



**Waterloo Region
District School Board**

REQUEST FOR TENDER

25-7705-RFT

Courtland Avenue Public School HVAC, Exterior and Interior Upgrades

ISSUE DATE: February 14, 2025

**ELECTRONIC SUBMISSIONS will be received by the Bidding System no later than
2:00 p.m. local time, on March 17, 2025.**

DIVISION 00 – BIDDING AND CONTRACT DOCUMENTS

00 01 00 Consultant/Professional Seals	6
DIVISION 00 – BIDDING AND CONTRACT DOCUMENTS	7
00 21 13 Instructions to Bidders	7
00 21 14 – General Contractors and Subcontractors	19
00 21 15 – Scope of Work	21
00 31 34 – Subsurface Investigation Report – NOT APPLICABLE	22
Appendix 00 31 34A – Soil Report – NOT APPLICABLE	23
00 41 13A – Asset and Warranty Card	24
00 56 13 – Definitions Stipulated Price	25
00 72 13 – Standard Terms and Conditions	27
00 73 00 “The Supplementary Conditions”	61
DIVISION 01 - GENERAL REQUIREMENTS	119
01 14 00 – Work Restrictions.....	119
01 21 00 – Allowances	123
01 31 00 – Project Managing And Coordination	125
01 32 00 – Construction Progress Documentation	131
01 33 00 – Submittal Procedures	134
01 35 17 – Fire Safety Procedures.....	139
Appendix 013517-A Contractor Hot Work Permit.....	147
01 35 23 – Health And Safety	148
01 35 43 – Hazardous Materials	154
Appendix 01 35 43A Asbestos Audit Report	158
REPORTS INSERTED AT END OF THE SPECIFICATION BOOK	158
Appendix 01 35 34B Lead Report – NOT APPLICABLE	159
01 42 00 – References.....	160
01 45 00 – Quality Control	165
01 51 00 – Temporary Utilities	172
01 53 00 – Temporary Construction Facilities.....	177
01 54 00 – Materials and Equipment	183
01 61 00 – Product Requirements.....	186
01 74 00 – Cleaning and Waste Management.....	198
01 78 10 – Closeout Submittals and Requirements.....	202
01 78 40 – Maintenance Requirements	208
01 79 00 – Demonstration and Training	211

DIVISION 02 – EXISTING CONDITIONS

02 41 19	Selective Demolition	1-7
02 81 16	Hazardous Materials	1-4

DIVISION 05 – METALS

05 50 00	Miscellaneous Metals	1-6
05 51 13	Steel Railings	1-6

DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES

06 10 00	Rough Carpentry	1-5
06 20 00	Finish Carpentry	1-9

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

07 01 50	Maintenance Roofing Work	1-4
07 84 00	Firestopping and Smoke seals	1-4
07 92 00	Sealants	1-5

DIVISION 08 – DOORS AND OPENINGS

08 11 13	Steel Doors and Frames	1-7
08 11 16	Aluminum Doors, Frames and Sidelights	1-9
08 51 13.13	Aluminum-Clad Wood Windows	1-10
08 70 00	Hardware	1-6
08 80 00	Glazing	1-5

DIVISION 09 – FINISHES

09 22 16	Non-Structural Metal Framing	1-7
09 29 00	Gypsum Board	1-8
09 51 23	Acoustical Tile Ceilings	1-6
09 65 13	Resilient Flooring Accessories	1-5
09 90 00	Painting	1-9
09 97 36	Electrostatic Coating	1-2

DIVISION 10 – SPECIALTIES

10 51 13	Metal Lockers	1-4

DIVISION 11 – EQUIPMENT

11 00 00	NA	

DIVISION 12 – FURNISHINGS

12 36 40	Stone Countertops	1-4

DIVISION 13 – SPECIAL CONSTRUCTION

13 00 00	NA	

DIVISION 14 – CONVEYING EQUIPMENT

14 00 00	NA	

DIVISION 20 – COMMON REQUIREMENTS FOR MECHANICAL

20 00 01	Mechanical Specification Index	1-2
20 02 51	Mechanical Contract General Requirements	1-13
20 05 11	Mechanical Work Requirements	1-12
20 05 31	Expansion Fittings and Loops	1-2
20 05 34	Bases, Hangers and Supports (Indoor)	1-6
20 05 35	Bases, Hangers and Supports (Outdoor)	1-5
20 05 49	Vibration Control Measures	1-4

20 05 53	Identification of Mechanical Services	1-6
20 06 11	Testing, Adjusting, and Balancing (TAB) of Mechanical Services	1-7

DIVISION 21 – MECHANICAL

21 00 00	NA	

DIVISION 23 – HEATING, VENTILATION, AND AIR CONDITIONING (HVAC)

23 05 23	Valves – Bronze Service	1-3
23 07 13	Duct Insulation	1-5
23 07 19	HVAC Piping Insulation	1-6
23 21 13	Hydronic Piping – Screwed/ Welded	1-5
23 21 14	Hydronic Piping – Rolled Grooved Heating (Victaulic - WRDSB)	1-10
23 23 13	Refrigerant Piping and Specialties	1-6
23 25 13	Water Treatment for Closed-Loop Hydronic Systems	1-5
23 31 13	Metal Ducts	1-7
23 33 13	Duct Accessories	1-4
23 33 14	Volume Control Dampers	1-3
23 33 18	Operating Dampers	1-2
23 33 53	Duct Liners	1-3
23 34 23	Packaged Exhausters	1-3
23 37 13	Diffusers, Registers, and Grilles	1-2
23 37 23	Louvres and Vents for Intake and Exhaust	1-3
23 82 23	Hydronic Unit Ventilators	1-5
23 82 29	Radiators, Convectors, and Cabinet Heaters	1-3

DIVISION 25 – INTEGRATED AUTOMATION

25 20 11	Building Automation System	1-26
	<u>BUILDING AUTOMATION GRAPHICS AND SEQUENCES INSERTED AT THE END OF DIVISION 25</u>	

DIVISION 26 – ELECTRICAL

26 00 11	Electrical Specification Index	1-1
26 01 15	Electrical Allowances and Fees	1-1
26 01 16	Electrical Contract General Requirements	1-20
26 01 17	Demolition and Renovation	1-2
26 01 20	Commissioning and Integrated Testing of Life Safety and Fire Protection Systems	1-4
26 05 19	Wires and Cables	1-2
26 05 20	Junction and Pull Boxes	1-1
26 05 21	Outlet Boxes, Conduit Boxes, and Fittings	1-2
26 05 22	Wire and Box Connectors – 0-1000 V	1-1
26 05 26	Grounding Secondary	1-2
26 05 33	Conduits, Conduit Fastenings and Conduit Fittings	1-3

26 05 75	Auxiliary Systems	1-1
26 24 16	Panelboards	1-2
26 24 17	Moulded Case Circuit Breakers	1-1
26 27 26	Wiring Devices	1-3
26 28 16	Disconnect Switches	1-1
26 51 13	Lighting Equipment	1-4
26 51 16	Digital Occupancy & Daylight Control Systems	1-7

DIVISION 27 – COMMUNICATIONS

27 00 00 NA

DIVISION 28 – ELECTRICAL SAFETY AND SECURITY

28 31 24	Fire Alarm System (Conventional)	1-4

DIVISION 31 – EARTHWORK

31 00 00 NA

DIVISION 32 – EXTERIOR IMPROVEMENTS

32 17 26.13	Tactile Warning Surfacing – Surface Mount	1-3

DIVISION 33 – UTILITIES

33 00 00 NA

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.

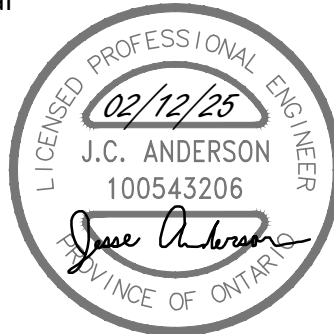
1.1.1 Architect



1.1.2 Structural



1.1.3 Mechanical



1.1.4 Electrical



END OF SECTION

DIVISION 00 – BIDDING AND CONTRACT DOCUMENTS

00 21 13 Instructions to Bidders

1. Designated Contact

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. Bidder's must not communicate in any manner with anyone other than the Designated Contact.

For the purposes of this procurement process, the Designated Contact 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: ABA Architects Inc.

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, or 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 Contact 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.

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.

5. Doing Business with the Waterloo Region District School Board

The Waterloo Region District School Board is a provincially funded institution reporting to the Ministry of Education of Ontario and is one of the larger school boards in Ontario, operating 121 school locations and serving approximately 64,000 students in the Region of Waterloo.

The Waterloo Region District School Board’s Vendor Registration program is transitioning to a fully integrated online eProcurement tool for bid opportunities through the electronic bidding system: [bids&tenders](#).

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.

The Board utilizes prequalified Roster Lists for specific categories/commodities awarded through a competitive process.

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

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	FEB 14, 2025
Non-Mandatory Pre-Bid Site Examination	Date: Thursday, February 20, 2025 Time: 3:45 PM 107 Courtland Ave. East, Kitchener ON Side Door/ Main Entrance
Deadline for Questions	MAR 06, 2025
Closing Date and Time	MAR 17, 2025, 2:00 pm local time
Anticipated Contract Start / Work begins	JUL 02, 2025
Occupancy	AUG 26, 2025
Construction Completion	NOV 28, 2025
Substantial Completion Date	DEC 31, 2025
Ready for Takeover	AUG 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. HST is extra and shall not be included in Bid prices.
- iv. The person submitting the Bid on behalf of the Bidder must have authority to bind the Bidder.
- v. Quantities may be estimated, and therefore the Board, at its discretion, may purchase more or less of the commodity based on the unit price bid.
- vi. All information required on the forms shall be completed in full including references and subcontractors that it proposes to use for Work described. Changes made to the list of nominated subcontractors after the closing of the Bid, must have prior written approval of the Board Contact.
- vii. 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.
- viii. Unit prices and/or provisional/supplementary 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.
- ix. Provisional or Supplementary 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 Provisional or Supplementary items are not purchased, or quantities are less than estimated, no adjustment or compensation will be awarded to the Bidder by the Board. Provisional or Supplementary 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.

19. Post-Award Meeting

A post-award meeting may be held consisting of the successful Vendor/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.

- 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 Applicable, 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

Ministry of Labour Notice of Project confirmation notice to be uploaded in Bids and Tender prior to mobilization and/or prior to first project draw

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 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, excluding hours occurring during a Saturday, Sunday, or a legal holiday, 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

ABA Architects Inc. was solicited to complete the design and act as the Prime Consultant for Courtland Avenue Public School HVAC Upgrades, Exterior and Interior Renovation. This renovation includes, but is not limited to, new classroom, offices and vestibule expansion on the lower level; new entry door as well as new windows for selected areas facing Courtland Avenue (to align with the City's heritage approval); electrical distribution upgrades; new LED lighting and ceiling in the stairwell, as well as selected classrooms; new AC and unit ventilators in selected classrooms; and replace pneumatic systems with DDC systems within project scope. Abatement work within selected areas is also include in this project. Refer to all documents for complete scope of work. Schedule and delivery are clearly indicated on contract documents. All student/ staff/ teacher areas that are accessible must be complete at noted deadlines, and have occupancy granted. All work occurring between September 2025 and June 2026 is to be completed after hours, or in hoarded areas as indicated in Contract Documents. All after-hours work is to be included in the overall contract cost.

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

Instructions:

- 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**

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

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 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 Vendor/Contractor 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 successful Bidder 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 Subcontractors, 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 successful Bidder 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 successful Bidder 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 successful Bidder 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 Vendor/Contractors 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 Vendor/Contractor, including the cancellation of the contract.

The Board expects that all employees and Vendor/Contractors 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 Vendors/Contractors

These Guidelines cover any vendor, contractor, supplier, 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 contractor's employees, sub-contractors, agents, consultants, and others on site in connection with the contractor's work or at the vendor/contractor's express or implied invitation.

- i. **Courtesy and Respect:** all vendor/contractors and their employees must conduct themselves in a manner that is lawful, courteous, businesslike, and respectful of all students, staff, faculty, guests, or visitors.
- ii. **Language and Behavior:** vendors/contractors 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 contractor or contractor's employee is prohibited. Offenders will be removed from WRDSB property and/or reported to the local Police Department.
 - iv. **Smoking:** Contractors and their employees are not permitted to smoke on WRDSB property, in or near any buildings.
 - v. **Fraternization:** Vendor/Contractors and their employees may not fraternize or socialize with WRDSB students or employees.
 - vi. **Appearance:** Vendor/Contractors 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. **Reporting:** The Vendor/Contractor 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 Vendor/Contractor is responsible for its employees, agents, consultants and guests. If prohibited conduct does occur, the vendor/contractor 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

Vendor/Contractors 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

- i. Broader Public Sector Accountability Act, 2010
- ii. Building Ontario Businesses Initiative Act, 2022
- iii. Construction Act
- iv. Architect Act
- v. Canada Revenue Agency (CRA) regulations
- vi. Accessibility for Ontarians with Disabilities Act (AODA)

- vii. Workplace Safety and Insurance Act (WSIB)
- viii. Occupational Health and Safety Act
- ix. Trade Agreements (CETA/CFTA)
- x. Education Act
- xi. [Fighting Against Forced Labour and Child Labour in Supply Chains Act](#)
- xii. [WRDBS Procurement Services Policies website](#)
- xiii. [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 successful Bidder(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 Vendor 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 and Municipal Freedom of Information and Protection of Privacy Act

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.

9. Confirmation to Proceed

No work shall commence until the Board has issued a purchase order and/or contract, if applicable to the successful Bidder. 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 Successful Bidder and the Board. For payment purposes, a Purchase Order shall be generated and issued to the Successful Bidder. 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 subcontractors, sub-consultants and suppliers also have no conflict with respect to other work and/or other clients.

The Vendor/Contractor, Subcontractors and 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 Vendor/Contractor 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 Vendor/Contractor 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 Subcontractor or Supplier that is directly or indirectly affiliated with or related to the Vendor/Contractor.

The Vendor/Contractor 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 Subcontractor or Supplier, and that the Owner relies on the maintenance of an arm's-length relationship between the Vendor/Contractor and its Subcontractors and Suppliers. Consistent with this fundamental term of the Contract, the Vendor/Contractor will not enter into any agreement or understanding with any Subcontractor 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 Vendor/Contractor, where such claim is, in whole or in part, in respect of a disputed claim by the Subcontractor or Supplier against the Vendor/Contractor, where the payment to the Subcontractor or Supplier by the Vendor/Contractor is agreed to be conditional or contingent on the ability to recover those amounts or a portion thereof from the Owner, failing which the Vendor/Contractor shall be saved harmless from all or a portion of those claims. The Vendor/Contractor acknowledges that any such agreement would undermine the required arm's-length relationship and constitute a conflict of interest. For greater certainty, the Vendor/Contractor shall only be entitled to advance claims against the Owner for amounts pertaining to Subcontractor or Supplier claims where the Vendor/Contractor has actually paid or unconditionally acknowledged liability for those claims or where those claims are the subject of litigation or binding arbitration between the Subcontractor or Supplier and the Vendor/Contractor has been found liable for those claims.

A breach by the Vendor/Contractor, any of the Subcontractors, 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 Vendor/Contractor 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 Vendor/Contractor 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 Contractor/Vendor

The Vendor/Contractor, 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 Vendor/Contractor 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 Vendor/Contractor'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 Vendor/Contractor 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 Vendor/Contractor 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 Vendor/Contractor is responsible under the Contract, the Board, following notice in writing to the Vendor/Contractor of his intention so to do, may withhold payment of any monies due to the Vendor/Contractor under this or any other Contract until the Vendor/Contractor 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 Vendor/Contractor shall notify the Board representative the same working day of any service disruption or damage and the Vendor/Contractor will immediately

notify the utility company to initiate repair. The Vendor/Contractor 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 Vendor/Contractor and at the Vendor/Contractor'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 \$100,000 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 Board 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 Vendor/Contractor fails to properly, promptly, and fully carry out the Work required by these documents, the Board reserves the right to notify the Vendor/Contractor 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 Vendor/Contractor 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 Vendor/Contractor 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. 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 Vendor/Contractor 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 Vendor/Contractors 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, Vendor/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 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 Vendor/Contractor 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

Vendor/Contractor 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 Vendor/Contractor 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 Vendor/Contractor 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.

19. 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 Vendor/Contractor 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.

20. Electrical Safety Requirements

All electrical equipment and components must bear a C.S.A. or Electrical Safety Association (E.S.A.) label.

21. Emergency and Maintenance

The care of the Works until completed, delivered to and accepted by the Board rests solely with the Vendor/Contractor 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 Vendor/Contractor's negligence, Act of God, or any cause whatsoever.

Should the Vendor/Contractor 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 Vendor/Contractor.

22. 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.

23. 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.

24. 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 Vendor/Contractor 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 Vendor/Contractor 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 Subcontractors 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.

25. 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 Work 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.

25.1 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.

26. 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.

27. Indemnification

The Bidder will indemnify and save harmless and defend the Board, and their respective elected officials, officers, employees, a

gents 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 subcontractors, 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.

28. Insurance Provisions

If selected, it is the responsibility of the Vendor/Contractor 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 Vendor/Contractor shall insure its undertaking, business, and equipment under the following coverage to protect and indemnify and save harmless the Board:

- i. **General Liability Insurance:** The Vendor/Contractor shall maintain liability insurance acceptable to the Board throughout the term of this Agreement from the date of commencement of work until one (1) year from the date of substantial performance of work. Liability coverage shall be provided for completed operations hazards from the date of substantial performance of the work, as set out in the certificate of substantial performance of work, on an ongoing basis for a period of 6 years following substantial performance of work. Coverage shall consist of a comprehensive policy of public liability and property damage insurance, with all applicable coverage extensions/ endorsements, in an amount of not less than \$5,000,000 per occurrence. Such insurance shall name the **Waterloo Region District School Board** and any other person or party identified in the contract documents, as an **additional insured** with a cross liability endorsement and severability of interests' provision. 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. A combination of primary coverage plus umbrella or excess liability insurance may be used.
- ii. **Owned and Non-Owned Automobile Liability Insurance:** The Vendor/Contractor shall maintain liability insurance on all Owned, Non-Owned and Leased Automobiles used in the performance of this work to a limit of \$2,000,000 per occurrence throughout the term of this Agreement from the date of commencement of work and until one (1) year after the date of substantial performance of work.
- 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 General Contractor 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 Vendor/Contractor and to leave the resolution of the claim with the Vendor/Contractor. 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 Vendor/Contractor, either directly by a third party or through the Board shall be promptly investigated by the Vendor/Contractor. The Vendor/Contractor shall contact the third party claimant within 48 hours of

receipt of notice of a claim. The Vendor/Contractor 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 Vendor/Contractor 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 Vendor/Contractor shall immediately report the claim to its Insurer for further review. (Insurer for this purpose is defined as either the Claims Department of the Vendor/Contractor's Insurance Company or the Claims Administrator at the Vendor/Contractor's Insurance Broker.) The Vendor/Contractor'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 Vendor/Contractor'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 Vendor/Contractor and/or its Insurer and to seek indemnification from the Vendor/Contractor or to exercise any other rights under the Contract.
- e. The Board may, without breaching this contract, retain from the funds owing to the Vendor/Contractor an amount that, as between the Board and the Vendor/Contractor, is equal to the balance in the Board's favour of all outstanding debts, claims or damages, whether or not related to this contract.

29. Invoice Requirements, Proper Invoice and Payment Terms

Except for Credit Card payments, all invoices shall be sent to finance-ap@wrdsb.ca for payment at the completion of the Work or after receipt of goods, unless otherwise stated.

- 29.1** In advance of invoicing, upon request, contracted Vendors will provide:
 - i. necessary company information to set up a WRDSB account and
 - ii. banking information if they wish to receive payment by Electronic Funds Transfer (EFT).
- 29.2** Requests to change company information, such as a name change due to a merger or acquisition, must be submitted in writing accompanied with a legal document/letter signed by a lawyer on the law firm's letterhead.
- 29.3** Invoices, not subject to the Construction Act, must contain the following information, where applicable, in order to be deemed complete:
 - i. Purchase Order Number
 - ii. Work Order Number
 - iii. Invoice Date

- iv. Unique Invoice Number
- v. Vendor name and address
- vi. Contract reference (RFT #, RFQ# etc.)
- vii. A description, including quantity where appropriate, month of service for ongoing contracts, and location of work
- viii. The amount payable for the services or materials that were supplied, including unit price (where applicable)
- ix. HST amount shown as a separate line item
- x. Payment Terms
- xi. Board Project Lead/ Contact and
- xii. Confirmation of completion of order and all Work as described in this Bid Solicitation Document.

29.4 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 successful Bidder 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 Vendor/Contractor'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 Vendor/Contractor'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.

29.5 Payment Terms

The 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. Vendors are required to invoice promptly, without delay.

30. Licenses and Permits

The successful bidder will be responsible for applications and fees associated with any and all licenses and permits required by any and all governing bodies. The successful bidder will attach a copy of all permits, and any other required documentation to the applicable assigned work order for Board records.

31. Locates, if applicable

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

The successful Bidder will obtain all utility locates in advance of work and all cost(s) associated with obtaining the utility locates will be the Vendor/Contractor's responsibility.

The successful Bidder 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.

32. 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 successful Bidder at the successful Bidder's expense.

33. 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.

34. 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.

35. No Branding

The Vendor/Contractor 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.

36. 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.

37. 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 Board Contact as identified in the Bid Solicitation Document; or
- iii. any other person connected in any way with the procurement.

38. 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.

39. Non-Assignment

No assignment by the Vendor/Contractor shall relieve the Vendor/Contractor of any responsibility for the full performance of all its' obligations under this contract.

The Vendor/Contractor shall not change its corporate name without the prior written approval of the Board.

40. 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 Vendor will be subject to further privacy and security reviews as required. This agreement will be renewed on an annual basis.

41. 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 subcontractors.

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 Vendor/Contractor 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.

42. 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).

43. Performance

- i. Where the Vendor/Contractor 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 Vendor/Contractor 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 Vendor/Contractor, 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 Vendor/Contractor 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 Vendor/Contractor 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 Vendor/Contractor 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 Vendor 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.

44. Permits and Licenses

Unless stated otherwise, the Vendor/Contractor 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.

45. 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.

46. Protection of Board Assets

The successful Bidder (the contractor / subcontractor) 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 Vendor/Contractor, at their expense, to the satisfaction of the Board. The Vendor/Contractor shall not cause any inconvenience to Board operations, staff, public or users of the Board facilities, within reason. Communication between the successful Vendor/Contractor 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.

47. 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](#)

48. Records, Inspection, Audits

The Board will have the right, upon reasonable notice, to full access to the accounts and records of the Vendor/Contractor in respect of the goods, services and equipment provided by it under the Contract, for the purposes of inspection and/or audit. The Vendor/Contractor 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.

49. 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, 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 Supplementary 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. 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.
- x. 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,
- xi. reject Bid(s) from Bidder who has engaged in lobbying or has contravened any of the terms of the Bid Solicitation Document.
- xii. 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.
- xiii. 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.
- xiv. accept a Bid other than the lowest or highest scoring and/or to not accept any Bid for any reason whatsoever.
- xv. award the contract as split-order, lump sum or individual-item basis, or such combination as shall best serve the interests of the Board
- xvi. 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.
- xvii. 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.
- xviii. select a Bidder other than the Bidder whose Bid reflects the lowest cost to the

- Board and/or award the Contract to any Bidder.
- xix. award any business/Work described in this Bid Solicitation to more than one (1) Bidder.
 - xx. not award the Contract if the costs of completing the Work exceed budget funding; or
 - xxi. do not respond to all requirements or do not represent fair market value or where necessary internal approvals are not obtained.

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.

50. Responsibilities of the Vendor

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 Vendor, which shall bind the Vendor 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 Vendor 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 Vendor.
- 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).

51. 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 subcontractors, 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.

52. 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 Vendor/Contractor relying on this or any other information or records.

Before starting work, the Vendor/Contractor 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 Vendor/Contractor themselves, the costs involved shall be borne by the Vendor/Contractor. The Vendor/Contractor will be responsible for any fees that may be associated with these services.

53. 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 Vendor/Contractor in written form

54. 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.

55. 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 Vendor/Contractor.

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

56. Site 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.

57. Site Use and Traffic Control

Vendor/Contractor'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 Vendor/Contractor shall, at their own expense, remove any equipment or material, which, in the Board's opinion, constitutes a traffic hazard.

The Vendor/Contractor 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 Vendor/Contractor 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 Vendor/Contractor shall regularly inspect the surface condition of these streets and promptly dispose of all the debris.

Should the Vendor/Contractor 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 Vendor/Contractor.

The Vendor/Contractor 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 Vendor/Contractor 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 Vendor/Contractor must be included in the quotation and included with the bid price.

The Vendor/Contractor 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.

58. 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.

59. 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.

60. Termination

If the Vendor/Contractor 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 Vendor/Contractor notice in writing of such failure. If the Vendor/Contractor 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 Vendor/Contractor.
- ii. The Board may withhold any payment due to the Vendor/Contractor hereunder until the Vendor/Contractor has remedied its failure.
- iii. The Board may engage the services of another Bidder to remedy the Vendor/Contractor's failure, and obtain reimbursement therefore from the Vendor/Contractor. The said reimbursement may be obtained either through deduction from any amounts owing to the Vendor/Contractor 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.

61. 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 Vendor/Contractor. The Board shall pay all reasonable costs incurred by the Vendor/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 Vendor/Contractor be paid an amount, which exceeds the Total Bid Price. The Vendor/Contractor will not be reimbursed

for any profits which may have been anticipated but which have not been earned up to the date of termination.

62. 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 Vendor/Contractor receives thirty (30) days written notice of such termination from the Board.

63. 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 Vendor/Contractor, 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 Vendor/Contractor, 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 Vendor/Contractor to ensure work continues and deadlines are met, despite any unforeseen interruption as a result of equipment failure.

It is the Vendor/Contractor'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 Vendor/Contractor 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 Vendor/Contractor 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.

64. Usage Reports

The Board, at no additional cost, may request usage reports to be provided annually or upon request.

65. 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.

66. Volume and Exclusivity

The Board makes no guarantee of value or volume of work to be assigned to the Successful Bidder. Any agreement executed with the Successful Bidder may not be an exclusive contract for the provision of the described goods/services.

67. 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.

68. Warranty and Maintenance

The Vendor/Contractor, 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 Vendor/Contractor is responsible for all required maintenance complete with materials and labour during the warranty period.

69. Work Continuity

The Vendor/Contractor 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 Vendor/Contractor, its subcontractors, suppliers, agents, employees, officers, directors, and all other persons and other entities for whose acts the Vendor/Contractor may be liable or for whom it is responsible in law and their respective officers, directors, agents and employees.

The Vendor/Contractor 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 Vendor/Contractor.

70. Work Requirements

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

71. Workplace Safety Insurance Board (WSIB) Certificate

The Board requires all Vendor/Contractors 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") stating that the vendor/contractor/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 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 31st day of December in the year 2025. .2 (if applicable) <i>Occupancy</i> by the 26th day of August in the year 2025, and .3 <i>Ready-for-Takeover</i> by the 26th 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	<u>Add</u> 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, the Consultant shall notify the Owner as provided in GC 5.3.1.2 and prepare a draft of the applicable Notice of Non-Payment for the amount in dispute."</i>
	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 Contractor, the Supplemental Instruction involves an adjustment in the Contract Price or in the Contract Time, it shall, within ten (10) Working Days of receipt of a Supplemental Instruction, provide the Consultant 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 Supplemental Instruction by the Contractor, without any adjustment in the Contract Price or Contract Time."

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 Owner" after the words "Consultant" 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 Contractor shall furnish promptly two copies to the Consultant and one copy to the Owner of all certificates and inspection reports relating to the Work."
	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 "Consultant", <u>add</u> "or the Owner".
	2.3.8	<u>Add</u> a new paragraph 2.3.8 as follows: "2.3.8 The Consultant will conduct periodic reviews of the Work in progress, to determine general conformance with the requirements of the Contract Documents. Such reviews, or lack thereof, shall not give rise to any claims by the Contractor in connection with construction means, methods, techniques, sequences and procedures, nor in connection with construction safety at the Place of Work, responsibility for which belongs exclusively to the Contractor."

GC 2.4 DEFECTIVE WORK

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

	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>."

"

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

SC23.1	GC 3.10	<u>Add</u> 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, 5.3.5, 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 or 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>Contract 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 "<i>Ready-for-Takeover</i>" 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 to address the cost of the following items:

1	Designated Substance Removal. (Additional removal not already identified in the ACM Summary report)	\$10,000.00
3	Window coverings (Additional window coverings not addressed elsewhere in the specification)	\$10,000.00
12	New furniture (New classroom and offices)	\$25,000.00
13	Locker repairs	\$40,000.00
14	Window Replacement (Unforeseen site condition)	\$10,000.00
Total of All Allowances:		\$95,000.00

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



Waterloo Region
District School Board

Appendix - 013517-A

Facility Services

CONTRACTOR HOT WORK PERMIT

STOP!

Avoid hot work or seek an alternative method if possible.

This hot work permit is required for any temporary operation involving open flames or producing heat and/or sparks.
This includes but is not limited to: brazing, cutting, grinding, soldering, torch-applied roofing and welding.

A SEPARATE PERMIT IS REQUIRED FOR EACH AREA

Board Supervisor/ Manager/Proj. Coordinator Responsibilities:

- Verify precautions taken in Section A
- Complete and retain Part 1
- Complete Section B prior to commencement of Hot Works
- Issue Part 2 to Contractor completing Hot Work & Post
- Obtain Part 2 when Fire Monitoring complete
- Return Part 1 and Part 2 to Controller, Facility Services

Contractor Responsibilities:

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

PART 1

Section A Indicate Precautions Taken	Section B Authorization Granted																																
☐ Available sprinklers, hose streams, and extinguishers available and in service	Board Supervisor/Manager/Proj. Coordinator: _____ Print Name _____ Signature _____																																
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	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)																																
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	Section C Contractor and Location Affected																																
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	<table border="1"><thead><tr><th>Dates: (max 7 days)</th><th>Name of Contractor conducting hot work</th><th>Name & signature of individual assigned to fire watch</th><th>Name & signature of individual assigned to fire monitoring</th></tr></thead><tbody><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td></tr></tbody></table>	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																												
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																														
Fire watch/hot work and monitoring ☐ Fire watch will be provided <u>during</u> and for <u>1 hour</u> after work including 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 space where appropriate ☐ Monitor hot work area for an additional <u>2 hours</u> after fire watch ☐ Other precautions taken (please detail): _____ _____ _____ _____	School: _____ Room/Area: _____ Nature of Job: _____ I verify the above location has been examined <u>each day</u> , the precautions listed in Section A have been taken <u>each day</u> , and permission is authorized for this work. I further acknowledge that if activity is during <u>school operational hours</u> , that appropriate <u>notification</u> has been given to <u>school administration</u> . Hot Works Contractor: _____ Signature _____ School Administrator notified: _____ Print Name _____ In Case of Emergency call: 911 - Then call: 519-570-0003 Ext. 4123																																

Refer to WRDSB Administration Procedure 4200 Hot Works/Fire Watch (Copies Available on Request)

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

REPORTS INSERTED AT END OF THE SPECIFICATION BOOK

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 KIA 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 SUMMARY

- .1 Review drawings, site conditions, and other specification sections to ascertain the extent and nature of work of this section.
- .2 The Work of this Section includes, but is not limited to the following:
 - .1 Demolish and removal of the following were indicated on the Drawings:
 - .1 Ceiling tiles and suspension grid scheduled for demolition, complete with existing light fixtures and equipment as scheduled.
 - .2 Partitions and associated framing.
 - .3 Millwork and associated support framing as scheduled.
 - .4 Lockers, complete with bases tops and doors where scheduled.
 - .5 Mechanical equipment and fixtures scheduled, including all associated piping and hangers.
 - .6 Electrical equipment and fixtures scheduled, including all associated hardware and hangers.
 - .2 Disconnect/cap existing service in areas of demolition.
 - .3 Trace, demolish and remove decommissioned mechanical and electrical services found during demolition. Remove decommissioned services to the area of demolition to the source, leaving no buried services in walls and floors, unless otherwise approved by written notice from the Owner.
 - .4 Dispose of demolished materials except where required to be salvaged or reused.
 - .5 Refer to demolition notes indicated on all disciplines Drawings.
- .3 Drawings contain details that suggest directions for solving some of the major demolition and removal requirements for this project; Contractor is required to develop these details further by submitting a demolition plan prepared by a professional engineer employed by the Contractor.

1.2 REFERENCE STANDARDS

- .1 The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- .2 All reference amendments adopted prior to the bid closing date of this Project shall be applicable to this Project.
- .3 All materials, installation and workmanship shall comply with all applicable requirements and standards.
- .4 American National Standards Institute (ANSI):
 - .1 ANSI A10.8, Scaffolding Safety Requirements
- .5 American Society for Testing and Materials (ASTM):
 - .1 ASTM C475/C475M, Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board
- .6 Canadian Standards Association (CSA):
 - .1 CSA S350- M, Code of Practice for Safety in Demolition of Structures.

- .7 National Fire Protection Association (NFPA):
 - .1 NFPA 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations
- .8 Provincial Legislation:
 - .1 Comply with all applicable local and provincial legislative requirements specific to Authority Having Jurisdiction for work governed by this Section.
 - .1 CSA S350 "Code of Practice for Safety in Demolition of Structures";
 - .2 Canadian Construction Safety Code;
 - .3 Employ rodent and vermin exterminators as required by health regulations.
 - .4 Obtain and pay for all necessary permits for waste and audit plans in compliance with provincial regulations.

1.3 DEFINITIONS

- .1 Demolish: Detach items from existing construction and legally dispose of them off site, unless indicated to be removed and salvaged or removed and reinstalled.
- .2 Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.
- .3 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- .4 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed, removed and salvaged, or removed and reinstalled.

1.4 EXAMINATION

- .1 Visit and examine the site and note all characteristics and irregularities affecting Work of this Section. Submit a pre-demolition inspection report. Ensure the Owner of premises being inspected is represented at inspection.
- .2 Where appropriate prepare a photographic or video record of existing conditions, particularly of existing work scheduled to remain.
- .3 Where applicable, examine adjacent tenancies not part of the scope of work. Determine extent of protection required to areas and related components not subject to demolition.

1.5 SUBMITTALS

- .1 Provide required information in accordance with Division 01.
- .2 Action Submittals: Provide the following submittals before starting any work of this Section:
 - .1 Prepare schedule in conjunction with overall project schedule and outline proposed methods in writing. Obtain approval before commencing demolition work, and indicate the following:
 - .1 Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
 - .2 Interruption of utility services.
 - .3 Coordination for shutoff, capping, and continuation of utility services.

1.6 QUALITY ASSURANCE

- .1 Conform to requirements of all authorities having jurisdiction.
- .2 Comply with applicable requirements of CSA S350-M "Code of Practice for Safety in Demolition of Structures".
- .3 Work of this Contract shall be executed by an approved company having a minimum of five (5) years continuous experience and able to deploy adequate equipment and skilled personnel to complete work expediently in an efficient and orderly manner.
- .4 Perform cutting and coring, where applicable, by a firm specializing in this type of work, able to produce evidence of successful completion of similar work over a period of at least five (5) years immediately prior to date of contract.
- .5 Apply for, secure, arrange and pay for all permits, notices and inspections necessary for proper execution and completion of work in this Section.
- .6 Professional Engineer Qualifications: Procure the services of a professional engineer who is experienced in providing relevant engineering services to perform the following:
 - .1 Review portions of the Work requiring structural performance, prepare plan of action, engineer temporary shoring and bracing, and Provide site administration and inspection for work of this Section.

1.7 PROTECTION

- .1 Prevent movement or settlement of adjacent work. Provide and place bracing or shoring and be responsible for safety and support of such work. Be liable for any such movement or settlement, and any damage or injury caused.
- .2 Cease operations and notify Consultant if safety of any adjacent work or structure appears to be endangered. Take all precautions to support the structure. Do not resume operations until reviewed with the Consultant.
- .3 Prevailing weather conditions and weather forecasts shall be considered. Demolition work shall not proceed when weather conditions constitute a hazard to the workers and site.
- .4 Prevent damage of surrounding vegetation by construction.
- .5 Prevent debris from blocking surface drainage inlets and mechanical and electrical systems which remain in operation.
- .6 Temporarily suspended work that is without continuous supervision shall be closed to prevent entrance of unauthorized persons.

1.8 PROTECTION OF SERVICES AND STRUCTURES

- .1 Take necessary precautions to guard against movement, settlement or collapse of existing adjacent utility services, public property and/or structures, whether to remain or not. If these or other unforeseen conditions develop, take immediate emergency measures, report to Consultant, confirm in writing, and await instructions before proceeding with any further related demolition work.
- .2 Prior to saw cutting or core drilling of existing concrete slabs, use ground penetrating radar (GPR) to detect utilities and structural reinforcing. Concrete X-Rays can be used when access to both sides of concrete slab is accessible for placement of required x-ray film.

1.9 EXISTING SERVICES

- .1 Prior to start of demolition disconnect all electrical service lines in the areas to be demolished. Post warning signs on all electrical lines and equipment which must remain energized to serve other areas during period of demolition. Disconnect electrical service lines in demolition areas to the requirements of local authority having jurisdiction.
- .2 In each case, notify the affected utility company in advance and obtain approval where required before commencing with the work on main services.
- .3 Arrange with utility companies for locating of such services and for disconnection of existing services owned by utility companies and which will be disconnected by said utility companies, provided such services do not interfere with adjacent tenancy operators.
- .4 Remove sewer and water lines where required within existing building as deemed necessary, and cap to prevent leakage, in accordance with authorities having jurisdiction.

1.10 DECOMMISSIONED SERVICES

- .1 Remove fully decommissioned electrical and mechanical service lines, plumbing, ducting, fixtures and all fasteners and supports for decommissioned items.
 - .1 Remove sewer and water lines where required within existing building as deemed necessary, and cap to prevent leakage, in accordance with authorities having jurisdiction.
- .2 Patch and repair surfaces affected by this selective demolition to match existing adjacent surfaces, as approved by the Consultant.

1.11 EXISTING WARRANTIES

- .1 Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

2 Products

2.1 DEBRIS, SALVAGED MATERIAL AND EQUIPMENT DISPOSAL

- .1 All materials and or equipment salvaged from demolition work becomes property of demolition Contractor unless designated otherwise.
- .2 At no cost to Owner repair or replace material and/or equipment scheduled to remain which is damaged by demolition work. Do not sell any salvaged material or equipment directly from project site.
- .3 Remove waste debris continually and entirely from project site during demolition work. Do not load vehicles transporting such debris beyond their safe capacity or in a manner which might cause spillage on public or private property. If spillage does occur, clean up immediately to prevent traffic hazards or nuisance.

2.2 PROTECTION - DUST TIGHT SCREENS

- .1 Vertical Temporary Protection:
 - .1 Provide dust tight screens or barriers to localize dust generating activities for the protection of tenants, employees, equipment, adjacent and finished areas of Work, and the public. Maintain and relocate protection until Work is complete. Respond immediately to complaints of dust received from the public, authorities having jurisdiction, Owner and Consultant.
 - .2 Obtain Consultant's approval of installed dustproof screens and protection methods before proceeding with construction/alteration work.
 - .3 Painted gypsum wallboard and metal stud dustproof screens, shall extend to underside of structure, and shall be erected to protect adjoining areas and rooms.

- .4 Apply bead of sealant or other acceptable seal continuously around periphery of each face of partitioning to seal gypsum board/structure junction where dustproof screens abut fixed building components. Seal perimeter of cutouts, around fixtures and fittings and other penetrations. Tape or seal between adjacent boards. Separate construction areas from occupied areas.
- .5 Provide protection for existing equipment sensitive to dust and noise. Prevent dust migration through HVAC or return air systems.
- .6 Co-ordinate location of dust barriers and dust tight doors with Consultant.
- .7 Install temporary packing at bottom of doors to areas where demolition/construction shall be performed to prevent dust seepage into existing spaces. Do not permit dust and dirt to escape beyond area being constructed/altered.
- .8 Provide daily vacuuming of construction dust from existing areas as work progresses; this shall be considered a minimum requirement, increase vacuuming as necessary. The Owner may have vacuuming work done by others and cost deducted from Contractor's progress payments if this requirement is not fulfilled.
- .9 Remove dustproof screens at completion of work in areas and make good damaged or blemished areas. Patch and make good to access, altered and damaged areas caused by work and screens. Maintain integrity of fire or sound separation.
- .2 Horizontal Temporary Protection:
 - .1 Supply and install durable paperboard that rolls out flat, complete with taped seams to seal out liquids.
 - .2 Basis of Design Materials: Ram Board Plus by ULINE.ca.

2.3 REPAIR MATERIALS

- .1 Use repair materials identical to existing materials:
 - .1 If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - .2 Use a material whose installed performance equals or surpasses that of existing material.
 - .3 Comply with material and installation requirements specified in individual Specification Sections.
- .2 Gypsum Board Patching Compounds: Joint compound to ASTM C475, bedding and finishing types thinned to provide skim coat consistency to patch and prepare existing gypsum board walls ready for new finishes in accordance with Section 09 29 00.
- .3 Fireproofing: Patch and repair all fireproofing damaged during demolition of adjacent surfaces with compatible fireproofing materials. Provide test reports from fireproofing manufacture warranting installation, adhesion and compatibility between existing and new fireproofing materials.

2.4 EXISTING MATERIALS

- .1 Items to be retained for re-use in new construction include, but are not limited to the following:
 - .1 Acoustic Ceiling Tile and Suspension System: Reconfigure for use with recessed lighting, as indicated on the Drawings.

- .2 Confirm with Owner any materials that appear to be in re-usable condition prior to disposal.
 - .1 Owner has first right of refusal for all materials that appear to be in re-usable condition.
- .3 Confirm with Consultant any materials scheduled for re-use that are not in re-usable condition prior to installation.

3 Execution

3.1 GENERAL

- .1 Exercise caution in dismantling, disconnecting of work adjacent to existing work designated to remain.
- .2 Carry out demolition in a manner to cause as little inconvenience to the adjacent properties as possible.
- .3 Carry out demolition in an orderly and careful manner.
- .4 Demolition by explosives is not permitted.
- .5 Selling or burning of materials on site is not permitted.
- .6 Lower waste materials in a controlled manner; do not drop or throw materials from heights.
- .7 At end of each day's work, leave in safe condition so that no part is in danger of toppling or falling.

3.2 SAFETY AND SECURITY

- .1 Maintain security of the building at all times during demolition work.
- .2 Provide and maintain fire prevention equipment and alarms accessible during demolition.

3.3 ACCESS ROUTES

- .1 Restrict operations to designated access routes.
- .2 Do not obstruct roads, parking lots, sidewalks, hydrants and the like.

3.4 SELECTIVE DEMOLITION

- .1 Provide necessary shoring and supports to assure safety of structure prior to cutting and coring.
- .2 Where practical, sawcut and remove material as required.
- .3 Where sawcutting is not appropriate, use suitable hand tools.
- .4 Demolish, cut-out and remove from site all other work noted on drawings or required to permit new construction.
- .5 Fill all openings in gypsum board walls with gypsum board and steel framing to match existing, skim coat to make wall smooth and even.
- .6 Demolish completely all ceiling panels and grid noted as demolition, and not requiring reinstallation in new reflective ceiling plan layout.
- .7 Patch and repair all walls, floor and ceilings damaged during demolition with material matching adjacent walls, prepare ready for new finishes.
 - .1 Prepare existing surfaces schedule to receive new finish by grinding, filling, over-coating, stripping, washing, etching, shot blasting or other chemical or mechanical means, as required to ensure satisfactory installation of new finish.

3.5 EXCESSIVE DEMOLITION

- .1 Where excessive demolition occurs, be responsible for cost of replacing such work.
- .2 Consultant shall determine extent of such 'over-demolition' and method of rectification.

3.6 COMPLETION

- .1 Leave project site as directed, reasonably clean and presentable, free from above grade debris, any salvaged material and/or equipment except those designated to remain.
- .2 Maintain access to exits clean and free of obstruction during removal of debris.

END OF SECTION

1 General

1.1 SUMMARY

- .1 Hazardous materials have been identified as being present in the building; abatement and removal form a part of the Work of the Project.

1.2 RELATED REQUIREMENTS

- .1 Section 02 41 19: Selective Demolition

1.3 REFERENCE STANDARDS

- .1 The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- .2 All reference amendments adopted prior to the bid closing date of this Project shall be applicable to this Project.
- .3 All materials, installation and workmanship shall comply with all applicable requirements and standards
- .4 Environment Canada:
 - .1 Canadian Environmental Protection Act, Latest
 - .2 Export and Import of Hazardous Waste Regulations (Latest), including amendments
- .5 Health Canada:
 - .1 Safety Data Sheets (SDS)
 - .2 Workplace Hazardous Materials Information System (WHMIS)
- .6 Transport Canada:
 - .1 Transportation of Dangerous Goods Act, Latest
 - .2 Transportation of Dangerous Goods Regulations, including amendments

1.4 DEFINITIONS

- .1 Dangerous Goods: Product, substance, or organism that is specifically listed or meets hazard criteria established in Transportation of Dangerous Goods Regulations.
- .2 Hazardous Material: Product, substance, or organism that is used for its original purpose; and that is either dangerous goods or a material that may cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into the environment.
- .3 Hazardous Waste: Any hazardous material that is no longer used for its original purpose and that is intended for recycling, treatment or disposal.
- .4 Workplace Hazardous Materials Information System (WHMIS): Canada wide system designed to give employers and workers information about Hazardous Materials used in workplace. Under WHMIS, information on Hazardous Materials is provided on container labels, safety data sheets (SDS), and worker education programs. WHMIS is put into effect by combination of federal and provincial laws.

1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Construction Meeting: Conduct a meeting at Project site in accordance with requirements listed in Division 01, to confirm extent of Hazardous Materials abatement and removal to review Contractor's project requirements, site safety concerns and scheduling requirements and to establish procedures for any materials listed in the hazardous materials report.
- .2 Coordination: Coordinate Hazardous Materials work so that work of this Section adheres to criteria indicated in the Hazardous Materials Report prepared by a specialist consultant retained by the Owner.

1.6 EXAMINATION

- .1 Visit and examine the site and note all characteristics and irregularities affecting Work of this Section. Submit a pre-demolition inspection report. Ensure the Owner of premises being inspected is represented at inspection.
- .2 Where appropriate prepare a photographic or video record of existing conditions, particularly of existing work scheduled to remain.
- .3 Where applicable, examine adjacent tenancies not part of the scope of work. Determine extent of protection required to areas and related components not subject to demolition.

