamel. This surface must have a reflectance of not less than 85%.

2.2 FIXTURE LENS

- .1 Unless otherwise noted fixture lenses shall be as follows:
 - .1 Lens thickness: 3.2 mm (1/8")
 - .2 Material: injection moulded clear prismatic virgin acrylic
 - .3 Frame: hinged, latched, steel.

2.3 LED FIXTURES

- .1 Fixture LED's must be tested in conformance with IESNA LM80 standard.
- .2 LED's must be selected using a binning algorithm to ensure colour and lumen output of a given fixture are consistent, as well as meet or surpass ANSI C78.377 specification for the rated lifetime of the fixture. Colour accuracy between products must be within a 2-step MacAdam ellipse.
- .3 Luminaires must be tested to IESNA LM79 by an independent approved laboratory.
- .4 Luminaires must be tested prior to shipping.
- .5 Luminaires must be ULC certified and approved for use in Canada.
- .6 Fixtures must maintain a minimum of 90% of their initial light output for 60,000 hours. Submit test results upon request.
- .7 Lumen values indicated for fixtures in the project documents are to be considered as "absolute" or "delivered" values.
- .8 Other than for specialty fixtures, and unless otherwise indicated, the maximum driver current is to be 750 mA.

2.4 STANDARD EXIT LIGHTING UNITS

- .1 Exit lighting units must conform to CSA C860, CSA 22.2 No. 141 (latest edition).
- .2 Housing: extruded aluminum housing, white finish.
- .3 Face and back plates: extruded aluminum.
- .4 Lamps: 2W LED.
- .5 Operation: 25 year.
- .6 Units are to be provided with three (3) pictogram legends indicating "left from here", "straight from here", and "right from here".
- .7 Face plate to remain captive for relamping.

2.5 ACCEPTABLE LIGHTING MANUFACTURERS

- .1 Refer to the light fixture schedule as indicated on drawings.

2.6 ACCEPTABLE FIXTURE ENERGY LISTINGS

- .1 Fixtures as noted on lighting fixture schedules are to be DLC or Energy Star listed as noted. Equal manufacturers shall supply proof of DLC/Energy Star listing as part of fixture approval and shop drawing process.

Part 3 Execution

3.1 INSTALLATION

- .1 Locate and install luminaires as indicated. Luminaires are not to be supported from the roof deck. Provide additional unistrut support channel and/or support from structure. Co-ordinate with consultant on site.
- .2 Ball align hangers must be provided for rod suspended fixtures.
- .3 Fixtures surface mounted to suspended ceilings must be secured through ceiling assembly to cross member supports. These supports are to be steel channels or angles independently secured **to structure** using # 12 "jack" chain. Each chain must be secured so no fixture weight is added to the ceiling assembly.
- .4 Plaster frames/flange kits must be provided by this Division for fixtures recessed in plaster and/or drywall ceilings.
- .5 Where specified, fixtures to be chain hung shall be hung using "jack" chain with a capacity to suit the fixture weight. Branch circuit wiring feeding these fixtures shall be AC90 cable "ty-wrapped" at 900mm (36") intervals along length of drop. Final appearance must be neat and professional.
- .6 Install exit lighting units with illuminated faces and chevrons/arrows indicating path(s) of exit as indicated. Unless otherwise noted install exit fixtures at 2400 mm (8' 0") above finished floor.
- .7 **Special installation: Secure fixtures to structure to conform to the Electrical Safety Code using "jack chain" NOT ceiling suspension wire. Where coreslab is used, suspension point must be independent of the one used for suspension of the ceiling assembly. As an alternate to jack chain the contractor may use a pre-manufactured aircraft cable suspension and fastening system as manufactured by Gripple (Gripple Cat. #HF02-10F2). Provide minimum 2 per fixture.**

3.2 WIRING

- .1 Connect luminaires to lighting circuits as indicated.
- .2 Connect exit fixtures to exit lighting circuits and unit equipment (if applicable).

3.3 LUMINAIRE ALIGNMENT

- .1 Align luminaires mounted in continuous rows to form straight uninterrupted line.
- .2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

3.4 DELIVERIES

- .1 Fixtures are to be completely assembled at the manufacturer's plant and delivered to the project site in original unitized containers. Ensure that a dry, protected and secure space is available for proper storage before scheduling delivery of fixtures.