1.7 QUALITY ASSURANCE

- .1 Regulatory Requirements: Perform work of this section in accordance with environmental, fire, health and safety acts, codes and regulations as established by the Authority Having Jurisdiction.
- .2 Qualifications: Provide proof of qualifications when requested by Consultant:
 - .1 Abatement and Removal Personnel: Use contractors, subcontractors or personnel who have specific training and experience with the abatement and removal of Hazardous Materials identified as being present at the project site; train personnel in accordance with Workplace Hazardous Materials Information System (WHMIS) requirements.
 - .2 Insurance: Use a hazardous materials abatement company that has adequate insurance for performing work of this Section.
 - .3 Equipment: Use equipment, storage containers and other temporary facilities appropriate to the level of risk presented by the Hazardous Materials identified as being present at the project site and that are acceptable to the Authority Having Jurisdiction.

1.8 SITE CONDITIONS

- .1 Hazardous materials identified in the Hazardous Materials report and other related information referenced in the Contract Documents are for the information only, and does not represent a warranty by the Consultant of actual site conditions; use of this information is at Contractor and Subcontractor's own risk.
- .2 Visit site to become acquainted with site conditions before submitting Bids to derive an opinion on the results of the information presented by the Hazardous Materials Report and the extent of work required to complete the requirements of this Section.
- .3 The Consultant and Owner recognize that conditions indicated in the Hazardous Materials Report actually encountered during construction may differ from the information presented in the Hazardous Materials Report; where this occurs the changed conditions will be administered as a change in accordance with the Contract.

1.9 DELIVERY, STORAGE AND HANDLING

- .1 Storage and Handling Requirements: Store and handle Hazardous Materials and wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines and as follows:
 - .1 Store and handle flammable and combustible materials in accordance with current Fire Code requirements.
 - .2 Store Hazardous Materials and wastes in closed and sealed containers.
 - .3 Label containers of Hazardous Materials and wastes in accordance with WHMIS.
 - .4 Store Hazardous Materials and wastes in containers compatible with that material or waste.
 - .5 Segregate incompatible materials and wastes.
 - .6 Ensure that different Hazardous Materials or hazardous wastes are not mixed.
 - .7 Store Hazardous Materials and wastes in secure storage area with controlled access.
 - .8 Maintain clear egress from storage area.
 - .9 Store Hazardous Materials and wastes in location that will prevent them from spilling into environment.
 - .10 Have appropriate emergency spill response equipment available near storage area, including personal protective equipment.
 - .11 Maintain inventory of Hazardous Materials and wastes, including product name, quantity, and date when storage began.
 - .12 Report spills or accidents immediately to Consultant and submit a written spill report within 24 hours of incident.
- .2 Transportation: Transport Hazardous Materials and wastes in accordance with federal Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial regulations and as follows:
 - .1 Comply with federal Export and Import of Hazardous Waste Regulations where it is necessary to export hazardous waste to another country.
 - .2 Comply with applicable federal, provincial and municipal laws and regulations for generators of hazardous waste.
 - .3 Use licensed carrier authorized by provincial authorities to accept subject material.
 - .4 Obtain written notice from intended hazardous waste treatment or disposal facility that it will accept material and that it is licensed to accept this material prior to shipping hazardous waste.
 - .5 Label containers with legible, visible safety marks as prescribed by federal and provincial regulations.
 - .6 Use trained personnel to handle, offer for transport, or transport dangerous goods.
 - .7 Provide photocopy of shipping documents and waste manifests to Consultant.
 - .8 Track receipt of completed manifest from consignee after shipping dangerous goods; provide a photocopy of completed manifest to Consultant.
 - .9 Report discharge, emission, or escape of Hazardous Materials immediately to Authority Having Jurisdiction and Consultant; take reasonable measures to control release.

2 Products

2.1 MATERIALS

- .1 Provide all temporary facilities, equipment, containers and spill remediation kits required by Authority Having Jurisdiction and as necessary to complete the work of this Section.
- .2 Provide SDS in proximity to where materials are being stored; communicate this location to personnel who may have contact with hazardous waste materials.

3 Execution

3.1 DISPOSAL

- .1 Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines.
- .2 Recycle hazardous wastes where there is approved, cost effective recycling process available.
- .3 Send hazardous wastes to authorized hazardous waste disposal or treatment facilities.
- .4 Burning, diluting, or mixing hazardous wastes for purpose of disposal is prohibited.
- .5 Disposal of Hazardous Materials in waterways, storm or sanitary sewers, or in municipal solid waste landfills is prohibited.
- .6 Dispose of hazardous wastes in timely fashion in accordance with applicable provincial regulations.
- .7 Take necessary precautions to avoid mixing clean and contaminated wastes.
- .8 Identify and evaluate recycling and reclamation options as alternatives to land disposal, such as:
 - .1 Hazardous wastes recycled in manner constituting disposal.
 - .2 Hazardous waste burned for energy recovery.
 - .3 Lead acid battery recycling.
 - .4 Hazardous wastes with economically recoverable precious metals.
 - .5 Additional items identified during the course of the work.
- .9 Sequence abatement and removal of Hazardous Materials with selective demolition work; complete removal of Hazardous Materials and make areas clean before actual start of demolition activities.

END OF SECTION

1 General

1.1 SUMMARY

- .1 Supply and install all miscellaneous metal work indicated on drawings and not included in the work of other Sections in addition to items listed in this Section.

1.2 RELATED REQUIREMENTS

- .1 Read carefully all other Sections and review drawings to determine extent of metal work supplied and installed, or installed by others.
- .2 Be responsible for co-ordinating this section with all related sections.

1.3 REFERENCE STANDARDS

- .1 The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- .2 All reference amendments adopted prior to the bid closing date of this Project shall be applicable to this Project.
- .3 All materials, installation and workmanship shall comply with all applicable requirements and standards.
- .4 Applicable Standards:
 - .1 American Society for Testing and Materials (ASTM):
 - .1 ASTM A53/A53M, Standard Specification for Pipe, Steel, Black and Hot Dipped, Zinc Coated, Welded and Seamless
 - .2 ASTM A276, Standard Specification for Stainless Steel Bars and Shapes
 - .3 ASTM A325, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
 - .4 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - .5 ASTM A666, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip Plate, and Flat Bar
 - .6 ASTM C939, Standard Test Method for Flow of Grout for Preplaced Aggregate Concrete (Flow Cone Method)
 - .7 ASTM A1011/A1011M, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with improved Formability, and Ultra-High Strength
 - .8 ASTM C1107/C1107M, Standard Specification for Packaged Dry, Hydraulic Cement Grout (Nonshrink)
 - .2 Canadian Standards Association (CSA):
 - .1 CSA G40.20-04/G40.21, General Requirements for Rolled or Welded Structural Quality Steel / Structural Quality Steel
 - .2 CAN/CSA-G164-M, Hot Dip Galvanizing or Irregularly Shaped Articles
 - .3 CSA-S16, Design of Steel Structures
 - .4 CSA-S136, North American Specification for the Design of Cold Formed Steel Structural Members
 - .5 CSA W47.1, Certification of Companies for Fusion Welding of Steel

- .6 CSA W55.3, Certification of Companies for Resistance Welding of Steel and Aluminum
- .7 CSA W59, Welded Steel Construction (Metal Arc Welding)
- .3 Canadian General Standards Board (CGSB):
 - .1 CAN/CGSB-1.181, Ready-Mixed Organic Zinc-Rich Coating
 - .2 CAN/CGSB-51.32-M, Sheathing, Membrane, Breather Type
 - .3 CGSB 31-GP-105Ma, Zinc Phosphate Conversion Coatings for Paint Base
- .4 The Society for Protective Coatings (SSPC):
 - .1 SSPC1 Solvent Cleaning
 - .2 SSPC2 Hand Tool Cleaning
 - .3 SSPC-3 Power Tool Cleaning
 - .4 SSPC-6 Commercial Blast Cleaning

1.4 QUALITY ASSURANCE

- .1 All Codes and Standards referred to in this Specification shall be current editions including all latest revisions and addenda.
- .2 Conform to requirements of CSA-S16, Design of Steel Structures and CAN/CSA-S136, Cold Formed Steel Structural Members.
- .3 Architectural metals work shall be of the highest architectural quality, free of scratches, pitting, roughness, marring, discolouration, staining and other imperfections.
- .4 Work of this Section to be executed by firm thoroughly conversant with laws, by-laws and regulations which govern, and capable of workmanship of best grade of modern shop and field practice known to recognized manufacturer's specializing in this work.
- .5 Work of this Section shall be executed by workers especially trained and experienced in this type of work. Have a full time, senior, qualified representative at the site to direct the work of this Section.
- .6 Where required by authorities having jurisdiction, have work of this Section designed by a professional engineer licensed to design structures and registered in the Province of the Work.

1.5 SUBMITTALS

- .1 Provide submittals bearing stamp or seal and signature of the Professional Engineer responsible for the design of the work of this Section.
- .2 Shop Drawings:
 - .1 Make thorough examination of drawings and details, determine the intent, extent, and materials, and be fully cognizant of requirements when preparing shop drawings.
 - .2 Submit shop drawings showing and describing in detail all work of this Section including large scale detail of members and materials, of connection and interfacing with work of other Sections, jointing details, and of anchorage devices, dimension, gauges, thicknesses, description of materials, metal finishing, as well as other pertinent data and information.
 - .3 Digital files of design drawings shall not be used in the preparation of shop drawings.

1.6 STORAGE, DELIVERY, HANDLING AND PROTECTION

- .1 Coordinate deliveries to comply with construction schedule and arrange ahead for strategic off the ground, under cover storage locations. Do not load any area beyond the design limits.
- .2 Adequately protect and crate all components against damage, dirt, disfigurement and weather during delivery and storage. Damaged materials shall not be used and shall be replaced by approved material.
- .3 Cover and protect the work of other Sections in the area of work from damage. Make good all damage to the satisfaction of the Consultant.
- .4 Protect the installed work of this Section and on completion the work shall be examined and damage shall be remedied to the complete satisfaction of the Consultant.

2 Products

2.1 MATERIALS

- .1 Structural Steel Sections and Steel Plate: New stock (not weathered or rusted); to conform to CAN/CSA-G40.21, Grade 300W (44W) and Grade 350W (50W) for wide flange shapes.
- .2 Hollow Structural Sections (HSS): New stock; to conform to CAN/CSA-G40.21, Grade 350W (50W), Class C, stress relieved.
- .3 Sheet Steel (Structural Quality): Conforms to ASTM A1011/A1011M.
- .4 Sheet Steel (Commercial Quality): Conforms to ASTM A653/A653M, stretcher levelled or temper rolled.
- .5 Tube: Conforms to ASTM A53.
- .6 Steel Pipe: Hot-dip galvanized, zinc coated, welded and seamless type steel pipe conforming to ASTM A53/A53M.
- .7 Stainless Steel Sheet, Strip, Plate, and Flat Bars: In accordance with ASTM A666, Type 304.
- .8 Stainless Steel Bars and Shapes: In accordance with ASTM A276, Type 304.
- .9 Non-Shrink Grout: Premixed, high strength, maximum bearing, impact resistant, non-shrink non-metallic aggregate grout having minimum 76 Mpa, 28 day compressive strength and conforms to ASTM C939 and ASTM C1107/C1107M.
- .10 Primer Paint: CISC/CPMA 2-75.
- .11 Bolts, Nuts, Washers: Conforms to ASTM A325.
- .12 Welding Materials: Conforms to CSA W59.
- .13 Metal Filler: Polyester based type.
- .14 Painting:
 - .1 Shop Applied Structural Steel Primer: Steel Spec Universal Primer (B50RV6227 Red), by Sherwin Williams Company of Canada Ltd., or approved equal. Apply a minimum of 2 mils dft./coat. Grey coloured primer is acceptable.
 - .2 Refer to Section 09 90 00, and coordinate with the above.
- .15 Isolation Coating: Acid and alkali resistant bituminous paint.
- .16 Butyl Tape: Extruded, high grade, macro-polyisobutylene tape of size, width and shore hardness to suit conditions.

2.2 FABRICATION

- .1 Fit and assemble work in shop where possible. Execute work according to details and reviewed shop drawings.
- .2 Take measurements at the building for work which is to fit or be connected to steel or concrete before commencing fabrication.
- .3 Where shop fabrication is not possible, make trial assembly in shop.
- .4 Do all welding in accordance with requirements of CSA W59, CSA W55.3 and CSA W47.1 including all supplements. Weld stainless steel electric arc process. Grind welds smooth and flush with surface of parent metal, where exposed to view and where specifically indicated on drawings. Welds shall be continuous seam welds unless specified otherwise. Maintain sharp arises.
- .5 Fit joints and intersecting members accurately in true planes, square, plumb, straight with tight joints and intersections.
- .6 Provide adequate reinforcing, fastenings, anchors, accessories required for fabrication and erection of work of this Section. Such items occurring on or in an exterior wall or slab shall be hot-dip galvanized. Make thread dimensions such that nuts and bolts will fit without rethreading or chasing threads.
- .7 Fabricate, drill and tap members to accommodate attachments, anchorage and work of other Sections where located and directed by them.
- .8 Exposed steel surfaces shall be smooth and free from imperfections such as warping, buckling, weld marks, burrs, rust and scale.
- .9 Gauges and sizes of metal shall be adequate for various conditions.
- .10 Make exposed metal fastenings and accessories of same material, texture, colour and finish as base metal on which they occur unless otherwise shown or specified. Keep exposed fastenings to an absolute minimum evenly spaced and neatly laid out. Make fastenings of permanent type unless otherwise indicated.

2.3 SHOP PAINTING AND PROTECTION

- .1 As per SSPC2 Hand Tool Clean and SSPC1 Solvent Clean, clean welds by wire brushing and wash down with clean water, to remove the chemical residues left by the electrodes, prior to painting.
- .2 Prepare steel as per SSPC-3 Power Tool Cleaning for Interior or SSPC-6 Commercial Blast Cleaning for exterior members. Remove rust, mill scale, oil, dirt, and other foreign matter before commencing shop painting.
- .3 Apply shop coat of primer to all surfaces except areas requiring field welding. Apply by brush, working paint well into surfaces, interstices and cavities.
- .4 Primer is to be free of runs, sags, or other collections of primer due to dipping of members into primer.
- .5 Steel work shall be painted under cover, and shall remain under cover, until the paint protection is dry.
- .6 Prime field welded areas after erection and touch up shop coat where damaged and barred by erection and handling.
- .7 Prime steel with two full coats of paint in strict accordance with paint manufacturer's directions.
- .8 Give the parts which are inaccessible after assembly two coats of primer coat paint, of different colours, when members are noted to be painted.

3 Execution

3.1 GENERAL

- .1 Verify at site that the Work to receive the work of this Section is free of irregularities detrimental to the installation and performance of the work and that it is located correctly and at proper levels before delivery and installation.
- .2 Erection: To meet specified requirements of CAN/CSA-S16.
- .3 Bearing Plates and Anchors: Standard.
- .4 Anchors: Anchors to structural concrete shall be approved inserts set into concrete or approved self-drilling expansion insets drilled and placed afterwards.

3.2 INSTALLATION

- .1 Assemble and erect work plumb, true, square, straight, level and accurate to sizes detailed, to reviewed shop drawings, free from distortion and defects detrimental to appearance and performance.
- .2 Isolate metals where necessary to prevent corrosion due to contact between dissimilar metals and between metals and masonry, concrete or plaster. Use bituminous paint or butyl tape.
- .3 Supply adequate instructions, templates, and if necessary, supervise installation of the fastenings or accessories requiring to be built-in by other Sections of the Work.

3.3 SCHEDULES

- .1 Where items are required to be built into masonry, concrete or other work, supply such items to respective Sections with all anchors and accessories for building in.
- .2 Itemized List: Supply and install metal work listed below unless specifically designated to be supplied only. Each item shall be as shown on drawings and as detailed on reviewed shop drawings.
- .3 Miscellaneous Steel Framing, Channels, Angles, Plates and Brackets: As required and indicated on drawings.
- .4 Masonry Lateral Supports:
 - .1 Install deflection space and lateral support for non-load-bearing masonry walls and partitions in accordance with specified requirements of CAN3-S304-M, where not provided by Section 05 50 00, Structural Steel.
 - .2 At walls with concealed tops:
 - .1 3" x 2" x 1/4" angles 8" long on both sides of walls. Anchor to structure above wall.
 - .3 At walls with tops exposed to view:
 - .1 3" x 2" x 1/4" angles, continuous on both sides of wall. Anchor to structure above wall.
 - .4 Finish: Prime paint.
- .5 Loose Lintels:
 - .1 Provide and install loose lintels if not by structural steel.
 - .2 Finish: Hot-dip galvanized after fabrication.

- .6 Other Miscellaneous Metal Components:
 - .1 As required and indicated on drawings.
 - .2 Finish: Prime paint for interior components, ready for finishing by Section 09 90 00 and hot-dip galvanized after fabrication for exterior components.

END OF SECTION

1 General

1.1 SUMMARY

- .1 This Section includes requirements for supply, fabrication and installation of:
 - .1 Steel Railings, as follows:
 - .1 Handrails attached to walls adjacent to stairs.
 - .2 Field Dimensions: Actual dimensions measured on site and used by fabricator to construct required assemblies.
 - .3 Established Dimensions: Dimensions derived from drawings or that can be reasonably determined from adjacent construction where actual dimensions required by components fabricated in this section are not available; dimensions shall have suitable tolerances so that assemblies can be adjusted on site to fit actual field dimensions.

1.2 REFERENCE STANDARDS

- .1 The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- .2 All reference amendments adopted prior to the bid closing date of this Project shall be applicable to this Project.
- .3 All materials, installation and workmanship shall comply with all applicable requirements and standards.
- .4 American Society for Testing and Materials (ASTM):
 - .1 ASTM A53/A53M Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless
 - .2 ASTM A108, Steel Bars, Carbon, Cold-Finished, Standard Quality
 - .3 ASTM A185/A185M, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
 - .4 ASTM A307, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
 - .5 ASTM A325 Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
 - .6 ASTM A653/A653M, Standard Specification For Steel Sheet, Zinc Coated (Galvanized) Or Zinc-Iron Alloy Coated (Galvannealed) By The Hot Dip Process.
 - .7 ASTM A1011/A1011M, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with improved Formability, and Ultra-High Strength
 - .8 ASTM C939, Standard Test Method for Flow of Grout for Preplaced Aggregate Concrete (Flow Cone Method)
 - .9 ASTM C1107/C1107M, Standard Specification for Packaged Dry, Hydraulic Cement Grout (Nonshrink)
- .5 Canadian Institute of Steel Construction (CISC):
 - .1 Handbook of Steel Construction, latest edition and revision.

- .6 Canadian Standards Association (CSA):
 - .1 CAN/CSA-G40.20-04/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels.
 - .2 CSA W47.1, Certification of Companies for Welding of Steel Structures
 - .3 CSA W48, Filler Metals and Allied Materials for Metal Arc Welding
 - .4 CSA W55.3, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings
 - .5 CSA W59, Welded Steel Construction (Metal Arc Welding)
- .7 National Association of Architectural Metal Manufacturers (NAAMM):
 - .1 NAAMM AMP 510, Metal Stair Manual
 - .2 NAAMM AMP 521, Pipe Railing Systems Manual
 - .3 ANSI/NAAMM MBG 533, Welding Specifications for Steel, Aluminum and Stainless Steel Bar Gratings, 2nd Edition.

1.3 DESIGN REQUIREMENTS

- .1 Design details and connections in accordance with requirements of CAN/CSA S16.1, and applicable codes and authorities having jurisdiction.
- .2 Design railing assemblies to withstand a minimum uniform load of 0.75 kN/m or a concentrated load of 1.0 kN at any point applied horizontally to top rail and a minimum of 1.5 kN/m applied vertically to top rail, with individual elements within the assembly designed for a concentrated load of 0.5 kN at any point in the element in accordance with the Building Code.

1.4 SUBMITTALS

- .1 Provide submittals in accordance with Division 01.
- .2 Shop Drawings: Provide shop drawings including, but not be limited to, the following:
 - .1 Sections and plans of railings indicating dimensions and assembly of components.
 - .2 Indicate fasteners, welds and connection details between railings; handrails; stairs, walls, brackets; reinforcements; anchors; and welded and bolted connections.
 - .3 Methods and locations of all exposed fastenings.
 - .4 Methods and locations of specified finishes.

1.5 QUALITY ASSURANCE

- .1 Detail and fabricate metal fabrications in accordance with the NAAMM AMP 510, 521, and 555; prepare fabrication and erection documents and materials lists in accordance with CSA S16.
- .2 Fabricator shall have a minimum five (5) years documented experience fabricating metal railings and shall perform work of this Section to the highest standard of modern shop and field practice, by personnel experienced in architectural quality metalwork.

1.6 SITE CONDITIONS

- .1 Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings where metal fabrications are indicated to fit walls and other construction.
- .2 Establish dimensions and proceed with fabricating metal fabrications where field measurements cannot be made without delaying the work; allow for trimming and fitting.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Store materials in a location and manner to avoid damage; stack materials to prevent bending or applying stress to components; keep handling of materials on-site to a minimum.
- .2 Store components and materials in clean, dry location, away from uncured concrete or masonry; cover with waterproof paper, tarpaulin or polyethylene sheeting in a manner that permits air circulation inside of covering.
- .3 Correct damaged material and where damage is deemed irreparable by the Owner, replace the affected item at no additional expense to the Owner.
- .4 Apply protective covering to face of all exposed finished metalwork before it leaves shop, covering to remain until item installed and ready for final finishing.
- .5 Fabricate large assemblies so they can be safely and easily transported and handled to their place of installation.

1.8 COORDINATION

- .1 Coordinate fabrication schedule with construction progress to avoid delaying the work.
- .2 Coordinate with Contractor so that field dimensions correspond to established dimensions.
- .3 Coordinate shop priming and finishing requirements.
- .4 Supply items required to be built-in by other Sections, with instructions for installation for work not installed by this Section; install finish hardware and items supplied under other Sections required for completion of components of this Section.

2 Products

2.1 MATERIALS

- .1 Use only materials that are new, free from defects that would impair the strength, durability or appearance, and of the best commercial quality for the purposes specified.
- .2 Sheet Steel (Structural Quality):
 - .1 Conforms to ASTM A1011/A1011M
- .3 Sheet Steel (Commercial Quality):
 - .1 Conforms to ASTM A1011/A1011M, stretcher levelled or temper rolled.
- .4 Steel Pipe: Hot-dip galvanized, zinc coated, welded and seamless type steel pipe conforming to ASTM A53/A53M-12.
- .5 Welding Materials:
 - .1 Conforms to CSA W59-03 (R2008).
- .6 Primer:
 - .1 Shop Applied Structural Steel Primer: Steel Spec Universal Primer (B50RV6227 Red), by Sherwin Williams Company of Canada Ltd., or approved equal. Apply a minimum of 2 mils dft./coat. Grey coloured primer is acceptable.
 - .2 Zinc Rich Paint For Touch-up of Galvanized Metals: Ready mixed, zinc-rich primer conforming to CAN/CGSB-1.181-99, Sealtight Galvafruid Zinc-Rich Coating by W.R. Meadows of Canada Limited or Zinc Clad No. 5 Organic Zinc Rich Primer by Sherwin Williams Company of Canada Ltd., or approved equal.
 - .3 Touch-up Primer (On Site): 'Procryl Universal Acrylic Primer' by Sherwin Williams Company of Canada Ltd, or approved equal. Touch-up primer shall be no less than 3 mil dft.

- .4 Refer to Section 09 90 00, and coordinate with the above.
- .7 Non-Shrink Grout:
 - .1 Premixed, high strength, maximum bearing, impact resistant, non-shrink metallic aggregate grout having minimum 76 Mpa 28 day compressive strength and conforms to ASTM C939-10 and ASTM C1107/C1107M-11, 'SikaGrout 212' by Sika Canada Inc., or approved equal.
- .8 Bituminous Paint:
 - .1 Conforms to CAN/CGSB-1.108-M89, Type 2.
- .9 Building Paper:
 - .1 Conforms to CAN/CGSB-51.32-M77.
- .10 Butyl Tape:
 - .1 Extruded, high grade, macro-polyisobutylene tape of thickness, width and shore hardness to suit conditions.
- .11 Galvanizing:
 - .1 All uncoated steel specified to be galvanized shall be galvanized after fabrication by the hot-dip process according to CAN/CSA-G164-M92 (R2003), with minimum coating of 2 oz./sq.ft. Galvanize after all welding is complete. Welding of galvanized material will not be permitted. Specially treat by phosphate conversion process conforming to CGSB 31-GP-105Ma ready to receive prime paint finish.

2.2 FABRICATION AND MANUFACTURE

- .1 Design Requirements:
 - .1 Fabricate railings to conform to the Ontario Building Code, latest edition, in particular Division B, Part 4, Sub-Section 4.1.5.
- .2 General:
 - .1 Fabricate steel railings to details indicated on Drawings and to Metal Stairs Manual, AMP 510-92.
 - .2 Fabricate to reviewed shop drawings and in general to details indicated on drawings and specified herein. Where possible, fit and shop assemble and deliver to site in largest practicable sections.
 - .3 Fabricated work shall be complete with components required for anchoring.
 - .4 Fit joints and intersecting members accurately with hairline joints in least conspicuous locations and manner. Make work in true plane with adequate fastenings.
- .3 Welding:
 - .1 Except where bolted connections are indicated, make railings of welded construction conforming to requirements of CSA W59-03(R2008).
 - .2 Grind exposed welds smooth. Machine materials and straighten in such a way that no disfigurement will show in finished work.
- .4 Fastenings and Connections:
 - .1 Weld connections where possible. Where not possible bolt or otherwise secure in approved manner. Where approved, install exposed fastenings of same materials, colour and finish as base metal on which they occur.
 - .2 Countersink screws unless noted otherwise and reinforce where necessary.

- .3 Use shop and field connections detailed. Where not detailed, connections shall comply with CSA S16-09.

2.3 COMPONENTS

- .1 Handrails:
 - .1 Provide wall mounted handrails as indicated on drawings, complete with brackets and anchoring devices.
 - .2 Handrails and Wall Brackets: Tubular steel, 38mm (1-1/2") dia. pipe rail with rod and mounting flange as detailed on Drawing A3.5.
 - .3 Finishing:
 - .1 Steel: After shop fabrication, thoroughly de-scale steelwork, remove roughness and irregularities by grinding, clean with wire brush, remove oil and grease from surface of steel and give one coat of primer. Give steelwork one coat of primer in shop working well into crevices and interstices.
 - .2 Hot-dip galvanized exterior steel railings and handrails.
 - .3 Colour: As indicated in the Finish Material Specifications Legend on the Drawings.

3 Execution

3.1 EXAMINATION

- .1 Examine the work of other Sections upon which the work of this Section depends and report any defects to the Consultant. Do not commence installation until such time as all wet trades have been completed. Commencement of work implies acceptance of surface and conditions.

3.2 PREPARATION

- .1 Provide anchorage devices and fasteners to other Sections where necessary for securing metal railings to in place construction; include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- .2 Perform cutting, drilling, and fitting required for installing metal railings.
- .3 Field check and verify that structural framing, enclosures, weld plates, blocking, and that size and location of pockets are placed in accordance with reviewed shop drawings.
- .4 Report discrepancies to Contractor and Consultant, and recommend corrective action by responsible parties.
- .5 Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- .6 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates and instructions for installation.

3.3 INSTALLATION

- .1 Furnish, set and secure framing brackets, hangers, anchors, inserts or similar supports for proper erection of railings before masonry and concrete is placed. Provide temporary supports and bracing required to position railings.
- .2 Do all coring, drilling and fitting necessary to attach work of this Section to adjoining work.
- .3 Continuous weld connections between handrails and balusters and in lengths of handrails.

- .4 Secure wall brackets to wall at 1220 (4') O.C. maximum with through-bolts and plate where these can be concealed, otherwise use bolts and expansion shields to achieve maximum rigidity of rail. Wood plugs for fixing to walls will not be permitted. Use metal anchoring devices.
- .5 Isolate where necessary to prevent electrolysis due to dissimilar metal-to-metal contact or metal-to-masonry and concrete. Use 2 coats of bituminous paint, butyl tape, or building paper.
- .6 Grind off surplus welding materials and provide sharp profiles and arises.
- .7 Build and erect work plumb, true, square, straight, level and accurate, to sizes detailed, to reviewed shop drawings, free from distortion or defects detrimental to appearance and performance.
- .8 Touch up with matching primer, or zinc rich paint for galvanized components, field welds, damaged and abraded surfaces, and surfaces not previously primed. Leave ready for finish painting by Section 09 90 00.

3.4 PROTECTION

- .1 Protect completed work from damage during and after installation.
- .2 Field repair or refinishing of damaged, marred or discoloured finishes will not be accepted.

3.5 CLEANING

- .1 Clean installations and assemblies progressively as work proceeds, and at completion of work.
- .2 Remove protective coverings and clean metal work using cleaning solutions and methods to suit the metal and its finish at completion of work.
- .3 Protect adjacent materials and finishes from damage or discolouring during cleaning.
- .4 At completion, remove all equipment, tools, surplus materials and debris from job site.

3.6 PIPE HANDRAIL AND WALL BRACKETS SCHEDULE

- .1 Provide handrails and brackets of the minimum diameter, standard weight pipe required to resist design loads, outer diameter 40mm (1.6") unless otherwise indicated on the drawings, and as follows:
 - .1 Return ends of metal wall handrails toward wall with radius corner and stop handrail 13mm (1/2") from wall with flat end.
 - .2 Space brackets at a maximum of 1220mm (4') and not more than 305mm (12") from the ends.
 - .3 Design railings, and supports, in accordance with loads specified in the Building Code.
 - .4 At least one handrail at side of stairway or ramp shall extend horizontally not less than 305mm (12") beyond top and bottom of stairway or ramp in accordance with Building Code.
 - .5 Weld posts to cast-in designed to resist post loads in accordance with the Building Code.
 - .6 Cap the ends of tube rails with 3mm (1/8") steel plate. Weld all around.

END OF SECTION

1 General

1.1 SUMMARY

- .1 Supply all labour, materials, equipment, services and perform all operations required to complete all rough carpentry work to the full intent of the drawings and as herein specified.

1.2 REFERENCE STANDARDS

- .1 The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- .2 All reference amendments adopted prior to the bid closing date of this Project shall be applicable to this Project.
- .3 All materials, installation and workmanship shall comply with all applicable requirements and standards
- .4 American Society for Testing and Materials (ASTM):
 - .1 ASTM A307, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
 - .2 ASTM C954, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness
 - .3 ASTM D6007, Standard Test Method for Determining Formaldehyde Concentrations in Air from Wood Products Using a Small-Scale Chamber
 - .4 ASTM D6330, Standard Practice for Determination of Volatile Organic Compounds (Excluding Formaldehyde) Emissions from Wood-Based Panels Using Small Environmental Chambers Under Defined Test Conditions
 - .5 ASTM E1333, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber
- .5 Underwriters Laboratories of Canada (ULC):
 - .1 CAN/ULC S102, Standard Method of Test for Surface Burning Characteristics of building Materials and Assemblies
- .6 American Wood Preservers Association (AWPA):
 - .1 AWPA Book of Standards, Latest edition
- .7 Canadian General Standards Board (CGSB):
 - .1 CAN/CGSB 71.26, Standard for Adhesives for Field-gluing Plywood to Lumber Framing for Floor Systems.
- .8 Canadian Roofing Contractors Association (CRCA):
 - .1 Roofing Specifications Manual – Latest Edition
- .9 Canadian Standards Association (CSA):
 - .1 CSA A172, High Pressure Paper Base, Decorative Laminates
 - .2 CSA B111, Wire Nails, Spikes and Staples
 - .3 CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles
 - .4 CSA O80 Series-21, Wood Preservation
 - .5 CSA O86, Engineering Design in Wood

- .6 CSA O112 Series, CSA Standards for Wood Adhesives
- .7 CSA O121, Douglas Fir Plywood
- .8 CAN/CSA-O141, Softwood Lumber
- .9 CSA O151, Canadian Softwood Plywood
- .10 CSA O325, Construction sheathing (Adopted NIST PS 2-18, with Canadian deviations)
- .11 CSA O437 Series, Standard on OSB and Waferboard
- .12 CSA O452 Series, Design Rated OSB
- .10 National Lumber Grading Association (NLGA):
 - .1 NLGA Canadian Lumber Grading Rules

1.3 DELIVERY, STORAGE, HANDLING AND PROTECTION

- .1 Coordinate deliveries to comply with construction schedule and arrange ahead for off-the-ground, under cover storage location. Do not load any area beyond the design limits.
- .2 Materials shall be carefully checked, unloaded, stored and handled to prevent damage. Protect materials with suitable non-staining waterproof coverings.
- .3 Do not store seasoned materials under conditions that will cause their moisture content to increase.
- .4 Protect edges and corners of sheet materials from damage during handling and storage.
- .5 Store preservative-treated materials under cover, off the ground and protected from moisture.

2 Products

2.1 MATERIALS

- .1 Framing Lumber:
 - .1 Lumber for structural components shall be of species and grade specified, well seasoned, processed and stamped at same mill with appropriate grade markings.
 - .2 Conform to requirements of Standard Grading Rules for Canadian Lumber of National Lumber Grades Authority the (NLGA) with latest supplements, approved by the Canadian Lumber Standards Administrative Board.
- .2 Lumber:
 - .1 Except as indicated or stated otherwise, lumber to be softwood, S4S, moisture content 19% or less, in accordance with the following standards:
 - .1 CSA O141-05 (R2009) - "Softwood Lumber".
 - .2 NLGA - "Standard Grading Rules for Canadian Lumber" (latest supplement).
- .3 Framing and Board Lumber:
 - .1 Treatable Species: No. 2 and better - S4S, Dry, 19%.
- .4 Framing, Furring, Strapping, Blocking:
 - .1 Spruce, 122c, "Standard" light framing, except as otherwise specified.

- .5 Rough Hardware:
 - .1 Provide rough hardware such as nails, spikes, staples, H-clips, bolts, nuts, washers, screws, clips, strap iron and including hardware for temporary enclosures.
 - .2 Nails for plywood shall be annular or spiral type, all other nails shall be spiral type. All nails, spikes and staples shall conform to CSA B111.
 - .3 All rough hardware shall be galvanized unless otherwise noted. Galvanizing shall conform to CAN/CSA-G164.
- .6 All Other Materials and Hardware:
 - .1 Shall be as noted on drawings.

2.2 PRESSURE PRESERVATIVE TREATED MATERIALS

- .1 Pressure Preservative Treated Lumber: Lumber graded and stamped in accordance with applicable grading rules and standards of associations or agencies approved to grade lumber by Canadian Lumber Standards Accreditation Board in accordance with CSA O80 Series -08.
 - .1 Species: Pine or Spruce-Pine
 - .2 Grade: No.2 or better structural posts and lumber, pieces may be grade stamped or shipment certified by letter of compliance.
 - .3 Grading authority: NLGA, paragraph 131CC
 - .4 Material having twisted grain or structural defects affecting integrity of lumber will not be acceptable for this project.
 - .5 Use only material with radius edges, minimum 6 mm.
 - .6 Kiln dry lumber materials to 8% moisture content or less.
- .2 Pressure Preservative Treated Plywood: Treated in accordance with CSA O80 Series -08 using water-borne preservative to obtain minimum net retention of 4 kg/m³ of wood. Plywood or laminated materials shall be manufactured with exterior grade adhesives. After treatment, plywood shall be kiln dried to moisture content of 8% or less.

2.3 PRESSURE FIRE RETARDANT TREATED MATERIALS

- .1 Treat by pressure impregnation with fire-retardant chemicals in accordance with CSA O80 Series -08 to provide classification for flame spread of not more than 25, smoke developed of not more than 75 in accordance with CAN/ULC S102.
- .2 All fire retardant wood must comply with the requirements in AWPAC Standard C20 for lumber and C27 for plywood.
 - .1 AWPAC C20: Structural Lumber, Fire-Retardant Pressure Treatment, lumber materials shall only be of species listed. After treatment, lumber 50 mm or less in thickness shall be kiln dried to moisture content of 8% or less.
 - .2 AWPAC C27: Plywood, Fire-Retardant Pressure Treatment, plywood or laminated materials shall be manufactured with exterior grade adhesives. After treatment, plywood shall be kiln dried to moisture content of 8% or less.
 - .3 All species to comply with CAN/ULC S102 for surface-burning characteristics and shall bear identification showing classification and type of fire retardant.
- .3 Each piece or bundle of fire-retardant treated material or panel to bear ULC inspection label or stamp attesting to FRS rating indicating flame spread, smoke developed, and fuel contributed classification meeting AWPAC standard C20 and C27 for Type A Use.

- .4 Fire retardant chemicals used to treat lumber must comply with FR-1 of AWPA Standard P17 and shall be free of halogens, sulphates and ammonium phosphate.
- .5 Acceptable materials: Plywood and lumber materials treated by licensed applicators with fire retardant materials from the following:
 - .1 Dricon FRTW by Hickson Corporation.
 - .2 Pyro-Guard by Hoover Treated Wood Products Inc.
 - .3 D-Blaze by Chemical Specialties Inc.

3 Execution

3.1 INSTALLATION - GENERAL

- .1 Consult with and co-operate with other Sections in advance and build-in or make provisions for installation of other work.
- .2 Provide and fit in place all furring, strapping, battens, nailers, sleepers, grounds and blocking required to provide adequate properly placed fixing for all wood finishes, fitments and as required for the work of others trades.
- .3 Blocking, strapping and other rough carpentry indicated shall not be regarded as complete or exact. Provide all rough carpentry work required, whether specifically shown or not.
- .4 Grounds shall be of a thickness to provide for application of finishes. Room side surfaces of grounds shall be plumb and in true plane throughout.
- .5 All nails shall be long enough so that at least half their length penetrate in to the second member. Splitting of wood members shall be minimized by staggering the nails in the direction of the grain and by keeping nails well in from edges.
- .6 Blocking shall be through-bolted to structure.
- .7 Anchor rough bucks to concrete or masonry with 10mm (3/8") diameter expansion bolts and shields or Drummond and Reeves security buck anchors, minimum three (3) per jamb.

3.2 WOOD BLOCKING, CANTS AND NAILERS

- .1 Provide wood blocking, cants and nailers, where shown to be required as detailed. Bolt securely in place.
- .2 Block under cants same thickness as installed roof insulation.
- .3 Check mechanical, electrical, architectural drawings and provide all blocking, cants, nailers etc. required.
- .4 Leave work ready for roofing work and prefinished sheet metal flashing installation.

3.3 PRESSURE PRESERVATIVE TREATED WOOD INSTALLATION

- .1 Comply with AWPA M4.
- .2 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation. Allow first coating to fully soak into grain before applying second coating in accordance with manufacturer's instructions.
- .3 Remove with fine sandpaper, chemical deposits on treated wood to receive applied finish.
- .4 Use only hot-dipped galvanized, corrosion resistant nail or screw fasteners. Staples are not acceptable for installation of preservative treated materials.

- .5 Use water-borne preservative treated wood for:
 - .1 Wood in contact with masonry or concrete;
 - .2 Wood within 457mm (18") of grade;
 - .3 Wood in contact with flashings;
 - .4 Wood in contact with waterproofing membranes, confirm compatibility with membrane manufacturer prior to application.
- .6 Use oil-borne preservative treated wood for:
 - .1 Wood in contact with the ground;
 - .2 Wood in contact with freshwater;

3.4 PRESSURE FIRE RETARDANT TREATED WOOD INSTALLATION

- .1 Field Cuts:
 - .1 Do not rip, mill or conduct extensive surfacing of fire retardant treated lumber, label will be voided.
 - .2 Only end cuts, drilling holes and joining cuts are permitted.
 - .3 All cuts on plywood will be considered end cuts.
 - .4 Fire-retardant lumber and plywood can be given a light sanding for cosmetic cleaning after treatment.
 - .5 Pre-cut to the greatest extent possible before treating.
- .2 Fire retardant treated plywood used in structural applications shall be graded or span-rated material.
- .3 Use only hot-dipped galvanized, corrosion resistant nail or screw fasteners. Staples are not acceptable for installation of fire-resistant treated materials.
- .4 Where humidity conditions are such that moisture may condense between hardware and treated wood, hardware shall be back-primed with a corrosive-inhibitive paint.
- .5 Back-prime at contact points and fasteners to prevent electrolysis when fire retardant framing members are used in metal buildings.

END OF SECTION

1 General

1.1 SUMMARY

- .1 Supply all labour, materials, equipment, services and perform all operations required to complete all finish carpentry, millwork and fitment installation including but not limited to the following:
 - .1 Interior millwork.
 - .2 Wood trim.
 - .3 High pressure decorative laminate.
 - .4 Site fabricated and installed shelving.
 - .5 Cabinet Hardware.

1.2 REFERENCE STANDARDS

- .1 The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- .2 All reference amendments adopted prior to the bid closing date of this Project shall be applicable to this Project.
- .3 All materials, installation and workmanship shall comply with all applicable requirements and standards.
- .4 Applicable Standards:
 - .1 American Society for Testing and Materials (ASTM):
 - .1 ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength
 - .2 ASTM D6007, Standard Test Method for Determining Formaldehyde Concentration in Air from Wood Products Using a Small Scale Chamber
 - .3 ASTM D6330, Standard Practice for Determination of Volatile Organic Compounds (Excluding Formaldehyde) Emissions from Wood-Based Panels Using Small Environmental Chambers Under Defined Test Conditions
 - .4 ASTM E1333, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber
 - .2 Underwriters Laboratories of Canada (ULC):
 - .1 CAN/ULC S102, Standard Method of Test for Surface Burning Characteristics of building Materials and Assemblies
 - .3 Canadian Standards Association (CSA):
 - .1 CSA B111, Wire Nails, Spikes and Staples
 - .2 CSA G164-M, Hot Dip Galvanizing of Irregularly Shaped Articles
 - .3 CAN/CSA O80 Series, Wood Preservation
 - .4 CSA O86, Engineering Design in Wood
 - .5 CSA O112 Series-M, Adhesives for Wood
 - .6 CSA O121-M, Douglas Fir Plywood
 - .7 CAN/CSA-O141-M, Softwood Lumber.
 - .8 CSA O151-M, Canadian Softwood Plywood.

- .9 CSA O325.0, Construction Sheathing
- .10 CSA O437 Series, OSB and Waferboard
- .11 CSA O452 Series, Design Rated OSB
- .4 National Lumber Grading Association (NLGA):
 - .1 NLGA Canadian Lumber Grading Rules

1.3 QUALITY ASSURANCE

- .1 Contractor executing work of this section shall have a minimum of five (5) years continuous experience in successful manufacture/fabrication and installation of work of type and quality shown and specified. Submit proof of experience upon Consultant's request.
- .2 Follow applicable requirements of The Architectural Woodwork Manufacturer's Association of Canada (AWMAC) Standard for Millwork latest edition, including supplements and modifications.
- .3 Unless otherwise indicated on drawings, all millwork shall be Custom Grade, in accordance with AWMAC standards.
- .4 Supplements and modifications to the above standards as indicated on the drawings or as specified herein shall govern work of this section.

1.4 SUBMITTALS

- .1 Provide submittals in accordance with Division 01.
- .2 Samples for Verification: Submit two (2) samples prior to fabrication of millwork as follows; accepted samples will form the standard of acceptance for the remainder of the work:
 - .1 High pressure decorative laminate for finishing of millwork
 - .2 Exposed Fasteners, Hardware and Accessories: One unit for each type and finish.
- .3 Shop Drawings:
 - .1 Submit detailed shop drawings of all shop fabricated finish carpentry components.

1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate sizes and locations of framing, blocking, furring, and reinforcements provided by work that is specified in other Sections is complete before starting work of this Section.
- .2 Pre-Construction Meeting: Arrange a preconstruction meeting attended by Contractors personnel, Consultant, finish carpentry Subcontractor to discuss:
 - .1 Installation requirements,
 - .2 Special surface effects and finishing,
 - .3 Coordination of work with adjacent finishes,
 - .4 Protection of finishes,
 - .5 Acceptability of substrates and quality of materials being used for the project.

1.6 DELIVERY, STORAGE, HANDLING & PROTECTION

- .1 Do not permit delivery of work of this section to site until area is sufficiently dry so that woodwork will not be damaged by excessive changes in moisture content.
- .2 Coordinate deliveries to comply with construction schedules and arrange ahead for under cover storage location.
- .3 Materials shall be carefully checked, unloaded, stored and handled to prevent damage. Protect material with suitable non-staining waterproof coverings.
- .4 Store material in original, undamaged containers or wrappings.
- .5 Unsatisfactory materials shall be promptly removed from the site.
- .6 Adequately protect the structure and work of other sections during delivery, storage, handling and execution of the work of this section.
- .7 Provide tools, plant and other equipment required for the proper execution of the work of this section.

1.7 SITE CONDITIONS

- .1 Site Measurements: Verify dimensions by site measurements before fabrication and indicate measurements on Shop Drawings where casework is indicated to fit walls and other construction; coordinate fabrication schedule with construction progress to avoid delaying the Work; locate concealed framing, blocking, and reinforcements that support woodwork by site measurements before being enclosed and indicate measurements on Shop Drawings.
- .2 Established Dimensions: Establish dimensions and proceed with fabricating casework without confirmed site measurements where site measurements cannot be made without delaying the Work; coordinate with the construction to ensure that actual dimensions correspond to established dimensions; allow for trimming and fitting.
- .3 Ambient Conditions: Maintain area or room in which casework is being installed at a uniform temperature and humidity for 24 hours prior to, during and after installation in accordance with AWS for relative humidity and moisture content; provide additional lighting to maintain a minimum of 430 lx on surfaces and areas where casework is being installed.

1.8 WARRANTY

- .1 Warrant plastic laminate work of this Section against defects in materials and workmanship in accordance with General Conditions but for an extended period of two (2) years and agree to repair or replace faulty materials or work which appears during warranty period, without cost to the Owner.
- .2 Defects shall include but not be limited to, opening of joints, cracking, shrinkage, warpage, delamination of plastic laminate.

2 Products

2.1 MATERIALS

- .1 Framing Lumber:
 - .1 Lumber for structural components shall be of species and grade specified, well seasoned, and processed and stamped at same mill with appropriate grade markings. Conform to requirements of standard grading rule for Canadian lumber of Nation Lumber Grades Authority (NLGA) latest issue, approved by Canadian Lumber Standards Administrative Board, as follows:
 - .1 Rough Carpentry for built-in work: No. 2 select grade Ontario white pine.

- .2 Blocking, Ground, Furring and Strapping, Bucks and Nailing Strips: C.L.A. No. 1 grade pine, kiln dried stock.
- .3 Non-Exposed Softwood: Fabricator's option, meeting requirements of CAN/CSA O141-05(R2009), kiln dried for interior use to a moisture content of 4% to 8%, and 7% to 10% for exterior use; Surface 4 sides (S4S).
- .2 Panel Materials:
 - .1 Plywood: Douglas Fir veneer core plywood, 19mm (3/4") thick or thickness as indicated on drawings, Select Sheathing-Tight Face, good two sides, sanded "B" faces and conforms to CSA 0121.
 - .2 Particleboard: ANSI A208.1, 700 kg/m³ density.
 - .3 Medium density fibreboard (MDF): ANSI A208.2, density minimum 750 kg/m³, moisture resistant.
 - .1 Basis of Design Materials: Premier Plus MR MDF by Flakeboard.
 - .4 Fire-Rated (FR) Medium density fibreboard (MDF): ANSI A208.2, meeting CAN/ULC S102, FSC certified; Modulus of Rupture (MOR): 4000 psi, with face screw hold of 250lbs.
 - .1 Basis of Design Materials: TRUPAN Fire-Rated (FR) MDF by Arauco.
- .3 Wood Trim: Provide interior millwork in accordance with AWS Section 6 for profiles and configurations required for the project and as follows:
 - .1 Casing:
 - .1 Size, Profile, and Finish: To match existing, adjacent window casing, as approved by the Consultant.
- .4 Glue: CSA 0112; Water-resistant urea-formaldehyde free resin glue.
- .5 Plastic Laminate Covered Components:
 - .1 Plastic laminate face sheets, backing and interior cabinets: High pressure, paper based, melamine surfaced, laminated plastic sheets, conforming to CAN/CSA-A172, with thickness tolerances in accordance with Table 1 of CAN/CSA-A172 and plastic laminate grades as follows:
 - .1 General Purpose Grade (GP): Minimum 1.27mm (0.050") thick.
 - .2 Post-forming Grade (PF): Minimum 1.06mm (0.042") thick.
 - .3 Colour (MEL-1 to MEL-3): As indicated in the Finish Material Specifications Legend on Drawing A2.04.
 - .2 Cores: Unless otherwise indicated, 19mm (3/4") thick core.
 - .3 Laminating Adhesive: CSA-0112, water resistant type.
 - .4 Draw Bolt Fasteners: 'K&V 516' by Knappe & Vogt Canada. No substitutions allowed.
- .6 Rough Hardware:
 - .1 Provide required rough hardware to frame and fix all finished carpentry and include for expansion shields, nails, spikes, screws, bolts, anchors, clips, plates, washers, rods, wires, wall brackets, chrome finishing trim, and other ironmongery which may be required. All wood screws shall be drill thread screws except at chipboard where self-tapping screws shall be used. All rough hardware shall be galvanized unless otherwise noted.

- .7 Cabinet Hardware: All cabinet hardware shall in general, conform to CAN/CGSB-9.25, ANSI/BHMA A156.9-1982 and shall be as follows, unless otherwise indicated on the Drawings:
 - .1 Acceptable manufacturers supplying cabinet hardware:
 - .1 Richelieu
 - .2 Stanley Hardware
 - .3 Knappe & Vogt Canada
 - .4 Hafele Canada Inc.
 - .2 Door/Drawer Pulls (PULL-1): As indicated in the Finish Material Specifications Legend on Drawing A2.04.
 - .3 Adjustable Steel Standards and Supports: Nickel plated steel, adjustable on 13mm (1/2") centres. Standards at 151mm (6") from top and bottom. One support per 305mm (12") length of standard.
 - .4 Hinges: 95 deg opening, self-closing, concealed casework type hinges for overlay doors, having dual adjustable with heat tempered steel working parts with bright nickel finish (US14).
 - .5 Silencers: Round vinyl, self-adhering type silencers. Provide 2 per door.
 - .6 Drawer Slides: Full extension, side mounting, zinc coated, steel ball bearing, medium duty rated.
 - .7 Cabinet Locks: Single and double door cabinet cylinder locks to suit conditions by Best Lock Corporation. Co-ordinate keying with the Owner/Tenant.
 - .8 Magnetic Catches: Cast aluminum type.
- .8 Wall Mounted Standards and Brackets:
 - .1 Basis of Design Manufacturer: Knappe & Vogt Canada.
 - .2 Wall Mounted Standards: 22mm (7/8") wide x 17.5mm (11/16") high 12 gauge heavy-duty wall mounted standards with 50mm (2") slot adjustment, 914mm (3') long and capable of supporting 65 lbs./100 sq.ft.
 - .3 Brackets: 305mm (12") heavy-duty steel brackets with single, moulded nylon cam lock lever.
 - .4 Shelf Rests: Provide end, centre and front type shelf rests, complete with rubber cushions as required and for joining 2 shelves on one bracket.
- .9 Accessories:
 - .1 Garment Hooks: 133mm (5-1/4") high with 75mm (3") projection, institutional type garment hooks with bright chrome finish complete with mounting screws, '2038 CHR' by Knappe & Vogt Canada.
 - .2 Closet Rods: Extension type zinc coated steel closet rods with zinc coated forged steel end brackets and 2 centre supports, 1524mm to 2438mm (60" to 96") extension type, complete with mounting screws, 'KV2 ZC' by Knappe & Vogt Canada.

2.2 FABRICATION AND WORKMANSHIP

- .1 Work shall be executed by skilled carpenters under the supervision of a competent carpentry foreman. All items shall be shop assembled, insofar as is practical. Unless indicated otherwise comply with AWMAC Custom Grade requirements.
- .2 Make thorough examination of drawings and details, check anchorage, interfacing with work of other sections and other factors influencing the installation of the work, and be fully cognizant of requirements.

- .3 Finished woodwork shall be free from bruises, blemishes, mineral marks, knots, shakes and other defects and shall be selected for uniformity of colour, grain and texture.
- .4 Be responsible for methods of construction and for ensuring that materials are rigidly and securely attached and will not be loosened by the work of other sections.
- .5 Fabricate the work in a manner which will permit expansion and contraction of the materials without visible open joints.
- .6 Mitre exposed corners; no end grain shall be visible in completed installation.
- .7 Provide solid wood edging at exposed plywood edges.
- .8 Jointing of shop assembled work shall be by means of mortise and tenons, dowels, stub tenons, dovetails, dadoes, lock joints as applicable for the jointing condition.
- .9 Accurately cut, mitre, fit and frame work together to produce tight hairline joints, rigidly secured together in a permanent manner using glue, blind screw fixing or nails. Use concealed glue blocks for additional strength where possible.
- .10 Finished woodwork shall be in one piece wherever possible and all trim shall be in long lengths. Where jointing is necessary in the length, the joints between pieces shall be scarfed, glued and properly fastened. The material being jointed shall match reasonably well for grain and colour where natural finish is specified. Joints between lengths where paint finish is to be applied may be finger jointed in lieu of scarfing. Trim shall be accurately cut and mitred at all corners, glued and properly fastened.
- .11 Machine dressed work shall be properly machine using sharp cutters, the finished work shall be free from drag, feathers, slivers or roughness of any kind. Remove machine marks by sanding.
- .12 Finished woodwork shall be carefully hand sanded after installation to remove roughness and planer marks. Sanding shall be done with the grain of the wood and finished with fine grit paper to leave a smooth scratch-free surface suitable to receive the paint or natural finishes to be applied over as specified in Section 09 90 00.
- .13 Nail heads in the finished surfaces shall be set with straight shank nail sets. Screw and bolt heads in finished surfaces shall be let into the work and capped with edge grain wood caps dressed and finished flush.
- .14 Provide cutouts for sinks, fixtures, fittings, inserts, outlet boxes, services, other mechanical and electrical items and appliances. Round corners, and chamfer edges. Where items for cutouts butt to underside or back of finished surface, finish exposed edge to match face. Where item covers cutout, and at all concealed cut edges of core material, apply uniform coating of seal to cut edges.
- .15 The finished work shall be of a high quality, with all corners having exact angles to ensure no swerve or twisting. All bends, crimps or angle parts shall be produced by professional equipment and tools for this purpose and if long runs or repeats are required, such shall be produced in the shop, or have proper equipment on site.
- .16 Counter Supports, Cabinets and Fitments:
 - .1 Provide and install counter supports, cabinets, and fitments as indicated on drawings.
 - .2 Shop fabricate and finish countertops and cabinet work in as large a size as practical. Verify field dimensions and conditions prior to fabrication.
 - .3 Make each unit rigid and self-supporting, suitable for individual removal. Assemble components with dovetail connections, mortise and tenon or blind dado joints, and adequately glued and secured with screws.

- .4 Construct cabinets of solid lumber framing, with 19mm (3/4") MDF gables. Provide 19mm (3/4") MDF bottoms. Provide minimum 6mm (1/4") thick MDF full width backs having joints concealed behind framing. Backs which support shelves, equipment, or other loads, shall be 19mm (3/4") thick MDF. Route backs into end gables.
- .5 Fabricate cabinet base in wood, separately in height indicated or, if not indicated, to match flooring base.
- .6 Fabricate cabinet doors of flush panels from 19mm (3/4") thick MDF framed with hardwood edging.
- .7 Make drawer fronts of 19mm (3/4") finished MDF, and wide enough to cover slide space. Provide 13mm (1/2") drawer backs, 16mm (5/8") sides, 6mm (1/4") dividers, and 6mm (1/4") bottoms, all of finished MDF. Fasten sides to fronts with dovetail joints, and grooved and glued joints for backs. Groove and glue bottoms into fronts and sides.
- .8 Drawers shall be supported and guided with side extension drawer slides.
- .9 Where a locking drawer is located below another drawer, provide 6mm (1/4") thick MDF diaphragm in framing immediately above locking drawer.
- .10 Fabricate shelving of 19mm (3/4") finished MDF. Route cabinet gables to receive fixed shelving where indicated and to receive recessed metal shelf standards flush with adjacent surfaces for adjustable shelving.
- .11 Fabricate countertops to details shown of 19mm (3/4") plywood, unless otherwise indicated on the Drawings as Solid Surface Countertops.
 - .1 Provide exterior grade waterproof Douglas Fir plywood for countertops to receive sinks. Fit corners and edges of countertops with solid stock. Extend side and backsplashes to heights indicated. Provide side returns to match backsplashes at all abutting fixed vertical surfaces.
- .12 Support counters without cabinets below on solid wood framing, and MDF gables.
- .13 Provide MDF shelf units with finished plywood cleats for shelving and coat rod installations. Provide closet rods with end flanges and intermediate supports.
- .17 Edging Treatment:
 - .1 3mm (1/8") Self Edge Laminate: HPDL, colour matching cabinet work, as indicated on the Drawings.
- .18 Plastic Laminate Covered Components:
 - .1 Meet requirements of CAN/CSA-A172, Appendix A.
 - .2 Bond plastic laminate to core with adhesive using pressure. Provide balanced construction with plastic laminate face sheet on exposed sides of core and backer/liner sheet. Finish drawers with liner sheet on both sides of core for balanced construction.
 - .3 Unless otherwise detailed, provide 19mm (3/4") thick core.
 - .4 Apply plastic laminate to core material in accordance with adhesive manufacturer's instructions. Provide same core and laminate profiles to provide continuous support and bond over entire surface.
 - .5 Use continuous lengths up to 2439mm (8'). Keep joints 610mm (2') from cutouts and in locations indicated on reviewed shop drawings.

- .6 Locate joints, where required at 2439mm to 3048mm (8' to 10') O.C. At L-shaped corners mitre plastic laminate, to the outside corner. Accurately fit members together to provide tight and flush butt joints, in true planes. Provide 6mm (1/4") blind spline and approved type draw bolts; one draw bolt for widths up to 150mm (6") at maximum 457mm (18") centres for widths exceeding 150mm (6"). Colour-match adjoining units.
- .7 Form shaped profiles and bends using postforming grade laminate to laminate manufacturer's instructions.
- .8 Where curved or bent surfaces are required, use postforming laminate.
- .9 Self-edge straight-line-edging with general purpose laminate and radius corners with postforming laminate, of same colour and finish as facing sheet, to cover exposed edges of core material. Apply with same adhesive as facing sheet. Chamfer edges uniformly at approximately 20 deg using machine router. Do not mitre laminate edges.
- .10 Fabricate horizontal wearing surfaces including counters, shelves, both sides of removable shelves, cabinet doors and drawer fronts, of general purpose laminate except where postforming is required.
- .11 Use general purpose laminate for exposed vertical surfaces except where otherwise specified or indicated.
- .12 Apply plastic laminate backing sheet to reverse side of core of plastic laminate finished work including under countertops and concealed portions of plastic laminate faced work. Provide backing sheet of specified minimum thickness, increased as required to compensate stresses caused by facing sheet.
- .13 Apply laminated plastic liner sheet to interior of cabinetry unless indicated otherwise.
- .14 Where cutouts are required in countertops for items that butt to underside of top only, trim edges of opening with postforming laminate. Use radiused corners and chamfer edges around cutouts to avoid chipping laminate. Where item covers cutout, apply uniform coating of sealer to cut edges.
- .15 Assemble work, true and square. Arrange adjacent parts of continuous laminate work to match in colour and pattern.

2.3 MOISTURE CONTENT

- .1 Moisture content of interior woodwork shall be between 8% and 12%.

2.4 FINISHES

- .1 Finishes shall match approved finished samples of wood treatment submitted by this section for each species of wood required. Wood items provided under this section shall be finished as part of the work of this section.
- .2 Apply stain to items where scheduled, indicated or as directed Consultant, providing uniform required stain colour(s).
- .3 Provide finishes as indicated in the Finish Material Specifications Legend on Drawing A2.04.

3 Execution

3.1 EXAMINATION

- .1 Inspect available spaces and check surfaces over which the work of this section is dependent for any irregularities detrimental to the application and performance of the work.

- .2 Notify Consultant in writing of all conditions which are at variance with those on the Contract Documents and/or detrimental to the proper and timely installation of the work of this section. The decision regarding correct measures shall be obtained from the Consultant prior to proceeding with the affected work.
- .3 Check humidity in building with moisture reading instruments if doubt exists that building is sufficiently dry and ready to receive millwork. Do not proceed until unsatisfactory conditions are corrected.
- .4 Commencement of work indicates acceptance of surfaces and conditions.

3.2 INSTALLATION - GENERAL

- .1 Provide and fit in place all furring, strapping, battens, grounds and blocking required to provide adequate properly placed fixing for all finish carpentry work and as required for the work of other sections.
- .2 Refer to drawings and coordinate with drywall, the painting and floor covering sections to establish sequence of installation or execution of each others' work. Pay particular attention to areas where materials are supplied by others and installed under this Contract.
- .3 All nails where their use is permitted, shall be long enough so that at least half their length penetrates into the second member. Splitting of wood members shall be minimized by staggering the nails in the direction of the grain and by keeping nails well in from edges.
- .4 Unless otherwise permitted by Consultant, fasten finish carpentry components in concealed manner.
- .5 Plastic laminate work shall be free of cracks and chipped or broken edges. Replace damaged components.
- .6 Fitments shall be installed level, plumb and true and complete in all respects.
- .7 Fit small scribe moulds of same material as fitment to hide voids at junction of fitment to fitment and fitment to walls, partitions, ceilings, furrings.
- .8 Provide and install all pass-thru doors, cable entry plugs, computer paper feed slot guides, casters, wall mounted standards with brackets and accessories as indicated on drawings, secure, plumb, level and true to line to adjacent surfaces and items.

3.3 PRIMING

- .1 Immediately in instances where primed work is cut (as for fitting), a coat of primer shall be applied to the resulting raw surfaces.

3.4 INSTALLATION - CABINET HARDWARE

- .1 Install cabinet hardware in shop wherever possible.
- .2 Install cabinet hardware secure, plumb, level, true to line, and in accordance with hardware manufacturers' instructions.
- .3 Cut and fit to finish carpentry and millwork for proper installation and operation of cabinet hardware.
- .4 Size cutouts so that hardware item completely covers cutouts.
- .5 Adjust and lubricate cabinet hardware as required for smooth and efficient operation without binding.

END OF SECTION

1 General

1.1 SUMMARY

- .1 Section Includes:
 - .1 Labour, Products, equipment and services necessary to complete the work of this Section.
- .2 Maintain the existing building watertight at all times.
- .3 Provide required temporary protection, and enclosures. Seal off or temporarily dam open roof edges to prevent any incidence of water into existing building or structure.

1.2 QUALITY ASSURANCE

- .1 Tie-in new work with adjacent existing roofing system in accordance with the manufacturer's recommendations for the products used. All products to be compatible with the existing and new roofing system components.
- .2 Do work to maintain existing roof warranty.
- .3 All work shall meet the requirements of the Canadian Roofing Contractors Association (CRCA), including all amendments.
- .4 Applicators: Member in good standing of the Canadian Roofing Contractors Association and which has a minimum of five (5) years of proven satisfactory experience in the Work of this Section.
- .5 Ensure surfaces to receive work of this Section are clean, level, smooth, solid and dry before commencing work each day.
- .6 Ensure temperatures during application are not less than the minimum recommended by the material manufacturer. Do not perform work during inclement weather conditions.
- .7 Stop work when temperature remains consistently below recommended temperature.
- .8 Use only dry materials and apply only during weather that will not introduce moisture into roofing system.
- .9 Arrange for roofing material manufacturer's representative to visit the site and discuss roofing application and any special requirements, prior to commencement of work.

1.3 SUBMITTALS

- .1 Provide submittals specified and as required to assess conformance with the Contract Documents and Division 01.
- .2 Shop Drawings: Provide shop drawings showing complete details of all conditions, construction and interfacing with work of other Sections.
- .3 Product Data: Submit three (3) copies of the manufacturers' recommended roofing inspection and maintenance procedures for inclusion in the maintenance instructions and data book.

1.4 PROTECTION

- .1 Provide all necessary protection measures to prevent fumes, dust particles, odours and other foreign matter created or caused by roofing operation from entering the building, including the return air ducts.
- .2 Provide temporary protection at work areas or access to work areas with minimum ½" plywood underlaid with 1" polystyrene insulation board extending 3' beyond work area. Remove protection at completion of work.
- .3 Prevent bitumen, precipitation and debris entering openings and drains during work.

- .4 Cover walls and adjacent work where materials hoisted or used. Locate kettles so that smoke and fumes will not discolour the building or adjacent buildings or become a nuisance to adjacent owners or the public.
- .5 Use warning signs and barriers. Maintain in good order until completion of work.
- .6 At end of each day's work or when stoppage occurs due to inclement weather, provide protection for completed work and materials out of storage.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials in original containers, sealed, with labels intact.
- .2 Do not store insulation in direct contact with the earth, road surface, or roof deck. Place suitable supports under the insulation upon delivery to protect it from absorbing dampness from the surrounding terrain or deck.
- .3 Store materials to manufacturer's instructions. Provide and maintain dry, off-ground weatherproof storage. Take particular care to prevent materials from absorbing moisture. Remove unsatisfactory materials promptly and provide new dry materials.
- .4 Deliver fasteners in boxes or kegs and keep in protective storage until used. Do not oil or grease fasteners.
- .5 Remove materials only in quantities required for same day use.
- .6 Remove and replace damaged, wet or broken materials.
- .7 Cover gravel during inclement weather.
- .8 Store materials away from open flame or ignition sources.

1.6 WARRANTY

- .1 Provide Canadian Roofing Contractors Association (CRCA) Standard Form of Warranty, complete with a copy of the CRCAs Preventative Maintenance Manual or similar written warranty acceptable to the Owner and the Consultant. The warranty shall be for a period of two (2) years from date of Substantial Performance.
- .2 Provide material and material/labour warranties offered by the material manufacturers.
- .3 Repair defects within twenty-four (24) hours of notification.
- .4 Inspect the roof thirty (30) days before expiry of warranty and correct defects within fifteen (15) days of inspection. This inspection shall be performed at no additional cost to the Owner.
- .5 Carry out repair work required under the warranty in accordance with the recommendation of the Consultant.

2 Products

2.1 MATERIALS

- .1 Roofing products: Matching and compatible with existing installed materials.
- .2 Roof Pavers:
 - .1 Provide pavers at all traffic concentration points (i.e. roof hatches, access doors, rooftop ladders, etc.), regardless of traffic frequency or whether or not these are explicitly indicated on Drawings.
 - .2 Concrete Roof Pavers: CSA A231.2, 30 MPa, precast concrete pavers, complete with smooth face non-slip finish and chamfered edges; Containing between 4% - 6% air entrainment.
 - .1 Size: 610 mm x 610 mm x 64 mm (24" x 24" x 2-1/2").

- .3 Paver Support Pedestals:
 - .1 Pedestal Paver System: Grid-like structure with integral spacer ribs on top surface, incorporating through-drainage and air ventilation.
 - .2 Composition: High density polyethylene, ultraviolet stabilized.
 - .3 Levelling plates: Pedestal base size x 1/8 inch (3 mm) thick.
 - .4 Colour: Black.
 - .5 Basis of Design Materials: Pave-El Paver Pedestals by Envirospec Inc.

3 Execution

3.1 EXAMINATION

- .1 Examine site conditions and surfaces to ensure that they are in satisfactory condition for the commencement of the work of this section. Do not proceed with work until surfaces are satisfactory.
- .2 Examine existing work to ensure materials used for work of this Section are compatible with and matching existing roofing system.

3.2 ROOFING INSTALLATION

- .1 Remove only areas of the existing roofing system which can be replaced, complete with membrane flashings, on the same day.
- .2 Adequately install cants at junctions between horizontal and vertical surfaces. Provide tight flush joints between length of cants and mitre corners.
- .3 Provide roofing and flashing construction to matching existing.
- .4 Install sheet metal work in accordance with CRCA specifications, using concealed fastenings except where approved before installation.
- .5 Fabricate metal flashings and other sheet metal work to details shown. Form pieces in 8' maximum lengths. Make allowance for expansion at joints.
 - .1 Hem exposed edges on underside 1/2". Miter and seal corners with sealant.
 - .2 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
 - .3 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.
 - .4 Counterflash membrane flashings at intersections of roof with vertical surfaces and curbs. Flash joints using S-lock forming tight fit over hook strips.
 - .5 Lock end joints and caulk with sealant.

3.3 PAVER AND SUPPORT PEDESTAL INSTALLATION

- .1 Install paver pedestal system in accordance with manufacturer's instructions.
- .2 Where dead level paver surface is required utilize levelling plates and multiple stacking of pedestals to achieve level surfaces. Locate levelling plates on top of upper pedestal.
- .3 Locate first row of pavers at an exterior edge, using 1/2 pedestals at edges and 1/4 pedestals at corners and partial angled paver locations.
- .4 Run subsequent rows of pavers parallel to first row.
- .5 Place pedestals with projecting ribs facing up. Place pavers tight to spacer ribs.
- .6 Lower pavers horizontally without nosing into position.

- .7 Align and shim pavers as work progresses.
- .8 Maximum variation in height between adjacent pavers for walking surfaces: 3mm (1/8").

3.4 CLEANING

- .1 Remove all existing debris from all roof areas.
- .2 Clear out roof drains, scuppers, eaves troughs and down spouts of debris resulting from work of this Section and ensure they are free draining at project completion.
- .3 Daily as the work proceeds and on completion, remove all surplus materials and debris resulting from work.
- .4 Remove stains, caulking or other adhesive from all affected surfaces.

END OF SECTION

1 General

1.1 SUMMARY

- .1 Supply and install materials in accordance with published 'Through-Penetration Firestop Systems' in UL's Fire Resistance Directory or the publication of another approved independent laboratory.

1.2 REFERENCE STANDARDS

- .1 The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- .2 All reference amendments adopted prior to the bid closing date of this Project shall be applicable to this Project.
- .3 All materials, installation and workmanship shall comply with all applicable requirements and standards.
- .4 Underwriters Laboratories of Canada (ULC):
 - .1 CAN/ULC S115, Standard Method of Fire Tests and Firestop Systems
- .5 American Society for Testing and Materials (ASTM):
 - .1 ASTM E814, Standard Test Method for Fire Tests of Penetration Firestop Systems

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Division 01.
- .2 Shop Drawings:
 - .1 Provide details indicating all reinforcing, anchorages, fastening and proposed method of installation for the various conditions within the project.
- .3 Samples:
 - .1 Submit samples of each type of firestop and smoke seal material and accessory.

1.4 QUALITY ASSURANCE

- .1 Applicator shall be licensed by the manufacturer of fireproofing materials.
- .2 Conform to flame and temperature ratings established by CAN/ULC-S115 and ASTM E814.
- .3 Submit manufacturer's certification that materials meet or exceed specified requirements.
- .4 Maintain flame and temperature ratings equal to surrounding materials.

1.5 DELIVERY, STORAGE, HANDLING AND PROTECTION

- .1 Deliver materials in original, unopened packages bearing name of manufacturer and product identification.
- .2 Store materials off ground, under cover, and away from damp surfaces.

1.6 SITE CONDITIONS

- .1 Do not apply materials when temperature of substrate material is below 4 deg C and surrounding air temperature is below 4 deg C, for 24 hours prior to application.

2 Products

2.1 MATERIALS

- .1 Bears UL, ULC or Warnock Hersey label and confirmation of compliance with ASTM E814 or CAN/ULC-S115.
- .2 Provide fire stopping and smoke sealing systems in accordance with CAN/ULC-S115 and shall also conform to special requirements in part 3.5 of the Building Code.
- .3 Fire-resistant rating of fire stopping material assemblies must meet or exceed the fire-resistance rating of the floor or wall section being penetrated.
- .4 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control shall be elastomeric seal type. Do not use a cementitious, or rigid seal at such locations.
- .5 Primers shall be to manufacturer's recommendation for specific material, substrate, and end use.
- .6 Damming and backup 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.
- .7 Sealants for vertical joints, shall be non-sagging type.

3 Execution

3.1 PROTECTION

- .1 Mask adjacent work of other Sections as necessary to avoid spillage onto adjoining surfaces. Remove stains on adjacent surfaces as required.

3.2 PREPARATION

- .1 Examine sizes and conditions to establish correct thickness and installation of backup materials. Ensure surfaces are dry and frost free.
- .2 Clean bonding surfaces of deleterious substances including dust, paint, rust, oil, grease and other foreign matter which may otherwise impair effective bonding.
- .3 Do not apply firestops and smoke seals to surfaces previously painted or treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.
- .4 Prepare surfaces in accordance with manufacturer's instructions.
- .5 Priming and Sealing: Prime surfaces in accordance with manufacturer's instructions.

3.3 APPLICATION

- .1 Mix materials in accordance with manufacturers' written instructions.
- .2 Apply in strict accordance with ULC certification and manufacturer's recommendations to provide a temperature and flame rated seal equal as a minimum to the rating of the wall or floor surrounding.
- .3 Seal all holes or voids made by penetrations to ensure an air and water resistant seal.
- .4 Seal all joints to ensure an air and water resistant seal, capable to withstand compression due to thermal, wind or seismic joint movement.
- .5 Consult with Mechanical Engineer and project manager prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.

- .6 Apply to mechanical and electrical service through-penetrations, to formed, sleeved, or cored openings in smoke and fire rated masonry, or gypsum wallboard stud walls and structural floors and ceilings.
 - .1 Coordinate with plumbing, HVAC and electrical contractors to ensure proper firestopping application, providing smoke seal around penetrations through fire rated assemblies. Ensure that end joints between lengths of firestopping material have been properly sealed.
- .7 Apply to head of smoke and fire rated gypsum wallboard stud wall abutting underside of structure (concrete or steel deck).
- .8 Apply to control joints in rated stud walls.
- .9 Apply to penetrations for passage of duct, cable, cable tray, conduit, piping, electrical busways and raceways through fire rated vertical barriers (walls and partitions), horizontal beams (floor/ceiling assemblies) and vertical service shaft walls and partitions.
- .10 Apply to safin gaps between edge of floor slabs and curtain walls.
- .11 Apply to openings between structurally separate sections of walls and floors.
- .12 Apply to gaps between tops of walls and ceiling or roof assemblies.
- .13 Apply to expansion joints in fire rated walls and floors.
- .14 Apply to openings and penetrations in fire rated partitions or walls containing fire doors.
- .15 Apply to openings around structural members which penetrate fire rated floors or walls.
- .16 Apply firestop and smoke seal materials in accordance with manufacturer's directions, with sufficient pressure to properly fill and seal openings.
- .17 Tool or trowel exposed surfaces.
- .18 Remove excess compounds promptly as work of this Section progresses and upon completion of work of this Section.

3.4 CURING

- .1 Cure materials in accordance with manufacturer's instructions.
- .2 Do not cover up materials until proper curing has taken place.

3.5 IDENTIFICATION

- .1 Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:
 - .1 The words: "Warning: Through-Penetration Firestop System - Do Not Disturb"
 - .2 Contractor's name, address and telephone number.
 - .3 Designation of applicable testing and inspection agency.
 - .4 Date of installation.
 - .5 Manufacturer's name for firestop materials.

3.6 CLEAN UP AND REPAIRS

- .1 Clean adjacent surfaces immediately and leave work neat and clean.
- .2 Remove excess materials using recommended procedures, as work progresses.
- .3 Remove dams after initial set of firestops and smoke seals as required.
- .4 Correct staining and discolouring of adjacent surfaces as directed by Consultant.

- .5 Remove all debris and excess materials entirely from the site and leave the work in a neat and tidy condition.
- .6 Perform one simulated smoke test for each penetration type once per day. Simulate smoke at a rate of four seconds/100 cubic feet (2.8 cubic metres) and maintain the fog density until inspection is complete.
- .7 After inspection is complete, repair all defective firestopping and smoke seals and test again. Continue this procedure until all firestopping and smoke seals pass test.

END OF SECTION

1 General

1.1 SUMMARY

- .1 Read other Sections of the Specification for extent of sealant specified in those Sections. Do all other sealing indicated, specified or required.
- .2 Provide all items, articles, materials, operations or methods listed, mentioned or scheduled on drawings and/or herein, including all labour, materials, equipment and incidentals necessary and required for the completion of the sealant.

1.2 REFERENCE STANDARDS

- .1 The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- .2 All reference amendments adopted prior to the bid closing date of this Project shall be applicable to this Project.
- .3 All materials, installation and workmanship shall comply with all applicable requirements and standards.
- .4 American Society for Testing and Materials (ASTM):
 - .1 ASTM C509, Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material
 - .2 ASTM C920, Standard Specification for Elastomeric Joint Sealants
 - .3 ASTM C1382, Standard Test Method for Determining Tensile Adhesion Properties of Sealants When Used in Exterior Insulation and Finish Systems (EIFS) Joints
 - .4 ASTM D2240, Standard Test Method for Rubber Property - Durometer Hardness
- .5 Canadian General Standards Board (CGSB):
 - .1 CAN/CGSB-19.13, Sealing Compound, One-Component, Elastomeric, Chemical Curing

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Division 01.
- .2 Action Submittals: Provide the following submittals before starting any work of this Section:
 - .1 Manufacturer's Data: Submit manufacturer's literature describing each material to be used in the work of this Section. Literature shall contain a statement that the material complies with the specified standard.
 - .2 Samples: Submit for approval and colour selection sample of each type of compound, recommended primers and joint filler or fillers proposed to be used.
 - .3 Mock-Up:
 - .1 If requested by the Consultant, construct mock-ups where directed to show location, size, shape, colour and depth of joints complete with back-up material, primer and sealant. Mock-up may be part of finished work.
 - .2 Allow 24-hours for inspection of work before proceeding with work.
 - .4 Safety Data Sheets: Submit WHMIS safety data sheets for inclusion with project record documents. Keep one copy of WHMIS safety data sheets on Site for reference by workers.

1.4 QUALITY ASSURANCE

- .1 Adhere to Manufacturer's recommendations for mixing or preparation of materials listed in this Section.
- .2 Pot life or installation times shall not be exceeded.
- .3 Integral materials which compose a joint detail shall be compatible.
- .4 Component parts, where possible, shall have the same manufacturer.
- .5 A representative of sealant material manufacturer shall visit the site during application to ensure that all Work is carried out according to the manufacturer's printed instructions.

1.5 SITE CONDITIONS

- .1 Apply sealants only to completely dry surfaces, and at air, substrate and material temperatures above minimum established by manufacturer's written specifications.

1.6 DELIVERY, STORAGE HANDLING AND PROTECTION

- .1 Deliver all materials to the jobsite in their original, unopened containers, with all labels intact.
- .2 Receive and store materials as recommended by materials manufacturer.
- .3 Maintain containers and labels in undamaged condition.

1.7 WARRANTY

- .1 Provide a written warranty endorsed and issued in the name of the Owner stating that all sealant work of this Section is warranted against leakage, cracking, crumbling, melting, running, deterioration, shrinkage, loss of cohesion, loss of adhesion, staining of adjoining or adjacent work or surfaces, or failure to provide intended seal for a period of five (5) years from the Date of Substantial Performance of the Work, and that any defects will be made good including, related materials and installation at no additional cost to the Owner.

2 Products

2.1 MATERIALS

- .1 Joint Cleaner:
 - .1 Non-corrosive solvents as recommended by sealant manufacturer for applicable substrate material(s).
- .2 Primer:
 - .1 Non-staining type as recommended by sealant manufacturer, for use on substrate conditions outlined, and compatible with specified sealant being applied.
- .3 Joint Back-Up – Backer Rod:
 - .1 Round, open cell, reticulated foam, 50% compression, compatible with sealant and primer, non-adhering to sealant.
- .4 Bond Breaker:
 - .1 Pressure sensitive plastic tape, not bondable to sealant as recommended by sealant manufacturer.

- .5 Sealant Type "A" – Joints around Interior Door Frames, Windows and Under Exterior Thresholds:
 - .1 One-part, low or medium modulus, neutral curing 100% silicone joint sealant, conforming to ASTM C920-11, Type S, Grade NS, Class 35.
 - .1 DC CWS by Dow Corning.
 - .2 SWS by GE
 - .3 SikaSil WS-305CN by Sika
 - OR
 - .2 One component, low modulus, moisture curing, polyurethane joint sealant, conforming to ASTM C920-11, Type S, Grade NS, Class 25.
 - .1 Dymonic FC by Tremco Ltd., division of RPM Company.
 - .2 Sikaflex 1A by Sika Canada Inc.
 - .3 Sonolastic NP1 by BASF.
 - .4 Pourthane NS by W.R MEADOWS
- .6 Sealant Type "G" – Exterior Wall Joints:
 - .1 Air-seal sealant: One part, silicone, shore A hardness 15-25, conforming to CGSB 19-GP-13M, classification C-1-40-B-N and C-1-25-B-N and ASTM C920-11, Type S, Grade NS, Class 25. Use NT, M, G, A and O:
 - .1 DC 791 by Dow Corning
 - .2 UltraPruf II SCS 2902 by GE
 - .3 Spectrum 3 by Tremco
 - .4 SikaSil N-Plus by Sika
- .7 Sealant Type "I" – HVAC Sealant:
 - .1 One-part, RTV, acetoxycure silicone sealant for heating, ventilation, air conditioning and refrigeration applications:
 - .1 Dow Corning HVAC Silicone Sealant
- .8 Sealant Type "J" – Electrical Sealant:
 - .1 One-part, white, non-flowing moisture cure adhesive for electrical applications:
 - .1 Dow Corning 738 Electrical Sealant
- .9 Sealant Type "K" - Interior Acoustical Sealant:
 - .1 Non-skinning, non-hardening, single component synthetic rubber sealant, conforming to CAN/CGSB-19.21-M:
 - .1 Tremco Acoustic Sealant
 - .2 Chemtron Metaseal
- .10 Preformed Compression Seal:
 - .1 Compartmental open cell neoprene extrusion type conforming to ASTM C509-06(2011), complete with liquid lubricant adhesive recommended by manufacturer.

3 Execution

3.1 INSPECTION

- .1 Verify at site that joints and surfaces conditions provided will not adversely affect execution, performance or quality of completed work.
- .2 Ensure masonry and concrete have cured 28 days minimum.
- .3 Ascertain that sealers and coatings applied to substrates are compatible with sealant used and that full bond of the sealant and substrate is attained. Request samples of the sealed or coated substrate from their fabricators for testing of compatibility and adhesion, if necessary.
- .4 Verify that specified recommended environmental conditions are present before commencing work.
- .5 Defective work resulting from application to unsatisfactory joint conditions will be considered the responsibility of those performing the work of this section.
- .6 Do not start work of this Section until conditions are satisfactory.

3.2 PREPARATION

- .1 Clean joint surfaces using joint cleaner as necessary, to remove dust, paint, loose mortar, and other foreign matter and dry joint surfaces.
- .2 Remove dust, silt, scale and coatings from ferrous metals by wire brush, grinding or sandblasting.
- .3 Remove oil, grease and other coatings from non-ferrous metals with approved cleaning solvent.
- .4 Ensure surfaces are free of frost, rust, lacquers, laitance, release agents, moisture or other matter which might adversely affect adhesion of sealant.
- .5 Examine joint sizes and correct as required to allow for anticipated movement and to achieve proper width/depth ratio per manufacturer's written recommendations for specified sealant.
- .6 Support joint filler on horizontal traffic surfaces against vertical movement which might result from traffic loads or foot traffic.
- .7 Prepare surfaces as recommended by sealant manufacturer.
- .8 Fully remove existing sealant scheduled to be removed and replaced with new sealant, in areas indicated on the Drawings.
 - .1 Follow manufacturers procedures for removal of existing sealant and test areas for adhesion of new sealant. Provide the Consultant with field report identifying results of adhesion testing.
- .9 Install joint backing material or apply bond breaker tape to achieve correct joint depth and prevent three-sided adhesion.
- .10 To protect adjacent surfaces, mask adjacent surfaces with tape prior to priming and/or sealing.
- .11 Prime sides of joints using two cloth method in accordance with manufacturer's directions immediately prior to sealing.
- .12 Before any sealing is commenced, a test of the material shall be made for indications of staining, poor adhesion or other undesirable effects.
- .13 Seal joints in surfaces to be painted before painting. Where surfaces to be sealed are prime painted in shop before sealing, check to make sure prime paint is compatible with primer and sealant. If incompatible inform Consultant, consult the manufacturer, and change primer and sealant to approved compatible types.

- .14 Check form release agent used on concrete for compatibility with primer and sealant. If incompatible inform Consultant and change primer and sealant to approved compatible types or clean concrete to Consultant's approval.

3.3 APPLICATION

- .1 Apply sealant in accordance with manufacturer's directions, using a gun with proper nozzle size, ensuring to fill voids and joints completely, to leave a weathertight, airtight installation. Superficial pointing with skin bead is not acceptable.
- .2 Neatly tool surface to a slight concave profile. Surface of sealant shall be smooth, free from ridges, wrinkles, sags, air pockets and embedded impurities.
- .3 Clean adjacent surfaces immediately and leave Work neat and clean. Remove excess sealant and droppings, using recommended cleaners as Work progresses. Remove masking tape after tooling of joints.

3.4 CLEANING AND PROTECTION

- .1 Remove all waste materials from site. Sealant shall be cleaned of all foreign material as recommended by the sealant manufacturer. Leave work in a condition satisfactory to the Consultant.

END OF SECTION

1 General

1.1 SUMMARY

- .1 This Section includes requirements for supply and installation of the following:
 - .1 Interior Steel Doors and Frames
 - .2 Sidelight Frames
 - .3 Fire Rated Door and Frame Assemblies

1.2 DEFINITIONS

- .1 Base Metal Thickness: Thickness dimensions are minimums as defined in referenced ASTM standards for both uncoated steel sheet and the uncoated base metal of metallic coated steel sheets.
- .2 Opening Sizes: Standard metric door sizes indicated on Drawing A10.1 Door and Frame Schedule, are considered nominal dimensions, measured from frame rabbet width and height, with allowances for nominal clearances between head, jamb and door bottom in accordance with CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames.

1.3 REFERENCE STANDARDS

- .1 The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- .2 All reference amendments adopted prior to the bid closing date of this Project shall be applicable to this Project.
- .3 All materials, installation and workmanship shall comply with all applicable requirements and standards.
- .4 American National Standards Institute (ANSI):
 - .1 ANSI/SDI A250.7, Nomenclature for Standard Steel Doors and Steel Frames
 - .2 ANSI/SDI A250.11, Recommended Erection Instructions for Steel Frames.
- .5 American Society for Testing and Materials (ASTM):
 - .1 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - .2 ASTM A879/A879M, Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface
 - .3 ASTM A924/A924M, Standard Specification for General Requirements for Sheet Steel, Metallic-Coated by the Hot-Dip Process.
- .6 Canadian General Standards Board (CGSB):
 - .1 CAN/CGSB 1.132-M, Primer, Zinc Chromate, Low Moisture Sensitivity
 - .2 CAN/CGSB 41-GP-19Ma, Rigid Vinyl Extrusions for Windows and Doors
 - .3 CAN/CGSB 82.5-M, Insulated Steel Doors
- .7 Canadian Standards Association (CSA):
 - .1 CSA W59, Welded Steel Construction (Metal Arc Welding)

- .8 Canadian Steel Door Manufacturers Association (CSDMA):
 - .1 Recommended Dimensional Standards for Commercial Steel Doors and Frames; latest edition
 - .2 Fire Labelling Guide
- .9 National Fire Protection Association (NFPA):
 - .1 NFPA 80, Fire Doors and Windows
 - .2 NFPA 252, Fire Tests of Door Assemblies
- .10 Underwriters Laboratories Canada (ULC):
 - .1 CAN/ULC S104-M, Fire Tests of Door Assemblies
 - .2 CAN/ULC S105, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN/ULC S104
 - .3 CAN/ULC S106, Standard Method for Fire Tests of Window and Glass Block Assemblies

1.4 SUBMITTALS

- .1 Provide requested information in accordance with Division 01.
- .2 Action Submittals: Provide the following submittals before starting any work of this Section:
 - .1 Product Data:
 - .1 Submit product data for each type of door and frame indicated, include door designation, type, level and model, material description, core description, construction details, label compliance, fire resistance ratings, and finishes.
 - .2 Shop Drawings:
 - .1 Show each type of frame, door, hardware blanking, reinforcing, tapping and drilling arrangements, metal gauges, thicknesses and finishes.
 - .2 Show details of doors including vertical and horizontal edge details.
 - .3 Submit door and frame schedule identifying each unit. Each unit shall bear a legible identifying mark corresponding to that listed in the door and frame schedule.
 - .3 Samples:
 - .1 Supply for Consultant's review, if requested, sample of frame corner showing construction, workmanship and finish.
 - .4 Informational Submittals: Provide the following submittals when requested by the Consultant:
 - .1 Source Quality Control Submittals: Submit information on zinc coating treatment and primer spot treatment, including instructions for surface treatment before site painting and any restrictions or special coating requirements.
 - .5 Certificates: Submit the following certificates or letters of compliance:
 - .1 Oversize Compliance: Submit oversize construction evidence indicating compliance with fire labelling for door and frame assemblies required to be fire protection rated and exceeding size limitations of labelled assemblies.

1.5 QUALITY ASSURANCE

- .1 Manufacturer: Obtain hollow metal doors and frames from single source of supply and from a single manufacturer, and as follows:
 - .1 Fabricate work of this Section to meet the requirements of the Canadian Steel Door and Frame Manufacturer's Association, Manufacturing Specification for Doors and Frames as a minimum, and as further modified in this section.
 - .2 Fabricator shall be a member in good standing of the Canadian Steel Door and Frame Manufacturer's Association.
- .2 Supplier: Obtain hollow metal doors and frames from single source of supply and from a single manufacturer.
- .3 Installer: Use installers who are experienced with the installation of hollow metal doors and frames of similar complexity and extent to that required for the Project.
- .4 Testing Agencies: Provide doors produced under label service program of a testing agency acceptable to Authorities Having Jurisdiction, and as follows:
 - .1 Steel Fire Rated Doors and Frames: Labelled and listed by an organization accredited by Standards Council of Canada for ratings specified or indicated.
 - .2 Provide fire labelled frame products for those openings requiring fire protection ratings, as scheduled:
 - .1 List by nationally recognized agency having factory inspection service and construct as detailed in Follow-up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.
 - .2 Fabricate all rated doors, frames and screens to labelling authority standard.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Coordinate deliveries to comply with construction schedule and arrange ahead for off-the-ground, under cover storage location. Do not load any area beyond the design limits.
- .2 Adequately protect units against rust and damage during manufacture, delivery and storage.
- .3 Store materials on planks in a dry area and cover to protect from damage. Make good immediately any damage done. Clean scratches and touch-up with rust-inhibitive primer.

1.7 SITE CONDITIONS

- .1 Site Measurements: Verify actual dimensions of openings by site measurements before fabrication and indicate measurements on shop drawings; coordinate fabrication schedule with construction progress to avoid delaying the Work.
- .2 Established Measurements: Establish dimensions and proceed with fabricating doors and frames without site measurements where site measurements cannot be made without delaying the Work; coordinate construction to ensure that actual site dimensions correspond to established dimensions.

2 Products

2.1 MATERIALS

- .1 Sheet Steel:
 - .1 Interior Doors and Frames (Normal Humidity): Electrolytic zinc coated steel sheets in accordance with ASTM A879/A879M, Commercial Steel (CS), Class B coating; mill phosphatized; suitable for unexposed applications; stretcher levelled standard of flatness.

- .2 Gauges:
 - .1 Door and Screen Frames:
 - .1 Gauge: 16 msg
 - .2 Doors (Honeycomb or Polystyrene Core):
 - .1 Door Faces:
 - .1 Gauge: 18 msg.
 - .3 Top and Bottom End Channels:
 - .1 Gauge: 18 msg.
 - .4 Reinforcements:
 - .1 Lock and Strike Reinforcements:
 - .1 Gauge: 16 msg.
 - .2 Hinge Reinforcements:
 - .1 Gauge: 10 msg.
 - .3 Flush Bolt Reinforcements:
 - .1 Gauge: 16 msg.
 - .4 Door Closer or Holder Reinforcements:
 - .1 Gauge: 12 msg.
- .3 Anchors:
 - .1 As required to suit condition.
- .4 Rubber Bumpers:
 - .1 3 per door.
- .5 Weatherstrip:
 - .1 Extruded aluminum with vinyl insert #W13 for head and jambs and #W5 for pairs of doors without mullions, manufactured by KN. Crowder Ltd.
- .6 Door Cores:
 - .1 Interior doors, except fire rated doors: Structural small cell; 25mm (1") maximum, kraft paper honeycomb; minimum weight 36 kg/ream; minimum density 16.5 kg/m³; sanded to required thickness.
- .7 Adhesives:
 - .1 Core Adhesive: Heat resistant, single component adhesive recommended by manufacturer.
- .8 Touch-Up Primer: Rust inhibitive primer meeting CAN/CGSB 1.132, touch up zinc coatings using shop applied primer; grey or red coloured primer, clear primer not acceptable; provide additional primer for site touch-up to repair damaged zinc and shop applied coatings.
- .9 Accessories:
 - .1 Glazing Stops:
 - .1 Glass mouldings: Formed steel having 0.8mm (1/32") metal core thickness, screw fixed.
 - .2 Accurately fit and butt at corners glazing trim and stops; located on secure side of door, or interior of room window frame.