3.5 TESTING/CERTIFICATION

- .1 At the completion of the project and in the presence of the consultant, test all exit and emergency fixtures. On company letterhead, the contractor is to prepare a chart indicating:
 - .1 Project
 - .2 Date
 - .3 Equipment type
 - .4 Certification of correct connection
 - .5 Certification of correct operation
 - .6 Duration of test in minutes (minimum 30)
 - .7 Actual period of testing (time of day)

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 CAN/ULC-S524 (latest edition), Installation of Fire Alarm Systems.
- .2 ULC-S525 (latest edition), Audible Signal Appliances for Fire Alarm Systems.
- .3 CAN/ULC-S526 (latest edition), Visual Signal Appliances, Fire Alarm.
- .4 CAN/ULC-S527 (latest edition), Control Units, Fire Alarm.
- .5 CAN/ULC-S528 (latest edition), Manual Pull Stations.
- .6 CAN/ULC-S529 (latest edition), Smoke Detectors.
- .7 CAN/ULC-S530 (latest edition), Heat Actuated Fire Detectors, Fire Alarm.
- .8 CAN/ULC-S531 (latest edition), Smoke Alarms.
- .9 CAN/ULC-S536 (latest edition), Inspection and Testing of Fire Alarm Systems.
- .10 CAN/ULC-S537 (latest edition), Verification of Fire Alarm Systems.
- .11 CAN/ULC-S552 (latest edition), Inspection, Testing and Maintenance of Smoke Alarms.
- .12 CAN/ULC-S553 (latest edition), Installation of Smoke Alarms.
- .13 OBC-2012, Ontario Building Code.

1.2 DESCRIPTION OF SYSTEM

- .1 System includes:
 - .1 Existing Edwards EST 3X Control panel to carry out fire alarm and protection functions including receiving alarm signals, initiating general alarm, supervising system continuously, actuating zone annunciators, and initiating trouble signals.
 - .2 Trouble signal devices.
 - .3 Power supply facilities.
 - .4 Addressable manual alarm stations.
 - .5 Addressable and conventional automatic alarm initiating devices.
 - .6 Audible and visual signal devices.
 - .7 End-of-line devices.
 - .8 Annunciators.
 - .9 Ancillary devices.
 - .10 Interface and zone modules.
 - .11 Remote trouble indicator.

1.3 REQUIREMENTS OF REGULATORY AGENCIES

- .1 This system is subject to review by local building department officials, local fire department officials. **Therefore, submission of verification certificate and field technician device verification sheets is required prior to inspection by these officials. Schedule accordingly.**

1.4 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Electrical General Requirements Section.
- .2 Include:
 - .1 Layout of equipment.
 - .2 Zoning.
 - .3 Complete wiring diagram.

1.5 OPERATION AND MAINTENANCE DATA

- .1 Provide operation and maintenance data for Fire Alarm System for incorporation into manual specified in Electrical General Requirements Section.
- .2 Include:
 - .1 Operation and maintenance instructions for complete fire alarm system to permit effective operation and maintenance.
 - .2 Technical data - illustrated parts lists with parts catalogue numbers.
 - .3 Copy of approved shop drawings.
 - .4 List of recommended spare parts for system.

1.6 TRAINING

- .1 Arrange and pay for on-site demonstrations by fire alarm equipment manufacturer to train operational personnel in use and maintenance of fire alarm system. **Obtain written receipt of training session and include in maintenance manual.**

1.7 SYSTEM OPERATION

- .1 Operation of any alarm initiating device to:
 - .1 Cause audible and visual signal devices to sound throughout building.
 - .2 Transmit signal to fire department via monitoring station.
 - .3 Cause zone of alarm device to be indicated on control panel and remote annunciator(s).
 - .4 Cause air conditioning and ventilating fans to shut down and to function so as to provide required control of smoke movement.
 - .5 Cause fire doors and smoke control doors if normally held open, to close automatically.
 - .6 Log the alarm in the historical alarm log file.

- .2 System Reset
 - .1 It shall not be possible to reset the fire alarm system until all the alarm zones have been properly reset or cleared.

1.8 PERFORMANCE CRITERIA

- .1 These specifications describe the minimum functional requirements for an electronically supervised, microprocessor based, fully integrated system. The initial installation shall include all the necessary electronic hardware, software and memory for a completely operable system in accordance with these specifications.