- .2 Sealant: As specified in Section 07 92 00.
- .3 Glazing: As specified in Section 08 80 00.
- .4 Door Silencers (Bumpers or Mutes): Manufacturer's standard black or grey neoprene silencers; three silencers on strike jambs of single door frames; two silencers on heads of double-door frames; stick on bumpers are not acceptable.
- .10 Materials for fire rated doors shall conform to ULC or ULI requirements.

2.2 FABRICATION AND MANUFACTURE

- .1 Gauges of metal shall be as specified. No deviations or substitutions will be accepted
- .2 Reinforcing specified is the minimum acceptable. Provide additional reinforcement where required to ensure a permanent, rigid, trouble free installation able to withstand the stresses of heavy commercial usage.
- .3 Cut, shear, straighten and work the steel in manner to prevent disfigurement of the finished work.
- .4 Punch frames for rubber door bumpers.
- .5 Fill seams, joints and weld depressions with epoxy metal filler, disc sand to a smooth, flat, uniform scratch-free surface, with all arrises sharp and true to line. Drilled and punches holes shall be reamed and have all burrs removed.
- .6 Finished work shall be free of warp, open seams, buckles, weld and grind marks and other surface defects detrimental to the production of a good paint finish.
- .7 Fastenings shall be concealed except those required for loose glazing stops.
- .8 Welding shall conform to CSA W59.
- .9 Hardware Requirements:
 - .1 Blank, mortise, reinforce, drill and tap doors and frames to receive templated hinges and other hardware as required. Check hardware lists for requirements.
- .10 Frames:
 - .1 Fabricate frames to profiles shown. Frames shall be fabricated to suite the header conditions of masonry work. Mitre corners of frames. Cut frame mitres accurately and weld continuously on inside of frame. Fabricate header frame to suit. Where site welding or splicing is required due to size of unit, the location of field joints shall be shown on the shop drawings and strictly adhered to.
 - .2 Protect strike and hinge reinforcements and other openings with mortar guard boxes welded to frame.
 - .3 Cutouts in doors for mortise lock sets shall be fitted with leaf spring clips and back limit stop to facilitate easy positioning and setting of locksets.
 - .4 Weld floor clip angles to inside of each jamb profile, two holes in each for anchorage to floor. Where required provide adjustable type floor clip angles.
 - .5 Fit frames with channel or angle spreaders, two per frame, to ensure proper frame alignment. Install stiffener plates or spreaders between frame trim where required, to prevent bending of trim and to maintain alignment when setting and during construction.
 - .6 Where frames occur in masonry provide and adjustable T-strap type or wire type anchor for every 610mm (24") of jamb length. Special anchors for frames to be set in concrete shall be as detailed.

- .7 Construct door frames of labelled fire doors as approved by ULC or ULI. Ratings for frames shall match doors. Locate label on the frame jamb midway between the top hinge and the head of door frame so that it is concealed when the door is closed.
- .8 Provide continuous weatherstripping at head and jambs of exterior door frames. Properly secure in place with screws and adjust as required.
- .11 Doors:
 - .1 Fabricate doors to present one continuous face free from joints, tool markings and abrasions.
 - .2 Reinforce, stiffen honeycomb doors with small cell honeycomb core laminated to the inside faces of panels. The core shall completely fill the inside hollow of the door.
 - .3 Reinforce around frame openings required for glazing or louvers. Provide glazing stops with countersunk oval head screws.
 - .4 Reinforce door edges with channel reinforcing. Bevel stiles 3mm (1/8"). Assemble by tack welding and fill.
 - .5 Fabricate fire rated door assemblies in accordance with ULC or ULI requirements. Provide labels for all fire rated doors. Locate label on the door midway between the top hinge and the head of the door so that it is concealed when the door is closed.
 - .6 Provide cutouts in doors for glazed lites as indicated on drawings and schedules. Glazing stops shall be square formed steel in single piece lengths sized to suit. Accurately mitre corners and finish in proper plane. Secure stops in place with flush, countersunk screws.
- .12 Finishing:
 - .1 Shop apply zinc rich primer to repair damaged zinc coatings arising from fabrication; cure primer fully before shipping to site; include compatible primer for site finishing and correction of surface abrasions to zinc coatings and factory applied primer.
 - .2 Remove weld slag and splatter from exposed surfaces.
 - .3 Fill and sand smooth tool marks, abrasions and surface blemishes to present smooth uniform surfaces.

3 Execution

3.1 EXAMINATION

- .1 Examine substrates, door swing arcs, areas of installation and conditions affecting installation for compliance with requirements for manufacturer's installation tolerances and other conditions affecting performance of work of this Section.
- .2 Verify roughing-in for embedded and built-in anchor locations before installing frames.
- .3 Verify door and frame size, door swing and ratings with door opening number before installing frames.
- .4 Installation of hollow metal doors and frames will denote acceptance of site conditions.

3.2 INSTALLATION

- .1 Install steel doors, frames, and accessories in accordance with reviewed shop drawings, ANSI A250.11, CSDMA Installation Guide, manufacturer's data, and as specified in this Section.
- .2 Door Frames:
 - .1 Remove temporary spreaders before installing door frames, leaving exposed surfaces smooth and undamaged.
 - .2 Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set; limit of acceptable frame distortion 1.6mm (1/16") out of plumb measured on face of frame, maximum twist corner to corner of 3mm (1/8"); align horizontal lines in final assembly.
 - .3 Brace frames rigidly in position until adjacent construction is complete; install wooden spreaders at third points of frame rebate to maintain frame width, install centre brace to support head of frames 1220mm (4') and wider in accordance with ANSI A250.1; do not use temporary metal spreaders for bracing of frames.
 - .4 Install glazing materials and studded door silencers.
 - .5 For frames over 1220mm (4') in width, provide vertical support at the centre of head.
- .3 Frame Tolerances: Install frames to tolerances listed in ANSI A250.11, and as follows:
 - .1 Squareness: Maximum 0.8mm (1/32") measured across opening between hinge jam and strike jamb.
 - .2 Plumbness: Maximum 0.8mm (1/32") measured from bottom of frame to head level.
 - .3 Alignment: Maximum 0.8mm (1/32") measured offset between face of hinge jamb and strike jamb relative to wall construction.
 - .4 Twist: Maximum 0.8mm (1/32") measured from leading edge of outside frame rabbet to leading edge of inside frame rabbet.
- .4 Doors:
 - .1 Fit hollow metal doors accurately in frames within clearances required for proper operation; shim as necessary for proper operation.
 - .2 Install hardware in accordance with manufacturers' templates and instructions.
 - .3 Adjust operable parts for correct clearances and function.
 - .4 Install glazing materials and door silencers. Install louvers and vents.
 - .5 Install fire rated doors within clearances specified in NFPA 80.
- .5 Adjusting and Cleaning:
 - .1 Immediately after installation, sand smooth any rusted or damaged areas of prime coat and apply touch up of air-drying primer compatible with factory applied primer, and as follows:
 - .1 Clean exposed surfaces with soap and water to remove foreign matter before site touch-up.
 - .2 Finish exposed site welds to a smooth uniform surface and touch-up with site applied rust inhibitive primer.
 - .3 Site apply touch-up primer on exposed surfaces where zinc coating or factory applied primer has been damaged during installation or handling.

END OF SECTION

1 General

1.1 SUMMARY

.1 This Section includes requirements for supply and installation of the following:

.1 Aluminum Doors, Frames and Sidelights.

1.2 REFERENCE STANDARDS

.1 The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.

.2 All reference amendments adopted prior to the bid closing date of this Project shall be applicable to this Project.

.3 All materials, installation and workmanship shall comply with all applicable requirements and standards.

.4 Aluminum Association (AA):

.1 Aluminum Design Manual, Latest Edition

.5 American Architectural Manufacturers Association (AAMA):

.1 AAMA 501, Methods of Test for Exterior Walls

.2 AAMA 611, Voluntary Specification for Architectural Anodized Aluminum

.3 AAMA 1503, Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections

.6 American National Standards Institute (ANSI):

.1 ANSI H35.1, Alloy and Temper Designation Systems for Aluminum

.2 ANSI/BHMA A156.1, Butts and Hinges

.3 ANSI/BHMA A156.3, Exit Devices

.4 ANSI/BHMA A156.4, Door Controls - Closers

.5 ANSI/BHMA A156.5, Cylinders and Input Devices for Locks

.6 ANSI/BHMA A156.6, Architectural Door Trim

.7 ANSI/BHMA A156.8, Door Controls - Overhead Stops and Holders

.8 ANSI/BHMA A156.16, Auxiliary Hardware

.9 ANSI/BHMA A156.21, Thresholds

.7 American Society for Testing and Materials (ASTM):

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

.2 ASTM A167, Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.

.3 ASTM B209/209M, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

.4 ASTM B221/B221M, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

.5 ASTM B308/B308M, Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles

- .6 ASTM B429, Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube
- .7 ASTM E330, Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference
- .8 ASTM E331, Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
- .9 ASTM E783, Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors
- .10 ASTM E1105, Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference
- .8 Canadian Standards Association (CSA):
 - .1 CAN/CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels
 - .2 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures
 - .3 CSA W47.2, Certification of Companies for Fusion Welding of Aluminum.
 - .4 CSA W59, Welded Steel Construction (Metal Arc Welding), Metric.
 - .5 CSA W59.2-M, Welded Aluminum Construction
- .9 Canadian Welding Bureau (CWB Group Industry Services):
 - .1 CWB 112E, Welding Symbols Study Guide
 - .2 CWB 113E, Weld Quality and Examination Methods Study Guide
- .10 The Society for Protective Coatings (SSPC)/National Association of Corrosion Engineers (NACE International):
 - .1 Surface Preparation Guidelines:
 - .2 SSPC-SP COM Surface Preparation Commentary for Steel and Concrete Substrates
 - .3 SSPC-PS Guide 12.00, Guide to Zinc-Rich Coating Systems

1.3 QUALITY ASSURANCE

- .1 The Contractor executing work of this section shall have a minimum of five (5) years continuous experience in the successful fabrication and installation of aluminum doors and frames of type and quality shown and specified. Submit proof of experience upon Consultant's request.
- .2 The installation shall be in conformity with laws, by-laws and regulations which govern the design and installation of aluminum doors and frames and the CSA, CGSB and ASTM standards specified.
- .3 The work shall be supervised by competent foremen in the shop and during erection. Workmen shall be skilled in their respective trades.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Construction Meeting: Conduct a pre-construction meeting in accordance with Division 01, on site to review methods and procedures related to aluminum doors and frames including, but not limited to, the following:
 - .1 Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.5 SUBMITTALS

- .1 Provide submittals in accordance with Division 01.
- .2 Shop Drawings:
 - .1 Submit shop drawings in accordance with the General Conditions.
 - .2 Related items shown on shop drawings which are not intended to be supplied as part of the work of this section, shall be so identified. All dimensions shall be clearly noted and methods of fastening and anchoring detailed. Show accurately and identify all adjacent materials.
 - .3 Drawings to show in full size detail all elements of assembly and construction including all variations of details required for aluminum doors and frames arrangement shown on the drawings. Design drawings shall bear the stamp of a professional engineer experienced in the design and fabrication methods pertaining to aluminum doors, frames and sidelights.
- .3 Samples:
 - .1 Submit full size section approximately 305mm (12") long of frame showing finish and profile for Consultant's review.
- .4 Maintenance Data and Operating Instructions:
 - .1 On completion of work of this section, supply maintenance and glazing instructions for insertion in maintenance manual.

1.6 PROTECTION

- .1 Protections of manufacturer's choice will be allowed, providing Consultant's approval is obtained, but manufacturer will be held responsible for staining and damage to aluminum work in case of failure of protection.

1.7 STORAGE, DELIVERY, HANDLING AND PROTECTION

- .1 Coordinate deliveries to comply with construction schedule and arrange ahead for strategic off the ground, under cover storage locations. Do not load any areas beyond the design limits.
- .2 Adequately protect and crate all components against damage, dirt, disfigurement and weather.
- .3 Exercise extreme care in handling units to prevent damage and scratched surfaces.
- .4 Cover and protect the work of other sections in the area of work from damage. Make good all damage to the satisfaction of the Consultant.
- .5 Be responsible for damage to the work until the building is complete and accepted by the Owner. In case of damage, material shall be completely removed and replaced with new.
- .6 Provide safe and adequate equipment on the site to execute the work, hoisting, scaffolding, staging, safety protection equipment, tools, plant and other equipment required for the completion of the work.

1.8 WARRANTY

- .1 Warrant work of this section against any defects in materials and workmanship in accordance with the General Conditions but for an extended period of ten (10) years and agree to promptly and without cost to Owner make good defects which become evident during warranty period. Without restricting the generality of the warranty, defects shall include leaking, deformation of members, breaking of glass due to thermal or structural movement, discolouration of finishes and failure of sealants.
- .2 Warrant that any unit failing shall be removed and replaced without cost to the Owner.

2 Products

2.1 MANUFACTURERS

- .1 Basis-of-Design products are named in this Section; additional manufacturers offering similar aluminum framed entrance and storefront systems may be incorporated into the work provided they meet the performance requirements established by the named products.
- .2 Acceptable Materials Manufacturers: Subject to compliance with requirements specified in this Section and as established by the Basis-of-Design Materials, manufacturers offering products that may be incorporated into the Work include; but are not limited to, the following:
 - .1 Alumicor Limited
 - .2 Oldcastle Building Envelope
 - .3 Kawneer Canada Ltd
 - .4 Or approved equivalent.

2.2 MATERIALS

- .1 Aluminum:
 - .1 Extrusions: AA6063-T5 alloy, anodizing quality, conforming to ASTM B221-92a.
 - .2 Plate and Sheet: AA1100-H14 alloy, anodizing quality unless otherwise indicated minimum 0.125" thick, conforming to ASTM B209-92a.
 - .3 Thresholds and Sills: AA6061-T6 alloy, anodizing quality, conforming to ASTM B221-92a.
 - .4 Exposed surfaces of aluminum shall be free of die marks, scratches, blisters, "leave-off" marks, or other blemishes, whether left unfinished or finished.
 - .5 Aluminum Welding Materials: Conforms to CSA W59.2.
- .2 Structural Steel Sections and Steel Plate:
 - .1 Conforms to CAN/CSA-G40.20/G40.21, Grade 300W. Hollow steel sections shall conform to CAN/CSA-G40.20/G40.21, Grade 350W, Class H.
 - .2 Steel Welding Materials: Conforms to CSA W59.
- .3 Glass and Glazing Materials: As indicated in Section 08 80 00 Glazing.
- .4 Sealant Materials:
 - .1 Perimeter Sealant: Multi-component, chemical curing epoxidized polyurethane type sealant conforming to ASTM C920.
 - .1 Basis of Design Materials: Dymeric 240 by Tremco (Canada) Ltd., or CWS/CCS by Dow Corning, (or approved equivalent). Colour as selected later by Consultant.
 - .2 Threshold Sealant: Oil based sealant conforming to CAN/CGSB-19.6.

- .5 Structural Sealant: Clear structural glazing, shore A hardness 15-25, conforming to CAN/CGSB-19.13-M, Classification C-1-40-B-N and C-1-25-B-N, and ASTM C920, Type S, Grade P, Class 25, use T, M.
 - .1 Basis of Design Materials: Chemtron Multiseal, or Tremco Spectrum 2 or Proglaze II, (or approved equivalent).
- .2 Backer Rod: Round open cell foam, extruded polyethylene, Shore A hardness of 20, tensile strength 140 to 200 kPa, oversized 30-50%, compatible with sealant and primer, non-adhering to sealant, 'Ethafoam SB' by Dow Chemical Canada Inc., or 'Sof Rod' by Tremco (Canada) Ltd. (or approved equivalent).
- .3 Joint Primers: As recommended by sealant manufacturer.
- .4 Solvents, Cleaning Agents and Other Accessory Materials: As recommended by sealant manufacturer in writing.
- .5 Bond Breakers: Where required, shall be polyethylene tape (or equal) as recommended by manufacturer of sealant in writing.
- .6 Zinc Rich Paint:
 - .1 Ready mixed, zinc rich primer conforming to CAN/CGSB-1.181, 'Sealtight Galvafrond Zinc-Rich Coating' by W.R. Meadows of Canada Limited, or 'Zinc Clad No.7 Organic Zinc Rich Primer' by Sherwin Williams Company of Canada Ltd., (or approved equivalent).
- .7 Bituminous Paint: Conforming to CAN/CGSB-1.108, Type 2.
- .8 Fasteners: "400" Series stainless steel, or "300" Series stainless steel.

2.3 ALUMINUM DOORS

- .1 Manufacturer's extruded aluminum glazed doors for manual swing operation, reinforced as required to withstand traffic conditions.
- .2 Exterior Door Type - Medium stile, thermally broken frame sections.
 - .1 Glazing Method: Square stops for single glazed doors, with non-removable glazing stops on outside of door.
 - .2 Basis-of-Design Model and Manufacturers: As indicated in the Door and Frame Specification Legend on Drawing A0.3

2.4 DOOR HARDWARE

- .1 Manufacturer's heavy duty hardware units in sizes and types as required to meet entrance use as indicated on Drawings, with the following opening force limitations:
 - .1 Egress Doors: Maximum 135 N to set door in motion and not more than 70 N to open door to minimum required width.
 - .2 Accessible Interior Doors: Maximum 20 N to operate door through entire range of movement.
 - .3 Delayed Egress Locks: Lock releases within 15 seconds after applying a force of not more than 70 N for not more than 3 seconds.
 - .4 Latches and Exit Devices: Not more than 70 N required to release latch.
- .2 Provide door hardware in accordance with the requirements of this Section; using products that are recommended and supplied by entrance system manufacturer; in accordance with referenced standards, meeting requirements for description, quality, type, and function listed in hardware schedule.
- .3 Hinges:
 - .1 Pivot Hinges: In accordance with BHMA A156.4, Grade 1, with 3 offset pivots located at top, intermediate and bottom of each door leaf.

- .2 Ball Bearing Butts: In accordance with BHMA A156.1, Grade 1, radius corner; manufactured with non-removable pins from nonferrous metal, with 4 hinges for each door leaf.
 - .1 Continuous Geared Hinges: Roton continuous geared hinges incorporating lubricated bearings between the knuckles, #780-112HD by Kawneer (or approved equivalent).
- .4 Locking Devices: Manufacturer's standard locking mechanism that do not require use of key, tool, or special knowledge for operation, and as follows:
 - .1 Mortise Auxiliary Locks: Lock body manufactured in accordance with BHMA A156.5, Grade 1, fabricated from corrosion resistant steel to fit into door stile specified and as follows:
 - .1 Bolt Action: Deadbolt/Latch
 - .1 Deadbolt: Maximum security deadbolts with cam and mortise with strike trim, 1850 Series by Adams-Rite Manufacturing Co. Locks shall be in one leaf of each pair of doors. Double doors shall be key operated on exterior side and thumb turn on the interior side (one leaf of each pair). Face of rails not having cylinders, shall not be drilled.
 - .2 Function: Triple Action, deadbolt and latch fully retracted for two way traffic by key; manually retracting latch secure for exiting only with deadbolt retracted; hook type deadbolt engaged for security.
 - .3 Faceplate Shape: To match profile of leading entrance stile.
 - .4 Finish: To match adjacent entrance stiles.
 - .5 Door Operation: Paired swinging door operation.
 - .2 Mortise Cylinders and Turns: As specified in Section 08 70 00.
 - .3 Panic Exit Devices: In accordance with BHMA A156.3, Grade 1, listed and labelled by a testing and inspecting agency acceptable to Authorities Having Jurisdiction for panic protection.
 - .1 1690 Concealed Rod Exit Device by Dor-O-Matic, or approved equal. Outside rim cylinder to retract latches for entry and interior cylinder to exit device for push/pull operation. Finish to match doors.
 - .4 Trims:
 - .1 Strikes: Provide strike with black plastic dust box for each latch or lock bolt; fabricated for aluminum framing.
 - .2 Closers: In accordance with BHMA A156.4, Grade 1, sized as required by door size, exposure to weather, and anticipated frequency of use; adjustable to meet site conditions and requirements for opening force; having accessories required for complete installation.
 - .1 Heavy-duty, concealed mounted, top jamb overhead type with hold-open feature, conforming to CAN/CGSB-69.20-M, 2030 Series by LCN Closers, or approved equal by Norton Door Controls.
 - .5 Concealed Overhead Holders: In accordance with BHMA A156.8, Grade 1.
 - .6 Surface Mounted Holders: In accordance with BHMA A156.16, Grade 1.
 - .7 Door Stops: In accordance with BHMA A156.16, Grade 1, floor or wall mounted as appropriate for door location indicated with integral rubber bumper.
 - .1 Basis of Design: GJ-100 Series by Glynn-Johnson, to suit condition.

- .8 Silencers: In accordance with BHMA A156.16, Grade 1.
- .9 Thresholds: Raised thresholds bevelled with a slope of not more than 1:2, with maximum height of ½"; in accordance with BHMA A156.21.
 - .1 Basis of Design: Thresholds by K.N. Crowder Mfg. Inc., or approved equal, to suit condition.

2.5 FABRICATION

- .1 Fabricate aluminum-framed glass swing doors in sizes indicated. Include a complete system for assembling components and anchoring doors.
- .2 Fabricate aluminum-framed glass doors that are re-glazable without dismantling perimeter framing.
 - .1 Door corner construction shall consist of mechanical clip fastening, SIGMA deep penetration plug welds and 1-1/8" long fillet welds inside and outside of all four corners. Glazing stops shall be hook-in type with EPDM glazing gaskets reinforced with non-stretchable cord.
 - .2 Accurately fit and secure joints and corners. Make joints hairline in appearance.
 - .3 Prepare components with internal reinforcement for door hardware.
 - .4 Arrange fasteners and attachments to conceal from view.
- .3 Fit and assemble as far as possible in factory and fabricate with:
 - .1 Metal sections drilled, tapped, welded, braced as required for the proper installation and fixing of all components and accessories, and supplied complete with all necessary anchors, clips, bolts, screws, for the installation.
 - .2 Members possessing sharply defined profiles, straight, square and true with surfaces in proper planes and exposed finished surfaces and edges smooth and free from defects.
 - .3 Fabricate the components to accommodate and interface with work of other sections by means of rabbets, interlocks, miscellaneous angles, trim and filler sections as required.
 - .4 Framing, bracing, reinforcing and anchors having structural properties adequate to safely sustain and stresses to which they will be subjected.
 - .5 Provision for proper expansion and contraction.
 - .6 Joints and intersections shall be accurately formed and tightly fitted.
 - .7 Bolts tight and threads nicked to prevent loosening of nuts, bolting and screwed work made as inconspicuous as possible.
 - .8 Preparation for glazing as required.
 - .9 Fabricate aluminum entrances and sliding doors to dimensions and profiles as shown. Exposed surfaces shall be free of mechanical fasteners. Units shall be true rigid assemblies, square and free of any distortions.
 - .10 Cut, drill, tap and reinforce each sliding door for locks, casters, hangers and hardware. Lock cylinders will be supplied by hardware section.
 - .11 Accurately prepare and reinforce with backing plates to ensure adequate strength, cut-outs, recesses and mortising required for Best lock cylinders and other hardware. Install lock cylinders.

2.6 FINISHES

- .1 Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- .2 Protect finish with strippable protective film.
- .3 High Performance Organic Finish:
 - .1 Two (2) Coat PVDF or FEVE Coating:
 - .1 Manufacturer's standard 2 coat, thermo-cured system consisting of specially formulated inhibitive primer and colour topcoat, and apply coating to exposed metal surfaces in accordance with AAMA 2605 and with coating and resin manufacturers' written instructions.
 - .2 Colour: Black.
 - .3 Basis of Design Materials: PPG Duranar.
- .4 Steel (Concealed):
 - .1 Hot-dip galvanized in accordance with CAN/CSA-G164, with minimum coating of 2 oz./sq.ft., or zinc rich paint.
- .5 Isolate where necessary to prevent electrolysis due to dissimilar metal-to-metal contact or metal-to-masonry and concrete contact. Use bituminous paint, butyl tape or other approved divorcing material.

3 Execution

3.1 PREPARATION

- .1 Take field measurements from actual structure and verify prior to commencement of fabrication.
- .2 Allow for dimensional tolerances and deviations from true planes permissible in the structural frame. Excessive deviations shall be reported to the Consultant in writing for correction. Commencement of the work implies acceptance of all conditions.

3.2 INSTALLATION

- .1 Erection shall be carried out by competent and skilled installers employed by the manufacturer.
- .2 Install swing door plumb, true and square complete with all necessary reinforcing and incidental components.
- .3 All anchors and fastening to structure shall be designed to allow complete adjustment for levelling and positioning of the frame and for deflection and creep of the structure without imposing loads on the swing doors.
- .4 The work shall be anchored and blocked as shown on the final shop drawings. Make provision for concealing anchors, clips, blocking and the like.
- .5 Refer to drawings for location of each type of glass.

3.3 ADJUSTING

- .1 Immediately prior to final cleaning of glass and before handing over building to Owner, make good damage and disfigurement to this work, remove protective coatings, stains and foreign matter from exposed exterior and interior surfaces of glass and aluminum and leave in first-class condition to Consultant's satisfaction.
- .2 Clean using soap and water, or water and approved solvents not injurious to aluminum, glass, glazing and sealant compounds. Do not use abrasives.

END OF SECTION

1 General

1.1 SUMMARY

- .1 This Section includes requirements for supply and installation of double glazed, aluminum-clad wood windows, single hung operable units and fixed units, as indicated on the Window and Screen Elevations on Drawing A0.3 Door, Screen & Window Schedules.
- .2 Drawings contain details that suggest directions for solving some of the major design requirements; these details can be developed further by the Contractor provided that the final installation adheres to aesthetic criteria established by the drawings and specified dimensions with all elements in planes as drawn, maintaining their relationships with all other building elements.
- .3 Work of this Section is intended to be designed and supplied by a single source window manufacturer and installed in accordance with the manufacturers written instructions.

1.2 REFERENCE STANDARDS

- .1 The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- .2 All reference amendments adopted prior to the bid closing date of this Project shall be applicable to this Project.
- .3 All materials, installation and workmanship shall comply with all applicable requirements and standards
- .4 North American Fenestration Standard (NAFS):
 - .1 NAFS - Canadian Supplement to AAMA/WDMA/CSA 101/I.S.2/A440, NAFS - North American Fenestration Standard/Specification for windows, doors, and skylights
- .5 National Fenestration Rating Council (NFRC):
 - .1 ANSI/NFRC 100, Procedure for Determining Fenestration Product U-factors
 - .2 ANSI/NRFC 400, Procedure for Determining Fenestration Product Air Leakage
 - .3 ANSI/NFRC 500, Procedure for Determining Fenestration Product Condensation Resistance Values
- .6 American Architectural Manufacturers Association (AAMA):
 - .1 AAMA 502, Voluntary Specification for Field Testing of Newly Installed Fenestration Products
 - .2 AAMA 1503, Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections
- .7 Canadian Standards Association (CSA):
 - .1 CAN/CSA A440/A440.1, Windows/User Selection Guide to CSA Standard CAN/CSA A440, Windows
 - .2 CAN/CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels
 - .3 CSA W47.1, Certification of Companies for Fusion Welding of Steel Structures
 - .4 CSA W47.2, Certification of Companies for Fusion Welding of Aluminum.
 - .5 CSA W59, Welded Steel Construction (Metal Arc Welding), Metric.

- .8 Canadian General Standards Board (CGSB):
 - .1 CAN/CGSB-1.108, Bituminous Solvent Type Paint
 - .2 CAN/CGSB-51.20, Expanded Polystyrene Thermal Insulation
- .9 American Society of Testing and Materials (ASTM):
 - .1 ASTM A167, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip
 - .2 ASTM E90, Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
 - .3 ASTM E283/E283, Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen
 - .4 ASTM E330/E330, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
 - .5 ASTM E331, Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference
 - .6 ASTM E1105, Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference

1.3 PREINSTALLATION MEETING

- .1 Pre-Construction Conference: Arrange a site meeting, to coincide with regular bi-weekly site meetings, attended by the Contractor, the Subcontractor's representative and foreman for this project, the Consultant, materials supplier(s), and other relevant personnel before commencement of work for this Section.

1.4 SUBMITTALS

- .1 Provide submittals in accordance with Division 01.
- .2 Action Submittals: Provide the following submittals before starting any work of this Section:
 - .1 Product Data: Submit product data including construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product indicated.
 - .2 Shop Drawings:
 - .1 Clearly indicate each type of window, extrusion profiles, method of installation, hardware reinforcement, anchorages and locations of exposed fasteners, finishes and glazing.
 - .2 Indicate structural attachment of entire assembly back to supporting structure.

1.5 PROJECT CLOSEOUT SUBMISSIONS

- .1 Provide operations and maintenance information in accordance with Division 01.
- .2 Submit data for cleaning of finishes and maintenance of operational hardware.

1.6 QUALITY ASSURANCE

- .1 Qualifications: Provide proof of qualifications when requested by the Consultant:
 - .1 Installer: Use personnel experienced with the materials specified, with work of similar complexity to that indicated for the project, and who are acceptable to manufacturer.
- .2 Pre-Construction Testing:
 - .1 Laboratory tests to be conducted on at least one full size sample taken from each batch of windows manufactured for the Project, including operable components.
 - .2 Submit certified copies of test results from an approved independent testing agency to confirm compliance with the CSA A440 minimum specified A, B, C ratings.
 - .3 Additional windows may be specified for testing at the discretion of the Consultant.
 - .4 The test data to be submitted to the Consultant for review and approval prior to installation. Include cost of testing in the Contract Price.

1.7 SYSTEM DESCRIPTION

- .1 Double-glazed thermally-broken aluminum windows, designed and installed to withstand local 1:50 year wind loading requirements in accordance with OBC, NBC, Climatic Information for Building Design in Canada and Wind Loads for Cladding and Windows – with maximum deflection of 1/175 of clear span under full design load, seismic loading, and minimum guard loads.
- .2 Include aluminum back-up mullions and steel mullion reinforcing as required to meet design criteria.

1.8 DESIGN REQUIREMENTS

- .1 Structural Loads:
 - .1 Wind Loads: As indicated on Structural Drawings.
- .2 Deflection of Framing Members:
 - .1 Deflection Normal to Wall Plane: test pressure to be wind load indicated on Structural Drawings.
 - .2 Deflection Parallel Glazing Plane: Test pressure to be 1.5 times wind pressure.
 - .3 Deflection of members carrying full dead load to not exceed amount that will reduce glass bite below 75% of design dimension or edge clearance between member and fixed glass or other fixed member above to less than 3mm (1/8").
 - .4 Clearance between the member and operable window to be at least 1.5mm (1/16").
- .3 Structural Performance: Provide systems identified in this Section, tested according to ASTM E330 as follows:
 - .1 When tested at positive and negative wind-load design pressures, systems do not show evidence that deflection is exceeding specified limits.
 - .2 When tested at 150% of positive and negative wind-load pressures, systems, including anchorage, do not show evidence of material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
 - .3 Test Durations: As required by design wind velocity, but not less than 10 seconds.

- .4 Provide flashing and trim systems to prevent water leakage to the building interior. Include flashings with frames to divert water away from glazing edges.
- .5 Air and Vapour Seal: Maintain continuous air barrier and vapour control layer throughout assembly as indicated on the Drawings.
- .6 Internal Drainage System: Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system to exterior by weep drainage network.
- .7 Provide aluminum clad windows, including anchorage, capable of withstanding, without failure, the effects of the following:
 - .1 Thermal movements: Design thermal barrier connection to achieve complete metal to metal separation between main framing and glass retention members except for screw fasteners. Assembled framed section shall have a maximum U-value of 0.231 W/m²*K.
 - .2 Movements of supporting structure including, but not limited to, deflection from uniformly distributed and concentrated live loads
 - .3 Dimensional tolerances of building frame and other adjacent construction
- .8 Failure of performance requirements will be considered to include, but not be limited to, the following:
 - .1 Deflection exceeding specified limits;
 - .2 Thermal stresses transferred to building structure;
 - .3 Framing members transferring stresses, including those caused by thermal and structural movements, to glazing;
 - .4 Noise or vibration created by wind and thermal and structural movements;
 - .5 Loosening or weakening of fasteners, attachments, and other components;
 - .6 Sealant failure;
 - .7 Failure of operating units to function properly.

1.9 SITE CONDITIONS

- .1 Site Measurements: Verify actual locations of structural supports by site measurements before fabrication and indicate measurements on Shop Drawings.
- .2 Established Dimensions: Establish dimensions and proceed with fabrication, where site measurements cannot be made without delaying the Work; coordinate construction to ensure that actual dimensions correspond to established dimensions.
- .3 Ambient Conditions: Confirm installation requirements for ambient and surface temperatures of sealants with manufacturer and apply sealants when temperatures are greater than manufacturer's stated minimum from time of application until sealants have cured.

1.10 WARRANTY

- .1 Provide manufacturers written guarantee, signed and issued in the name of Owner, to replace the following items for defective material and workmanship for the time stated from date of Substantial Performance:
 - .1 Framing, Panels and Glazing: Failure of performance requirements specified in Contract Documents; 5 years
 - .2 Sealed Glass Units: Misting, dusting and seal failure; 5 years
 - .3 Sealants: Failure to maintain seal; 5 years
 - .4 Aluminum Brake Shapes: Oil canning and de-laminations; 5 years

2 Products

2.1 MANUFACTURERS

- .1 Basis-of-Design products are named in this Section; additional manufacturers offering similar Products may be incorporated into the work provided they meet the performance requirements established by the named products provided they submit requests for substitution in a minimum of five (5) days in advance of Bid Closing.
- .2 Acceptable Materials and Manufacturers: Subject to compliance with requirements specified in this Section and as established by the Basis-of-Design Materials, manufacturers offering products that may be incorporated into the Work include; but are not limited to, the following:
 - .1 Aluminum-Clad Wood Windows:
 - .1 Norclad 500 Series Hung Series by Norwood Windows and Doors.
 - .2 Or approved equivalent.

2.2 WINDOWS DESIGN CRITERIA

- .1 Provide high-efficiency tilt-and-turn aluminum-clad wood windows with keyed locked-turn available only to building maintenance, to meet Passive House Thermal Conductive standards, windows to be certified components for use in project climate by Passive House Institute, Darmstadt, Germany.
- .2 Window glazing provided by Window Manufacturer. No substitutions allowed.
- .3 Insulated Glass Unit:
 - .1 Manufacture sealed insulating glass units without edge channels or tape, that is, with bare glass edges.
 - .2 Use two stage seal method of manufacture, as follows:
 - .1 Primary Seal: Polyisobutylene sealing compound between glass and metal spacer/separator. Colour: Black.
 - .2 Secondary Seal: Structural silicone based, filling gap between the two lites of glass at the edge up to the spacer/separator and primary seal. Colour: Black.
 - .3 Install stainless steel capillary breather tubes to equalize pressure differentials between insulating glass fabricating location and insulating glass installation location; crimp tube immediately prior to installation in accordance with glass fabricators written instructions.
 - .4 Factory sealed type insulating glass units conforming to CAN/CGSB 12.8, with low emissivity coating on 2nd surface and as follows:
 - .1 Outer Lite: Minimum 6mm (1/4") thick, clear, heat strengthened glass conforming to CAN/CGSB-12.1-M, Type 2, Class "B" with low emissivity coating on the 2nd surface. Tempering shall be performed using horizontal tong-free method.
 - .2 Gas Infill: 13mm (1/2") Argon Filled.
 - .3 Internal Muntin Bars: Aluminum grilles located between the glass, rectangular; Colour: White, unless otherwise indicated on the Drawings.
 - .4 Inner Lite: Minimum 6mm (1/4") thick, clear, tempered glass conforming to CAN/CGSB-12.1-M, Type 2, Class "B". Tempering shall be performed using horizontal tong-free method.

2.3 MATERIALS

- .1 Timber Structural Profiles:
 - .1 Wood Species: Pine.
 - .2 Profile Depth and Thickness: As indicated on the Drawings.
- .2 Aluminum: Materials recommended by manufacturer for type of use and finish indicated, and as follows:
 - .1 Sheet and Plate: In accordance with ASTM B209/B209M, and ANSI H35.1 AA1100-H14, or AA5005-H32 or H34, anodizing quality.
 - .2 Extruded Bars, Rods, Profiles, and Tubes: In accordance with ASTM B221/B221M), and ANSI H35.1 AA6063-T5 or T6, anodizing quality.
 - .3 Extruded Structural Pipe and Tubes: In accordance with ASTM B429, and ANSI H35.1 AA6061-T6 or AA6063-T6, anodizing quality.
 - .4 Structural Profiles: In accordance with ASTM B308/B308M, anodizing quality.
 - .5 Welding Rods and Bare Electrodes: CSA W59.2.
- .3 Steel Reinforcement: Coat steel with manufacturer's standard corrosion resistant primer applied immediately after surface preparation and pre-treatment, and as follows:
 - .1 Rolled Sheet or Strip: CSA G40.20/G40.21.
 - .2 Structural Shapes, Plates and Bars: CSA G40.20/G40.21.
- .4 Brackets and Reinforcements: Manufacturer's standard high strength aluminum with non-staining, nonferrous shims for aligning system components.
- .5 Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding fasteners and accessories compatible with adjacent materials.
 - .1 Use self locking devices where fasteners are subject to loosening or turn out from thermal and structural movements, wind loads, or vibration.
 - .2 Reinforce members as required to receive fastener threads.
 - .3 Use only concealed fasteners, unless use of exposed fasteners has been accepted in writing by the Consultant. When approved, use exposed fasteners with countersunk Phillips screw heads.
 - .4 Finish exposed portions to match framing system.
 - .5 Use slip joint linings, spacers, and sleeves at movement joints of material and type recommended by manufacturer.
- .6 Anti-Rotation Channels: Extruded aluminum anti-rotation channel designed to mechanically retain air seal membrane to the face of the tubular back section.
- .7 Anchors: Three way adjustable anchors that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.
- .8 Concealed Flashing: Manufacturer's standard corrosion resistant, non-staining, non-bleeding flashing compatible with adjacent materials.
- .9 Glazing Sealants: Provide a multi component structural silicone sealant for pre-assembled glazing units.
 - .1 Basis of Design Materials:
 - .1 Proglaze II by Tremco;
 - .2 Illmod 600 by Tremco;
 - .3 983 by Dow Chemical;

- .10 Transition Membranes: Full length mechanically anchored, extruded silicone rubber transition membrane to perimeter of frame profile to provide continuous air/vapour retarder to adjacent wall construction:
 - .1 Basis-of-Design Materials: Tremco Proglaze ETA Engineered Transition Assembly, or approved equivalent.
- .11 Glazing Gaskets: Manufacturer's standard sealed corner pressure glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers; as recommended by manufacturer for joint type.
- .12 Dielectric separator: Bituminous paint CAN/CGSB-1.108.
- .13 Thermal separator: Provided by window manufacturer.
- .14 Foamed-In-Place Insulation:
 - .1 Two component polyurethane froth/spray kit, UL Class I (flame spread of 25 or less), Great Stuff by Dow Building Solutions Inc., or approved equal.
- .15 Fasteners: To ASTM A167, stainless steel, type 304 selected to prevent galvanic action with the components fastened, of suitable size to sustain imposed loads.
- .16 Supporting angles, plates, bars, rods, and other steel accessories: Mild steel CAN3-G40.20/G40.21, shop painted with zinc chromate primer, thickness as required to sustain imposed loads and in no case less than 5 mm thick.
- .17 Metal air seal/vapour barrier (by window supplier) to be bonded to window frame and extend behind wood mounting frame as indicated on details. Seal all corners to maintain air sea/vapour retarder. Note that flexible flashing with continuous metal retaining strip will be supplied and installed by the interior finishing contractor.
- .18 Sill Angle: Extruded aluminum sill to suit sill depth, with perpendicular turn up to under sill and back with custom preformed black EPDM sill joint seal and with aluminum sliding closure.

2.4 HARDWARE

- .1 Windows:
 - .1 Operable hopper windows to have single lever operator/multi-point locking, as supplied by the window manufacturer.

2.5 INSECT SCREENS

- .1 Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches, and as follows:
 - .1 Fabricate screens and frames in accordance with CAN/CSA A440 and CAN/CGSB 79.1.
 - .2 Fabricate insect screens to fully integrate with window frame.
 - .3 Locate screens on outside of window and provide for each operable exterior sash.
- .2 Screen Frames:
 - .1 Extruded Aluminum or Aluminum Tubular Framing Sections: Aluminum sections having 1/32" minimum nominal wall thickness, with finish matching aluminum window members.
- .3 Screen Fabric:
 - .1 Screen Class: Class A in accordance with CAN/CGSB 79.1.
 - .2 Screen Strength: S2 in accordance with CAN/CSA A440 and CAN/CGSB 79.1.
 - .3 Screen Style: Style 1 in accordance with CAN/CGSB 79.1.

- .4 Fabric Mesh Material: Aluminum Wire: Charcoal grey or black finish; in accordance with CAN/CGSB 79.1.

2.6 FABRICATION

- .1 Fit and assemble all Work in the shop insofar as practical.
- .2 Carefully fit and match all Work for continuity of line and design, using rigidly secured joints with hairline contact, unless otherwise shown.
- .3 Reinforce members and joints with steel plates, bars, rods or angles for rigidity and strength as needed to fulfill performance requirements. Use concealed stainless steel fasteners for jointing which cannot be welded.
- .4 Separate unlike metals or alloys with a heavy coating of bituminous paint, separator gaskets or slip gaskets as required to prevent galvanic action.
- .5 Provide weepholes in the glazing recess and an airseal at the interior glassline.

2.7 FINISHES

- .1 Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- .2 Protect finish with strippable protective film.
- .3 As Fabricated Finish (Mill Finish): AA-M10, as fabricated mechanical finish.
- .4 High Performance Organic Finish:
 - .1 Two (2) Coat PVDF or FEVE Coating:
 - .1 Manufacturer's standard 2 coat, thermo-cured system consisting of specially formulated inhibitive primer and colour topcoat, and apply coating to exposed metal surfaces in accordance with AAMA 2605 and with coating and resin manufacturers' written instructions.
 - .2 Colour: To match Norclad Delicate White, as approved by the Consultant.
- .5 Timber – Interior Surface:
 - .1 Sanded timber surface after installation to remove roughness and planer marks. Sanding shall be done with the grain of the wood and finished with fine grit paper to leave a smooth scratch-free surface suitable to receive the paint or natural finishes to be applied over as specified in Section 09 90 00.
- .6 Steel (Concealed):
 - .1 Hot-dip galvanized in accordance with CAN/CSA-G164, with minimum coating of 2 oz./sq.ft., or zinc rich paint.
- .7 Isolate where necessary to prevent electrolysis due to dissimilar metal-to-metal contact or metal-to-masonry and concrete contact. Use bituminous paint, butyl tape or other approved divorcing material.

3 Execution

3.1 INSPECTION

- .1 Inspect Work and conditions affecting the Work of this Section. Proceed only after deficiencies, if any, have been corrected.
- .2 Ensure that all flashings built-in or provided by others integrate with system to divert moisture to exterior.
- .3 Ensure that all reglets, anchor blocks or inserts required to receive system are correctly located and installed.

- .4 Ensure that all anchors and setting or installing components provided by this Section for installation are properly located and installed.
- .5 Ensure that building air and vapour retarding membranes can be sealed to window units to maintain system integrity.

3.2 PREPARATION

- .1 Obtain all dimensions from the job site.
- .2 Provide data, dimensions and components, anchors and assemblies to be installed by others in proper time for installation.

3.3 ERECTION

- .1 Erect Work in strict accordance with manufacturer's written instructions.
- .2 Conceal all anchors and fitments. Exposed heads of fasteners not permitted. All joints in exposed work to be flush hairline butt joints.
- .3 Use anchors that will permit sufficient adjustment for accurate alignment. Make allowance for deflection of building structure.
- .4 Build in and provide any supplementary reinforcing and bracing required by assembly loads and deflections.
- .5 Secure Work adequately to structure in a manner not restricting thermal and wind movement.
- .6 Correctly locate and install flashings, deflectors and weep holes to ensure proper drainage of moisture to exterior.
- .7 Maintain alignment with adjacent Work.
- .8 Isolate aluminum surfaces from adjacent dissimilar materials and metals with coatings of bituminous paint.
- .9 Apply foamed-in-place insulation around new windows, and around penetrations through walls and where indicated. Apply foamed-in-place insulation with suitable equipment in accordance with the manufacturer's written instructions. Fill all joints completely, leaving no voids or gaps and trim excess material.

3.4 GLAZING

- .1 Ensure all stops, gaskets, splines, seals etc., are perfectly aligned and ready to receive glazing and insulated panels as specified herein.
- .2 Install glazing to approved details and instruction, using material specified.
- .3 Glazing stops, snap covers shall be of a continuous length from corner to corner and be fitted at corners.
- .4 All preformed tapes or gaskets shall be of a continuous length corner to corner and shall be cut over length to prevent stretching. Joints, splices and corners shall be mitred and sealed.
- .5 Clean all contact surfaces of glazing with solvent and wipe dry. Ensure all glazing channels are clean, true to line, and free of dirt or debris and that weep and drainage vents are open.
- .6 Rest glazing on setting blocks at 1/4 points.
- .7 Install shims at sides to align glass units.

3.5 SEALANT

- .1 Caulk and seal full perimeter of windows to building air/vapour retarder to provide and maintain the designed air/vapour/thermal barrier integrity and weather tightness.
- .2 Install sealants and back-up materials in strict accordance with manufacturer's written instruction.

3.6 TOLERANCES

- .1 Maximum Variation from Level or Plumb: 3mm in 900mm (1/8" in 3').

3.7 ADJUSTING AND CLEANING

- .1 At completion and continuously as Work proceeds, remove all surplus materials, debris and scrap.
- .2 At completion of Work, remove all protective surface covering film and wrappings. Clean all glass, panels and frames using mild soap or other cleaning agent approved by manufacturer.
- .3 Remove all excess glazing or joint sealing materials from exposed surfaces. Clean and polish glass.
- .4 Adjust operating hardware to function properly, without binding and to provide tight fit at contact points and weather-stripping.