1.9 QUALITY ASSURANCE

- .1 Each and all items of the fire alarm system shall be listed as the products of a single manufacturer under the appropriate category by the Underwriter's Laboratories of Canada and shall bear the "U.L.C." label.
- .2 Each and all items of the fire alarm system shall be covered by a one year parts and labour warranty covering defects resulting from faulty workmanship and materials. The warranty shall be deemed to begin on the date the system is accepted by the Project Manager on issuance of the substantial performance certificate for the project.
- .3 All control equipment must have Transient Protection Devices to comply with U.L.C. requirements.

Part 2 Products

2.1 GENERAL

- .1 The existing fire alarm system is a hybrid system with an addressable Edwards EST3X panel and conventional devices, single stage, zoned, non-coded, indicating, fully integrated fire alarm.
- .2 The existing fire alarm control panel shall allow for loading or editing of special instructions and operating sequences as required. The system shall be capable of on site programming to accommodate expansion, and changes required by local codes. All software operations shall be stored in a non-volatile programmable memory within the fire alarm control panel. Loss of primary and secondary power shall not erase the instructions stored in memory.
- .3 The ability to selectively program input/output control functions based on ANDing, ORing, NOTing, Timing and Special Coded Operations is also to be incorporated in the resident software programming of the system.
- .4 The system shall have the ability to manually disable and enable any device/circuit individually for maintenance or testing purposes.
- .5 It shall be possible to reprogram selected or all smoke detector initiating zones for alarm verification.

- .6 It shall be possible to program an adjustable time delay circuit for each waterflow initiating circuit to prevent false alarms that may be caused by erroneous pressure surges in the sprinkler system.
- .7 All on site programming changes to the fire alarm system shall be password protected.
- .8 All Control Panels are to be properly grounded to building ground. Conduit ground will not be acceptable. The green coloured grounding loop shall be a minimum #14 AWG insulated copper conductor run in conduit. The ground loop shall be connected to building water supply to the line side of the water meter. Ground wire must not be run in the same conduit as the Fire Alarm wiring.

2.2 POWER REQUIREMENTS

- .1 The existing control panels shall receive 120 VAC power via a dedicated overcurrent protected circuit. The incoming power to the system shall be supervised so that any power failure must be audibly and visually indicated at the control panel and the remote annunciator. A green 'Power On' LED shall be displayed continuously while incoming power is present.
- .2 Control Panel output power supply shall have the following operating characteristics:
 - .1 Rated for five Amps continuous duty
 - .2 24 VDC filtered and regulated
 - .3 Power limited with a range of 20.4 VDC to 32 VDC.
 - .4 Automatic "Brownout" transfer to standby batteries when supply voltage falls to 102 VAC
- .3 Standby power for the system is produced by dual-sealed, lead acid, gelled cell batteries, series connected with sufficient Amp. Hour capacity to operate the system under supervisory conditions with AC power disconnected for 24 hours and at the end of this period operate the alarm devices for thirty consecutive minutes. The batteries shall be dual-sealed, maintenance free type.
- .4 The system batteries shall be supervised so that a low battery condition or disconnection of the batteries shall be audibly and visually annunciated at the control panel.
- .5 Battery charger shall have the following operating characteristics:
 - .1 Ability to charge a range up to 33 AH to 70% of their capacity within 12 hours.
 - .2 Compatible with either lead acid or nicad batteries.
- .6 All circuits requiring system operating power shall be individually fused at the control panel.
- .7 The system shall be modular in design to allow future expansion with a minimum of hardware additions and system interruptions.

2.3 FIRE ALARM CONTROL PANEL

- .1 The existing fire alarm control panel is an Edwards EST 3X.
- .2 All auxiliary manual controls shall be supervised so that all switches must be returned to the normal automatic position to clear system trouble.
- .3 Signal Circuits shall be independently supervised and fused such that a fault on one circuit shall not affect the operation of any of the other circuits. All signal circuits shall be configured as follows:
 - .1 Class "B" wiring, current limited.
 - .2 Rated at two Amps of continuous power.
 - .3 Capable of powering polarised 24 VDC audible and visual signalling appliances.
- .4 Provide dry contact auxiliary control circuits as follows:
 - .1 Central Station alarm output.
 - .2 Central Station trouble output.
 - .3 SPDT Form C relays fused at 2 A @ 24 VDC.
- .5 System Expansion Modules connected by ribbon cables shall be supervised for module placement. Should a module become disconnected the system trouble indicator must illuminate and audible trouble signal must sound.
- .6 The Fire Alarm Control Panel shall be capable of supporting RS-232-C I/O ports. CPU data output to the I/O ports shall be in a parallel ASCII format at field adjustable baud rates of 220, 300, 1200, 2400 and 4800.
- .7 A walk test feature must be provided.
- .8 All system controls shall be housed in a surface wall mounted steel cabinets. Finish shall be according to the manufacturer's standards.
- .9 All modules shall be secured behind hinged locked door with a full viewing tempered plastic window. The hinged locked doors shall give access to all the operating controls but shall not expose live connections.
- .10 All internal wiring, control circuits, connections and terminals shall only be accessible behind a removable metal retainer plate.
- .11 All Cabinets are to be properly grounded to building ground. Conduit ground will not be acceptable.
- .12 The system must provide communication with addressable initiating devices. All of these devices will be annunciated on the control panel's main LCD display. Annunciation shall include the following conditions for each point:
 - .1 40 Character Zone/Device Location
 - .2 Type of Device
 - .3 Detector Status (Normal/Alarm/Trouble)
 - .4 Device Missing/Failed

- .13 The communication format must be a completely digital poll/response protocol to allow tapping of the circuit wiring. A high degree of communication reliability must be obtained by using parity data bit error checking routines for address codes and check sum routines for the data transmission portion of the protocol.
- .14 Each addressable device must be uniquely identified by an address code entered on each device base at time of installation. The use of jumpers to set address will not be acceptable due to the potential of vibration and poor contact.
- .15 It shall be possible for the owner's representative to change a smoke detector without any special tools or programming.
- .16 The system shall support 100% of addressable devices in alarm or operated at the same time, under both primary (AC) and secondary (battery) power conditions. Systems, which cannot support 100% of their point capacity in alarm simultaneously, cannot assure appropriate system response and are not acceptable.
- .17 **The appropriate quantity of isolator modules shall be installed so that a wiring fault (short, open, or ground) within one floor area shall not prevent the normal operation of other addressable devices on other floor areas.**
- .18 The system shall maintain the sensitivity level set, for each sensor, over time by automatically compensating for environmental factors such as dust and dirt accumulations in a smoke sensor's chamber. The smoke sensor shall be a smoke density measuring device having no self-contained set-point. **The control panel shall determine the alarm decision for each sensor.**
- .19 The system shall automatically indicate when an individual sensor needs cleaning. When a sensor's average value reaches a predetermined value a 'Dirty Sensor' trouble condition shall be audibly and visually indicated at the control panel for the individual sensor.
- .20 All data transmissions, **including the analogue value**, between the smoke sensors and the control panel shall be digitally transmitted and incorporate parity and checksum digital data checks of each transmission.
- .21 An operator from the control panel, having a proper access level, shall have the ability to:
 - .1 Manually access and print the following information for each sensor in a report format that can be easily understood by the user:
 - .1 Primary Status
 - .2 Device Type
 - .3 Present Average Value
 - .4 Present Sensitivity Selected
 - .5 Highest Peak Detection Values
 - .6 Sensor Chamber Status (Normal, Almost Dirty, Dirty, Excessively Dirty)
 - .2 Manually control the following of each sensor:
 - .1 Clear Peak Detection Values

- .2 Enable or Disable the Point
 - .3 Clear Verification Tally
 - .4 Control a Sensor's Relay Driver Output
- .22 It shall be possible to program the control panel to **automatically** change the sensitivity settings of each sensor based on **time-of-day** and **day-of-week**.

2.4 INTELLIGENT DETECTORS-GENERAL OPERATION

- .1 Addressable devices shall use simple to install and maintain decade, numbered 0 to 9, address switches. Detectors that have expanded addressing will have decade switch numbered from 0 to 15 for the most significant digit to allow detector addressing from 1 to 250.
- .2 Device addressing shall be accomplished by either an electrical or mechanical means.
- .3 Detectors shall be intelligent (analog) and addressable, and shall connect with two wires to the fire alarm control panel signalling line circuits.
- .4 Addressable smoke detectors shall provide dual alarm and power/polling LEDs. Both LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. If required, the LED flash shall have the ability to be removed from the system program. An output connection shall also be provided in the base to connect an external remote alarm LED.
- .5 The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. Sensitivity shall be automatically adjusted by the panel on a time-of-day basis.
- .6 Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance.
- .7 The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature.
- .8 The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.
- .9 Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (PHOTO, THERMAL).
- .10 Detectors will operate in an analog fashion, where the detector simply measures its designed environment variable and transmits an analog value to the FACP based on real-time measured values. The FACP software, not the detector, shall make the alarm/normal decision, thereby allowing the sensitivity of each detector to be set in the FACP program and allowing the system operator to view the current analog value of each detector.