END OF SECTION

1 General

1.1 SUMMARY

- .1 Supply and install door hardware listed in the Door Hardware Schedule on Drawing A0.3, establishes the quality standards, finishes, manufacturers and functions.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Submission of Substitutions: Materials other than the named products for the Project may be acceptable to the Consultant. Submit manufacturer's names and complete catalogue number of alternative hardware types proposed for supply and submit this list for review before preparing shop drawings.
- .2 Consultant will review all proposed alternates prior to close of bids when submitted no later than five (5) days prior to bid closing date
- .3 Substitutions for materials of this section will be considered after the close of bids.
- .4 Pre-installation Conference: Arrange a preconstruction meeting to discuss the following:
 - .1 Keying Conference: Conduct keying conference at Project site and incorporate decisions into final keying schedule after reviewing door hardware keying system.
- .5 Coordination: Obtain and distribute templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Coordinate with shop drawings of other work to confirm that adequate provisions are made for locating and installing door hardware.

1.3 SUBMITTALS

- .1 Provide required information in accordance with Division 01.
- .2 Action Submittals: Provide the following submittals before starting any work of this Section:
 - .1 Product Data: Submit product data indicating installation details, material descriptions, dimensions of individual components and profiles, and finishes.
 - .2 Shop Drawings: Submit shop drawings indicating details of electrified door hardware including, but not limited to, the following:
 - .1 Wiring Diagrams: Detail wiring for power, signal, and control systems and differentiate between manufacturer installed and site installed wiring.
 - .3 Samples:
 - .1 Submit samples of complete line of hardware and finishes, if and when requested, to accompany any proposal for substitution. Fully label each sample as to manufacture, type, size and location for use proposed.
 - .4 Hardware Schedule: Submit door hardware schedule prepared by Architectural Hardware Consultant (AHC), detailing fabrication and assembly of door hardware.
- .3 Do not order hardware from manufacturers until samples have been approved. Hardware and finishes supplied shall be identical with approved samples.

1.4 PROJECT CLOSEOUT SUBMISSION

- .1 Operation and Maintenance Data: Provide operations and maintenance information in accordance with Division 01.
- .2 Spare Parts and Tools: Submit unique parts and tools for maintaining hardware system in accordance with Division 01.

1.5 DELIVERY, HANDLING AND PROTECTION

- .1 Pack hardware in suitable wrappings and containers to protect from injury during shipping and storage. Enclose accessories, fastening devices and other loose items with each item. Mark packages for easy identification as indicated on approved delivery schedule. Hand over hardware to designated installer.

1.6 WARRANTY

- .1 Warrant door closers to remain free from defects in materials and workmanship in accordance with the General Conditions, but for a period of five (5) years, and locks and locksets for two (2) years. Agree to promptly make good defects which become apparent within warranty periods without cost to Owner.

2 Products

2.1 GENERAL

- .1 Supply to the job site all items of finishing hardware as indicated in the Hardware Scheduled appended to this Section. All items to be supplied with complete and adequate fixing and anchoring devices necessary for satisfactory installation into or upon the various surfaces to which it is to be affixed.
- .2 Cooperate with all trades using hardware supplied under this Section.
- .3 Render a complete service to the metal fabrication contractor wherein full cooperation is assured them of the supply of hardware information, and templates as requested.
- .4 Supply for installation by others where specified, as scheduled or indicated on the drawings.
- .5 In case of dispute the Consultant's decision will be binding in all cases.
- .6 Provide six, (6) copies of the hardware specification for field construction and office use.
- .7 All hardware shall be of the best quality and design, construction and finish, free from all defects.
- .8 All blank strikes shall be ASA with no lip.
- .9 Lock strikes shall be ASA with lip.
- .10 All deadlock strikes shall be ASA with no lip.
- .11 Where door pulls are scheduled on one side of door and a push plate on the other side, the contractor shall be responsible for fixing, so that the pull shall be secured through the door from the reverse side and the push plate installed to cover the thru bolts which will be countersunk flush with door.
- .12 All door closers shall be non sized and where possible non handed. They shall be sized and adjusted by the installer to suit the site conditions.
- .13 Panic sets are to be of style specified and completely plated.
- .14 Before installing any hardware, carefully check all architectural drawings of Work requiring hardware, verify door swings, door and frame material and operating conditions. Ensure hardware will fit Work.
- .15 Provide ULC approved hardware to ULC labelled doors.
- .16 Check shop drawings and frame and door lists affecting hardware type and installation. Certify to correctness or advise Consultant in writing of required revisions.

- .17 Templates:
 - .1 Check hardware schedule, drawings and specifications. Furnish promptly to applicable trades any patterns, templates, template information and manufacturer's literature required for proper preparation for and application of hardware, in ample time to facilitate progress of Work.
 - .2 Exposed screws for installing hardware shall have Phillips or Robertson heads.
 - .3 All door closers shall have back-checking features and shall be of proper size to operate door efficiently.
 - .4 Use no wall stops on drywall.
 - .5 Rim Panic Device strikes shall be mortise type application. Equip panic devices with hex bolts.
- .18 Hinges
 - .1 Provide mortise type hinges, steel based for interior doors and stainless steel or brass for exterior doors or interior doors exposed to moisture.
 - .2 Provide hinges with stainless steel pins; non removable for exterior and public interior exposure, non rising for non security exposure.
 - .3 Provide full length continuous geared hinges, continuous pin and barrel hinges or full mortise type heavy weight butt hinges on all high frequency use or extreme weighted doors.
 - .4 Where doors are required to swing 180 degrees, provide ball bearing type swing clear hinges sufficient to clear trim.
- .19 Locks, Cylinders, Latches and Bolts
 - .1 Locks are to be ANSI Grade 1 mortise type unless specified otherwise.
 - .2 Equip all locks with anti-friction latches with auxiliary latch guard. All fire rated doors must have a minimum latch throw as indicated on the fire door label.
 - .3 Where lever trim is required, provide levers containing concealed mounting and constructed of solid cast or forged material.
 - .4 Locks must be lever type.
 - .5 Provide locks in accordance with current barrier free accessibility requirements as set out by the OBC or by the jurisdiction having authority, when located in the barrier free path of travel.
 - .6 Strikes shall be ANSI standard size with curved lip strikes for latch bolts and no lip strikes for deadlocks. Provide complete with wrought iron boxes finished to match strike.
 - .7 Provide Cylinders and thumb turns with the correct cam or tailpiece to operate hardware correctly. Coordinate with Section 08 11 16 when applicable.
 - .8 Automatic flush bolts are to be equipped on all fire rated pairs of doors with regular use. Provide a coordinator in conjunction with automatic flush bolts.
 - .9 Provide a filler bar when using coordinators for a clean architectural appearance.
- .20 Exit Device
 - .1 All exit devices installed on labelled fire doors shall carry a ULC or Warnock Hersey Label.
 - .2 Coordinate exit devices with astragals, coordinators, carry open bars and thresholds for correct and safe operation.

- .3 All exit devices shall have exposed metal to match architectural finishes used on other hardware.
- .4 Exit devices are push pad style only.
- .5 Provide non-fire rated exit devices with hex key dogging feature (Cylinder dogging may be required in lieu of hex key dogging).
- .6 Provide Power supplies of same manufacturer when using electrified exit devices.
- .7 Match style and finish of trims on exit devices for locksets used.
- .21 Closers
 - .1 All closers shall be hydraulically controlled and full rack and pinion in operation.
 - .2 All closers shall be fully adjustable including the following features: back check, speed control, and latch speed control.
 - .3 Provide mounting plates where required on special frame applications.
 - .4 Install all necessary attaching brackets, mounting channels, and cover plates where necessary for correct application of door closers.
 - .5 Supply to the Owner any special keys and wrenches as usually packed with door closers.
 - .6 Closers complete with a cover unless specified otherwise by the Consultant. Provide cover of matching architectural finish to the other hardware used in the project.
 - .7 Coordinate closers with overhead stops & holders.
- .22 Push Plates and Door Pulls
 - .1 Provide and install stainless steel plates in type #304 stainless steel and install secure with screw fastening.
 - .2 Length of kick plates shall be 1-1/2" less than door width for single doors and 1" less than door width for doors in pairs.
 - .3 All stainless steel plates are 0.050" thick, free of rough or sharp edges. Corners and edges to have slight radiuses. Install kick plates and armor plates on both sides of the door with 3M tape or counter sunk screws as specified.
 - .4 Where door pulls are scheduled on one side of door and push plates on other side, issue installations instructions to ensure that the pull is secured through door from reverse side and countersunk flush with door installation of push plate. Locate push plate to cover fasteners for door pulls.
- .23 Door Stops and Holders
 - .1 Wall stops are only to be used on wall conditions such as block or masonry. If necessary to mount on drywall, provide proper backing to ensure no damage to the wall.
 - .2 Supply floor stops of sufficient height to suit floor conditions and the undercut of the door.
 - .3 Provide gray rubber exposed resilient parts.
 - .4 Surface mount overhead door stops may be used unless they conflict with the door closer. All overhead stops are to be set to 90 degree opening unless stated otherwise.

- .24 Door Seals
 - .1 Perimeter seals must be provided that fully seal all gaps between the floor, door and frame. Perimeter seal must protect against weather, smoke and sound.
 - .2 Frame gasketing must be constructed of neoprene. The aluminum housing must have a rib to prevent against distortion during installation.
 - .3 Provide aluminum frames with felt inserts by door supplier.

2.2 HARDWARE FINISHES

- .1 P - Primed
- .2 32D - Brushed Stainless Steel
- .3 AL - EN - Aluminum Paint
- .4 26D - Brushed Chrome
- .5 15 - Brushed Nickel
- .6 28 - Anodized Aluminum
- .7 CAD - Cadmium Plated
- .8 26 - Polished Chrome
- .9 3 - Polished Brass
- .10 EAB - Brass Paint
- .11 BRN – Brown
- .12 630 – Stainless Steel

3 Execution

3.1 INSTALLATION

- .1 Subcontractor installing the hardware shall carefully follow manufacturers' instructions for installation of all finish hardware.
- .2 For mounting heights of various hardware items refer to the following, unless otherwise indicated on the Drawings:
 - .1 Locksets: 1024mm (40-5/16") from centre of knob to finished floor.
 - .2 Deadlocks: 1220mm (48") from centre of cylinder to finished floor.
 - .3 Mortise Night Latches: 1024mm (40-5/16") from centre of cylinder to finished floor.
 - .4 Panic Bolts: 1024mm (40-5/16") from centre of crossbar to finished floor.
 - .5 Push Plates: 1143mm 45" from centre of plate to finished floor.
 - .6 Guard Bars: 1024mm (40-5/16") from centre of bar to finished floor.
 - .7 Door Pulls: 1067mm (42") from centre of pull to finished floor.
 - .8 Blank Strike: 1024mm (40-5/16") from centre of strike to finished floor.
 - .9 Blank Fronts: 1024mm (40-5/16") from centre of strike to finished floor.

3.2 PERFORMANCE

- .1 Adjustment and Cleaning:
 - .1 Provide services of competent mechanic without additional cost to Owner. Mechanic shall inspect installation of all hardware furnished under this Section and supervise all adjustments (by trades responsible for fixing) necessary to leave hardware in perfect working order.

END OF SECTION

1 General

1.1 SUMMARY

- .1 Furnish glazing materials and accessories to complete the fabrication and installation of:
 - .1 Float Glass
 - .2 Tempered Glass
 - .3 Laminated Safety Glass
 - .4 Fire Rated, Ceramic Fire-Rated Glass

1.2 REFERENCE STANDARDS

- .1 The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- .2 All reference amendments adopted prior to the bid closing date of this Project shall be applicable to this Project.
- .3 All materials, installation and workmanship shall comply with all applicable requirements and standards
- .4 American Society for Testing and Materials (ASTM):
 - .1 ASTM C542, Standard Specification for Lock-Strip Gaskets
 - .2 ASTM C920, Standard Specification for Elastomeric Joint Sealants
 - .3 ASTM C1172, Standard Specification for Laminated Architectural Flat Glass
 - .4 ASTM C1503, Standard Specification for Silvered Flat Glass Mirror
- .5 Canadian General Standards Board (CGSB):
 - .1 CAN/CGSB-12.1, Tempered or Laminated Safety Glass
 - .2 CAN/CGSB-12.3, Flat, Clear Float Glass
 - .3 CAN/CGSB-12.8, Insulating Glass Units
 - .4 CAN/CGSB-12.9, Spandrel Glass
 - .5 CAN/CGSB-12.11, Wired Safety Glass
 - .6 CGSB-12.20, Structural Design of Glass for Buildings
- .6 National Fire Protection Association (NFPA):
 - .1 NFPA 80, Standard For Fire Doors and Other Opening Protectives

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Division 01.
- .2 Action Submittals: Provide the following submittals before starting any work of this Section:
 - .1 Product Data: Submit manufacturer's product data for each type of product specified. Data shall indicate compliance with specification and installation recommendations of manufacturer of products being used.
 - .2 Samples: Submit samples of materials if required by Consultant before commencing work of this section. Samples shall be clearly labeled with manufacturer's name and type.
 - .3 Shop Drawings: Submit shop drawings, to the Consultant for review prior to fabrication.

- .4 Samples for Verification: Submit samples for verification including sample sets showing the full range of variations expected where products involve normal colour variations.
- .5 Maintenance Data: Upon completion of installation, supply instructions covering re-glazing, adjustments and other relevant maintenance data.

1.4 QUALITY ASSURANCE

- .1 Conform to the requirements of the Flat Glass Marketing Association Glazing Manual, latest Edition.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements: Deliver packaged materials in their original containers with manufacturer's labels and seals intact.
- .2 Storage and Handling Requirements: Store vertically, blocked off the floor in a weatherproof enclosure in original containers with manufacturers labels and seals intact until read for installation, and as follows:
 - .1 Install glass as soon as possible after delivery to site.
 - .2 Handle glass carefully to its place of installation.
 - .3 Prevent damage to glass, adjacent materials and surfaces.

1.6 SITE CONDITIONS

- .1 Ambient Conditions: Maintain temperature, humidity and solar exposure conditions of Glass Glazing materials during shipping, storage and site installation as required by manufacturer to maintain warranty and performance of installed products.

1.7 WARRANTY

- .1 Provide manufacturer's warranty for the following types of glass listed, against defects in materials and workmanship for the period indicated, commencing from the date of Substantial Performance of Work:
 - .1 Seal Failure: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions.
 - .2 Evidence of Failure: Obstruction of vision by dust, moisture, or film on interior surfaces of glass.
 - .3 Allowable Specific Exclusions: Breakage resulting from thermal stress will be accepted as a limitation to the warranty in accordance with CAN/CGSB 12.20.
 - .4 Warranty Period: Ten (10) Years.

2 Products

2.1 MATERIALS

- .1 Float Glass (FG1): In accordance with CAN/CGSB-12.3, glazing quality and as follows:
 - .1 Clear Glass: No tint
- .2 Tempered Glass:
 - .1 Clear, conforming to CAN/CGSB-12.1, Type 2, Class 'B'. Tempering shall be performed using horizontal tong free method.

- .3 Laminated Safety Glass (TG1): In accordance with CAN/CGSB-12.1 and ASTM C1172 as follows:
 - .1 Glass: Clear, tempered glass.
 - .2 Type: 1 - Laminated.
 - .3 Class: B - Float Glass.
 - .4 Category: II - Fully Tempered.
- .4 Fire Rated, Ceramic Fire-Rated Glass (FLG1): Material used in door and screen applications with fire rating requirements of 60 minutes with hose stream test.
 - .1 Fire Rated Glass: Two-ply of glass ceramic, laminated with Teflon or PVB interlayer and as follows:
 - .1 Thickness: 8mm
 - .2 Fire Rating: 60 minutes.
 - .3 Labelled: Permanent logo listing name of product, manufacturer, testing laboratory, fire rating period and safety requirements
 - .4 Basis-of-Design Materials:
 - .1 Technical Glass Products, FireLite Plus
 - .2 VetroTech, Keralite Select L
 - .3 SAFTI: Pyran Platinum L
- .5 Gaskets:
 - .1 Neoprene/EPDM thermoplastic rubber type gaskets of sufficient thickness to be compressed 25% when installed, having 2,000 psi tensile strength, with 50 durometer shore A hardness plus/minus 5, maximum 30% resistance to permanent set, resistance to ozone without cracking, minimum elongation at break of 300% and conforming to ASTM C542.
 - .2 Colour - "Black".
- .6 Sealant:
 - .1 One component, silicone base, solvent curing sealant conforming to ASTM C920. Colour as selected Later by Consultant.
- .7 Glazing Compound:
 - .1 Non-hardening modified oil type glazing compound.
- .8 Setting Blocks:
 - .1 Neoprene/EPDM rubber type, 4" long, with 40 to 50 durometer shore A hardness plus/minus 5; resistant to sunlight, weathering, oxidation and permanent deformation under load and wide enough to extend from fixed stop to opposite face of glass of thickness suitable to glazing condition to provide adequate glazing "bite".
- .9 Spacer Shims:
 - .1 Neoprene/EPDM rubber type, with 40 to 50 durometer shore A hardness plus/minus 5; resistant to sunlight, weathering, oxidation and permanent deformation under load and of adequate thickness to provide correct glass to face clearance at least 1/8".
- .10 Glazing Tape:
 - .1 Macro-polyisobutylene preformed glazing tape, 'Polyshim' or 'Vision Strip' by Tremco Ltd., division of RPM Company, or approved equal.

2.2 INSULATING GLASS

- .1 Insulating Glass Units: Provide sealed insulating glass units in accordance with CAN/CGSB-12.8 in configurations indicated, and as specified in Section 08 51 13.13.

2.3 FABRICATION AND MANUFACTURE

- .1 Label each light of glass with the registered name of the product and the weight and quality of the glass.
- .2 Check dimensions on site before cutting materials.
- .3 Minimum bite or lap of glass on stops and rabbets as recommended by glass manufacturer. Finish surfaces shall be free of tong marks.
- .4 Cut glass true to dimensions, square, plumb and level. Verify all dimensions prior to fabrication.
- .5 Distortion, pock marking or defects detrimental to appearance and/or performance, as determined by the Consultant, will be rejected.

2.4 GLAZING COMPOUND FOR FIRE RATED GLAZING MATERIALS

- .1 Glazing Tape: Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2%, designed for compression of 25% to effect an air and vapour seal.
- .2 Silicone Sealant: One-part neutral curing silicone, medium modulus sealant, Type S; Grade NS; Class 25 with additional movement capability of 50% in both extension and compression (total 100%); Use (Exposure) NT; Uses (Substrates) G, A, and O as applicable.
 - .1 Acceptable materials:
 - .1 Dow Corning Corp., Dow Corning 795
 - .2 General Electric Co., Silglaze-II 2800
 - .3 Tremco Inc., Spectrum 2
- .3 Setting Blocks: Hardwood, glass width by 4"x 1/4" thick.
- .4 Spacers: Neoprene or other resilient blocks of 40 to 50 Shore A durometer hardness, adhesive-backed on one face only, tested for compatibility with specified glazing compound.
- .5 Cleaners, Primers, and Sealers: Type recommended by manufacturer of glass and gaskets.

2.5 FABRICATION: FIRE RATED GLASS

- .1 Fabricate glass and other glazing products in sizes required to glaze openings indicated for project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standards as required to comply with system performance requirements.

3 Execution

3.1 EXAMINATION

- .1 Examine areas of work affecting the work of this section. Report in writing all defects, errors and discrepancies immediately to the Consultant.
- .2 Commencement of work implies acceptance of surfaces and conditions.

3.2 PREPARATION

- .1 Openings shall be free from moisture, frost, rust, dirt and foreign matter.
- .2 Clean surface to receive sealant with a clean cloth dampened with xylol or a 50-50 mixture of acetone and xylol. Wipe dry with a clean, dry cloth.

3.3 INSTALLATION

- .1 Conform to the recommendation of the glazing manual, Flat Glass Marketing Association, latest edition and as specified herein.
- .2 Unless otherwise indicated on drawings otherwise, provide tempered glass at all doors, transoms, sidelights and vision lites within 2'-6" of grade and/or finished floor.
- .3 Glaze doors scheduled to be glazed. Set sheet glass with draw lines horizontal.
- .4 Glaze interior openings using compound or glazing tapes or gaskets.
- .5 Install removable stops. Insert spacer shims between glass and stops at 24" O.C. and not less than 1/4" below "sight lines". Fill remaining voids with sealant or glazing compound to "sight lines" and trim sealant/glazing compound to produce clean, sharp, straight lines without voids or depressions.
- .6 Replace loose stops in their original positions, tighten all screws. Refer to drawings and door and frame schedule for locations of each type of glass.

3.4 INSTALLATION – FIRE RATED GLASS

- .1 Comply with GANA standards and instructions of manufacturers of glass, glazing sealants, and glazing compounds.
- .2 Protect glass from edge damage during handling and installation. Inspect glass during installation and discard pieces with edge damage that could affect glass performance.
- .3 Place hardwood setting blocks located at quarter points of glass with edge block no more than 150mm (6") from corners.
- .4 Glaze vertically into labelled fire rated metal frames or partition walls with same fire rating as glass and push against tape for full contact at perimeter of pane or unit.
- .5 Place glazing tape on free perimeter of glazing in same manner described above.
- .6 Do not remove protective edge tape. Install removable stop and secure without displacement of tape.
- .7 Do not pressure glaze. Knife trim protruding tape. Provide minimum 1/4" edge clearance.
- .8 Install vision panels in fire rated doors to requirements of NFPA 80.
- .9 Install so that appropriate fire rating labels and markings remain permanently visible.

3.5 CLEANING

- .1 Repair all defects caused by the work of this section. Remove as work progresses, all excess or foreign materials or droppings which would set or become difficult to remove from surfaces at time of final cleaning.
- .2 Immediately prior to acceptance of work of this section by Consultant, remove temporary protection, clean and polish exposed surfaces of all work of this section. Use proper cleaning materials and methods to prevent damage to surfaces, finishes, sealer or work of other trades. Make good such damage to Consultant's satisfaction.
- .3 Do not use steel wool, wire brushes or steel scrapers on any finished surfaces.
- .4 Replace or make good to Consultant's satisfaction, upon completion of work of this section, all defective, scratched or damaged work, at no extra cost to the Owner.

END OF SECTION

1 General

1.1 SUMMARY

- .1 Section Includes the following:
 - .1 Non-load-bearing steel framing systems for interior partitions.
 - .2 Suspension systems for interior ceilings.
 - .3 Grid suspension systems for gypsum board ceilings.

1.2 REFERENCE STANDARDS

- .1 The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- .2 All reference amendments adopted prior to the bid closing date of this Project shall be applicable to this Project.
- .3 All materials, installation and workmanship shall comply with all applicable requirements and standards
- .4 American Society for Testing and Materials International (ASTM):
 - .1 ASTM A641/A641M, Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
 - .2 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - .3 ASTM A792/A792M, Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
 - .4 ASTM A875/A875M, Specification for Steel Sheet, Zinc-5% Aluminum Alloy-coated by the Hot Dip Process
 - .5 ASTM A1003/A1003M, Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members
 - .6 ASTM C645, Standard Specification for Nonstructural Steel Framing Members
 - .7 ASTM C754, Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products
 - .8 ASTM C840, Standard Specification for Application and Finishing of Gypsum Board
 - .9 ASTM C954, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness
 - .10 ASTM C955, Standard Specification for Cold-Formed Steel Structural Framing Members
 - .11 ASTM C1002, Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
- .5 Canadian Standards Association (CSA):
 - .1 CSA S136, North American Specification for the Design of Cold Formed Steel Structural Members
- .6 Canadian General Standards Board (CGSB):
 - .1 CAN/CGSB-7.1, Lightweight Steel Wall Framing Components

- .7 Canadian Sheet Steel Building Institute (CSSBI):
 - .1 CSSBI S6 (Latest), Guide Specification for Lightweight Steel Framing

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Division 01.
- .2 Action Submittals: Provide the following submittals before starting any work of this Section:
 - .1 Product Data: Submit manufacturer's product data for each materials specified including recommended application rates and methods of installation.
- .3 Informational Submittals: Provide the following submittals during the course of the work:
 - .1 Product Certificates: For each type of code-compliance certification for studs and tracks.
 - .2 Shop Drawings: Submit shop drawings showing the design, construction and relevant details of furring, enclosures and partitions which require a fire rating.

1.4 QUALITY ASSURANCE

- .1 Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Steel Stud Manufacturers Association (SSMA).
- .2 Contractor executing work of this Section shall have a minimum of five (5) years continuous experience in successful installation of work of type and quality shown and specified. Submit proof of experience upon Consultant's request.

1.5 DELIVERY, STORAGE, HANDLING AND PROTECTION

- .1 Coordinate deliveries to comply with construction schedule and arrange ahead for off the ground, enclosed, under cover storage location. Do not load any area beyond the design limits.
- .2 Materials shall be carefully checked, unloaded, stored and handled to prevent damage. Protect materials with suitable non-staining waterproof coverings.
- .3 Store material in original, undamaged containers or wrappings with manufacturer's seals and labels intact.

2 Products

2.1 PERFORMANCE REQUIREMENTS

- .1 Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E119 by an independent testing agency.
- .2 STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.2 FRAMING SYSTEMS

- .1 Framing Members, General: Comply with ASTM C754 for conditions indicated.
 - .1 Steel Sheet Components: Comply with ASTM C645 requirements for steel unless otherwise indicated.
 - .2 Steel sheet components shall comply with ASTM C645 requirements for metal, unless otherwise indicated.

- .3 Steel for non-loadbearing members shall have metallic coats that conform to ASTM A653M or ASTM A792M with minimum metallic coating weighs (mass) of Z120 and AZM150 respectively.
- .4 Framing members shall comply with the CAN/CSA S136 - North American Specification for the Design of Cold Formed Steel Structural Members, for conditions indicated.
- .5 Isolate where necessary to prevent electrolysis due to dissimilar metal-to-metal contact or metal-to-masonry and concrete contact. Use bituminous paint, butyl tape or other approved divorcing material.
- .2 Studs and Tracks: ASTM C645.
 - .1 Steel Studs and Tracks:
 - .1 Minimum 0.0179" (25 gauge), screwable with crimped web and returned flange. Provide knockout openings in web at 150mm (6") O.C. to accommodate (if required) horizontal mechanical and electrical service lines, and bracing. Widths as indicated on drawings. Provide structural studs where indicated.
 - .2 Framing behind all fire resistant gypsum board shall be minimum 0.0329" (20 gauge).
 - .3 Where metal stud framing forms walls are to be thermally insulated as indicated on drawings, provide metal studs with integrated fastening system for glass fibre/mineral fibre insulation.
 - .4 Provide special shapes indicated on drawings as part of steel stud/drywall assemblies.
 - .3 Slip-Type Head Joints: Where indicated, provide one of the following:
 - .1 Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to tracks while allowing 2" (51-mm) minimum vertical movement.
 - .2 Double-Track System: ASTM C645 top outer tracks, inside track with 2" (51 mm) deep flanges in thickness not less than indicated for studs and fastened to studs, and outer track sized to friction-fit over inner track.
 - .3 Deflection Track: Steel sheet top track manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - .4 Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 - .1 Minimum Base-Steel Thickness: As indicated on Drawings.
 - .5 Cold-Rolled Channel Bridging: Steel, 0.0538" (1.367 mm) minimum base-steel thickness, with minimum ½" (13 mm) wide flanges.
 - .1 Depth: As indicated on Drawings.
 - .2 Clip Angle: Not less than 1-1/2" x 1-1/2" (38 mm x 38 mm), 0.068" (1.72 mm) thick, galvanized steel.
 - .6 Hat-Shaped, Rigid Furring Channels: ASTM C645.
 - .1 Depth: As indicated on Drawings.
 - .7 Resilient Furring Channels: ½" (13 mm) deep, steel sheet members designed to reduce sound transmission.
 - .1 Configuration: hat shaped.

- .8 Cold-Rolled Furring Channels: 0.053" (1.34 mm) uncoated-steel thickness, with minimum ½" (13 mm) wide flanges.
 - .1 Depth: As indicated on Drawings
 - .2 Furring Brackets: Adjustable, corrugated-edge-type steel sheet with minimum uncoated-steel thickness of 0.0329" (0.8 mm).
 - .3 Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062" (1.59 mm) diameter wire, or double strand of 0.048" (1.21 mm) diameter wire.
- .9 Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4" (32 mm), wall attachment flange of 7/8" (22 mm), minimum uncoated-steel thickness of 0.0179" (0.455 mm), and depth required to fit insulation thickness indicated.

2.3 GYPSUM BOARD SUSPENSION SYSTEMS

- .1 Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062" (1.59 mm) diameter wire, or double strand of 0.048" (1.21 mm) diameter wire.
- .2 Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.16" (4.12 mm) in diameter.
- .3 Flat Hangers: Steel sheet, in size indicated on Drawings.
- .4 Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-steel thickness of 0.0538" (1.367 mm) and minimum ½" (13 mm) wide flanges.
 - .1 Depth: As indicated on Drawings.
- .5 Furring Channels (Furring Members):
 - .1 Cold-Rolled Channels: 0.0538" (1.367 mm) uncoated-steel thickness, with minimum ½" (13 mm) wide flanges, ¾" (19 mm) deep.
 - .2 Steel Studs and Tracks: ASTM C645.
 - .1 Depth: As indicated on Drawings.
 - .3 Hat-Shaped, Rigid Furring Channels: ASTM C645, 7/8 inch (22 mm) deep.
 - .4 Resilient Furring Channels: 1/2" (13 mm) deep members designed to reduce sound transmission.
 - .1 Configuration: Hat shaped.
- .6 Grid Suspension System for Gypsum Board Ceilings (CA2): ASTM C645, direct-hung system composed of main beams and cross-furring members that interlock.

2.4 AUXILIARY MATERIALS

- .1 General: Provide auxiliary materials that comply with referenced installation standards.
 - .1 Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- .2 Isolation Strip at Exterior Walls: Provide one of the following:
 - .1 Asphalt-Saturated Organic Felt: ASTM D226/D226M, Type I (No. 15 asphalt felt), nonperforated.
 - .2 Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8" (3.2 mm) thick, in width to suit steel stud size.

3 Execution

3.1 EXAMINATION

- .1 Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- .2 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- .1 Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 - .1 Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
- .2 Coordination with Sprayed Fire-Resistive Materials:
 - .1 Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling tracks to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24" (610 mm) o.c.
 - .2 After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that are required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

- .1 Installation Standard: ASTM C754.
 - .1 Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.
- .2 Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- .3 Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- .4 Install bracing at terminations in assemblies.
- .5 Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

- .1 Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
- .2 Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- .3 Install studs so flanges within framing system point in same direction.
- .4 Install tracks at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts that penetrate partitions above ceiling.
 - .1 Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.

- .2 Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install track section (for cripple studs) at head and secure to jamb studs.
 - .1 Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
- .3 Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
- .4 Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
- .5 Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- .5 Direct Furring:
 - .1 Screw to wood framing.
 - .2 Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.
- .6 Z-Shaped Furring Members:
 - .1 Erect insulation, vertically and hold in place with Z-shaped furring members spaced 24" (610 mm).
 - .2 Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24" (610 mm) o.c.
 - .3 At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12" (305 mm) from corner and cut insulation to fit.
- .7 Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8" (3 mm) from the plane formed by faces of adjacent framing.

3.5 INSTALLING CEILING SUSPENSION SYSTEMS

- .1 Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - .1 Hangers: 48" (1219 mm).
 - .2 Carrying Channels (Main Runners): 48" (1219 mm)
 - .3 Furring Channels (Furring Members): 24" (610 mm), unless otherwise indicated on the Drawings.
- .2 Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- .3 Suspend hangers from building structure as follows:
 - .1 Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - .1 Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

- .2 Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - .1 Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
- .3 Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
- .4 Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
- .5 Do not attach hangers to steel roof deck.
- .6 Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
- .7 Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
- .8 Do not connect or suspend steel framing from ducts, pipes, or conduit.
- .4 Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- .5 Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- .6 Installation Tolerances: Install suspension systems that are level to within 1/8" in 12' (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION

1 General

1.1 SUMMARY

- .1 This Section includes requirement for supply and installation of components required for a complete gypsum board assembly with proprietary components as follows:
 - .1 Gypsum Board Panels:
 - .1 Standard Gypsum Board
 - .2 Gypsum Ceiling Board
 - .3 Impact/Abuse Resistance Gypsum Board
 - .4 Fire Rated Impact/Abuse Resistance Gypsum Board
 - .2 Gypsum Wallboard Accessories:
 - .1 Screws, tape, joint compound and all other accessories required for gypsum board ceiling and wall partitions.
 - .2 Access Panels.

1.2 REFERENCE STANDARDS

- .1 The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- .2 All reference amendments adopted prior to the bid closing date of this Project shall be applicable to this Project.
- .3 All materials, installation and workmanship shall comply with all applicable requirements and standards.
- .4 American Society for Testing and Materials International (ASTM):
 - .1 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 - .2 ASTM C475/C475M, Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board
 - .3 ASTM C840, Standard Specification for Application and Finishing of Gypsum Board
 - .4 ASTM C954, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness
 - .5 ASTM C1002, Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs
 - .6 ASTM C1047, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base
 - .7 ASTM C1396/C1396M, Standard Specification for Gypsum Board
 - .8 ASTM C1629/C1629M, Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.
 - .9 ASTM D3273, Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber

- .10 ASTM D3274, Standard Test Method for Evaluating Degree of Surface Disfigurement of Paint Films by Fungal or Algal Growth, or Soil and Dirt Accumulation
- .5 Underwriters Laboratories of Canada (ULC):
 - .1 CAN/ULC S101, Standard Methods of Fire Endurance Tests of Building Construction and Materials
 - .2 CAN/ULC S102, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies
 - .3 CAN/ULC S114, Standard Method of Test for Determination of Non-Combustibility in Building Materials
- .6 ULC List of Equipment and Materials
 - .1 Underwriters' Laboratories (UL), Standards for Safety acceptable to the Standards Council of Canada (SCC)

1.3 QUALITY ASSURANCE

- .1 Contractor executing work of this Section shall have a minimum of five (5) years continuous experience in successful installation of work of type and quality shown and specified.
- .2 Submit proof of experience upon Consultant's request.

1.4 SUBMITTALS

- .1 Provide submittals in accordance with the requirements of Division 01.
- .2 Shop Drawings: Submit shop drawings showing the design, construction and relevant details of furring, enclosures and partitions which require a fire rating.
- .3 Product Data: Submit manufacturer's current technical literature for each component.
- .4 Samples: Supply for Consultant's review, if requested, samples of the following:
 - .1 Board: Submit sample of each panel product specified, 150mm (6") square.
 - .2 Trim: Submit sample of each type of trim specified, 305mm (12") long.
- .5 Quality Assurance Submittals:
 - .1 Design Data, Test Reports: Provide manufacturer's test reports indicating product compliance with indicated requirements.
 - .2 Manufacturer's Instructions: Provide manufacturer's written installation instructions.

1.5 DELIVERY, STORAGE, HANDLING AND PROTECTION

- .1 Coordinate deliveries to comply with construction schedule and arrange ahead for off the ground, enclosed, under cover storage location. Do not load any area beyond the design limits.
- .2 Materials shall be carefully checked, unloaded, stored and handled to prevent damage. Protect materials with suitable non-staining waterproof coverings.
- .3 Store material in original, undamaged containers or wrappings with manufacturer's seals and labels intact.
- .4 Protect bagged products from excessive moisture or wetting. Store metal component sections in crates to prevent damage to material. Do not use bent or deformed material.

1.6 PROJECT CONDITIONS

- .1 Establish and maintain environmental conditions for application and finishing gypsum wallboard to comply with ASTM C 840 and in accordance with manufacturer's written instructions.
- .2 In cold weather (outdoor temperatures less than 13 deg. C, controlled heat in the range of 13 deg. C to 21 deg. C must be provided. Recommended temperature must be maintained twenty-four (24) hours before, during, and after entire gypsum board joint finishing and until the permanent heating system is in operation or the building is occupied.
 - .1 Minimum temperature of 10 deg. C shall be maintained during gypsum board application.
- .3 Ventilate building spaces to remove excess moisture and humidity during the drying process. Avoid drafts during dry, hot weather to prevent materials from drying too rapidly.

2 Products

2.1 MATERIALS - WALLBOARD

- .1 Standard Gypsum Board:
 - .1 Conforming to ASTM C1396, ivory paper faced, tapered edges, 1220mm (48") wide sheets of maximum practical lengths to minimize end joints, 13mm (1/2") thick, unless otherwise indicated on Drawings.
 - .2 Acceptable Materials and Manufacturers:
 - .1 Sheetrock Brand Gypsum Panels by CGC Inc.
 - .2 ProRoc Regular by CertainTeed.
 - .3 ToughRock Gypsum Wallboard by Georgia-Pacific Canada.
 - .4 Or approved equivalent.
- .2 Gypsum Ceiling Board:
 - .1 Sag Resistant Gypsum Board: Meeting requirements of ASTM C1396M, ceiling board manufactured to have more sag resistance than regular type gypsum board with long edges tapered, and as follows:
 - .1 Location: Ceiling surfaces.
 - .2 Acceptable Materials:
 - .1 Sheetrock Interior Ceiling Board by CGC Inc.
 - .2 Tough Rock CD Ceiling Board by Georgia Pacific Canada.
 - .3 ProRoc Interior Ceiling Board by CertainTeed.
- .3 Impact/Abuse Resistant Gypsum Board:
 - .1 Manufactured to produce greater resistance to surface indentation and impact penetration resistance than standard gypsum panels:
 - .1 Gypsum panels with glass fibre reinforced core, tapered edges, minimum 5/8" thickness, conforming to ASTM C1396M and tested to the following performance ratings.
 - .2 Acceptable Materials:
 - .1 Sheetrock Abuse Resistant by CGC Inc.
 - .2 Abuse Resistant by CertainTeed.

- .3 ToughRock Abuse Resistant by Georgia Pacific Canada.
- .4 Fire Rated Abuse Resistant Gypsum Board:
 - .1 Manufactured to produce greater resistance to surface indentation and impact penetration resistance than standard gypsum panels:
 - .1 Gypsum panels with glass fibre reinforced core, tapered edges, minimum 5/8" thickness, Type X ULC fire rating, conforming to ASTM C1396M and tested to the following performance ratings.
 - .2 Acceptable Materials:
 - .1 Sheetrock Abuse Resistant Firecode by CGC Inc.
 - .2 Abuse Resistant Type X by CertainTeed.
 - .3 ToughRock Abuse Resistant Fireguard by Georgia Pacific Canada.

2.2 ACCESSORIES

- .1 Concrete Anchors:
 - .1 Self-drilling tie wire anchors, "Red-Head No. T-32" by Phillips Drill Company, Division of ITT Industries of Canada Ltd., or approved equal.
- .2 Concrete Inserts:
 - .1 Hot-dip galvanized "turtle back" type concrete inserts to suit conditions as approved by Consultant, by Acrow-Richmond National Concrete Accessories, Division of Premetalco Inc., or approved equal.
- .3 Gypsum Wallboard Accessories:
 - .1 In general, gypsum wallboard accessories shall conform to ASTM C1047.
 - .2 Corner Beads:
 - .1 Made from galvanized steel sheet conforming to ASTM A653, minimum 0.0179" (25 gauge). Minimum width of flanges 28mm for 13mm (1-1/8" for 1/2") thick wallboard and 32mm for 16mm (1-1/4" for 5/8") thick wallboard.
 - .3 Casing Beads:
 - .1 Made from galvanized steel sheet conforming to ASTM A653, minimum 30 gauge, U-shaped designed for finishing with joint compound.
 - .4 Control Joints:
 - .1 Made from galvanized sheet steel conforming to ASTM A653, minimum 0.0179" (25 gauge), or roll-formed zinc-alloy to resist corrosion, with expansion joint material perforated flanges.
 - .5 Reveals:
 - .1 Galvanized sheet steel conforming to ASTM A653, minimum 0.0179" (25 gauge), in profiles as indicated on drawings.
- .4 Wallboard Screws:
 - .1 Corrosion resistant, self-drilling, self-tapping gypsum wallboard screws conforming to ASTM C1002 (Type S) and ASTM C954 (Type S-12), 25mm (1") long No. 6 for single layer application, 41mm (1-5/8") long No. 7 for double layer application.
 - .2 At fire rated construction, type and size of wallboard screw shall be same as used in fire-rating test.

- .5 Joint Compound for Interior Gypsum Board:
 - .1 Conforming to ASTM C475 and as recommended by gypsum wallboard, fire-rated gypsum wallboard and exterior wallboard manufacturers to suit conditions.
- .6 Joint Compound for Abuse-Resistant Panels:
 - .1 ToughRock™ Sandable Joint Compound, by Georgia-Pacific.
 - .2 Durabond/Sheetrock Setting-Type Joint Compound, by CGC Canada Inc.
- .7 Resilient Sponge Tape:
 - .1 Closed cell neoprene sponge type tape with self-sticking adhesive on one side. 'Permastik 122X' by Jacobs and Thompson Ltd., or foamed vinyl type tape, 'Arnofoam' by Arno Adhesive Tape Incorporated.
- .8 Adhesive:
 - .1 Conforming to CGSB 71-GP-25M, and as recommended by manufacturer and compatible with contacted surfaces.
- .9 Access Panels:
 - .1 Standard Access Panels: Supply 610mm x 610mm (24" x 24") self framing metal access panels with integral locks as approved by Consultant, where required for access to concealed controls and equipment, by Le Hage Metal Ltd., or Acudor Products Limited, or approved equal.

3 Execution

3.1 EXAMINATION

- .1 Examine gypsum wallboard panels for damage and existence of mould. Install only undamaged panels.
- .2 Examine gypsum wallboard in accordance with GA-231 for water damage.
- .3 Examine areas and substrates, with installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.
- .4 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- .1 Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
- .2 Coordinate installation of gypsum board suspension systems with installation of acoustical ceiling tiles (ACT) suspension systems. Where gypsum board suspension systems abut ACT systems, ensure that ceiling tiles grid fit into gypsum grid without affecting overall design and appearance.
- .3 Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION - GENERAL

- .1 Conform to ASTM C840, except as otherwise specified herein. Cooperate with mechanical, electrical and other trades to accommodate fixtures, fittings and other items in wallboard areas.

- .2 Review extent of temporary heat provided. Carry out the work of this Section only when temperature is maintained and controlled in the range of 13 deg. C to 21 deg. C for at least twenty-four (24) hours before installing gypsum board and shall be maintained until joint compound and adhesives are dried or cured.
- .3 Bring gypsum board into contact, but do not force into place.

3.4 GYPSUM WALLBOARD - SINGLE LAYER APPLICATION

- .1 Metal Studs:
 - .1 Apply gypsum wallboard with screws. Erect wallboard with long dimension at right angles to supports. For fire rated partitions, erect board vertically or horizontally according to the ULC listing. Locate end joints over supporting members.
 - .2 Locate vertical joints at least 305mm (12") from the jamb/head/sill lines of openings.
 - .3 For parallel application space screws at 200mm (8") O.C. at board edges at 305mm (12") O.C. on board fields.
- .2 Fasteners:
 - .1 Perimeter screws shall be not less than 10mm (3/8") from edges and ends and shall be opposite the screws on adjacent boards.
 - .2 Screws shall be driven with a power screw gun and set with countersunk head slightly below the surface of the board.
- .3 Joints: Finish all joints.

3.5 FIRE RESISTANT ASSEMBLIES

- .1 Fire resistance rating of gypsum board assemblies and framing shall be as called for on drawings or schedules, and as required to conform with applicable codes and requirements of authorities having jurisdiction.
- .2 Appropriate ULC designs as listed in current ULC list of equipment and materials, Volume II, Building Construction, shall be placed when applicable. Extend partitions full height through ceiling space unless otherwise noted on drawings.
- .3 Vertical bulkheads in ceiling spaces over fire rated glazed partitions, doors and the like shall have same fire rating as the door or partition over which they occur. All such bulkheads shall be of drywall construction unless otherwise noted.
- .4 Use fire rated gypsum board as specified.
- .5 Where lighting fixtures, diffusers, and the like are recessed into fire rated ceilings or bulkheads, provide enclosure to maintain required fire rating. Form removable panel to give access to fixture outlet box.
- .6 Where fire hose cabinets or other fixtures or equipment are recessed in fire rated walls or partitions, provide drywall enclosure or backing to maintain required fire rating, unless otherwise detailed.

3.6 CONTROL JOINTS

- .1 Install control joints using metal control joint strip as specified where:
 - .1 A partition, furring or column fireproofing abuts a structural element, dissimilar wall or partition assembly, or other vertical penetration, or ceiling.
 - .2 A ceiling or soffit abuts a structural element, dissimilar wall or partition assembly or other vertical penetrations.
 - .3 Wings of "L", "U" and "T"-shaped ceiling/soffit areas are joined;
 - .4 Construction changes within the plane of the partition or ceiling or soffit.

- .5 Partition, restrained ceiling or furring run exceeds 9144mm (30').
- .6 Unrestrained ceiling dimensions exceed 15240mm (50') in either direction.
- .7 Expansion or control joints occur in the base exterior wall.
- .8 Wallboard is installed over masonry control joints.
- .9 And elsewhere as indicated on the drawings.
- .2 Install in accordance with manufacturer's instructions. Where application is on furring members and double furring members at control joints, place one furring member on each side of the control joint.

3.7 BULKHEADS

- .1 Fur out bulkheads in areas indicated and as required to conceal mechanical, electrical or other services in rooms where drywall finishes are scheduled, and elsewhere if called for on drawings.
- .2 Ensure hangers are installed as to prevent splaying.

3.8 ACCESS DOORS

- .1 Access doors supplied by this Section and Mechanical and Electrical shall be built-in by this Section where required in gypsum board installations, in accordance with manufacturer's recommendations, to match and blend with surrounding surfaces.
- .2 Refer to drawings for locations.

3.9 THERMAL BREAK

- .1 Install self-sticking resilient sponge tape at edges of wallboard in contact with metal windows and exterior door frames to provide a thermal break.
- .2 Adhere tape to casing bead and compress during installation.

3.10 FINISHING

- .1 Before proceeding with installation of finishing materials ensure the following:
 - .1 Wallboard is fastened and held close to framing and furring.
 - .2 Fastening heads in wallboard are slightly below surface in dimple formed by driving tool.
- .2 Levels of Gypsum Wallboard Finish:
 - .1 Level 0: Temporary construction only.
 - .2 Level 1: Plenum areas and above ceilings. Where a fire-resistance rating is required finishing should be in accordance with reports of fire tests of assemblies that have met the requirements of the fire rating imposed.
 - .3 Level 2: Areas of water resistant gypsum backing board under tile, exposed areas where appearance is not critical.
 - .4 Level 3: Service corridors and areas to receive heavy or medium textured coatings or heavy-duty wall coverings.
 - .5 Level 4: Areas to receive light textured coatings or lightweight wall coverings.
 - .6 Level 5: Areas to receive gloss, semi-gloss or flat sheen paints and critical lighting conditions. Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges, and apply skim coat over entire surface for corridors, long hallways, walls and ceilings longer than 7500 mm or walls higher than 3600 mm , and for all curved or angled wall surfaces.

- .3 Finish gypsum wallboard in strict accordance with ASTM C840, GA-214 and GA-216 and as follows:
 - .1 Fill and tape joints and internal corners and fill screw depressions in board face and smooth out along corner beads and metal strip with joint compound. Mix joint compound (powder) in accordance with manufacturer's written instructions.
 - .2 Prefill "V" grooves of rounded edges with special setting type joint compound using a 127mm to 150mm (5" to 6") joint finishing knife. Finish flush with tapered surface ready for tape reinforcing application. Allow prefill material to dry thoroughly before application of embedding compound and tape.
 - .3 Apply joint compound in thin uniform layer. Embed reinforcing tape accurately centred on joint and securely pressed in, leaving sufficient compound under tape to provide proper bond. Immediately apply skim coat over tape application. Allow to dry thoroughly before application of next coat.
 - .4 Apply fill coat finishing the tapered depression flush with board surfaces. Allow to dry thoroughly before application of finish coat.
 - .5 Apply finish coat extending slightly beyond the filler coat and feathered out onto the board surface. Do not apply finish coat to gypsum board scheduled to be sprayed with acoustic surfacing finish. Sand between coats and following the finishing coat, where necessary, and leave surface smooth and ready for painting.
 - .6 Finish screw depressions with filler material and finish coat as specified above. Joint and depression finish shall in no case protrude beyond the plane of the board surface.
 - .7 Furnish corner beads and metal trim flush with board surface using filler and finishing coats feathered out approximately 50mm (2") and 100mm (4") respectively onto the board surface.
 - .8 Provide metal casing beads at exposed edges, at junctions of gypsum/cement board with dissimilar material, at control joints and at junction with columns. Casing beads are required at perimeter of gypsum/cement wallboard ceilings and soffits. Fasten with screws at 305mm (12") O.C. along entire length.
 - .9 Finish gypsum board to receive a Level 4 finish, unless indicated on the Drawings as a Level 5 finish.

3.11 REPAIRS

- .1 After taping and finishing has completed, and before decoration, repair all damaged and defective work, including non-decorated surfaces.
- .2 Patch holes or openings 13mm (1/2") or less in diameter, or equivalent size, with a setting type finishing compound or patching plaster.
- .3 Repair holes or openings over 13mm (1/2"), or equivalent size, with 16mm (5/8") thick gypsum wallboard secured in such a manner as to provide solid substrate equivalent to undamaged surface.
- .4 Tape and refinish scratched, abraded or damaged finished surfaces including cracks and joints in non-decorated surface to provide smoke tight construction, fire protection equivalent to the fire rated construction and STC equivalent to the sound rated construction.

3.12 PROTECTION

- .1 Protect installed products from damage during remainder of construction period.
- .2 Remove and replace panels that are damaged.

END OF SECTION

1 General

1.1 SUMMARY

- .1 This Section includes requirements for supply and installation of ceilings consisting of the following, complete with exposed suspension system and trim:
 - .1 Acoustical tiles for interior ceilings.
 - .2 Fully concealed, direct-hung, suspension systems.

1.2 REFERENCE STANDARDS

- .1 The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- .2 All reference amendments adopted prior to the bid closing date of this Project shall be applicable to this Project.
- .3 All materials, installation and workmanship shall comply with all applicable requirements and standards.
- .4 American Society for Testing and Materials (ASTM):
 - .1 ASTM C635/C635M, Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings
 - .2 ASTM E1264, Standard Classification for Acoustical Ceiling Products
- .5 Underwriters Laboratories of Canada (ULC):
 - .1 CAN/ULC S102, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate layout and installation of acoustic tile ceiling and suspension system with other construction that penetrates ceilings or is supported by them including; but not limited to, light fixtures, HVAC equipment, fire suppression system, and partition assemblies, and as follows:
 - .1 Schedule and coordinate installation of ceiling to occur after completion of overhead mechanical and electrical work.
 - .2 Schedule and coordinate ceiling installation with mechanical and electrical trades building in components into ceiling finish panels.
- .2 Pre-Installation Conference: Conduct conference at Project site in accordance with requirements of Division 01 to discuss coordination issues with Contractor, Subcontractor and Consultant present.

1.4 SUBMITTALS

- .1 Provide submittals in accordance with Division 01.
- .2 Action Submittals: Provide the following submittals before starting any work of this Section:
 - .1 Product Data: Submit product data for each type of product specified.
 - .2 Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling mounted items indicating the following:
 - .1 Ceiling suspension system members.
 - .2 Method of attaching suspension system hangers to building structure.

- .3 Ceiling mounted items including light fixtures; air outlets and inlets; speakers; sprinklers; and special mouldings at walls, column penetrations, and other junctures of acoustic ceilings with adjoining construction.
- .3 Samples for Initial Selection: Manufacturer's colour charts consisting of sections of acoustic panels, suspension systems, and trim showing the full range of colours, textures, and patterns available for each type of ceiling assembly indicated.
- .4 Samples for Verification: Full size units of each type of ceiling assembly indicated; in sets for each colour, texture, and pattern specified, showing the full range of variations expected in these characteristics:
 - .1 150mm (6") square samples of each acoustic panel type, pattern, and colour
 - .2 Set of 305mm (12") long samples of exposed suspension system members, including trim, for each colour and system type required.
- .5 Maintenance and Materials:
 - .1 Provide five percent (5%) of each type of acoustic ceiling panels and two percent (2%) of each suspension system and trim for future repairs. Identify cartons and place where directed by the Owner.
 - .2 Maintenance materials shall be of same production run as installed materials.

1.5 INFORMATIONAL SUBMITTALS

- .1 Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - .1 Ceiling suspension-system members.
 - .2 Structural members to which suspension systems will be attached.
 - .3 Method of attaching hangers to building structure.
 - .4 Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
 - .5 Size and location of initial access modules for acoustical tile.
 - .6 Items penetrating finished ceiling and ceiling-mounted items including the following:
 - .1 Lighting fixtures.
 - .2 Diffusers.
 - .3 Grilles.
 - .4 Speakers.
 - .5 Sprinklers.
 - .6 Access panels.
 - .7 Perimeter moldings.
 - .7 Show operation of hinged and sliding components adjacent to acoustical tiles.
 - .8 Minimum Drawing Scale: $\frac{1}{4}" = 1'$ (1:48).

1.6 QUALITY ASSURANCE

- .1 The Contractor executing work of this Section shall have a minimum of five (5) years continuous experience in successful installation of work of type and quality shown and specified. Submit proof of experience upon Consultant's request.
- .2 Single-Source Responsibility: Provide acoustic ceilings and grid components by a single manufacturer to ensure compatibility.
- .3 Letter of Certification:
 - .1 Contractor together with manufacturer, shall submit a written confirmation, signed by manufacturer's registered professional Engineer, stating that the suspended ceiling system will provide adequate support for electrical fixtures.

1.7 DELIVERY, STORAGE, HANDLING AND PROTECTION

- .1 Coordinate deliveries to comply with construction schedule and arrange ahead for off-the-ground, under cover storage location. Do not load any area beyond the design limits.
- .2 Materials shall be carefully checked, unloaded, stored and handled to prevent damage. Protect materials with suitable non-staining waterproof coverings.
- .3 Store material in original, undamaged containers or wrappings with manufacturer's seals and labels intact.

1.8 SITE CONDITIONS

- .1 Ambient Conditions: Install acoustic unit ceilings only when building is enclosed, has sufficient heat, when overhead mechanical and electrical work is complete, and dust and moisture producing activities are complete; maintain uniform temperatures and relative humidity within range recommended by material manufacturer from the time of installation until Substantial Performance for the project; make adjustments to temperature and humidity gradually within tolerances indicated by manufacturer.

1.9 WARRANTY

- .1 Acoustical Panel: Submit manufacturers standard ten (10) year written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to the following:
 - .1 Panels: Sagging and warping.
 - .2 Grid System: Rusting and manufacturer's defects.

2 Products

2.1 MANUFACTURERS

- .1 Acceptable Materials Manufacturers: Subject to compliance with requirements specified in this Section, manufacturers offering products that may be incorporated into the Work include the following:
 - .1 Armstrong World Industries, Inc.
 - .2 Chicago Metallic
 - .3 CertainTeed
 - .4 CGC Interiors, a USG Company

2.2 DESIGN CRITERIA

- .1 Superimposed Loads: Determine superimposed loads applied to suspension systems by components of the building and verify that adequate hangers are installed to support additional loads in conjunction with normal loads of the ceiling system, and as follows:
 - .1 Maximum Deflection: Limit deflection to L/360 in accordance with ASTM C635 deflection test.

2.3 MATERIALS

- .1 Acoustic Panels (ACT-1): Provide manufacturer's standard panels of configuration indicated in accordance with ASTM E1264 classifications as designated by the nominal values for types, patterns, acoustic ratings, and light reflectance class listed in this Section; with flame spread rating of 25 or less and smoke developed rating of 50 or less when tested in accordance with CAN/ULC S102 and as follows:
 - .1 Physical Properties: Type: A; Form: A1.2; Pattern: E; Fire Class: A.
 - .2 Dimensions: 610mm x 1220mm x 16mm (24" x 48" x 5/8").
 - .3 Edge Profile: 15/16 Square Lay-In Edge.
 - .4 Colour: White.
 - .5 Acoustic and Visual Performance (Minimum Nominal):
 - .1 Noise Reduction Coefficient (NRC): 0.55
 - .2 Ceiling Attenuation Class (CAC): 35
 - .3 Light Reflectance: 0.80
 - .6 Basis of Design Materials: As indicated in the Finish Material Specifications Legend on Drawing A2.04
- .2 Metal Suspension System (CA1): Manufacturer's standard direct hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C635 requirements and as supplied by same materials supplier as acoustic panels for intermediate duty, exposed tee bar and as follows:
 - .1 Tee Bar Grid Face Width: 24mm (15/16").
 - .2 Module: Sized as appropriate to acoustic panel size.
 - .3 Hangers, Braces and Ties: Nominal 14 ga. diameter steel wire, galvanized.
 - .4 Exposed Finish: Manufacturer's standard satin, white finish.
 - .5 Corrosion Resistance: Hot-dip galvanized or stainless steel components.
 - .6 Metal Suspension System (for ACT-1):
 - .1 Tee Bar Grid Face Width: 24mm (15/16").
 - .2 Basis of Design Material: 15/16" Prelude XL by Armstrong World Industries, Inc.
- .3 Tie Wire: Manufacturers standard 1.2mm (3/64") galvanized soft annealed steel wire.
- .4 Accessories:
 - .1 Miscellaneous 'U' clips, splicers, screws, anchors, nails, wire, hold-down clips, and the like, for complete installation.

3 Execution

3.1 INSPECTION

- .1 Examine the work upon which the work of this Section depends and report any defects to the Consultant. Do not commence installation until such time as all wet trades have been completed. Commencement of work implies acceptance of surface and conditions.
- .2 Ensure that a uniform minimum temperature of 15 deg. C and humidity of 20 - 40% before, during and after installation is maintained.

3.2 INSTALLATION

- .1 Cooperate with mechanical, electrical, drywall and other trades to accommodate fixtures, and the like. Examine mechanical and electrical drawings to establish hanger layout and ensure that ceiling hanger layout and furring are designed to span ducts, and the like, where required. Supply all hangers, including inserts for hangers and supplementary framing members as required for complete installation.
- .2 Prior to installation of acoustic panels notify the Consultant for inspection and approval of suspension system.
- .3 All installations shall be by skilled mechanics and in strict accordance with system manufacturer's printed directions to produce first-class, flush finished surface in true plane, free from drooping, warped, soil or damaged board or grid.
- .4 Accurately space and level all runners and securely wire to main runner channels or hangers as applicable. Join cross tees to main runners by interlocking ends through preformed slots in web of main steel tees. Where joints occur in main tees, they shall be butted together flush and secured with interlocking tack. Tee-to-tee intersections and tee-to-edge mould connections shall be fitted tight, flush and parallel to ceiling plane without twists or gaps. Provide continuous runners each side of light fixtures and frame around all openings.
- .5 Provide all additional supports, hangers and steel trapeze channel framing required to support fixtures located under mechanical ducts.
- .6 Space hangers to support grid on 1220mm (48") centres each way securely fastened to structure. Hangers shall not, under any circumstances, be secure to pipes, ducts or any electrical or mechanical items.
- .7 Frame around recessed fixtures, grilles and openings with an allowance for movement.
- .8 Grid systems shall be accurately spaced, square, true in line at correct elevations and level with water or laser beam to a tolerance of 3mm in 3048mm (1/8" in 10'). Grid shall be symmetrically laid so that border panels are not less than half size. Lay out panels square with walls. Obtain Consultant's approval of layout before proceeding.
- .9 The suspension system shall support the ceiling assembly with a maximum deflection of 1/360 of the span.
- .10 Install ceiling suspension system in accordance with ASTM C636 installation procedures.
- .11 Anchors, where required, shall be self-drilling type, installed by means of an electrically powered drill specifically designed for this purpose. The anchor manufacturer shall evaluate the specific job conditions and advise in writing regarding anchor sizes necessary. The safe working load shall not exceed 25% of the manufacturer's stated average test loads for the anchor.
- .12 Receive instruction from the anchor manufacturer regarding correct usage and comply with these requirements.
- .13 "Ramset" or similar powder actuated fastening devices WILL NOT BE PERMITTED.
- .14 Attach hangers to inserts and anchors where structural concrete occurs.

- .15 Hangers shall be looped through the eye bolts of inserts and anchors and around steel joists, securely wire tie the loop of the hanger to the hanger in each case with two strands of tie wire for permanent securement.
- .16 Do not attach hangers to or through steel deck. Attach hangers to steel joist. Where joist spacing is not suitable and where ducts and other equipment interfere, provide cross channels between joists and securely wire tie in position for support of hangers.
- .17 Hangers shall be plumb and not pressed against ducts, pipes or conduits. Splayed hangers are not acceptable. Arrange hangers to cause as little interference as possible to ducts and piping.
- .18 Form hangers tightly and sharply around main runner channels to prevent movement or rotation of the channel within the loop. Securely saddle tie channel to hanger and return loop leg of hanger to the hanger with two strands of tie wire in each case.
- .19 Kinks or bends shall not be made in hangers as a means of levelling main runner channels.
- .20 Assemble ceiling system in accordance with drawings. Install ceilings centered on room axis unless noted otherwise. Lay patterned ceiling panels in one direction with pattern parallel to the shortest room dimension.
- .21 Cooperate with the mechanical contractor and cut ceiling panels as required to accommodate air handling diffuser throughout the work.
- .22 Place panels on flanges of tees. Finish panels to all vertical surfaces with edge mouldings.
- .23 Provide hold-down clips at acoustical system to hold units tight to grid system within 6096mm (20') of an exterior door and an operable window.
- .24 Provide special cut furring members and access openings of required size to all locations where access to ceiling space is required.
- .25 Install acoustic ceiling panel types as indicated on drawings and schedules.

3.3 CLEANING

- .1 Thoroughly clean all acoustic ceiling surfaces upon completion of the installation.
- .2 Promptly as the work proceeds and on completion, remove all surplus materials and debris resulting from the work of this Section.

END OF SECTION

1 General

1.1 SUMMARY

- .1 This Section includes, but is not limited to, the following:
 - .1 Resilient accessories:
 - .1 Resilient Wall Base.
 - .2 Resilient Stair Treads and Risers
 - .3 Resilient Accessories for Transition Strips.

1.2 REFERENCE STANDARDS

- .1 The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- .2 All reference amendments adopted prior to the bid closing date of this Project shall be applicable to this Project.
- .3 All materials, installation and workmanship shall comply with all applicable requirements and standards
- .4 American Society for Testing and Materials (ASTM):
 - .1 ASTM F1861, Standard Specification for Resilient Wall Base
 - .2 ASTM F1869, Standard Test Method for Measuring Moisture Vapour Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
 - .3 ASTM F2169, Standard Specification for Resilient Stair Treads

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Close spaces to traffic during installation and until time period after installation recommended in writing by manufacturer; install accessories after other finishing operations, including painting and ceiling construction have been completed.
- .2 Pre-Installation Conference: Conduct conference at Project site to verify project requirements, substrate conditions, patterns and layouts, coordination with other Sections affected by work of this Section, manufacturer's installation instructions and manufacturer's warranty requirements.

1.4 SUBMITTALS

- .1 Provide submittals in accordance with Division 01.
- .2 Action Submittals:
 - .1 Product Data: Submit one copy of product data for each type of product specified.
 - .2 Shop Drawings: Submit shop drawings indicating:
 - .1 Location of seams and edges
 - .2 Location of columns, doorways, enclosing partitions, built-in furniture, cabinets, and cut-out locations
 - .3 Type and style of resilient transition strip used between adjacent flooring types
 - .3 Samples for Selection: Submit manufacturer's colour charts and samples for initial selection consisting of full range of colours and patterns available for each type of product indicated.

- .4 Samples for Verification:
 - .1 Submit samples of each different specified product for verification of colour and pattern in manufacturer's standard size, but not less than 150mm (6") long for resilient accessories.
- .3 Maintenance Data and Operating Instructions:
 - .1 Operation and Maintenance Data: Submit manufacturer's written instructions for maintenance and cleaning procedures, include list of manufacturers recommended cleaning and maintenance products, and name of original installer and contact information in accordance with Division 01.
- .4 Safety Data Sheets:
 - .1 Submit WHMIS safety data sheets for incorporation into the Operation and Maintenance Manual. Keep one copy of WHMIS safety data sheets on site for reference by workers.
- .5 Maintenance Materials:
 - .1 Provide 9144mm (30') lineal feet coil stock of each colour of resilient accessories specified, boxed and labelled.
 - .2 Store maintenance materials on the premises as directed by the Owner.

1.5 QUALITY ASSURANCE

- .1 Contractor executing work of this Section shall have a minimum of five (5) years continuous experience in successful installation of work of type and quality shown and specified. Submit proof of experience upon Consultant's request.

1.6 DELIVERY, STORAGE, HANDLING AND PROTECTION

- .1 Coordinate deliveries to comply with Construction Schedule and arrange ahead for off-the-ground, under cover storage location. Do not load any area beyond the design limits.
- .2 Materials shall be carefully checked, unloaded, stored and handled to prevent damage. Protect materials with suitable non-staining waterproof coverings.
- .3 Store material in original, undamaged containers or wrappings with manufacturer's seals and labels intact.
- .4 Restrict traffic by other trades during installation.

1.7 ENVIRONMENTAL CONDITIONS

- .1 Temperature of room, floor surface and materials shall not be less than 21 deg C for forty-eight (48) hours before, during and for forty-eight (48) hours after installation. Concrete floors shall be aged for a minimum of twenty-eight (28) days and shall be dry before application of the resilient accessories.
- .2 Avoid exposure to high humidity, cold drafts and abrupt temperature changes.

1.8 WARRANTY

- .1 Warrant the work of this Section against defects in materials and workmanship in accordance with the General Conditions but for an extended period of five (5) years and agree to repair or replace faulty materials or work which become evident during warranty period without cost to the Owner.
- .2 Defects shall include, but not limited to, bond failure, and extensive colour fading.

2 Products

2.1 RESILIENT ACCESSORIES

- .1 Resilient Wall Base (BASE-1): Smooth, buffed exposed face and ribbed or grooved bonding surface supplied in maximum practical length, with pre-moulded end stops and external corners to match base, conforming to ASTM F1861 and as follows:
 - .1 Type: TV – Thermoplastic Vinyl.
 - .2 Group: 1 – Homogeneous/Solid.
 - .3 Style: Coved with toe.
 - .4 Height: 100mm (4")
 - .5 Thickness: 3mm (1/8")
 - .6 Length: Manufacturers standard maximum length.
 - .7 Colour, Model and Manufacturer: As indicated in the Finish Material Specifications Legend on Drawing A2.04.
- .2 Resilient Transition and Edge Strips (TS):
 - .1 Extruded vinyl shapes meeting or exceeding ADA Recommendations for change of level transitions for transition between floors finishes having different levels.
 - .2 Transition Strip (TS1): Carpet Tile to Resilient Flooring Transition.
 - .1 Basis of Design Material: Transition Strip Model CTA-XX-A by Tarkett Commercial, or approved equivalent.
 - .2 Colour: As selected by the Consultant from the Manufacturer's standard product line.
 - .3 Transition Strip (TS2): Ceramic Tile to Carpet Tile Flooring Transition.
 - .1 Basis of Design Material: Transition Strip Model CTA-XX-L by Tarkett Commercial, or approved equivalent.
 - .2 Colour: As selected by the Consultant from the Manufacturer's standard product line.
 - .4 Transition Strip (TS3): Carpet Tile to Concrete Slab Transition.
 - .1 Basis of Design Material: Transition Strip Model CTA-XX-J by Tarkett Commercial, or approved equivalent.
 - .2 Colour: As selected by the Consultant from the Manufacturer's standard product line.
- .3 Resilient Stair Treads and Risers (STR-1):
 - .1 Provide stair treads and risers from single manufacturer to ensure compatibility between treads, risers and contrasting edge tape.
 - .2 Rubber stair treads manufactured from a homogeneous composition of 100% synthetic rubber, high quality additives, and colorants to meet the performance requirements of ASTM F2169 Standard Specification for Resilient Stair Treads, Type TS, Class 1 and 2, Group 1 and 2.
 - .3 Stair Nosing Edge Contrasting Tape Insert: 2" wide strip of contrasting colour to comply with A.D.A. and Visually Impaired. Standard formulation exceeds ASTM E 648 Class 1 Flammability requirements.
 - .4 0.080" (2mm) thick vinyl riser, compatible with square nose edge of stair treads, as recommended by stair tread manufacturer.

- .5 Basis of Design Material: Angle Fit Rubber Stair Treads by Tarkett Commercial, or approved equivalent.
- .4 Fillers and Primers:
 - .1 Types and brands approved, acceptable to flooring material and resilient accessories for the applicable conditions. Use non-shrinking latex compound.

3 Execution

3.1 EXAMINATION

- .1 Examine substrates, areas, and conditions affecting work are in accordance with manufacturer's requirements, and as follows:
 - .1 Verify that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that could interfere with resilient accessories installation.

3.2 PREPARATION

- .1 Comply with manufacturer's written installation instructions for preparing substrates indicated to receive resilient accessories.
- .2 Broom and vacuum clean substrates immediately before installing materials indicated in this Section.

3.3 INSTALLATION

- .1 Comply with manufacturer's written installation instructions.
- .2 Layout resilient base as follows:
 - .1 Fit joints tight and vertical.
 - .2 Joints along one plane shall be at minimum 6096mm (20') spacing, at inconspicuous locations.
 - .3 Mitre internal corners, use pre-moulded sections for external corners and exposed ends.
 - .4 Install base on solid backing. Adhere tightly to wall and floor surfaces.
 - .5 Scribe and fit to door frames and other obstructions.
 - .6 Install outside corners prior to installation of straight sections.
 - .7 Install straight and level to variation of plus or minus 3mm over 3m (1/8" over 10') straight edge.
 - .8 Do not stretch base during installation.
 - .9 Shave back of base where necessary to produce snug fit to substrate.
- .3 Layout resilient accessories as follows:
 - .1 Install edge strips at unprotected and exposed edges where flooring terminates.
- .4 Installation of resilient stair treads and risers:
 - .1 Apply flooring and tread adhesive, using v-notched trowel at rate recommended by tread manufacturer.
 - .2 Install riser, and stair treads in adhesive and apply roller pressure to ensure full contact with adhesive.
 - .3 Remove excess adhesive.
 - .4 Apply contrasting edge tape to stair treads and protect from foot traffic for 24 hours.

- .5 Each type of material used shall be from one manufacturer throughout the work and material in each area shall be of same production run.
- .6 Remove and replace loose, damaged and defective materials where required and as directed by Consultant.

3.4 CLEANING AND PROTECTION

- .1 Cleaning and finishing of resilient accessories shall be performed in accordance with the manufacturer's instructions and recommendations.
- .2 Work shall be handed over to the Owner free of blemishes.

END OF SECTION

1 General

1.1 SUMMARY

- .1 Provide labour, materials, tools and other equipment, services and supervision required to complete interior painting work.
- .2 Surface preparation for this section will be limited to priming and back-priming, and specific pre-treatments noted in this section or as specified in the Master Painters Institute (MPI) Painting Specification Manual.

1.2 RELATED REQUIREMENTS

- .1 Other sections of the specification requiring painting refer to this section. Coordinate requirements of referencing sections.

1.3 REFERENCE STANDARDS

- .1 The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- .2 All reference amendments adopted prior to the bid closing date of this Project shall be applicable to this Project.
- .3 All materials, installation and workmanship shall comply with all applicable requirements and standards.
- .4 Applicable Standards:
 - .1 Environmental Choice Paints and Surface Coatings, Low VOC Product Listings Program (ECP):
 - .1 Paints and Surface Coatings, Low VOC Product Listings
 - .2 The Master Painters Institute (MPI):
 - .1 New Surfaces: Architectural Painting Specification Manual.
 - .2 Existing Surfaces: Maintenance Painting Specification Manual.
 - .3 The Society for Protective Coatings (SSPC):
 - .1 Coating Materials Guidelines
 - .2 Surface Preparation Guidelines
 - .3 Application, Inspection and Quality Control Guidelines

1.4 DEFINITIONS

- .1 Gloss Levels: Standard coating terms defined by MPI Manual apply to products of this Section as follows, unless otherwise indicated on the Drawings:
 - .1 G1: Matte or Flat: Lustreless or matte finish with a gloss range below 10 when measured at 85° to meter and 0 to 5 when measured at 60°.
 - .2 G2: Velvet: Matte to low sheen finish with a gloss range of 10 to 35 when measured at 85° to meter and 0 to 10 when measured at 60°.
 - .3 G3: Eggshell: Low sheen finish with a gloss range of 10 to 35 when measured at 85° to meter and 10 to 25 when measured at 60°.
 - .4 G4: Satin: Low to medium sheen with a gloss range of minimum 35 when measured at 85° to meter and 20 to 35 when measured at 60°.
 - .5 G5: Semi-Gloss: Medium sheen finish with a gloss range of 35 to 70 when measured at 60° to meter.

- .6 G6: Gloss: High sheen finish with a gloss range of 70 to 85 when measured at 60° to meter.
- .7 G7: High Gloss: Reflective sheen having a gloss range in excess of 85 when measured at 60° to meter.
- .2 Gloss Values: Generally, provide paints and coatings having the following sheens when installed on the following substrates:
 - .1 Walls: Eggshell (G3).
 - .2 Trim and Doors: Satin (G4).
 - .3 Ceilings: Flat (G1).

1.5 SUBMITTALS

- .1 Provide required information in accordance with Division 01.
- .2 Action Submittals: Provide the following submittals before starting any work of this Section:
 - .1 Product Data: Submit list of all painting materials used for the Work to the Consultant for review prior to ordering materials for each paint system indicated, including block fillers and primers.
 - .1 Material List: An inclusive list of required coating materials indicating each material and cross reference specific coating, finish system, and application; identify each material by manufacturer's catalogue number and general classification.
 - .2 Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.
 - .2 Samples: Provide stepped samples, defining each separate coat, including block fillers and primers using representative colours required for the project; label each sample for location and application, and as follows:
 - .1 Drawdown Samples: Provide three (3) drawdown sample charts (cards) for each type, texture and colour of finish specified for verification purposes before ordering paint materials.
 - .3 Informational Submittals: Provide the following submittals when requested by the Consultant:
 - .1 Certification: Submit certification reports for paint products indicating that they meet or exceed low VOC and coloured base requirements listed in this Section.

1.6 PROJECT CLOSEOUT SUBMISSIONS

- .1 Operation and Maintenance Data: Submit copies of paint manufacturer's written maintenance information for inclusion in the operations manual in accordance with Division 01, including specific warning of any maintenance practice or materials that may damage or disfigure the finished Work.
- .2 Maintenance Materials: Deliver maintenance materials to Owner in quantities indicated and in accordance with Division 01, that match products installed; packaged with protective covering for storage, and identified with labels describing contents and building location and as follows:
 - .1 Paints and Coatings: Minimum of 4-4L containers of field colours and 4-1 L containers of each accent colour, and all remnants.

1.7 QUALITY ASSURANCE

- .1 Conform to the standards contained in the MPI Manual for interior work.
- .2 Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in service performance, and as follows:
 - .1 Have a minimum of five (5) years proven satisfactory experience and shall show proof before commencement of work that he will maintain a qualified crew of painters throughout the duration of the work.
 - .2 When requested provide a list of the last three comparable jobs including, name and location, specifying authority, start and completion dates and cost amount of the painting work.
 - .3 Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with trade regulations.
- .3 Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats and as follows:
 - .1 Use only paint manufacturers and products as listed under the Approved Products section of the MPI Manual Architectural Painting Specification Manual.

1.8 DELIVERY, STORAGE, AND HANDLING

- .1 Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 7 deg C (45 deg F).
 - .1 Maintain containers in clean condition, free of foreign materials and residue.
 - .2 Remove rags and waste from storage areas daily.

1.9 FIELD CONDITIONS

- .1 Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 10 and 35 deg C (50 and 95 deg F).
- .2 Maintain temperatures above 10 deg C for 24 hours before, during, and 24 hours after application.
- .3 Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 3 deg C (5 deg F) above the dew point; or to damp or wet surfaces.

1.10 WARRANTY

- .1 Provide upon completion of the work, a Warranty Certificate, in the name of the Owner, stating that the work of this section was performed in accordance with these specifications and the MPI manual (latest edition), and is warranted against defects in material or installation, for a period of two (2) years from Date of Substantial Performance.

2 Products

2.1 MANUFACTURERS

- .1 Subject to compliance with requirements, manufacturers that have attained the prerequisites for ecologically sustainable labelling mark on their products and may be incorporated into the Work include; but are not limited to, the following:
 - .1 Benjamin Moore and Co. Limited
 - .2 Sherwin-Williams LLC
 - .3 Dulux Paints (PPG)

2.2 PAINT, GENERAL

- .1 MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists".
- .2 Material Compatibility:
 - .1 Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - .2 For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- .3 VOC Content: For field applications, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
 - .1 Flat Paints and Coatings: 50 g/L.
 - .2 Nonflat Paints and Coatings: 50 g/L.
 - .3 Dry-Fog Coatings: 150 g/L.
 - .4 Primers, Sealers, and Undercoaters: 100 g/L.
 - .5 Rust-Preventive Coatings: 100 g/L.
 - .6 Zinc-Rich Industrial Maintenance Primers: 100 g/L.
 - .7 Pretreatment Wash Primers: 420 g/L.
 - .8 Shellacs, Clear: 730 g/L.
 - .9 Shellacs, Pigmented: 550 g/L.

2.3 EXTERIOR PRIMER AND PAINT SCHEDULE

- .1 Epoxy Primer:
 - .1 For use on ferrous metals, concrete and masonry substrates.
 - .2 Basis of Design Materials:
 - .1 100% Solids Epoxy Pre-Primer V155 by Benjamin Moore, or approved equivalent from Dulux Paints (PPG) or Sherwin-Williams LLC.
- .2 Acrylic Metal Primer:
 - .1 For use on non-ferrous metals.
 - .2 Basis of Design Materials:
 - .1 Corotech® V110 Acrylic Metal Primer by Benjamin Moore, or approved equivalent from Dulux Paints (PPG) or Sherwin-Williams LLC.
- .3 Topcoat - Pre-Catalyzed Waterborne Epoxy Paint:
 - .1 Low VOC, durable to allow scrubbing once cured with a high abrasion resistance.
 - .2 Resists water and common cleaning chemicals, and adheres to existing surfaces including existing paint, drywall, primed masonry and primed metal.
 - .3 Basis of Design Materials:
 - .1 Corotech High Performance Pre-Catalyzed Waterborne Epoxy by Benjamin Moore.
 - .2 Pro Industrial Pre-Catalyzed Waterbased Epoxy by Sherwin Williams.
 - .3 Pitt-Glaze Wb1 High-Performance Pre-Catalyzed Waterborne Epoxy by Dulux (PPG).

2.4 INTERIOR PRIMER AND PAINT SCHEDULE

- .1 Primer Schedule:
 - .1 Wood, and engineered wood products:
 - .1 Basis of Design Materials: Fresh Start Undercoater and Primer/Sealer (K032) by Benjamin Moore, or approved alternate by Dulux Paints (PPG) and Sherwin-Williams.
 - .2 Drywall:
 - .1 Basis of Design Materials: Ultra Spec 500 Interior Latex Primer (K534) by Benjamin Moore, or approved alternate by Dulux Paints (PPG) and Sherwin-Williams.
 - .3 Ferrous Metal (Steel and Iron):
 - .1 Basis of Design Materials: Ultra Spec HP Acrylic Metal Primer (FP04) by Benjamin Moore, or approved alternate by Dulux Paints (PPG) and Sherwin-Williams.
 - .4 Non-Ferrous Metal (Galvanized & Aluminum):
 - .1 All new metal surfaces must be thoroughly cleaned.
 - .1 Basis of Design Materials: Corotech Oil & Grease Emulsifier (V600) by Benjamin Moore, or approved alternate by Dulux Paints (PPG) and Sherwin-Williams.
 - .2 New shiny non-ferrous metal surfaces that will be subject to abrasion should be dulled with very fine sandpaper or a synthetic steel wool pad to promote adhesion.
 - .1 Basis of Design Materials: Ultra Spec HP Acrylic Metal Primer (FP04) by Benjamin Moore, or approved alternate by Dulux Paints (PPG) and Sherwin-Williams.
- .2 Topcoat - High-performance, One-Component Latex Paint:
 - .1 Specifically engineered for the toughest high traffic areas in busy commercial spaces.
 - .2 Characteristics:
 - .1 Vehicle: Proprietary Acrylic Copolymer.
 - .2 Pigment: Titanium Dioxide.
 - .3 Volume Solids: 41.2 ± 2%
 - .4 Spread Rate Per 3.79 L: 37.2 – 41.8 sq. m. (400 – 450 sq. ft.)
 - .5 Recommended Film Thickness:
 - .1 Wet: 3.6 – 4.0 mils.
 - .2 Dry: 1.5 – 1.7 mils.
 - .6 Dry Time @ 25 °C (77 °F) @ 50% RH
 - .1 To Touch: 1 hour.
 - .2 To Recoat: 2 – 3 hours.
 - .7 Surface Temperature During Application:
 - .1 Min: 10 °C (50 °F).
 - .2 Max: 32.2 °C (90 °F).

- .8 Storage Temperature:
 - .1 Min: 4.4 °C (40 °F).
 - .2 Max: 32.2 °C (90 °F).
- .9 VOC 48.4 g/L
- .3 Basis of Design Materials:
 - .1 Scuff-X by Benjamin Moore.
 - .2 Scuff Tuff Interior Waterbased Enamel by Sherwin Williams.
 - .3 Dulux Diamond Distinction by Dulux (PPG).
- .3 Paint Schedule (PT-1 and PT-2) Schedule:
 - .1 Colour, finish, gloss level and manufacturer as indicated in the Finish Material Specification Legend on Drawing A0.3.

3 Execution

3.1 EXAMINATION

- .1 Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- .2 Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - .1 Fiber-Cement Board: 12 percent.
 - .2 Wood: 15 percent.
 - .3 Portland Cement Plaster: 12 percent.
 - .4 Gypsum Board: 12 percent.
- .3 Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- .4 Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- .5 Proceed with coating application only after unsatisfactory conditions have been corrected.
 - .1 Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- .1 Comply with manufacturer's written instructions and recommendations in "MPI Painting Specification Manual" applicable to substrates and paint systems indicated.
- .2 Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - .1 After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- .3 Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - .1 Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

- .4 Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer, but not less than the following:
 - .1 Hand tool cleaning (SSPC-SP 2) or power tool cleaning (SSPC-SP 3).
- .5 Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- .6 Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.
- .7 Gypsum Wallboard: Repair all surfaces in gypsum wallboard with wallboard joint finishing compound or spackling compound, filled out flush and sanded smooth. Clean all surfaces and taped joints of dust, dirt and other contaminants and be sure they are thoroughly dry before applying paint.
- .8 Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.
- .9 Mix and prepare paint materials according to manufacturer's written instructions.
 - .1 Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 - .2 Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 - .3 Use only thinners approved by paint manufacturer and only within recommended limits.

3.3 APPLICATION

- .1 Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
 - .1 Use applicators and techniques suited for paint and substrate indicated.
 - .2 Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - .3 Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - .4 Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - .5 Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- .2 Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match colour of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- .3 Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
 - .1 The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer.

- .2 If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
 - .1 Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
 - .2 Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
 - .3 If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
- .3 Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.
- .4 Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
 - .1 Spray Equipment (Preferred Method): Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.
 - .1 Tip range between .015 and .019. Total fluid output pressure at tip should not be less than 2400 psi.
 - .2 Recommended Tip: Fluid Tip E.
 - .2 Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
 - .3 Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
- .5 Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and colour breaks.
- .6 Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - .1 Paint the following work where exposed in equipment rooms and where exposed in occupied spaces:
 - .1 Equipment, including panelboards.
 - .2 Uninsulated metal piping.
 - .3 Uninsulated plastic piping.
 - .4 Pipe hangers and supports.
 - .5 Metal conduit.
 - .6 Plastic conduit.
 - .7 Tanks that do not have factory-applied final finishes.
 - .8 Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - .9 Other items as directed by Consultant.

- .7 Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

- .1 Colour: Flat (gloss level 1), nonspecular, black.

3.4 FIELD QUALITY CONTROL

- .1 Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 - .1 Contractor shall touch up and restore painted surfaces damaged by testing.
 - .2 If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- .1 At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- .2 After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- .3 Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Consultant, and leave in an undamaged condition.
- .4 At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

- .1 Steel and Ferrous Metal Substrates:
 - .1 Primer: 100% solids epoxy primer.
 - .2 Topcoat: High-Performance Waterborne Epoxy System.
- .2 Galvanized and Non-Ferrous Metal Substrates:
 - .1 Prime Coat: Acrylic Metal Primer.
 - .2 Topcoat: High-Performance Waterborne Epoxy System.
- .3 Wood Substrates: Wood trim, doors and frames, paneling and casework:
 - .1 Prime Coat: Acrylic Primer Sealer.
 - .2 Topcoat: High-Performance Waterborne Epoxy System.
- .4 Gypsum Board Substrates:
 - .1 Prime Coat: Acrylic Primer Sealer.
 - .2 Topcoat: High-Performance Waterborne Epoxy System.

END OF SECTION

1 General

1.1 SUMMARY

.1 Section Includes:

- .1 Refinishing of existing metal locker bodies, shelving and bases, as indicated on the Drawings by electrostatic process.

1.2 QUALITY ASSURANCE

- .1 Applicator shall be trained and approved by the manufacturer, having a minimum of five (5) years successful experience preparing and coating over prefinished metal of work of type and quality shown and specified herein. Submit proof of experience upon Consultant's request.
- .2 Materials and workmanship shall comply with the recommendations and directions of the manufacturer. Verify dry film thickness at random locations chosen by Consultant and in the presence of the Consultant.

1.3 SUBMITTALS

- .1 Submit submittals in accordance with Division 01.
- .2 Samples:
 - .1 Submit three, 305mm (12") long samples of prefinished (to match existing) metal locker body coated with the specified electrostatic coating for colour and gloss approval, and for adhesion and abrasion testing.
- .3 Safety Data Sheets:
 - .1 Submit WHMIS safety data sheets for inclusion in maintenance and data manual specified in Division 01. Keep a copy of WHMIS data sheets on the site for reference by workers.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Store materials in original undamaged condition in warm, dry location with manufacturer's labels and seals intact.
- .2 Handle and store in accordance with manufacturer's and supplier's directions.

1.5 ENVIRONMENTAL REQUIREMENTS

- .1 Maintain surface and ambient conditions in accordance with the requirements of the coating manufacturer's instructions immediately prior to and during application and for the period of curing after application.
- .2 Adhere to manufacturer's instructions concerning conditions which prohibit coating application.

2 Products

2.1 MATERIALS

- .1 Direct-to-Metal (DTM) mastic urethane is a two-component urethane designed for protecting metal surfaces, providing excellent gloss and colour retention as well as superior abrasion, chemical, and solvent resistance.
 - .1 Characteristics:
 - .1 Volume Solids: 70%
 - .2 Pigment Type: Titanium Dioxide.
 - .3 Dry Time: Touch: 2 hrs; Recoat: 8 hrs; Full Cure: 72 hrs.

- .4 Gloss/Sheen: Gloss 85-95 @ 60 deg.
- .5 Recommended Film Thickness: Dry: 3.5-4.5 mils; Wet: 5.1-6.5 mils.
- .2 Basis of Design Materials: DTM Mastic Urethane by Benjamin Moore, or Durethane DTM 95-3300 Series by PPG.
- .3 Colour: As selected by the Consultant from the manufacturer's full product line.

3 Execution

3.1 PREPARATION

- .1 Remove existing aluminum entrance doors and hardware in sequence to maintain security of building for applying electrostatic coating to doors in shop. Protect existing doors from damage during delivery to and from shop.
- .2 Thoroughly clean and prepare the surface for adhesion of primer to substrate before applying coating to ensure proper adhesion of the coating. Ensure surfaces are dry, clean, smooth and free from dust, dirt, grease, oil, loose crystals and extraneous matter.
- .3 Carefully mask out and protect adjacent surfaces and construction not indicated and/or scheduled to receive work of this Section from overspray and dripping.

3.2 APPLICATION

- .1 Apply electrostatic coating to existing aluminum entrance doors in shop and field apply electrostatic coating to other existing aluminum surfaces as indicated on drawings.
- .2 Apply coating by electrostatic process in strict accordance with manufacturer's instructions.
- .3 Ensure application of each coat extends into all corners, pinholes and other difficult areas and ensure full coverage at outside edges and corners.
- .4 Provide a smooth finish, free of laps, sags, runs, pin holes, crawls and skips. Back lap all edges to achieve full coverage.
- .5 Use unadulterated coating except where specified otherwise in manufacturer's printed instructions. Mix coating thoroughly in accordance with manufacturer's instructions and maintain sufficient agitation during application to prevent separation of ingredients.
- .6 Before applying the succeeding coat, allow each coat to dry for at least the period recommended by the coating manufacturer for overcoating and longer if conditions are such as to retard curing and drying.
- .7 Reinstall existing aluminum entrance doors with existing hardware in proper locations. Adjust and lubricate doors and hardware as required for smooth efficient operation.
- .8 Replace and/or refinish all damaged surfaces and construction caused by the work of this Section.

END OF SECTION

1 General

1.1 SUMMARY

- .1 This Section includes requirements for supply and installation of commercial metal lockers and accessories required for a complete and functioning installation.

1.2 REFERENCE STANDARDS

- .1 American Society for Testing and Materials (ASTM) A1008 - Standard Specification for Steel Sheet, Carbon, Cold-Rolled, Commercial Quality.
- .2 ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- .3 ADAAG - American with Disabilities Act, Accessibility Guidelines.
- .4 ANSI A117.1 - Accessible and Usable Buildings and Facilities

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Division 01.
- .2 Action Submittals: Provide the following submittals before starting work of this section:
 - .1 Product Data: Submit product data from manufacturer indicating proposed components and installation requirements.
 - .2 Shop Drawings: Show and describe in detail materials, finishes, dimensions, details of connections and fastenings elevations, plans, sections, metal thicknesses, hardware and any other pertinent information.
 - .3 Samples:
 - .1 Submit duplicate 305mm x 305mm samples of panel showing finish on both sides, two finished edges and core construction.
 - .2 Submit duplicate representative samples of each hardware item, including brackets, fastenings and trim.
 - .4 Submit necessary templates and instructions where supports or anchors have to be built-in by others.
- .3 Provide maintenance data for maintenance of metal finishes work for incorporation into Maintenance Manual.

1.4 ADMINISTRATION REQUIREMENTS

- .1 Coordination: Coordinate site dimensions affecting work of other Sections and provide data, dimensions and components, anchors and assemblies installed by other Sections in sufficient time for installation of products specified in this Section.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements: Deliver, handle and store prefabricated units in accordance with manufacturer's directions.
- .2 Store units at site on raised wood pallets protected from the elements and corrosive materials, and Do not remove from crates or other protective covering until ready for installation.

2 Products

2.1 APPROVED PRODUCTS AND MANUFACTURERS

- .1 Basis-of-Design Products: Products named in this Section were used as the basis-of-design for the project; additional manufacturers offering similar products may be incorporated into the work of this Section provided they meet the performance requirements established by the named products and provided they submit requests for substitution in accordance with Division 01.
- .2 Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include; but are not limited to, the following:
 - .1 ASI Storage Solutions Inc.
 - .2 Shanahan's Building Products
 - .3 GSS (General Storage Systems)
 - .4 Hadrian Manufacturing Inc.
- .3 Commercial Lockers:
 - .1 Size: 457mm (18") wide x 457mm (18") deep x 1829mm (72") high.
 - .2 Construction:
 - .1 Doors: One-piece double wall envelope construction, complete with honeycomb core, welded construction, complete with recessed handle box.
 - .1 Outer Panel: 16 gauge thick.
 - .2 Inner Panel: 20 gauge thick.
 - .2 Frame: Minimum 16 gauge steel channel, welded construction complete with 11 gauge padlock hasp.
 - .3 Body: Minimum gauge requirements:
 - .1 Panels: 20 gauge.
 - .2 Shelves: 16 gauge.
 - .3 Fillers: 16 gauge.
 - .4 Bottoms: 16 gauge.
 - .5 End Panels: 16 gauge.
 - .6 Bolt Spacing: 229mm o.c. maximum spacing.
 - .4 Handle: Recessed lock pocket, one piece construction, 20 gauge.
 - .5 Tops: Sloped, continuous overtop of a bank of lockers, 20 gauge.
 - .6 Hinge: Continuous, heavy-duty full length 16 gauge piano hinge riveted to both door and frame.
 - .3 Configuration: Single tier.
 - .4 Basis of Design Product: SLM Deluxe Series Locker by Shanahan's Building Products.
 - .1 Acceptable alternate models and manufacturers:
 - .1 Tradition Plus Collection by ASI Storage Solutions Inc.
 - .2 Excalibur Locker by General Storage Systems Ltd.
 - .3 Atlas Institutional Lockers by Anthony Steel Manufacturing.

2.2 MATERIALS

- .1 Sheet Steel: Cold rolled carbon steel, commercial quality stretcher levelled or temper rolled to stretcher levelled standard of flatness free from surface imperfections and conforming to ASTM A366/A336M-91.
- .2 Locker Paint: Electrostatically applied, thermo-setting, high performance primer and powder coating.
- .3 Welding Materials: Conforming to CSA W59.
- .4 Fasteners: Non-corrosive type.
- .5 Steel Plate: Conforming to CAN/CSA-G40.20/G40.21, Grade 44W.
- .6 Chromeplating: Chrome plating on steel by "electroplating" method, with plating sequence as follows; 0.00035" thickness of Copper, followed by 0.00039" thickness of Nickel, followed by 0.00064" thickness of Chromium.
- .7 Polyurethane Coating: Oil modified, clear gloss or stain interior type conforming to CAN/CGSB-1.175-M.