- .11 Detectors shall provide address-setting means using decimal switches and shall also store an internal identifying code that the control panel shall use to identify the type of device. LEDs shall be provided that shall flash under normal conditions, indicating that the device is operational and is in regular communication with the control panel.
- .12 Addressable devices shall provide address-setting means using decimal switches and shall also store an internal identifying code that the control panel shall use to identify the type of device. LED(s) shall be provided that shall flash under normal conditions, indicating that the device is operational and is in regular communication with the control panel.
- .13 The sensors shall be of a low profile design and ULC listed for both ceiling and wall mount applications.
- .14 Automatic smoke sensors shall be equipped with a dust cover, which shall be removed at the time of verification to prevent dust and dirt entering the smoke chamber during construction.
- .15 A magnetic test switch shall be provided to test detectors and modules. Detectors shall report an indication of an analog value reaching 100% of the alarm threshold.

2.5 INTELLIGENT DUCT SMOKE DETECTOR

- .1 The smoke detector housing shall accommodate an intelligent photoelectric detector (as noted above) that provides continuous analog monitoring and alarm verification from the panel.
- .2 When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system.
- .3 Duct smoke detector sensor assemblies shall be complete with duct housing, photoelectric smoke detector, and sampling tubes as required. The duct-housing base shall come complete with an auxiliary set of form C dry contacts rated at 120 VAC, 3 Amps.
- .4 The system shall automatically indicate when an individual duct sensor needs cleaning.

2.6 END OF LINE RESISTORS

- .1 End-of-line resistors for signalling circuits shall be sized to ensure the correct supervisory current flows in each circuit.
- .2 End-of-line resistors shall be mounted on a stainless steel plate for mounting on a standard single gang box and bear the ULC label.

2.7 INTELLIGENT MODULES – GENERAL OPERATION

- .1 The modules shall have a minimum of 2 diagnostic LEDs mounted behind a finished coverplate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The module shall be capable of storing up to 24 diagnostic codes, which can be retrieved for troubleshooting assistance. Input and output circuit wiring shall be supervised for open and ground faults. The module shall be suitable for operation in the following environment:
 - .1 Temperature: 0°C to 49°C (32°F to 120°F).
 - .2 Humidity: 0-93% RH, non-condensing.

2.8 MONITOR MODULE

- .1 The monitor modules shall have the following operating characteristics:

A flashing LED indicates that the module is in communication with the control panel. The LED latches steady on alarm (subject to current limitations on the loop).
- .2 The monitor modules shall have the following features:

Nominal operating voltage: 15 to 32 VDC.
Maximum current draw: 5.1 mA (LED on)
Average operating current: 400 uA (LED flashing)
EOL resistance: 47K ohms.
Temperature range: 0°C to 49°C (32°F to 120°F)
Humidity range: 10% to 93% noncondensing
Dimensions: 114.3 mm (4.5") high x 101.6 mm (4") wide x 31.75 mm (1.25") deep. Mounts to a 101.6 mm (4") square x 53.975 mm (2.1/8") deep box.

2.9 ISOLATOR MODULE

- .1 Fault isolator modules shall be provide to automatically isolate wire-to-wire short circuits on an SLC loop. The fault isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC loop. If a wire-to wire short occurs, the fault isolator module shall automatically open-circuit (disconnect) the SLC loop. When the short circuit condition is corrected, the fault isolator module shall automatically reconnect the isolated section of the SLC loop. The fault isolator module shall not require any address-setting, and its' operations shall be totally automatic. It shall not be necessary to replace or reset a fault isolator module after its normal operation. The fault isolator module shall mount in a standard 10.16 cm (4") deep electrical box, in a surface-mounted backbox, or in the fire alarm control panel. It shall provide a single LED which shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

2.10 CONTROL MODULE

- .1 Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered, polarized audio/visual notification appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contact relay.
- .2 The control module NACs may be wired for Style Z or Style Y (Class A/B) with up to 1 Amp of inductive A/V signal, or 2 Amps of resistive A/V signal operation, or as a dry contact (Form-C) relay. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to ensure that 100% or all auxiliary relay or NACs may be energized at the same time on the same pair of wires.
- .3 The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 Amps at 30 VDC.

2.11 SYSTEM WIRING

- .1 The system wiring must be FSA rated in conformance with the Electrical Safety Code to suit the type of installation.
- .2 Wiring shall be minimum #18 AWG twisted shielded pair in conduit. "Securex 2" armoured cable will be permitted to be used for "drops" to devices on accessible ceilings.
- .3 As indicated on system riser diagram initiating device wiring shall be run in a loop with a home run from the last device to the control panel (Class 'A' configuration). Wiring from the "loop" module to conventional devices must be supervised, run in conduit, and conform to the standards of the Electrical Safety Code.
- .4 Signal wiring is to be cross connected in a class 'B' configuration.
- .5 Install isolator modules and end of line resistors in service rooms no higher than 2.4 M AFF. Provide location of these devices at the time of shop drawing submission.
- .6 **These are the basic wiring requirements for system operation. Prior to tender close manufacturer and contractor are to confirm all necessary wiring specifications and requirements.**

2.12 APPROVED EQUIPMENT

<u>DEVICE</u>	<u>EDWARDS</u>
<u>Existing</u>	EST 3X
<u>Control Panel</u>	
<u>Intelligent Devices</u>	
Duct Type Smoke Detector (c/w Air Sampling Tubes)	SIGA-SD c/w SIGA-PS
Monitor Module	SIGA-CT Series
Control Module	SIGA-CR
Isolator Module	SIGA-IM

Part 3 Execution

3.1 INSTALLATION

- .1 Additional components shall be installed in accordance with CAN/ULC-S524 (latest edition) and approved manufacturers manuals and wiring diagrams. The contractor shall furnish all conduit, wiring, outlet boxes, junction boxes, cabinets and similar devices necessary for the complete installation, All wiring shall be of the type recommended by the Electrical Safety Code, approved by local authorities having jurisdiction for the purpose, and shall be installed in dedicated conduit throughout.
- .2 Connect alarm circuits to main control panel.
- .3 Locate and install signal devices and connect to signalling circuits.
- .4 Connect signalling circuits to main control panel.
- .5 Install end-of-line devices at end of applicable alarm and signalling circuits.
- .6 **Connect smoke damper integral detector outputs to monitor modules for alarm condition and for monitoring of AC power to smoke damper as trouble condition at fire alarm panel based on module address.**

3.2 PROTECTION

- .1 Contractor is to ensure all fire protection system detectors are protected from dust, dirt, humidity, and water at all times during construction. This applies to detectors installed, stored on site or stored in storage containers. Any detectors that are damaged or dirty shall be replaced at the contractor's expense.

3.3 FIELD QUALITY CONTROL

- .1 The system shall be installed and fully tested under the supervision of trained manufacturer's representative. The system shall be demonstrated to perform all the functions as specified.

3.4 ACCEPTABLE INSTALLER

- .1 The fire alarm / life safety system specified herein shall be installed by an Authorized Electrical Contractor who is CFAA certified.

3.5 EXAMINATION

- .1 Prior to the commencement of any of the work detailed herein, an examination and analysis of the area(s) where the Fire Alarm / Life Safety System and all associated components are to be installed shall be made.
- .2 Any of these area(s) which are found to be outside the manufacturers' recommended environments for the particular specified products shall be noted on a Site Examination Report which shall be given to the Building Owners Representative, and the Consultant.
- .3 Any shorts, opens, or grounds found on existing wiring shall be corrected prior to the connection of these wires to any panel component or field device.

3.6 DEMONSTRATION

- .1 Each of the intended operations of the installed Fire Alarm / Life Safety System shall be demonstrated to the Building Owners' Representative and the Consultant.

3.7 SYSTEM TEST

- .1 Perform tests in accordance with General Electrical Requirements Section and CAN/ULC-S537-(latest edition) Standard for the Verification of Fire Alarm Systems.
- .2 Fire alarm system:
 - .1 Test each device and alarm circuit to ensure noted devices transmit alarm to control panel and actuate general alarm and ancillary devices.
 - .2 Check annunciator panels to ensure zones are shown correctly.
 - .3 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of system.