2.3 FINISHES

- .1 Lockers:
 - .1 Specially treat metal locker surfaces by phosphate conversion process conforming to CGSB 31-GP-105a, ready to receive locker paint finish.
 - .2 Electrostatically apply locker paint to all metal locker surfaces. Colours as selected by Consultant from manufacturer's standard product range.

2.4 FABRICATION

- .1 General: Make work square, plumb, straight and true. Make joints and intersections tightly fitted and securely fastened.
- .2 Finish: All parts to be thoroughly degreased, cleaned and given a bonding, rust-retarding phosphate coat and two finish coats of powder coating. Material then to be baked to produce a hard durable finish.
- .3 Body: End sides to have double bend at front edge to add stiffness. Front edge of shelf to be bent to prevent small items from rolling off.
- .4 Sloping Tops: Constructed in long lengths, not less than 3658mm. Provide all angle and channel framing required. All fastenings to be concealed. Panels shall be accurately formed free of waves and buckles and set true to line horizontally and vertically.
- .5 Filler Panels: Minimum 20 gauge sheet steel, powder coated to match locker colour. Extend filler panels from finished floor to top of sloping top. Top of panel to be same slope as sloping top. Secure panels from inside of lockers.
- .6 Door Frames: Vertical members to have three right angle bends to reduce the danger of exposed edges and add strength. Horizontal members to be bent to channel shape of 19mm x 63.5mm x 19mm. Weld parts together to form a strong, rigid unit. Provide two rubber bumpers on lock side of frame approximately 38mm from top and bottom of door.
- .7 Doors: Fully enclosed at rear with a flush minimum 27 gauge thick reinforcing sheet to form a closed box and make a rigid, whip-free unit. Face of door to be free from protruding handles, locks, louvers, etc.
- .8 Bases (where concrete bases are not indicated): 18-gage sheet steel, powder coated to match locker colour, 100mm high, complete with top and bottom legs and intermediate vertical steel reinforcement at back.
- .9 Commercial Locker Ventilation: Cut slots at top and bottom of each locker to allow air to flow freely in and out of entire locker from bottom to top.

- .10 Locking and Latching: Make provision for locking with a standard combination padlock arrangement with no moving parts. Entire lock pocket recess shall be nickel plated with durable black nylon-coated pull and nylon type No. 6 friction catch permanently fixed in door with hidden fastener and aligned to accept plunger and hold door in closed position. Padlock: Supplied by Owner.
- .11 Number Plates: Black with bright contrasting block numerals on polished aluminum plate, riveted to door face, recessed into door. Numerals shall not less than 19mm high and non-erasable. Lockers shall be numbered as indicated later by the Consultant.
- .12 Interior Equipment: Three (3) single prong coat hooks.
- .13 Hardware: Vandal resistant cadmium plated nuts, bolts, lock washers, nut covers, angle clips and fastenings.

3 Execution

3.1 EXAMINATION

- .1 Do not begin installation until substrates and bases have been properly prepared.
- .2 Notify Consultant if substrate and bases are of unsatisfactory preparation before proceeding.

3.2 INSTALLATION

- .1 Install metal lockers and accessories at locations shown in accordance with manufacturer's instructions.
- .2 Install lockers level and plumb with flush surfaces and rigid attachment to anchoring surfaces.
- .3 Anchor lockers to floor and wall at 48" or less, as recommended by the manufacturer.
- .4 Bolt adjoining locker units together to provide rigid installation.
- .5 Install sloping tops and metal fillers using concealed fasteners. Provide flush hairline joints against adjacent surfaces.

3.3 ADJUSTING AND CLEANING

- .1 Adjust doors and latches to operate without binding. Verify that latches are operating satisfactorily.
- .2 Touch-up with factory-supplied paint and repair or replace damaged products before Substantial Completion.

3.4 PROTECTION

- .1 Protect installed products until completion of project.

END OF SECTION

1 General

1.1 SUMMARY

- .1 This Section includes requirements for supply and installation of the following:

- .1 Quartz countertops on top of millwork.

1.2 REFERENCE STANDARDS

- .1 The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- .2 All reference amendments adopted prior to the bid closing date of this Project shall be applicable to this Project.
- .3 All materials, installation and workmanship shall comply with all applicable requirements and standards.
- .4 American Society for Testing of Materials (ASTM):
- .1 ASTM C616/C616M, Standard Specification for Quartz-Based Dimension Stone

1.3 SUBMITTALS

- .1 Provide product information in accordance with Division 01.
- .2 Action Submittals: Provide the following samples before starting any work:
- .1 Product Data: Indicate product description, fabrication information, and compliance with specified performance requirements.
- .2 Shop Drawings: Submit shop drawings indicating dimensions, component sizes, fabrication details, attachment provisions and coordination requirements with adjacent work.
- .3 Samples for Initial Selection: Submit minimum 305mm x 305mm (12" x 12") samples. Indicate full colour and pattern variation.
- .4 Consultant recognizes that stone is a natural material, and that variations in tone and hue, and hairline cracks are normal to this material; however, countertops will be rejected at site under the following conditions:
- .1 Finish, texture colour and hue are outside of a reasonable range of variation based on the submitted samples.
- .2 Cracks visible from greater than 915 mm from surface of countertop.
- .3 Project Closeout Submissions:
- .1 Operation and Maintenance Data: Submit manufacturer's care and maintenance data, including repair and cleaning instructions in accordance with Division 01.

1.4 QUALITY ASSURANCE

- .1 Qualifications: Provide proof of qualifications when requested by Consultant:
- .1 Fabricator: Use a fabricator having a minimum of three (3) years experience in fabrication and installation of stone countertops and have training and certification from the manufacturer for work of similar scope and complexity as that required for the project.
- .2 Installer: Install using personnel experienced in installation decorative stone countertops of similar design and complexity as that required for this Project.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements: Deliver components to project when areas are ready for installation.
 - .1 Transport stone countertops with care, securely anchored to pallet, to prevent damage to materials or finishes.
 - .2 Transport stone countertops to the site after completion of adjacent construction that could damage materials of this Section.
- .2 Storage and Handling Requirements:
 - .1 Store stone countertops indoors in an area adjacent to installation.
 - .2 Block off floor.
 - .3 Tilt slightly and secure to prevent fall over.
 - .4 Protect and wrap to prevent abuse, damage or soiling.

1.6 SITE CONDITIONS

- .1 Site Measurements: Verify dimensions by site measurements before fabrication and indicate measurements on shop drawings where stone countertops are indicated to fit between or around other construction; coordinate fabrication schedule with construction progress to avoid delaying the Work.
- .2 Established Dimensions: Establish dimensions and proceed with fabricating stone countertops without site measurements where site measurements cannot be made without delaying the Work; coordinate construction to ensure that actual site dimensions correspond to established dimensions; allow for trimming and fitting.

2 Products

2.1 COUNTERTOP MATERIALS

- .1 Provide Grade 1 stone only; seconds material will not be acceptable, sealed in accordance with manufacturer's standard to prevent staining and discolouration, and as follows:
 - .1 Quartz (QTZ-1):
 - .1 In accordance with ASTM C616; Classification.
 - .2 Thickness: 19mm, unless otherwise indicated on the Drawings.
 - .3 Edge Profile: Square.
 - .4 Colour, Finish, and Manufacturer: As indicated in the Finish Material Specifications Legend on Drawing A2.04.

2.2 COUNTERTOP SUPPORT MATERIALS

- .1 Steel Support Framing: Refer to Section 05 50 00, fabricate steel support framing to support weight of stone materials and to account for cut outs and openings required for installation.
- .2 Wood Core: Fabricate countertop core from shop sanded exterior grade veneer core plywood, as indicated in Section 06 20 00.
- .3 Shims: Fabricator's standard shim materials to fully support stone slab on wood core to provide flat and level installation that does not transfer stresses that could cause cracking in stone slab.

- .4 Fasteners: As recommended by manufacturer and as follows:
 - .1 Draw Bolt Fasteners: Mitre butt joint fastener, adjustable and requiring no special tools for installation, galvanized.
 - .2 Non-Exposed Fasteners: Fabricators choice consistent with quality level specified; exposed fasteners will not be permitted.

2.3 ACCESSORIES

- .1 Joint Adhesive: Manufacturers recommended adhesive designed to create chemically bonded, inconspicuous, nonporous joints.
- .2 Sealant: Mildew resistant, silicone sealant, as specified in Section 07 92 00. Colour: As selected by the Consultant from the manufacturer's standard product line.
- .3 Stone Sealer: Clear penetrating sealer as recommended by manufacturer having zero Volatile Organic Compounds (VOC).
- .4 Cleaner: Type recommended by manufacturer.

2.4 FABRICATION

- .1 Fabricate units to maximum size capable of being safely transported and handled to place of final installation in accordance with shop drawing and manufacturers written instructions using a fabricator certified by the manufacturer.
- .2 Fabricate and machine shapes to profiles indicated on Drawings; obtain all dimensions affecting fabrication and installation from job site before starting fabrication.
- .3 Cut, drill and shape fabrications as required to receive plumbing fittings and services, and built-in accessories, provide edge treatments, back splashes, and other details as indicated on Drawings.
- .4 Finish edges and surfaces true, level and even with inconspicuous joints between having no voids formed using manufactures standard joint adhesive and reinforcing strips.
- .5 Make cut outs with 3mm (1/8") radius corners to prevent stress cracking.
- .6 Fabrication assemblies with tolerances as follows:
 - .1 Variation in component size: $\pm 3\text{mm}$ (1/8").
 - .2 Location of openings: $\pm 3\text{mm}$ (1/8") from indicated location.
- .7 Match numbered components assembled on site; number items to show proper location on site; number on back using material that will not show or telegraph through finished assemblies.
- .8 Provide anchorage to receive Work of other Sections scheduled and detailed to be installed.

3 Execution

3.1 EXAMINATION

- .1 Examine substrates, areas, and conditions where installations of stone countertops occur, with Installer present, for compliance with manufacturers requirements. Verify that substrates and conditions are satisfactory for installation and comply with requirements specified.
 - .1 Carefully inspect the backup structure and millwork to verify that it is ready to accept the work of this Section.
 - .2 Verify all anchors, seats, connections attached to miscellaneous metal supports properly and securely fastened in correct locations.
 - .3 Verify access to point of installation for each stone unit.

3.2 INSTALLATION

- .1 Seal stone materials before shipping to site.
- .2 Support stone countertops evenly to prevent stress fractures.
- .3 Apply a thin bead of adhesive to top edges of base cabinet and set stone on top, square to face of cabinet work; cut out openings to match fixtures required and remove from countertops after final set of adhesive.
- .4 Secure and tighten connections with equal torque to prevent stress fractures after stone units are properly aligned, vertically and horizontally with each other and with other related building components.
- .5 Seal joints between countertops and adjacent materials, and between abutting countertops with silicone sealant.
- .6 Adhere under mount sinks to countertops using manufacturer's recommended adhesive and mounting hardware.
- .7 Install backsplashes and end splashes as indicated on Drawings; Adhere to countertops using manufacturer's standard colour matched silicone sealant.
- .8 Coordinate plumbing connections and electrical requirements with affected Sections of work.

3.3 CLEANING AND PROTECTION

- .1 Keep components and hands clean during installation; remove adhesives, sealants and other stains as work progresses; keep components clean until Substantial Performance for the Project.
- .2 Demonstration: Inform Owner of cleaning techniques and required cleansing materials.
- .3 Repair or replace damaged work that cannot be repaired to match installed work at no additional cost to the Owner.
- .4 Protect stone surfaces and corners liable to damage with wood blocking, sacking, or other means, to prevent damage and chipping of installed countertops until Substantial Performance of the Project.

END OF SECTION

1 General

1.1 SUMMARY

- .1 This Section includes requirements for supply, fabrication and installation of the following:
 - .1 Surface mount, tactile warning surface tiles in an inline truncated dome pattern on all stair landings at locations and to dimensions indicated on Drawings.
 - .2 Scarifying of existing concrete surface to allow for flush mounting of tactile warning surface tile with existing concrete stair.

1.2 SUBMITTALS

- .1 Provide submittals in accordance with Division 01.
- .2 Product Data: Submit manufacturer's literature describing products, installation procedures and maintenance instructions.
- .3 Shop Drawings: Submit manufacturer's standard Shop Drawings showing all pertinent characteristics of the surface mounted tactile warning tile, including profile, fastener locations and installation methods.
- .4 Samples for Verification Purposes: Submit two (2) samples of tactile warning surface tile, a minimum of 200mm x 200mm (8" x 8"), labeled and containing the following information: Name of Project, Submitted by, Date of Submittal, Manufacturer's Name, and Catalog Number.
- .5 Maintenance Instructions: Submit copies of manufacturer's specified maintenance practices for each type of tactile warning surface tile and accessories.

1.3 QUALITY ASSURANCE

- .1 Provide tactile warning surface tiles as produced by a single manufacturer with a minimum of five years experience in manufacturing surface mounted tactile warning tiles.
- .2 Installer's Qualifications: Engage an experienced installer certified in writing by the Tactile Warning Surface manufacturer, who has successfully completed installations similar in material, design, and extent to that indicated for the Contract.
- .3 Tactile Warning Surface Tiles: Compliant with ADAAG, PROWAG, ISO 23599 requirements as well as CSA B651-12 Accessible Design for the Built Environment.

2 Products

2.1 MANUFACTURERS

- .1 Acceptable Materials Manufacturers: Subject to compliance with requirements specified in this Section and as established by the Basis-of-Design Materials, manufacturers offering products that may be incorporated into the Work include; but are not limited to, the following:
 - .1 ADA Solutions Inc., Model ADA SA TWS Panels, 2.35" dome spacing, or approved equivalent, as accepted by the Consultant.

2.2 PERFORMANCE CRITERIA

- .1 Water Absorption: Not to exceed 0.20%, when tested in accordance with ASTM D570.
- .2 Slip Resistance: 0.80 minimum combined wet/dry static coefficient of friction when tested in accordance with ASTM C1028.
- .3 Compressive Strength: 25,000 psi minimum, when tested in accordance with ASTM D695.
- .4 Tensile Strength: 10,000 psi minimum, when tested in accordance with ASTM D638.

- .5 Flexural Strength: 25,000 psi minimum, when tested in accordance with ASTM D790.
- .6 Abrasion Resistance: 300 minimum, when tested in accordance with ASTM C501.
- .7 Flame Spread: 25 maximum, when tested in accordance with ASTM E84.
- .8 Salt and Spray Performance of Tactile Warning Surface: No deterioration or other defects after 200 hours of exposure, when tested in accordance with ASTM-B117.

2.3 MATERIALS

- .1 Tile Composition: Tactile warning surface tiles shall be manufactured using an exterior grade, homogeneous glass and carbon reinforced polyester based Sheet Molding Compound (SMC) composite material.
 - .1 Truncated domes contain fibreglass reinforcement.
 - .2 Colour: Homogeneous throughout Tile:
 - .1 Federal Yellow (Y).
- .2 Domes:
 - .1 Square grid pattern of raised truncated domes of 5mm (0.2") nominal height, base diameter of 22.8mm (0.9") and top diameter of 11.5mm (0.45").
 - .2 Dome spacing: Center-to- center (horizontally and vertically) spacing of 60mm (2.35").
 - .3 Field Area: Consisting of a non-slip textured surface with a minimum static coefficient of friction of 0.80, wet and dry. At a minimum, the thickness of the body of tactile warning surface tile measures 4.8mm (0.1875") nominal.
- .3 Tile Dimensions:
 - .1 Rectangular Tile; 610mm (24") deep x 1524mm (60") long. Provide different tile lengths to reduce the amount of cut tiles. Center tiles evenly over stair edge, as approved by the consultant. Minimum tile length: 229mm (9").
- .4 Fasteners: The tactile warning surface tile shall have minimum twelve to twenty-four countersunk fastening holes, depending on the length of the tile. Color matched, stainless steel 304, flat head drive anchor: 6mm (1/4") diameter x 38mm (1 1/2") long.
- .5 Adhesive and Sealants: As recommended by tactile warning surface tile manufacturer.

3 Execution

3.1 PREPARATION

- .1 Substrate Condition:
 - .1 Ensure substrate has been scarified at a depth to allow tactile warning surface tile to install flush with adjacent existing concrete stair level.
 - .2 Ensure substrate is in suitable condition, and in compliance with material manufacturer's recommendations, to receive work of this Section.

3.2 INSTALLATION

- .1 Tactile warning surface tile shall be installed per manufacturer's instructions.
- .2 When multiple tactile warning surface tile regardless of size are used, the truncated domes shall be aligned between the tactile warning surface tiles and throughout the entire tactile warning surface installation.
- .3 Minimize cutting of tactile warning surface tiles on site.
- .4 Remove tile inclined edge prior to tile installation.

- .5 Apply adhesive on the backside of tactile warning surface tile following the perimeter and internal cross pattern established by the SA Tile manufacturer.
- .6 Set Tactile warning surface tiles true and square to the stair edge as detailed in the Drawings, allowing 3mm (1/8") separation between successive SA Tiles for expansion and contraction.
- .7 Drill holes true and straight to a depth of 63.5mm x 6mm (2 1/2" x 1/4") using the recommended bit. As necessary, additional countersunk holes may be added to tactile warning surface tile.
- .8 Mechanically fasten tactile warning surface tile to the concrete substrate using composite sleeve anchors. Ensure that the fastener has been set to full depth, straight and true.
- .9 Following the installation of tactile warning surface tiles, apply sealant to the perimeter edge. Follow the tactile warning surface manufacturer's recommendations when applying the sealant in a cove type profile to blend and seal the SA Tile edge to the adjoining surfaces.
- .10 Do not allow foot traffic on installed tactile warning surface tile until the perimeter edge sealant has cured sufficiently to avoid tracking.

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 Work Requirements
- 20 05 31 Expansion Fittings and Loops
- 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

Division 23 Heating, Ventilating, and Air Conditioning (HVAC)

- Common Work Results for HVAC**
- 23 05 23 Valves: Bronze Service
- HVAC Insulation**
- 23 07 13 Duct Insulation
- 23 07 19 HVAC Piping Insulation
- Hydronic Piping and Pumps**
- 23 21 13 Hydronic Piping - Screwed/Welded
- 23 21 14 Hydronic Piping - Rolled Grooved Heating (Victaulic)
- 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 18 Operating Dampers
- 23 33 53 Duct Liners
- HVAC Fans**
- 23 34 23 Packaged Exhausters
- Air Outlets and Inlets**
- 23 37 13 Diffusers, Registers, and Grilles
- 23 37 23 Louvres, Intakes, and Exhaust

	Convection Heating and Cooling Units
23 82 23	Hydronic Unit Ventilators
23 82 29	Radiators, Convectors, and Cabinet Heaters
Division 25	Integrated Automation
25 20 11	Building Automation 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 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.

1.5 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.

1.6 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.

1.7 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.

1.8 ALTERNATES AND SUBSTITUTIONS (THIS SECTION FOR WRDSB JOBS)

- .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.

1.9 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 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.

1.10 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.

1.11 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 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

1.12 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
 - Above grade rough-in plumbing and drainage
 - Plumbing Fixtures
 - Plumbing Equipment
 - Heating piping
 - Piping Insulation
 - Ductwork

Duct Insulation
Grilles & Diffusers
Fire Stopping
Fans & Equipment (Unit Ventilators)
Heat Pump Equipment
Refrigeration Piping
Building Automation Systems
Testing Adjusting and Balancing
HVAC system startup/commissioning
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.**

1.13 COMMISSIONING CONTRACT BREAKDOWN

.1 This contractor shall work with the HVAC system commissioning contractor as specified elsewhere. The following commissioning breakdown shall be indicated on the contract breakdown draw.

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.
- .5 Warranty Duration: two (2) year warranty period applies.

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 Contractor letter verifying all refrigeration leak detection systems and their interlocks to downstream devices have been installed and tested.

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 the 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 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.

1.4 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.

1.5 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.

1.6 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.

1.7 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 Hydronic heating elements 200 mm (8") to bottom of cabinet
 - .2 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.

1.8 ANCHOR BOLTS AND TEMPLATES

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

1.9 PROTECTION OF OPENINGS

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

1.10 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.
 - .4 **All starters for mechanical equipment to be provided by this contractor. Wired by Electrical Division.**

1.11 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".

1.12 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.

1.13 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.

1.14 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.

1.15 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.

1.16 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.

1.17 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 onsite inspections and certifies installation. Submit inspection reports/certification at time of substantial completion.

1.18 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.

1.19 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. Apply two coats where applicable equipment is located outdoors.
- .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.

1.20 SPARE PARTS

- .1 Furnish spare parts in accordance with general requirements and as follows:
 - .1 One set of packing/mechanical seals for each pump.
 - .2 One casing joint gasket for each size pump.
 - .3 One head gasket set for each heat exchanger.
 - .4 One glass for each gauge glass.
 - .5 One set of belts for each type or each size of machinery.
 - .6 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.

1.21 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.

1.22 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.

1.23 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.

1.24 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.

1.25 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.

1.26 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.

1.27 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.

1.28 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.

1.29 DEMOLITION

- .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.

1.30 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.

1.31 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.

1.1 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.

1.2 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.

1.3 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 REFERENCES

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 American Society for Testing and Materials
 - .1 ASTM A53/A53M, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A105/A105M, Specification for Carbon Steel Forgings for Piping Applications.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with general requirements.
- .2 Indicate for each item as applicable:
 - .1 Manufacturer, model number, line contents, pressure and temperature rating.
 - .2 Movement handled; axial, lateral, angular and the amounts of each.
 - .3 Nominal size and dimensions including details of construction and assembly.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit maintenance data in accordance with general requirements.
- .2 Data to include:
 - .1 Servicing requirements, including any special requirements, stuffing box packing, lubrication and recommended procedures.

Part 2 Products

2.1 FLEXIBLE CONNECTION

- .1 Application: to suit motion.
- .2 Minimum length in accordance with manufacturer's recommendations to suit offset.
- .3 Inner hose: stainless steel corrugated.
- .4 Braided wire mesh stainless steel outer jacket.
- .5 Diameter and type of end connection: as indicated.
- .6 Operating conditions:
 - .1 Working pressure: 1034 kPa (150 psi).
 - .2 Working temperature: 250°C (482°F).
 - .3 To match system requirements.

2.2 ANCHORS AND GUIDES

- .1 Anchors:
 - .1 Provide as indicated.
- .2 Alignment guides:
 - .1 Provide as indicated.
 - .2 To accommodate specified thickness of insulation.
 - .3 Vapour barriers, jackets to remain uninterrupted.

2.3 EXPANSION COMPENSATORS (EXP)(2"-4")

- .1 All welded packless guided construction complete with multi ply stainless steel bellows.
- .2 Operating temperature (700°F).
- .3 Provide model HP3 for steel pipe and model HBFF3 for copper pipe.
- .4 Movement capability of 4" axial. Welded ends.
- .5 Material to match piping system.
- .6 Acceptable materials:
 - .1 Metraflex HP
 - .2 Mark David Canada
 - .3 Senior Flexonics

Part 3 Execution

3.1 INSTALLATION

- .1 Install expansion joints with cold setting, as indicated as instructed by Consultant. Make record of cold settings.
- .2 Install expansion joints and flexible connections in accordance with manufacturer's instructions.
- .3 Install pipe anchors and guides as indicated. Anchors to withstand 150% of axial thrust.

3.2 APPLICATION

- .1 Provide on all vibration isolated equipment.
- .2 Provide where requested by equipment manufacturers installation manuals.
- .3 Install in accordance with manufacturer's recommendations.
- .4 **Provide expansion compensators (exp.) on radiation heating element exceeding 3.6 M (12' – 0") in length. Provide one expansion compensators on each length of return piping in cabinet.**

3.3 THERMAL EXPANSION

- .1 Provide in long runs of heating mains exceeding 100 ft. in length.

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 RISER CLAMPS

- .1 Steel or cast iron pipe: black carbon steel to MSS-SP-58, type 42, UL listed.
- .2 Copper pipe: carbon steel copper plated to MSS-SP-58, type 42.
- .3 Bolts: to ASTM A 307.
- .4 Nuts: to ASTM A 563.

2.4 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.

2.5 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 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.

1.3 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.

.3 Manufacturer's installation instruction.

1.4 MAINTENANCE DATA

.1 Provide maintenance data for incorporation into manual specified in general requirements.

1.5 QUALITY ASSURANCE

.1 Roof accessories manufactures to have minimum five (5) years documented experience in the design and fabrication of roofing specialties and accessories.

1.6 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 NON-PENETRATING MECHANICAL UNIT SUPPORT (SMALL UNITS)

- .1 Provide zero penetration support on roof where indicated.
- .2 Supports shall be ballasted to resist wind loads.
- .3 Ballast system shall be fully engineered by manufacturer to withstand:
 - .1 Unit weight
 - .2 Wind loads based on prevailing wind conditions on roof of building.
- .4 Engineered shop drawings, stamped by a Professional Engineer shall be provided indicating loading and calculations that demonstrate that the stand is suitable for the proposed application.
- .5 Base shall be made of non-combustible material.
- .6 Frames shall be galvanized. All fastenings, rods, nuts, washers, etc. shall be stainless steel.
- .7 Provide shop drawings as specified. Install to manufacturers recommendations.
- .8 Acceptable materials:
 - .1 Portable pipe hanger
 - .2 Bigfoot systems
 - .3 Miro rooftop support
 - .4 Trikon Systems
 - .5 Walravin BIS Yet
 - .6 Ecofoot

2.3 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

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

2.4 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.

2.5 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:
Quick Block
Erico

2.6 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.
- .2 Acceptable materials:
 - .1 Vibro-Acoustics

- .2 Korfund
- .3 IAC Acoustics
- .4 Vibron

2.4 SPRINGS

- .1 Design stable springs so that ratio of lateral to axial stiffness is equal to or greater than 1.2 times the ratio of static deflection to working height. Select for 50% travel beyond rated load. Units to be complete with levelling devices.
- .2 Ratio of height when loaded to diameter of spring to be between 0.8 to 1.0.
- .3 Cadmium plate for all installations.
- .4 Colour code springs.

2.5 SPRING MOUNT

- .1 Zinc or cadmium plated hardware; housings coated with rust resistant paint.
- .2 Type M2 - stable open spring: support on bonded 6 mm (1/4") minimum thick ribbed neoprene or rubber friction and acoustic pad.
- .3 Type M3 - stable open spring: 6 mm (1/4") minimum thick ribbed neoprene or rubber friction and acoustic pad, bonded under isolator and on isolator top plate; leveling bolt for rigidly mounting to equipment.
- .4 Type M4 - restrained stable open spring: supported on bonded 6 mm (1/4") minimum thick ribbed neoprene or rubber friction and acoustic pad; built-in resilient limit stops, removable spacer plates.
- .5 Type M5 - enclosed spring mounts with snubbers for isolation up to 950 kg (2100 lbs) maximum.
- .6 Performance: as indicated.
- .7 Acceptable materials:
 - .1 Korfund
 - .2 IAC Acoustics
 - .3 Vibron
 - .4 Vibro-Acoustics

2.6 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 Performance as indicated.

- .5 Acceptable materials:
 - .1 Vibron
 - .2 IAC Acoustics
 - .3 Korfund
 - .4 Vibro-Acoustics

2.7 ACOUSTIC BARRIERS FOR ANCHORS AND GUIDES

- .1 Acoustic barriers: between pipe and support, consisting of 25 mm (1") minimum thick heavy-duty duct and neoprene isolation material.
- .2 Acceptable materials:
 - .1 Vibron
 - .2 IAC Acoustics
 - .3 Vibro-Acoustics

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 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 Pictograms:
 - .1 Where required, to Workplace Hazardous Materials Information System (WHMIS) regulations.

- .8 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
Glycol heating water supply	Yellow	GLYCOL HEATING WATER SUPPLY
Glycol heating water return	Yellow	GLYCOL HEATING WATER RETURN
Condensate	Green	CONDENSATE
Refrigeration suction	Yellow	REF. SUCTION
Refrigeration liquid	Yellow	REF. LIQUID
Refrigeration hot gas	Yellow	REF. HOT GAS
Conduit for low voltage Control wiring	White	CONTROL WIRING___VOLTS

2.6 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.

2.7 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.

2.8 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.

2.9 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: In conspicuous location to facilitate easy reading and identification from operating floor.
- .2 Standoffs: Provide for nameplates on hot and/or insulated surfaces.
- .3 Protection: 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 Flowset Balancing Ltd.
431 Willis Dr.
Oakville, Ontario
L6L 4V6
(416) 410-9793
 - .4 Clark Balancing Ltd.
8094 Esquesing Line
Milton, Ontario
L9T 2X9
(905) 693-1518
 - .5 Airwaso Canada Inc.
London, Ontario
N6E 3P3
(519) 652-4040

- .6 Dynamic Flow Balancing Ltd.
 Oakville, Ontario
 L6L 2X4
 (905) 338-0808

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, chilled water, condenser water, glycol 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 SYSTEMS

- .1 Plumbing systems:
 - .1 TAB procedures:
 - .2 Pressure booster systems: test for capacity and pressures under all conditions and at all times.
- .2 Recirculating Systems pump flows, pressures
- .3 Pumped sanitary and storm water systems: test for proper operation at all possible flow rates.

1.23 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 Building pressure conditions:
 - .1 Adjust HVAC systems, equipment, controls to ensure specified pressure conditions at all times.
 - .2 TAB procedures:

<u>Positive</u>	<u>Negative</u>
Classrooms	Corridors
- .4 Zone pressure differences:
 - .1 Adjust HVAC systems, equipment, controls to establish air pressure differentials, with all systems in all possible combinations of normal operating modes.
- .5 Provide duct testing as specified.
- .6 Provide AHU testing as specified.
- .7 Provide plenum testing as specified.
- .8 Changing of air handling equipment sheave and belts as required for specified air flow sheaves and belts supplied by unit manufacturer. Retest equipment after sheave change.

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 (ANSI)/ American Society of Mechanical Engineers (ASME).
 - .1 ANSI/ASME B1.20.1, Pipe Threads, General Purpose (Inch).
- .3 American Society for Testing and Materials (ASTM).
 - .1 ASTM A276, Specification for Stainless Bars and Shapes.
 - .2 ASTM B62, Specification for Composition Bronze or Ounce Metal Castings.
 - .3 ASTM B283, Specification for Copper and Copper Alloy Die Forgings (Hot-Pressed).
 - .4 ASTM B505, Specification for Copper-Base Alloy Continuous Castings.
- .4 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS).
 - .1 SP-25, Standard Marking System for Valves, Fittings, Flanges and Unions.
 - .2 SP-80, Bronze Gate Globe, Angle and Check Valves.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with general requirements.
- .2 Submit data for all valves specified this section.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit maintenance data for incorporation into manual specified in general requirements.

Part 2 Products

2.1 GENERAL

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

2.2 END CONNECTIONS

- .1 Connection into adjacent piping/tubing:
 - .1 Steel pipe systems: Screwed ends.
 - .2 Copper tube systems: Solder ends.

2.3 LOCKSHIELD KEYS

- .1 Where lockshield valves are specified, provide 10 keys of each size: malleable iron cadmium plated.

2.4 VALVES

- .1 All valves shall be of commercial grade and of same manufacturer.
- .2 Acceptable Manufacturers:
Newman Hattersley Canada Ltd.
Jenkins/Crane
Milwaukee
Toyo
Kitz

2.5 CHECK VALVES

- .1 Requirements common to all check valves, unless specified otherwise:
 - .1 Standard specification: MSS SP-80.
 - .2 Connections: with hex. shoulders.
- .2 NPS 50 mm (2") and under, swing type, bronze disc, Class 125:
 - .1 Body: Y-pattern with integral seat at 45, screw-in cap with hex head.
 - .2 WP = 860 kPa (125 psi) steam, 1.4 MPa (203 psi) WOG.
 - .3 Disc and seat: renewable rotating disc, two-piece hinge disc construction; seat: regrindable.
- .3 NPS 50 mm (2") and under, swing type, bronze disc:
 - .1 Body: Y-pattern with integral seat at 45, screw-in cap with hex head.
 - .2 Class 150, WP = 1.03 MPa (150 psi) steam, 2.07 MPa (300 psi) WOG.
 - .3 Disc and seat: renewable rotating disc, two-piece hinge disc construction; seat: regrindable.
- .4 NPS 50 mm (2") and under, swing type, composition disc, Class 200:
 - .1 Body: Y-pattern with integral seat at 45, screw-in cap with hex head. WP = 1.4 MPa (203 psi) cold water.
 - .2 Disc: renewable rotating disc of number 6 composition to suit service conditions, bronze two-piece hinge disc construction.
- .5 NPS 50 mm (2") and under, horizontal lift type, composition disc, Class 150:
 - .1 Body: with integral seat, union bonnet ring with hex shoulders, cap. WP = 1.03 MPa (150 psi) steam, 2.7 MPa (391 psi) WOG.
 - .2 Disc: renewable PTFE for steam #6 composition for oil, water, or gas service rotating disc in disc holder having guides top and bottom, of bronze to ASTM B 62.
- .6 NPS 50 mm (2") and under, vertical lift type, bronze disc, Class 125:
 - .1 Body: with integral seat. WP = 860 kPa (125 psi) steam, 1.4 MPa (203 psi) WOG.
 - .2 Disc: rotating disc having guides top and bottom, disc guides, retaining rings.

2.6 SILENT CHECK VALVES

- .1 NPS 50 mm (2") and under:
 - .1 Body: cast high tensile bronze to ASTM B 62 with integral seat.
 - .2 Pressure rating: Class 125, WP = 860 kPa (125 psi) steam, 1.4 MPa (203 psi) WOG Class 150, WP = 1.03 MPa (150 psi) steam, 2.07 MPa (300 psi) WOG.
 - .3 Connections: screwed ends to ANSI B1.20.1 and with hex. shoulders.
 - .4 Disc and seat: renewable rotating disc.
 - .5 Stainless steel spring, heavy duty for downflow applications.
 - .6 Seat: regrindable.

2.7 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.

Part 3 Execution

3.1 INSTALLATION

- .1 Install rising stem valves in upright position with stem above horizontal.
- .2 Remove internal parts before soldering.

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: 0.42 W/M•°C (.29 BTU•IN/HR•FT²•°F)
- .5 Type C-6: Pipe and tank insulation: Fibreglass segmented board bonded to laminated vapor retarder:
 - .1 Mineral fibre: to ASTM C1393 type II or type IIIA, Category 2.
 - .2 Jacket: ASJ or FSK type
 - .3 Maximum "k" factor: 0.26 BTU • IN/HR • FT² • °F (0.037 W/M • °C) or less
- .6 Manufacturers:
 - .1 All materials must be supplied by the same manufacturer.
 - .2 Acceptable Materials:
 - .1 Johns Manville
 - .2 Knauf
 - .3 Manson

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")
Round supply/exhaust air ducts requiring additional finish/jacket	C-6	25 mm (1")
Supply, return and fan exhaust ducts exposed (visible) in space being served	none	
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.
- .2 **C-6 insulation is also acceptable. Same thickness, schedule, and facing to be used as C-1 material.**

- .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 "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.

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.

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
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
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 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 (1.25") 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 (1.25") and under: screwed fittings with pulverized lead paste.
 - .2 NPS 65 mm (2½") and over: welding fittings and flanges to CSA W47.1.
 - .3 Flanges: plain or raised face, slip-on.
 - .4 Flange gaskets: suitable for hydronic heating up to 110°C (220°F).
 - .5 Pipe thread: taper.
 - .6 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 NPS 50 mm (2") and smaller: screwed ends.
 - .3 NPS 65 mm (2 ½") and larger: flanged ends.
- .2 Drain valves: Gate, Class 125, non-rising stem, solid wedge disc, with chain and cap.
- .3 Swing check valves:
 - .1 NPS 32 mm (1.25") and under:
 - .1 Class 150, swing, with PTFE disc, as specified. Bronze. Jenkins 4475TJ.
 - .2 NPS 65 mm (2 1/2") and over:
 - .1 Flanged or Grooved ends, Bronze trim, Cast Iron: Gate, Globe, Check.
- .4 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 (1.25") and under screwed ends to ANSI B1.20.1 and with hex. shoulders.
 - .2 NPS 65 mm (2½") and over flanged or grooved ends.
- .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.
- .5 All valves shall be of commercial grade and of same manufacturer.
- .6 Acceptable Manufacturers:
 - .1 Newman Hattersley Canada Ltd.
 - .2 Jenkins/Crane
 - .3 Milwaukee
 - .4 Toyo
 - .5 Kitz

2.3 BALANCING VALVES

- .1 Size 32 mm (1.25") and below: 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 (¼") 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 ($\frac{3}{4}$ "), 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 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.
 - .3 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).
 - .4 ANSI/ASME B18.2.2, Nuts for General Applications: Machine Screw Nuts, Hex, Square, Hex Flange, and Coupling Nuts (Inch Series).
 - .5 ANSI/AWWA C111/A21.11, Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- .3 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.
 - .6 **ASTM E202, Test Method for Analysis of Ethylene Glycols and Propylene Glycols.**
 - .7 ASTM F-1476, Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.
- .4 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

25-7705-RFT

- .3 Accessories
- .4 Grooved joint products shall be shown on drawings and product submittals and shall be specifically identified with the applicable Victaulic style or series number.

1.3 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for incorporation into manual specified in general requirements.

1.4 APPLICATION

- .1 Hydronic heating over 43°C (110°F).

Part 2 Products

2.1 ACCEPTABLE MATERIALS

- .1 Victaulic.
- .2 No alternates.

2.2 PIPE

- .1 Steel pipe: to ASTM A53/A53M, Grade B, as follows:
 - .1 NPS 40 mm (1 ½") up to 150 mm (6"): Schedule 40.
 - .2 **NPS 200 mm (8") and over, Schedule 30.**
 - .3 **NPS 300 mm (12") and over, 10 mm (3/8") wall thickness.**
- .2 Final connection to copper heating elements.
 - .1 Type "L" copper with 95/5 solder joints and dielectric couplings. Maximum length 600 mm (24").

2.3 PIPE JOINTS

- .1 NPS 32 mm (1 ¼") and under: screw fittings with pulverized lead paste. Refer to 23 21 13 Hydronic Piping – Screwed, Welded.
- .2 Rolled grooved with Grade E (EPDM) gaskets.

2.4 FITTINGS

- .1 Grooved fittings: ASTM A536, Grade 65-45-12, ductile iron; ASTM A234, Grade WPB, wrought steel; or factory-fabricated from ASTM A53 steel pipe.
- .2 Grooved joint couplings shall consist of two ductile iron housing segments, pressure responsive elastomer gasket, and ASTM A449 zinc-electroplated steel bolts and nuts. Couplings shall comply with ASTM F-1476, Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications.
 - .1 Rigid: Couplings shall be Victaulic Style 107N Installation-Ready with angled bolt pad design to provide system rigidity and support and hanging in accordance with ANSI B31.1 and B31.9. Couplings must be installed with Grade EHP (EPDM-HP) gaskets, rated for water service to 120°C (250°F).

25-7705-RFT

- .2 Flexible: Use in locations where vibration attenuation and stress relief are required. Flexible couplings may be used in lieu of flexible connectors at equipment connections. Three couplings, for each connector, shall be placed in close proximity to the vibration source. Basis of Design: Victaulic Style 177 Installation-Ready, and Style 77.
- .3 AGS series two-segment couplings with lead-in chamfer on housing key and wide-width FlushSeal gasket. Basis of Design: Victaulic Style W07 (rigid) and Style W77 (flexible).
- .3 Flanges: Victaulic Style 741 / W741.
- .4 Hole Cut Products and Branch Connections:
 - Victaulic Style 920 / 920N Mech. Tee
 - Victaulic Style 923 Vic-Let Outlet
 - Victaulic Style 924 Vic-O-Well Thermometer Outlet

2.5 VALVES

- .1 Connections:
 - .1 **NPS 32 mm (1 ¼") and smaller: screwed ends.**
 - .2 **and larger: rolled grooved ends.**
 - .3 NPS 50 mm (2") and smaller: screwed ends.
 - .4 NPS 65 mm (2 ½") and larger: rolled grooved ends.
- .2 Butterfly valves: Application: Isolating each cell or section of multiple component equipment and where indicated. Valve seat shall be pressure responsive in sizes through NPS 300 mm (12"). The stem shall be offset from the disc centerline to provide complete 360-degree circumferential seating.
 - .1 NPS 50 mm (2") to **40 mm (1 ½")**: Victaulic Vic 300 MasterSeal
 - .2 NPS 350 mm (14") and over: Victaulic AGS-Vic300
- .3 Drain valves: Gate, Class 125, non-rising stem, solid wedge disc, with chain and cap.
- .4 Check valves:
 - .1 **NPS 32 mm (1 ¼") and under:**
 - .1 Class 150, swing, with PTFE disc, as specified.
Bronze. Jenkins 4475TJ.
 - .2 **NPS 40 mm and over:** Victaulic Style 716 Vic – check and AGS W715 for NPS 350 mm (14") and over.
- .5 Ball valves:
 - .1 **NPS 32 mm (1 ¼") 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: stainless steel tamperproof ball drive.

25-7705-RFT

- .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.
- .9 Extended handles on chilled water valves.
- .10 Full port.
- .11 Jenkins 201SJ.

.6 Strainers:

- .1 Tee strainers: NPS 40 mm (1½") and over: Victaulic 730/W730 Tee Type Vic-Strainer.
- .2 Wye Strainer: NPS 50 mm (2") and over: Victaulic 732/W732 Wye Type Vic-Strainer.

2.6 BALANCING VALVES

- .1 Size 15 mm (1/2") to 50mm (2"): DZR Brass (Ametal®) globe type or bronze body, brass ball, NPT connections and variable orifice. Victaulic Series 786 / 787.
 - .1 Victaulic Koil-Kits Series 799, 79V, 79A, and 79B may be used at coil connections. The kit shall include a Series 786/787/78K circuit balancing valve or series 76 (where automatic balancing valves are required), Series 78Y Strainer-Ball or Series 78T Union-Ball valve combination, Series 78U Union-Port fitting, and required coil hoses. A Style 793 and/or 794 and/or Pilot R differential pressure controller shall be provided as required. A meter shall be provided by the valve manufacturer that shall remain with the building owner after commissioning.
 - .2 Combination balancing and control valve: at mechanical contractor and control contractor agreement, combination balancing/control valves will be accepted: ½" – 2" Victaulic TC on/off, Victaulic Series TM Modulating. For sizes 2-1/2" – 6" Fusion C
 - .3 Pressure Independent balancing and control valve (PIBCV) to be provided where required: Victaulic Series TCP/7CP/Fusion P
- .2 Size 65 mm (2 1/2") to larger: Victaulic Tour Anderson Series 788/789.
- .3 Differential pressure readout ports with internal EPT inserts and check valves, 6 mm (¼")NPT tapped drain/purge ports, memory stop and calibrated nameplate.
- .4 Acceptable materials:
 - .1 Tour & Anderson
 - .2 No alternates.

2.7 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.

25-7705-RFT

- .3 Plastic vents are not acceptable.
- .4 Acceptable materials:
 - .1 Maid-O-Mist No. 67
 - .2 Spirax Sarco

2.8 EXPANSION JOINTS AND FLEXIBLE CONNECTIONS

- .1 Application: to suit motion.
- .2 Minimum length in accordance with manufacturers recommendations to suit offset.
- .3 Victaulic Style 150 Mover slip-type expansion joint or Style 155 Expansion Compensators. The expansion joint shall be installed with Style 07 Zero-Flex couplings.

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.
- .10 Grooved Joints: Install in accordance with the manufacturer's latest published installation instructions.
 - .1 Pipe ends shall be clean and free from indentations, projections and roll marks in the area from pipe end to (and including) groove.
 - .2 Gasket shall be manufactured by the coupling manufacturer and verified as suitable for the intended service.
 - .3 A manufacturer's factory trained representative shall periodically visit the job site and review the installation for best practices. This shall be at the expense of the installing contractor. The installing Contractor shall correct any identified deficiencies.

- .4 Victaulic product that has been examined and has not met the visual inspection criteria for proper installation must be corrected and re-examined by Inspection Services prior to the completion of the project. Any Victaulic product that has not been corrected or was not examined will not be considered as part of the successful completion of Inspection Services.
- .5 Upon completion of the manufacturer's inspection of the installation and any identified corrections, the manufacturer will provide the owner or purchaser with a limited warranty on manufacturer's products.

3.2 PIPE END PREPARATION

- .1 Refer to the latest Victaulic installation instructions.
- .2 Outside diameter of grooved pipe shall not vary more than the tolerance approved. Any internal or external weld bead or seams in the groove area must be ground smooth and flush. The end of the pipe internally must be cleaned of any material that might interfere with or damage the internal roll.
- .3 Pipe surface shall be free from indentations and projections from the end of the pipe to the groove, to provide a leak tight seat for the gasket. All loose paint, scale, dirt, chips, grease and rust must be removed. It is the recommendations of Victaulic that the pipe be square cut.
- .4 Bottom of the groove must be free of loose dirt, chips, rust and scale that may interfere with proper coupling assembly.
- .5 Groove dimensions shall conform to standard roll groove specifications as published by Victaulic.
- .6 Pipe shall be grooved using Victaulic roll grooving system with track enhanced grooving rolls.

3.3 "ZERO-FLEX" COUPLING INSTALLATION

- .1 Refer to the latest Victaulic installation instructions.
- .2 Pipe must be free from indentation, projections, or roll marks on exterior from the end to the groove, to assure a leak tight seat for the gasket.
- .3 Gasket supplied must be checked to be certain it is suited for intended service. Colour code identifies gasket grade. Apply a thin coat of Victaulic Lubricant to gasket lips and outside of gasket.
- .4 Place gasket over pipe end, being sure lip does not overhang pipe end.
- .5 Align and bring two pipe ends together and slide gasket into position centered between the grooves on each pipe. No portion of the gasket shall extend into the groove on either pipe.
- .6 Loosely assemble all segments leaving one nut and bolt off to allow for "swing-over" feature.
- .7 With one nut and one bolt removed, use "swing-over" feature to position housings over gasket and into position into the grooves on both pipes.
- .8 Remaining bolt shall be inserted. Bolt track head must engage into housing recess.
- .9 Nuts shall be tightened alternately and equally and must maintain metal-to-metal contact at the angle bolt-pads. Tighten securely to assure a rigid joint.