- .4 Class A circuits
 - .1 Test each conductor on all circuits for capability of providing alarm signal on each side of single open-circuit fault condition imposed near middlemost point of circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.
 - .2 Test each conductor on all circuits for capability of providing alarm signals during ground-fault condition imposed near middlemost point of circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.
 - .5 Class B circuits
 - .1 Test each conductor on all circuits for capability of providing alarm signal on line side of single open-circuit fault condition imposed at electrically most remote device on circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.
 - .3 The control panel shall continuously perform as automatic self-test routine on each sensor, which will functionally check the sensor electronics and ensure the accuracy of the valves being transmitted to the control panel.
 - .4 Automatic testing will occur at a rate of one sensor every four minutes.
 - .5 The sensor's average analogue value is the average of the last 2000 recorded analogue entries of its chamber.
 - .6 Any sensor that fails this test shall indicate a '**SELF-TEST ABNORMAL**' trouble condition with the sensor's address at the control panel.
 - .7 The system shall automatically indicate when an individual sensor needs cleaning. When the sensor's average value reaches a predetermined value, a '**DIRTY SENSOR**' trouble condition shall be audibly and visually indicated at the local control panel for that sensor. IF a '**DIRTY SENSOR**' indication is left unattended and its average value increases to a second predetermined value, an '**EXCESSIVELY DIRTY SENSOR**' trouble condition shall be indicated at the local control panel for that sensor. To prevent false alarms, these '**DIRTY**' conditions shall in no way decrease the amount of smoke obscuration necessary to generate an alarm condition.
 - .8 An operator having a proper access level, shall have the capability to manually access the following information from the control panel:
 - .1 Primary Status
 - .2 Device Type
 - .3 Present Average Value
 - .4 Present Sensitivity Selected*
 - .5 Highest Peak Detection Values (HVP)*
 - .6 Sensor Range (Normal, Dirty, Excessively Dirty)
- * Values shall be in 'percent of smoke obscuration' format so that no interpretation is required by the operator.

- .9 Provide “Integrated Testing” of this life safety system in conformance with the noted specification section. Include all associated costs in tender.

END OF SECTION

25-7630-RFT - Laurentian Public School HVAC and Building Controls Upgrade

Opening Date: January 28, 2025 4:30 PM

Closing Date: February 18, 2025 2:00 PM

Schedule of Prices

* Denotes a "MANDATORY" field

Do not enter \$0.00 dollars unless you are providing the line item at zero dollars to the Board.

Bid Price Form

The amounts stipulated on the Bid Price Form(s) are intended to cover the cost of the complete Work as described in this Procurement and must remain fixed and firm for the term of the Contract unless otherwise specified in this Procurement.

All prices shall be in Canadian Funds, Free On Board (FOB) Destination, and Freight Prepaid (Board locations). and shall be exclusive of Harmonized Sales Tax (HST) but shall include all materials, labour, equipment, disbursements, expenses, insurance, bonding, customs charges, freight, shipping and handling costs, travel costs and all other charges of every kind attributable to the Work and Services provided.

Bid Price includes Cash Allowance

Line Item	Description	Unit of Measure	Quantity	Bid Price *	Total
1	25-7630-RFT Laurentian Public School HVAC and Building Controls Upgrade as per scope of work	Lump Sum	1		
Subtotal:					

Summary Table

Bid Form	Amount
Bid Price Form	
HST (13%)	\$ 0.00
Total Contract Amount:	

Bid Questions

Bidder Instructions

Answer all questions that are marked Mandatory. Reference information is provided below

Question #1 Reference

Bill S-211 - This enactment enacts the Fighting Against Forced Labour and Child Labour in Supply Chains Act, which imposes an obligation on certain government institutions and entities to ensure measures are taken to prevent and reduce the risk that forced labour or child labour is used by suppliers or in their supply chains. The Board principles align with Bill S-211.

Question #2 Reference

"Ontario Business" definition as per the BOBI Act:

- is a supplier, manufacturer or distribution of any business structure;
- conducts its activities on a permanent basis in Ontario; and
- has either
 - its headquarters or main office in Ontario, or
 - at least 250 full-time employees in Ontario at the time of the applicable procurement process.

Question #4 Reference

The Board will require General Contractors on the approved Roster List to have their IHSA - Certificate of Recognition (COR®) by January 2026. Although not mandatory for this bid opportunity, the Board requests bidders to respond to the question below YES or NO.

NOTE: By responding NO, you acknowledge the deadline requirement above.

Confirm your organization will comply with this Act.
YES or NO. If no, please explain.

Does your company qualify as an Ontario Business
under the BOBI Act? YES or NO

If you answered NO to Question #2 above, is your
company a Canadian business? YES or NO

Does your company have a current IHSA - Certificate
of Recognition (COR®)? - YES or NO

Specifications

Bidder's Contact Information

A Site Supervisor and Project Manager, assigned to manage and supervise the Work, must be named in this form. Personnel will be subject to approval by the Board and cannot be changed without prior written approval from the Board.

A dedicated Site Supervisor is required full-time for this project. If your company is awarded more than one project/contract, a different Site Supervisor is required for each project. In the event of this situation, you have the option to name and include a resume for an alternative Site Supervisor at this time.

If providing an alternative Site Supervisor with your submission, it is understood, that the alternative Site Supervisor will only be reviewed if the first Site Supervisor has already been accepted and working on another WRDSB project.

Note: resumes are required to be uploaded in the document section. Optional for alternative Site Supervisor

Title	Name *	E-mail *	Cell Phone Number *	
Project Manager				*
Site Supervisor				*
Optional – Alternative Site Supervisor				

Documents

It is your responsibility to ensure the uploaded file(s) is/are not defective or corrupted and are able to be opened and viewed by the Owner. If the attached file(s) cannot be opened or viewed, your Bid Submission may be rejected.

Upload a resume for each person named in the Specification section.

- Project Manager - Resume * (mandatory)
- Site Supervisor - Resume * (mandatory)
- Optional - Alternative Site Supervisor - Resume (only if Site Supervisor #1 is assigned to another WRDSB project prior to this award) (optional)

BONDING UPLOAD SECTION

Refer to the Bonding Requirements Section of the Terms and Conditions.

Bonding is required if the project is equal to or greater than \$200,000.00. Note: The Bidding System has flagged these fields as mandatory. If your bid is less than \$200,000.00, please upload a pdf document stating: Not Applicable.

Bidders shall upload their electronically verifiable and enforceable (e-Bond) format for Bid Deposit Bond and Agreement to Bond separately in this section. If both Bonds are in the same pdf file, please upload it in both fields and indicate one is a "duplicate"

The date on the Bonds must be the Closing Date

Tender # and Project Title must be included on the Bonds

- Bid Deposit Bond * (mandatory)
- Agreement to Bond * (mandatory)

Addenda, Terms and Conditions

I/We have read and understand this Bid Solicitation document, and agree to perform the Work required in accordance with this Bid

Solicitation document, including all addenda, at the price(s) detailed in the Bid.

I/We confirm that:

1. The person named in this Bid is authorized to sign and electronically submit this Bid through the Bidding System.
2. I/We meet all mandatory requirements of the Bid Solicitation document.
3. The bid will remain open for a specified acceptance period after the Closing Time. The Board may, at any time within this period, accept the Bid whether or not any other Bid has previously been accepted.
4. All prices provided in the Bid will remain fixed and firm for the duration of the term of the agreement, unless specified otherwise.
5. All prices provided in my/our Bid are in Canadian funds and include all charges of every kind attributable to the Work. Harmonized Sales Tax will be extra and not shown, unless specified otherwise.
6. To the best of my/our knowledge and belief:
 - a) the information provided in the Bid is correct; and
 - b) the Bid is made without any comparison of figures or arrangement with any other individual, corporation or person submitting a Bid for the same Work and is in all respects fair and without collusion or fraud.
7. I/We comply with the all applicable Board policies, provincial, and federal laws, and are aware of the Board's "Principles of Business Conduct" and will comply.
8. I/We agree and understand that the recommendation to award the Work may be subject to the approval from the Board as well as availability of funds.
9. I/We agree to be bound by the terms and conditions of the Bid Solicitation document and submit this Bid on behalf of the Bidder.

☐ I have the authority to bind the Bidder.

The Bidder/Proponent is to declare any actual, potential or perceived conflict of interest that could arise from submitting the Bid/Proposal.

Do you have a potential conflict of interest?

☐ Yes ☐ No

The Bidder acknowledges and agrees that the addendum/addenda below form part of the Bid Solicitation Document.

Please check the box in the column "**I have reviewed this addendum**" below to acknowledge each of the addenda.

File Name	I have reviewed the below addendum and attachments (if applicable)	Pages
There have not been any addenda issued for this bid.		