3.4 “REDUCING” COUPLING INSTALLATION

- .1 Refer to the latest Victaulic installation instructions.
- .2 Pipe must be free from indentation, projections, or roll marks on exterior from the end to the groove, to assure a leak tight seat for the gasket.
- .3 Gasket supplied must be checked to be certain it is suited for intended service. Colour code identifies gasket grade. Gasket must be thoroughly lubricated.
- .4 Place large opening of the gasket over the larger pipe ends until the Assembly Washer touches the pipe end.
- .5 Align the pipe centerlines and insert the smaller pipe end in the gasket. Assembly washer provided by Victaulic shall be used.
- .6 Coupling housings shall be positioned over the gasket into the groove on each pipe.
- .7 Insert bolts and apply nuts.
- .8 Nuts must be tightened alternately and equal until housing bolt pads are firmly together – metal-to-metal.

3.5 “OUTLET” COUPLING INSTALLATION

- .1 Refer to the latest Victaulic installation instructions.
- .2 Pipe must be free from indentation, projections, or roll marks on exterior from the end to the groove, to assure a leak tight seat for the gasket.
- .3 Gasket supplied must be checked to be certain it is suited for intended service. Colour code identifies gasket grade. Gasket must be thoroughly lubricated.
- .4 Gasket shall be placed on one pipe end so the lips on one side cover the area between the pipe end and the groove. The gasket must not overlap the groove. The pipe ends shall be d to touch the reinforcement ribs inside the gasket.
- .5 Bring mating pipe or fitting into position and insert into gasket. The gasket shall not overlap the groove, but fully cover the pipe end.
- .6 Housings shall be placed over the gasket and the housing keys must engage into the grooves. Ample lubricant shall be applied to the gasket outlet neck and the upper housing interior.
- .7 Insert bolts and apply nuts.
- .8 Nuts must be tightened alternately and equally until housing bolt pads are firmly together – metal-to-metal.

3.6 VICTAULIC “FLANGE ADAPTOR” INSTALLATION

- .1 Refer to the latest Victaulic installation instructions.
- .2 Pipe must be free from indentation, projections, or roll marks on exterior from the end to the groove, to assure a leak tight seat for the gasket.
- .3 Gasket supplied must be checked to be certain it is suited for intended service. Colour code identifies gasket grade.
- .4 Victaulic Flange adaptor shall be opened fully and hinged flange shall be placed around the grooved pipe end with the circular key section locating into the groove.

- .5 Standard bolt shall be inserted through the mating holes of the Vic-Flange adaptor to secure firmly in the groove.
- .6 Gasket shall be fully lubricated and pressed into the cavity between the pipe O.D. and flange recess.
- .7 Standard flange bolt shall be placed in the hinge hole (opposite the lock bolt) and the bolt assembly shall be directed to mate with the adjoining flange. Remaining flange bolts shall be added and tightened evenly until faces contact firmly.
- .8 Where Vic-Flange adaptors do not mate to a hard smooth surface, Victaulic Flange Washers must be used.

3.7 MECHANICAL-T OUTLET INSTALLATION

- .1 Refer to the latest Victaulic installation instructions.
- .2 Holes must be drilled.
- .3 Gasket supplied must be checked to be certain it is suited for intended service. Colour code identifies gasket grade.
- .4 In preparation for assembly, one nut and bolt shall be removed from the housing. The other nut and bolt shall be loosened until it is flush with the nut and bolt. Remove the tape and lift the gasket from the mechanical-T outlet.
- .5 Victaulic lubricant shall be applied to all surfaces of the gasket and the gasket shall be properly repositioned into the housing using alignment tabs.
- .6 When assembling the coupling, the lower housing shall be rotated 90 degrees away from the upper housing. Place the upper, or outlet section on to the face of the pipe in line with the outlet hole. The lower section shall then be rotated around the pipe to close the two halves. The locating collar must be in the outlet hole.
- .7 Insert bolt and apply nut. Oval neck must engage in recess of the housing.
- .8 Nuts shall be tightened alternately and equally until the housing is in complete surface contact in the gasket pocket area and the assembly is rigid.
- .9 Where mechanical-T are used as transition pieces between two runs, they must be assembled onto the runs before the branch connections are made.

3.8 VIC-LET STRAPLESS OUTLET & VIC-O-WELL STRAPLESS THERMOMETER & PRESSURE GAUGE INSTALLATION

- .1 Refer to the latest Victaulic installation instructions.
- .2 Holes must be drilled.
- .3 Do not use for branch piping connections where size may not be available. Use first available size and reducer.
- .4 Gasket supplied must be checked to be certain it is suited for intended service. Colour code identifies gasket grade. Victaulic lubricant shall be applied to exposed gasket sealing lip.
- .5 Vic-Let outlet toe shall align with pipe. Tilt toe into the hole and drop into the pipe. The Vic-Let outlet must be positioned with the heel inside the pipe.

- .6 Collar shall be held in position while nut is being hand tightened. Nut shall then be wrench tightened until collar deforms to contact pipe all around. Maintain collar/gasket alignment to prevent gasket pinching. Do not exceed 200 ft.lbs. Vic-Let outlet shall not be reused after initial installation.

3.9 ROUST-A-BOUT PLAIN END PIPE COUPLING INSTALLATION

- .1 Refer to the latest Victaulic installation instructions.
- .2 Pipe shall be marked as required.
- .3 Gasket supplied must be checked to be certain it is suited for intended service. Colour code identifies gasket grade. Apply a thin coat of Victaulic Lubricant to gasket lips and outside of gasket.
- .4 Place gasket over pipe end, being sure lip does not overhang pipe end.
- .5 The pipe shall be butt and held in position while slide the gasket back into position. The gasket must be centered between the marks.
- .6 Housings shall be placed over the gasket.
- .7 Insert bolts and apply nuts.
- .8 Nuts must be tightened alternately and equally to standard torque specifications as published by Victaulic. Segments must be assembled with equal gaps between the bolt pads.

3.10 VALVE INSTALLATION

- .1 Install valves in upright position with stem above horizontal.
- .2 Install butterfly valves on chilled water and condenser water lines only.
- .3 Install butterfly 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 (2 1/2") 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.

3.11 AIR VENTS

- .1 Install at high points of systems.
- .2 Install isolating ball valve on automatic air vent inlet.

25-7705-RFT

3.12 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 Tape joints in prefabricated insulation on valves installed in chilled water mains.
- .4 Refer to Testing Adjusting and Balancing Section for applicable procedures.

3.13 FLUSHING AND CLEANING

- .1 Coordinate flushing and cleaning of mechanical systems with HVAC water treatment contractor **and HVAC systems commissioning contractor.**
- .2 Flush and clean **new** piping system in presence of Consultant.
- .3 **Refer to Water Treatment Section.**

3.14 FILLING OF SYSTEM

- .1 Refill system with clean water adding water treatment as specified.

3.15 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.

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 Hard copper to be used. Throughout the project, the use of annealed copper shall not be used without approval of the consultant.
- .2 Install in accordance with CSA B52, EPS 1/RA/2 and ANSI/ASME B31.5.
- .3 Connect to equipment with isolating valves and unions.
- .4 Provide space for servicing, disassemble, and removal of equipment and components all as recommended by manufacturer.
- .5 Protect all openings in piping against entry of foreign material.
- .6 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.
- .7 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.

3.3 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 SHIPPING/ FEEDING CHEMICAL CONTAINERS

- .1 High density moulded polyethylene, with liquid level graduations, cover.
- .2 Agitators: as required by manufacturer.

2.3 CONDUCTIVITY CONTROLLER

- .1 Fully transistorized, suitable for wall or flush panel mounting, linear over full measuring range of 0-5000 micro omhs.
- .2 Insensitive to phase angle shifts, capable of operating on 95-130 Volts without affecting accuracy, power, bleedoff status lights.

2.4 CONDUCTIVITY PROBES

- .1 Dual carbon elements in PVC holder, quick disconnect, self-locking connection.

2.5 WATER TREATMENT FOR HYDRONIC SYSTEMS

- .1 Hot water heating system: Reuse existing pot feeder.

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 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.

25-7705-RFT

- .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.

3.3 START-UP

- .1 Start up water treatment systems in accordance with manufacturer's instructions.

3.4 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.

25-7705-RFT

- .5 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.
- .6 Certificates:
 - .1 Upon completion, furnish certificates confirming satisfactory installation and performance.
- .7 Commissioning Reports:
 - .1 To include system schematics, test results, test certificates, raw and treated water analyses, design criteria, all other data required by Consultant.
- .8 Commissioning activities during Warranty Period:
 - .1 Check out water treatment systems on regular basis and submit written report to Consultant.

3.5 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.**

25-7705-RFT

- .7 Flush and clean new piping system in presence of Consultant.
- .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 Re-install strainer screens/baskets only after obtaining Consultant'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

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 WATERTIGHT DUCT

- .1 Provide watertight duct for:
 - .1 Fresh air intake.
- .2 Form bottom of horizontal duct without longitudinal seams. Solder or weld joints of bottom and side sheets. Seal all other joints with duct sealer.

2.10 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
General Exhaust	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 WATERTIGHT DUCT

- .1 Slope horizontal branch ductwork down towards hoods served. Slope header ducts down toward risers.
- .2 Fit base of riser with 150 mm (6") deep drain sump and 25 mm (1") drain connected, with deep seal trap and valve and discharging to open funnel drain.

3.4 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.

3.5 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).

3.6 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. **The extent of the cleaning shall be limited to the area immediately surrounding the new connection point.**
- .5 Ensure all systems are clean prior to start up.

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:
 - Nailor
 - E. H. Price
 - Titus

2.4 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:
 - Duro Dyne IP1 or IP2
 - Duct mate

2.5 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.

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:
 - Duro Dyne
 - Ductmate
 - 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.

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:
 - Honeywell
 - Johnson
 - T. A. Morrison
 - E.H. Price
 - Tamco
 - Ruskin
 - Nailor
 - Henderson Industrial
 - Ventex/Alumavent
 - Pottorff

2.2 BACK DRAFT DAMPERS

- .1 Automatic gravity operated, multi leaf, aluminum construction with nylon bearings, centre pivoted or counterweighted, as indicated.
- .2 Acceptable materials:
 - T.A. Morrison
 - Tamco Series 7000
 - Ruskin
 - Nailor
 - E.H. Price
 - Henderson Industrial
 - Ventex/Alumavent
 - 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.

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.
- .7 ASTM C177, Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
- .8 CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.

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 REFERENCES

- .1 All codes, standards, etc. as referenced shall be the latest edition.
- .2 AMCA 99, Standards Handbook.
- .3 ANSI/AMCA 210, Laboratory Methods of Testing Fans for Certified Aerodynamics Performance Rating.
- .4 AMCA 300, Revised 1987, Reverberant Room Method for Sound Testing of Fans.
- .5 AMCA 301, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
- .6 ANSI/ASHRAE 51, Laboratory Methods of Testing Fans for Certified Aerodynamics Performance Rating.
- .7 ANSI/NFPA 96 – Ventilation Control and Fire Protection of Commercial Cooking Operations.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with general requirements.
- .2 Product data to include fan curves and sound rating data.

1.3 OPERATION AND MAINTENANCE DATA

- .1 Provide operation and maintenance data for incorporation into manual specified in general requirements.

1.4 CERTIFICATION OF RATINGS

- .1 Catalogued or published ratings shall be those obtained from tests carried out by manufacturer or those ordered from independent testing agency signifying adherence to codes and standards in force.
- .2 Provide confirmation of testing.

Part 2 Products

2.1 FANS GENERAL

- .1 Capacity: flow rate, total static pressure Pa, r/min, W (" w.c., r/min, bhp) model and size and sound ratings as indicated on schedule.
- .2 Statically and dynamically balanced. Constructed in conformity with AMCA 99.
- .3 Sound ratings: comply with AMCA 301, tested to AMCA 300.
- .4 Performance ratings: based on tests performed in accordance with ANSI/AMCA 210, and ANSI/ASHRAE 51.

- .5 Bearings: sealed lifetime of self aligning type with oil retaining, dust excluding seals and a certified minimum rated life of 80,000 100,000 h in accordance with AFBMA L10 life standard. Bearings to be rated and selected in accordance with AFBMA 9 and AFBMA 11.
- .6 Provide vibration isolation hangers/pads for all fans.
- .7 Electrical components and motors within the airstream shall be classified for use in a Class I, Zone 2 system (as defined by the Electrical Safety Code) when connected to ductwork systems served by refrigerant containing air handling systems.
- .8 Acceptable materials:
 - .1 Greenheck
 - .2 Penn-Barry
 - .3 Cook
 - .4 Jenco (S & P)/Jenn
 - .5 Carnes
 - .6 Acme
 - .7 Twin-City
- .9 Provide factory mounted speed control for all direct drive motors.

2.2 CABINET FANS – IN-LINE

- .1 Fan characteristics and construction: as centrifugal fans.
- .2 Casing floor mounted or cabinet hung single inlet aluminum wheel in factory fabricated casing complete with vibration isolators and seismic control measures, motor, V-belt drive and guard inside or outside casing as indicated.
- .3 Fabricate casing of zinc coated or phosphate treated steel reinforced and braced for rigidity. Provide removable panels for access to interior. Uncoated, steel parts shall be painted over with corrosion resistant paint to CAN/CGSB 1.181. Internally line cabinet with 25 mm (1") thick rigid acoustic insulation, pinned and cemented bell mouth inlet cone.
- .4 Size, type, and capacity: as indicated.

2.3 EXISTING EXHAUST AIR FANS

- .1 Refurbish existing exhaust air fans as follows:
 - .1 Vacuum entire unit interior.
 - .2 Lubricate all bearings.
 - .3 Replace fan belt(s).
 - .4 Rebalance to capacity indicated.

Part 3 Execution

3.1 INSTALLATION

- .1 Install in accordance with manufacturer's instructions.

- .2 Provide flexible duct connection for all fans.
- .3 Provide backdraft damper at building exterior penetration.
- .4 Provide and install vibration isolation.
- .5 Provide and install roof curb for all roof mounted fans.
- .6 Provide and install sleepers for utility set style roof mounted fans; provide roof curb for duct penetration.

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 SUPPLY GRILLES AND REGISTERS

- .1 Type, size, and capacity: as indicated.

2.3 RETURN AND EXHAUST GRILLES

- .1 Type, size, and capacity: as indicated.

2.4 DIFFUSERS

- .1 Type, size, and capacity: as indicated.

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 EH Price BCDE439
 - .2 Greenheck WRH
 - .3 Nailor 1720
 - .4 Carnes GLAB
 - .5 Penn Barry
 - .6 Ventex
 - .7 Pottorff

2.2 THIN LINE FIXED LOUVRES – ALUMINUM

- .1 Construction: welded with exposed joints ground flush and smooth.
- .2 Material: extruded aluminum alloy 6063-T5.
- .3 Blade: stormproof pattern with centre watershed in blade, reinforcing bosses and maximum blade length of 1500 mm (60").
- .4 Perimeter flange frame, head, sill and jamb: 50 mm (2") deep one piece extruded aluminum, minimum 3 mm (1/8") thick with approved caulking slot, integral to unit
- .5 Fastenings: stainless steel (Society of Automotive Engineers) SAE-194-8F with SAE-194-SFB nuts and resilient neoprene washers between aluminum and head of bolt, or between nut, ss washer and aluminum body.
- .6 Screen: 20 mm (3/4"), 2 mm (5/64") diameter wire aluminum birdscreen on inside face of louvres in formed U-frame.
- .7 Finish:
 - Powder Coated
 - Colour: to Consultant's approval.
- .8 Acceptable materials:
 - .1 Construction Specialties A2097
 - .2 E.H. Price NJE2
 - .3 Greenheck ESJ-150
 - .4 Krueger
 - .5 Ruskin
 - .6 Ventmaster
 - .7 Nailor
 - .8 Ventex

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 GENERAL

- .1 Conform to general provisions for mechanical division in General Requirements section.

1.2 SUBMITTAL

- .1 Submit shop drawings and product data in accordance with general requirements,
- .2 Indicate the following: complete specifications, wiring diagrams (showing all interconnections); weight; performance details.
- .3 Provide data for inclusion in the Operating and Maintenance manuals in accordance with general requirements.

1.3 REFERENCES

- .1 C.1 CSA B52-2023, Mechanical Refrigeration Code.
- .2 C.2 CAN/CSA-C22.2 No 60335 Safety of Household and similar electrical appliances – Heat Pumps, Air-conditioners and dehumidifiers.

Part 2 Products

2.1 HORIZONTAL UNIT VENTILATOR

- .1 Exterior cabinet panels shall be constructed of heavy gauge steel. Units shall be supplied as heating and cooling: hydronic heat coils, DX cooling coil, remote condenser. Units shall be constructed such that testing and trouble-shooting can be accomplished in the end pockets of the unit without affecting the normal airflow pattern through the unit.
- .2 Floor mounted units shall have an integral pipe tunnel for convenient crossover of piping or electrical wiring in accordance with local and National Electric Codes (NEC). The front surface shall consist of three separate, removable panels. Control compartment must be accessible without removing the entire front panel. Unit discharge grille shall be welded continuous bar type with round edged steel bars placed for a 10° vertical deflection. Adjustable side deflection vanes shall be located beneath the continuous bar grille for easy adjustment by maintenance personnel]. A 6 mm (1/4") painted galvanized mesh screen shall be furnished and located beneath the discharge grille. Unit top surface shall be supplied with a textured paint surface that resists scuffing and hides fingerprints.

Overall unit depth shall be 550 mm (21 7/8").
- .3 Motors shall be direct drive electronically commutated motors (ECM) and be mounted on rubber isolation. Blowers shall be designed specifically for unit ventilator operation. ECM motors shall be programmed to meet the scheduled airflow at the specified external static pressure with additional speed taps for manual adjustment on site during balancing. Motors shall consist of a brushless, permanently lubricated ball bearing construction for maintenance free operation.

- .4 Hydronic coils are to be constructed with copper tubes and mechanically bonded aluminum corrugated plate fins. Water coils shall be furnished with a threaded drain plug at the lowest point. A manual air vent shall be provided at the high point of the coil on all floor mounted units. An auto air vent shall be provided at the high point of the coil on all ceiling mounted units.
- .5 Unit manufacturer shall provide and install a capillary type auto reset freeze stat across the leaving side of the hot water coil. When tripped, the freeze stat shall be wired to shut the outdoor air dampers.
- .6 DX coils are to be constructed with copper tubes and mechanically bonded aluminum corrugated plate fins. All DX coils must be supplied with a factory installed thermal expansion valve. The expansion valve must be sized for the manufacturer's matching remote condensing unit.
- .7 Air Cooled Condensing Units / Heat Pumps - The unit ventilator manufacturer shall provide remote air-cooled condensing units / air-source heat pumps where indicated on plans. The outdoor unit shall be factory precharged and shall be design matched to the indoor unit. The outdoor unit shall be a heat pump, capable of both heating and cooling operations.

The installing contractor shall provide and install between indoor and outdoor unit the interconnecting refrigerant tubing of the size recommended by the unit manufacturer. The installing contractor shall evacuate the indoor coil and interconnection tubing and charge the system in accordance with manufacturer's instructions.

Outdoor unit shall have corrosion resistant cabinet, with hermetically sealed scroll compressor with internal spring isolation, external isolation, low ambient control or cut out, overload protection, copper tube aluminum fin condenser coil, direct drive propeller fan with permanently lubricated ball bearing single phase motor with internal overload protection. Compressor shall be two stage.

System shall be factory charged with R32 or R454B refrigerant (to match unit ventilator).

- .8 Microprocessor-based control for each unit ventilator that must be adaptable to future network system. This control must be pre-engineered, preprogrammed and pretested and shall be factory installed before shipment. The microprocessor-based control shall monitor room conditions and automatically adjust unit operations to maintain these requirements. The control sequence shall be on the basis of ASHRAE Cycle II or ASHRAE Cycle III as selected by owner. The manufacturer shall provide this DDC controller in each unit ventilator.

The direct digital controller shall have the following tenant adjustments as an integral part of the device: room temperature setpoint, minimum percent outdoor air setting, and unoccupied setpoint (offset). Each controller shall be furnished with an LED status/fault indicator on board and a communication port to allow monitoring and adjustment from a portable computer.

Each unit shall be furnished with: Room Sensor c/w Humidity and Motion Sensor.

- .9 Separate room air and outdoor air dampers. The room air damper shall be constructed of aluminum and shall be counterbalanced against back pressure. Outdoor air damper shall be two-piece double wall construction with 15 mm (1/2") thick, 1.5 lb. density fiberglass insulation sandwiched between welded 1.0 mm (20 Ga.) galvanized steel blades for rigidity and to inhibit corrosion. Dampers shall be fitted with neoprene seals along all the sealing edges. Damper bearings shall be made of nylon or other material which does not require lubrication. Dampers shall be factory mounted complete with modulating spring return damper actuator for proportional damper control.
- .10 Economizer Operation: The unit shall have the capacity for 100% outdoor air when outdoor conditions allow.
- .11 Integral factory installed face and bypass damper. The face and bypass damper shall be constructed of aluminum and have a dead air space to minimize pickup in the bypass position. The long sealing edges of the damper shall be fitted with silicone rubber impregnated glass cloth seals with blended mohair seals on the ends for long life and positive sealing. Chilled water units shall be arranged to minimize the bypass of humid outdoor air during partial cooling load conditions. The drain pan shall be piped thru the exterior wall grille.
- .12 Drain pan constructed of stainless steel and shall be insulated. A drain outlet shall be provided on both ends of the pan with one outlet capped. The drain hand of connection shall be easily field-reversed by relocating the cap to the opposite end.
- .13 Condensate Pump shall be factory installed within the unit, behind the return air grille. The head capacity of the pump shall be minimum 20 feet. Pump shall be equipped with overflow alarm contact.
- .14 Filters shall be of the manufacturer's standard washable type.
- .15 Unit manufacturer shall provide an external wall louvre for the outdoor air intake. The louvre and frame shall be of heavy gauge aluminum with 45 deg. blades. The blade profile shall be designed to prevent water penetration. The louvre shall have ½" birdscreen attached to the inner face and shall have a minimum free area of 1.1 sq. ft. The finish on the louver shall be a custom color as selected by the consultant.
- .16 Unit manufacturer shall provide a wall sleeve and shall be custom sized to suit the wall depth. The wall sleeve shall include air flow separators to prevent mixing of fresh air, condenser air intake and condenser air exhaust.
- .17 **Unit manufacturer shall provide a decorative exterior aluminum wall grille constructed of heavy gauge aluminum with rectangular holes to match louvre blade spacing to maximize the air opening. Grille to be secured to wall louvre/ exterior wall. The grille finish shall match the louvre above.**
- .18 All internal line voltage wiring shall be by the unit manufacturer.
 - .1 A suitably rated unfused disconnect switch shall be factory installed within the unit.

- .19 Controls
 - .1 Control items shall be furnished by the unit manufacturer. Components shall be UL or CSA list devices listed in the country intended for use and approved by factory for fit and form prior to arrival.
 - .2 Control items to be factory installed may include:
 - .1 DDC controller
 - .2 Supply Air Temperature sensor
 - .3 Mixed Air Temperature sensor
 - .4 Supply Air Fan current sensor
 - .5 Enthalpy control for economizer operation
 - .3 Controls shall be BacNet for integration to the BAS system.
- .20 Unit Selection and capacity: As per schedule on drawings.
- .21 Acceptable manufacturers:
 - .1 Daikin
 - .2 Trane
 - .3 Engineered Air

2.2 SYSTEM CONTROL

- .1 Equipment control will be by the BAS system. Coordinate with controls contractor.

2.3 REFRIGERANTS

- .1 Refrigerant shall be an A1 or an A2L classified refrigerant.
- .2 Refrigerant charge shall not exceed 3 kg (6.6 lbs)
- .3 For all units with refrigerant charge in excess of 3kg provide a leak detection system as follows:
 - .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.

Part 3 Execution

3.1 INSTALLATION

- .1 Install in accordance with manufacturer's instructions.
- .2 Install equipment exposed to finished areas after walls and ceiling are finished and painted. Avoid damage.
- .3 Protection: Provide finished cabinet units with protective covers during balance of construction.
- .4 Unit Ventilators: Locate as indicated, level and shim units, and anchor to structure. Coordinate with existing wall louvre and radiation cabinet. Adjust existing adjacent surfaces as required for a complete finished installation.
- .5 Hydronic Units: Install with shut-off valve on supply and lockshield balancing valve on return piping. If not easily accessible, extend vent to exterior surface of cabinet for easy servicing.
- .6 Connect drain pan to condensate drain. **Provide condensate pump as required to ensure drain termination through wall is above grade.**
- .7 Provide refrigerant piping, refrigerant accessories and refrigerant from condensing unit to DX coil.
- .8 The mechanical contractor shall charge the refrigeration system after installation and ensure that the cooling system is operating correctly.

3.2 START UP AND INSTRUCTION

- .1 Unit Manufacturer shall provide start up and instruction to the owner.

3.3 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.

END OF SECTION

Part 1 General

1.1 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with general requirements.
- .2 Indicate:
 - .1 Equipment, capacity, piping, and connections.
 - .2 Dimensions, internal and external construction details, recommended method of installation with proposed structural steel support, sizes and location of mounting bolt holes.
 - .3 Special enclosures.
- .3 Primer coat to be off white.
- .4 All hydronic heating shall be by a single manufacturer.

1.2 MAINTENANCE DATA

- .1 Provide maintenance data for incorporation into manual specified in general requirements.

Part 2 Products

2.1 DAMPERS

- .1 Factory built, internal damper, complete with operator, at enclosure air outlet grille for each convection type heating unit not thermostatically controlled. Refer to schedules on drawings.

2.2 CAPACITY

- .1 As indicated.

2.3 EXISTING WALL FIN AND CABINET CONVECTORS (H-EX)

- .1 Remove existing cover, vacuum existing fin and components.
- .2 Replace damaged components including but not limited to hangers, wall mounting brackets, damper positioning nob, etc.
- .3 Replace existing control valve where installed and ensure operation.
- .4 Replace isolating valves where indicated.
- .5 Reinstall existing cabinet. Touch up paint where paint is chipped.

2.4 CABINET UNIT HEATERS (H-EX)

- .1 Remove existing cover, vacuum existing fin, motor, fan, and components.
- .2 Replace damaged components including but not limited to hangers, wall mounting brackets, etc.

- .3 Provide new DVR for control by new low voltage DDC connection to BAS.
- .4 Replace existing control valve.
- .5 Replace isolating valves, air vents, drain valves, etc.
- .6 Replace filter media.
- .7 Reinstall existing cabinet. Touch up paint where paint is chipped.
- .8 Confirm operation fan and control valve with control system.

Part 3 Execution

3.1 INSTALLATION

- .1 Install in accordance with manufacturer's instructions.
- .2 Install in accordance with piping layout and reviewed shop drawings.
- .3 Provide for pipe movement during normal operation.
- .4 Maintain sufficient clearance to permit performance of service maintenance.
- .5 Check final location with Consultant if different from that indicated prior to installation. Should deviations beyond allowable clearances arise, request and follow Consultant's directive.
- .6 Valves
 - .1 Install valves with stems upright or horizontal unless approved otherwise.
 - .2 Install isolating gate valves on inlet and balancing valves on outlet of each unit.
- .7 Venting:
 - .1 Install screwdriver vent on cabinet convactor, terminating flush with surface of cabinet.
 - .2 Install standard air vent with cock on continuous finned tube radiation.
- .8 Clean finned tubes and comb straight.
- .9 Install flexible expansion compensators as indicated.
- .10 Mount wall mounted convectors at 200 mm (8") above finish floor.
- .11 Mount wall mounted radiation at 200 mm (8") above finish floor unless otherwise indicated.
- .12 **Thermostats on outside walls: mount on insulated backplates.**
- .13 On units fed from below floor provide factory manufactured piping shrouds on the exposed piping between base of the radiation cabinet and finished floor. Shroud shall be manufactured by the radiation manufacturer. Shroud shall match finish of the radiation cabinet.
- .14 **On fan forced units set discharge patterns and fan speeds to suit requirements prior to acceptance.**
- .15 **Provide new filter media.**

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 Two (2) year warranty period applies.
- .3 Warranty Coverage:
 - .1 Applies to parts and labour.

END OF SECTION

Part 1 General

1.1 GENERAL NOTE

- .1 This Section is to be read in conjunction with Division 1, the General Conditions and the General Requirements of the Mechanical Trades, and the documents required by the BIDDING REQUIREMENTS and CONDITIONS OF THE CONTRACT sections.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- .1 Heating, Ventilation, and Air Conditioning
Testing and Balancing
Electrical
- .2 Supply all necessary efforts to provide the project DDC Lon Works system as specified.

1.3 DESCRIPTION OF SYSTEM

- .1 Provide an extension of the existing DCC control system for the packaged unit ventilators, remote condensing units, exhaust fans, forced flow heaters, and other equipment indicated. 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 and monitor all air handling units, exhaust fans, and other equipment as specified in this section.
- .2 The DDC System shall include the new DDC System to the latest Board standards. All controller Chipsets to latest release versions.
- .3 The work shall include but is not limited to the following:
 - .1 A local stand alone programmable building automation control (BAS) system for each system as indicated.
 - .2 Split A/C unit control for all remote condensing units.
 - .3 Radiation heating control.
 - .4 Building low temperature alarm (all spaces with sensor).
 - .5 All dampers, operators, etc, required under this contract.
 - .6 All electric wiring, switches, relays, etc., for a complete operating system.
 - .7 All wiring incidental to controls system.
 - .8 System and equipment trending and scheduling.
 - .9 System training.
- .4 All the necessary controls, motors, control wiring, conduit, control panels, instrumentation, computer software, and network access units, for the specified system shall be provided under this section. The installed system shall incorporate electronic and digital control devices to perform the control sequences and programs outlined herein. Specific control sequence requirements are as detailed in subsequent sections of this specification and on the drawings.

- .5 All electrical wiring, mechanical installations, and control sequences shall comply with local and provincial electrical and mechanical codes.
- .6 It is the responsibility of the BAS contractor to provide dedicated 120 V power for the automation system from a spare breaker in the nearest electrical panel. Obtain all necessary ESA permits, inspections, and approvals for all power related work.
- .7 Testing, debugging, confirmation of total system operation and owner training on the complete operation of the system and the computer software shall also be provided in this section.

1.4 SCOPE OF WORK

- .1 The contractor shall supply, install, test, and commission a complete microprocessor based programmable HVAC control system including all system components as described further. The system shall include the necessary engineering, supervision, and programming for a completely operational system. Submit complete As-built information describing the operation/programming and installation/wiring of the new DDC system.
- .2 Update existing software and graphics in the existing OWS located on site.
- .3 Ensure that software is up to date in the existing PC located at the Board maintenance office on Dutton Drive in Waterloo, Ontario.

1.5 ASSOCIATED WORK SPECIFIED IN OTHER SECTIONS

- .1 The contractor shall coordinate the installation of devices furnished in this section with the installing contractor by trade jurisdiction.
- .2 Sheet Metal/Ventilating Contractor

Install all single and multiple section dampers, interconnecting linkages, blank-off plates, duct transitions, access doors, louvers and similar items as required for the system and/or as indicated on the drawings.
- .3 Electrical Contractor

Install and connect electrical power to all motors, transformers and starters. A power supply will be available from the panel in the mechanical room for DDC system control panels.

1.6 MANUFACTURER

- .1 Bids for the BAS contract will only be accepted from the following vendors/installers:
 - .1 Energy Controls and Mechanical Services Inc.
565 Trillium Drive, Unit 6
Kitchener, Ontario
N2R 1J4
Tel: (519) 893-2638
- .2 All control equipment and materials shall be new and of the manufacturer's latest standard design that complies with the specification requirements.

1.7 SYSTEM ACCEPTANCE

- .1 System commissioning and interface to facilities management network shall be performed by the Building Automation contractor.
- .2 On project completion, the contractor shall issue a report to the consultant stating that the system is complete, that all hardware and software functions have been verified and that the system is operating in accordance with the specifications. A demonstration of complete system operation shall be made to the owner's authorised representative.
- .3 Upon successful completion of the system demonstration, the owner's representative shall be requested to approve, in writing, the satisfactory operation of the DDC System, interface devices and accessories.
- .4 The consultant shall verify through the owner's representatives that the entire system is complete and operating to the satisfaction of the owner before final acceptance is approved.

1.8 MAINTENANCE DATA AND SERVICE

- .1 Provide maintenance data for controls and instrumentation for incorporation into maintenance manual.
- .2 After acceptance, seasonally check and readjust control systems for change over. Make two (2) site trips. Notify Engineer of scheduled dates. Carry out any preventive maintenance required including parts and labour. Report to Engineer, in writing, results or resettings made.
- .3 Provide as-built information in accordance with Division 01 and Division 20 requirements.

1.9 WARRANTY

- .1 The Control Contractor shall guarantee the control system as specified to be free from defects in workmanship and material under normal use and service for a period of 12 months. Items found defective shall be replaced free of charge for a period of 12 months following written acceptance of the completed project contract by the Owner.
- .2 Custom hardware and materials specific to this control system shall be similarly guaranteed for a period of 24 months.
- .3 Service conducted on the system during the period of warranty shall be performed by the Contractor on-site. Any component serviced off-site shall be temporarily replaced with an identical device at no additional expense.
- .4 Equipment guaranteed for a longer period by the OEM shall be replaced by the Contractor until the manufacturer's limit, on a labour only basis.
- .5 Provide telephone support for the duration of the guarantee period accordingly. Submit a written procedure for the reporting of system malfunction by the Owner for required Contractor service. Provide telephone numbers, hour of use, and a 24/7 emergency response number for support.

1.10 SUBMITTALS

- .1 Prior to the installation of any equipment, the contractor shall provide the engineer with six (6) copies of shop drawings and specifications for all devices and equipment used for the complete system installation.
- .2 Upon completion of the installation and prior to acceptance and owner training, the contractor shall furnish the engineer with three (3) copies of installation and operation manuals for the complete system. Each manual shall include:
 - .1 "As Built" drawings, including plan layout, conduit runs, interconnection between devices, and panel wiring diagrams as finally installed.
 - .2 A complete application description, address location, sequence of operation and I/O summary for each controller installed in the system.
- .3 System Architecture Schematics: Provide a complete drawing(s) which details all components of the monitoring and control system. Identify the individual type of controllers, communication buses and speeds, power sizes and distribution, etc. by location and name. Field devices need not be shown.
- .4 Equipment Description: Provide technical specifications of all additional project equipment used in the system, including all field devices. Include manufacturer, model number, power requirements, accuracy, etc. Identify the information by point labels. Technical specifications will be presented in OEM Adobe "PDF" formats only.
- .5 Provide a DDC system generated points list describing the type, function, and label of all control points for cross reference with specification points list and/or sequence of operation.
- .6 Provide an Operator's Manual consisting of instructions, program listings and control sequences for the control system. Provide specific instructions, which explain the remote access procedure, all default and programmed DDC system and OWS software passwords, and supervisory control operation.
- .7 Provide an OEM CD-ROM containing all product line documentation, manuals, release notes, controller firmware files, etc. Provide internet access to an OEM website which provides current file access to the items on the CD-ROM.
- .8 Backup diskettes of all final data files, programs and computer software for the system, as accepted by the owner, for reloading into the site computer in the event of a system catastrophe or site computer memory failure. The contractor shall also keep one copy of backup diskettes for the system archived in a software storage vault at their business location.
- .9 Shop drawings shall be approved before any materials are delivered or installed at the project site.

1.11 TESTING AND BALANCING

- .1 During the system testing and balancing by an independent agency fully demonstrate the operation of all sensors, dampers, actuators, controls, valves, etc. This contractor shall be present during the testing and balancing and make adjustments as often as necessary to satisfy the testing and balancing agency.

Part 2 Products

2.1 MONITORING AND CONTROL SYSTEM (MCS)

- .1 The MCS as specified shall include all necessary hardware, software programming, engineering, installation, calibration, sensors, controlling devices and wiring to provide a complete and functional DDC HVAC system.
- .2 The MCS shall be a real-time based, multi-user, multi-tasking, computerized control system incorporating distributed direct digital control processing formats as specified. Mechanical and single loop digital controllers (SLDC) are prohibited.
- .3 The MCS controllers shall consist of stand-alone, non-application specific (ASC) , microprocessor based panels which communicate on industry standard communications buses to central/remote display terminals. Provide a functional peer-peer "ECHELON" communications network at each site. Provide software and hardware as required to complete an Ethernet TCP/IP, PTP(RS232), and MS/TP(RS485) network protocol for the DDC system in "Echelon", ISO Standard. The operator's WorkStation software, DDC hardware control panels and products, shall communicate using the protocols and LAN/WAN IP standards as defined by the current ANSI/ASHRAE Echelon standard governed by SSPC 135 (www.Echelon.org).

Note: The basis for the Echelon communications is to exchange all data and alarms as points. The Echelon protocol shall exchange system points over the local/remote networks installed including the ethernet LAN/WAN. Echelon communications which use conversion devices, PC/software or Gateway/Bridge, for OEM protocols are not acceptable.

- .4 The individual MCS controllers will be able to initiate all alarm reporting and selective data uploading to central/remote display terminals via LAN/WAN connections based on TCP/IP standards.
- .5 A fail-safe control mode shall allow equipment to be protected if any controller is disabled or malfunctions.

2.2 CONTROLLERS

- .1 The Direct Digital Control (DDC) panels shall have UPS backup and shall consist of the following:
 - .1 Each DDC controller shall utilize its own microprocessor and must be capable of stand-alone direct digital operation to perform custom program control, monitoring, alarm reporting, trending, and fail-safe control. Application specific controllers will not be accepted.
 - .2 Memory protection for a minimum of 24 hours by zero maintenance capacitor backup shall be provided after a loss of primary power for each DDC controller. This protection shall at a minimum include continuous real-time clock operation and automatic system restart upon power return. Outputs shall have the option of being set to "staggered start" upon power reset.

2.3 DDC SOFTWARE

- .1 Provide an "Open-Protocol" based controls communication for the system integration of other control system hardware/software products via the "ECHELON" ISO standard.

The ECHELON protocol shall communicate all system data via the Ethernet LAN/WAN. DDC communications networks across routers between DDC panels via Echelon/IP shall be provided and demonstrated.
- .2 Provide both a menu tree and command prompt type of operator's control software to include complete input/output data base entry, custom application programming, alarm definitions, data trending, report summaries, as a minimum.

The menu tree shall be custom programmed in order to restrict user configured control options based on a minimum of four levels of defined password protection.
- .3 The default units of measurement shall be Metric SI, Imperial units are base optional.
- .4 The control software concept shall be based on everything is a "point". Any input, output, controller, schedule, calendar, trend, alarm, program, controller or system option is a point that can be addressed. All points can be shared within common control applications, transferred over control networks, modified, printed, saved or deleted as required through operator terminals and in control programs.
- .5 Universal Inputs/outputs. All universal point types shall be software configured by selecting sensor options in database creation and modification templates. All changes shall be possible while the system is on-line and operational. The configuration shall be done in a form so that the user is never required to be knowledgeable about the programming itself, only the system and applications.
- .6 All numerical point values shall be displayed in integer format or floating point between -3.4×10^{38} to 3.4×10^{38} , i.e. .00000123, 7.879E-12, 100. Selected engineering units shall accompany point values.
- .7 All points can be printed in an "all-points" log or in selected groups (inputs, outputs, variables, etc.) by the user using "Wild-Card" conventions.
- .8 All points will be programmed to alarm based on user defined input ranges for both digital change of state and analog point values.
- .9 Provide the following control routines:
 - Start/Stop by Schedule, Duty cycle, Optimization, Level, Electrical demand.
 - Process Loop Control - P, PI, PID.
 - Economizer Control of Free Outdoor Air Cooling.
 - Boiler Plant Optimization. Adaptive Hot Water Reset.
 - Equipment Trend Log, Run-Time Monitoring.
 - Unitary Equipment Programs.Custom control programs developed shall be added to the library of software routines.

- .10 Provide the following Operators:
- Logical "NOT", "AND", "OR", "XOR". Minimum of three Expressions.
 - Value Power "^". (i.e., $2^3 = 8$)
 - Addition "+", Subtraction "-".
 - Multiplication "*", Division "/".
 - Integer of a Division "\", Remainder of Division "MOD".
 - Less Than "<", Greater Than ">".
 - Less Than or Equal "<=", Greater Than or Equal ">=".
 - Equal "=", Not Equal "<>".
- .11 Provide a DDC based custom control strategy programming language based on a high level "Control" type code such as Basic. Assembler type or proprietary based programming languages will not be accepted. All programs shall use embedded comment statements to describe control sequences within the software program.
- All the above functions must be accomplished via DDC software.
- Editing Features
- .1 Provide full screen editor to enable editing of the program source code down to character by character changes.
 - .2 Provide the capability in the editor of accepting programs from ASCII files that have been created on other text editors and word processors.
 - .3 If a point name is changed, all occurrences of that will point will automatically be changed, regardless of where the occurrence exists.
 - .4 Provide cutting and pasting functions within editor, such that sections of the code from one program can be easily cut and pasted into a different code on residing in another controller.
 - .5 Provide debug utility, which will indicate line of code containing structural or syntax error.
 - .6 If coding contains line number reference, provide automatic renumbering feature to sequentially renumber lines.
 - .7 Provide the capability to automatically view value and/or status of points used within the code without exiting editor.
 - .8 Provide at least TEN (10) unique local variables that can be declared for each individual code.
- .12 Control software "Firmware" shall be the most recent version available and shall be upgraded with new versions, which become available within the warranty period.

2.4 LOCAL DISPLAY TERMINAL SOFTWARE

- .1 Provide all type software required for monitoring, control, and programming of all system functions via command and graphics level modes. The software is to be modular in order to permit expansion or revision of the system. The software shall provide DDC system access and colour graphics operation from local PC.

- .2 Software versions shall operate under the latest version of all the Microsoft Windows operating systems. The software versions shall be Windows compliant and permit multitasking operation. The software shall permit multiple "windows" to be simultaneously open for the DDC system, desktop, and other third party programs, i.e. "Netscape", "Microsoft Word" etc.
- .3 Provide multiple-level system access protection on any DDC port to allow restricted control of system operations according to user capability. Provide six levels minimum for 32 system users.
- .4 Control sequences are to be created in high-level code.
- System alarms shall indicate the specific graphic for display in response to alarm recognition.
- System points on all graphic displays shall include custom text files for on-line review by operators to describe specifics about the point.
- The graphic displays shall use any type of DDC system point in quantities limited only by the usable display area of the monitor.
- All DDC points shall be referenced in OEM/Echelon point ID format. Control points from other control systems shall be displayed directly in the graphics software application stipulated.
- Explanation, creation, modification, programming of graphics shall be detailed in OEM manuals and in electronic "PDF" format.
- Displays should permit:
- At least 30-local/network points minimum per page.
 - Automatic updating every 10 seconds minimum.
 - Alarm display and control conditions.
 - Simple means of color printing.
- Provide a display for:
- Main summary page. Complete with project title, OAT conditions, other.
 - Energy Data.
- .5 The system shall trend and display either numerically or graphically any digital and analog system point with a value. Data files in standard formats for direct use with third-party spreadsheet software (Microsoft Excel) shall be included. Automatic upload of trend data by the system shall be included. The trend features including elapsed time period between logging, value accuracy, number of points, and engineering units shall be programmable. The DDC programs shall control the start/stop, snapshot, and reset of analog and digital trends.
- A minimum of four points can be trended in one database.
- .6 The system alarms shall be directed to the Remote Central Display Terminal for hard disk type record purposes. The alarm format shall be in ASCII format sent by Ethernet LAN/WAN and e-mail compatible formats. Alarm report printouts shall be obtained by request of a system operator.

2.5 GENERAL REQUIREMENTS FOR SENSORS AND FIELD DEVICES

- .1 Actuation of control devices shall be electronic. Spring return fail-safe actuation shall be provided when loss of property and/or property damage is possible and where specified.
- .2 All equipment, unless specified to contrary, shall be fully proportioning, modulating in operation.
- .3 Space and duct sensors shall be electronic suitably located for specific application. Space sensing units shall be mounted 1500 mm from floor to centre for non-adjustable and 1200 mm from floor for adjustable unless otherwise noted or agreed to by the consultant.
- .4 Sensors shall meet or exceed the specified standards.
- .5 All sensors shall be capable of operating over the expected operating range and humidity.

2.6 MOTORIZED CONTROL DAMPERS

- .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 1% of total flow based on a approach velocity of 7.62 m/s (1500 ft/min) 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 CONTROL VALVES

.1 General:

- .1 All automatic control valves shall be fully proportioning, unless specified otherwise. The valves shall be quiet in operation and fail safe in normally open position unless specified otherwise. All valves shall be capable of operating at varying rates of speed to correspond to the exact dictates of the controllers and variable load requirements. The valves shall be capable of operating in sequence with other valves and/or dampers when required by the sequence of operation. All control valves shall be suitable for the pressure conditions and shall close against the differential pressures involved.
- .2 All control valves shall be sized by the control vendor and be guaranteed to accommodate the flow rates as scheduled.
- .3 The valve seat differential pressure rating shall exceed the pump dynamic head design pressure.
- .4 All control valve bodies shall be suitable for the static and dynamic pressures of the system. Control valve operators shall be sized to close against a differential pressure equal to the design pump head plus 10 percent.
 - .1 Design body pressure shall be determined by the adding the static pressure due to the height of the system plus the compression tank charge plus the maximum head of the system pump at cut off. Provide 10% design factor.
- .5 The valve seat differential pressure rating shall exceed the pump dynamic head design pressure.
- .6 Cold water, hot water and steam valves, throttling type, and bypass valves shall have equal percentage flow characteristics.
- .7 All automatic control valves installed exposed to the elements shall be provided with electric actuators with operating characteristics and accessories as described in herein. Coordinate with electrical contractor for power availability and point of connection.
- .8 All automatic control valves controlled by the BAS shall be furnished by the controls contractor unless noted otherwise in these documents.

.2 Controlled Media

- .1 The control valve shall be suitable for chilled water to a minimum of 35°F (2°C) and hot water to a maximum temperature of 250°F (121°C). 3-way 1-1/2 inch and 2 inch valves shall be suitable for chilled water to a minimum of 35°F (2°C) and hot water to a maximum temperature of 230°F (110°C). The control valve shall be suitable for up to 50% ethylene or propylene glycol solutions where applicable.

- .3 Threaded Valves, line size ½" to 2":
 - .1 Control valve bodies shall be constructed of forged brass according to ASTM B283 (C37700, CuZn39Pb2 or equivalent), and shall meet requirements of ANSI 250 and 600WOG pressure classes.
 - .2 Inlets and outlets shall be clearly marked on the valve bodies.
 - .3 Valve ball shall consist of nickel-plated brass, chrome-plated brass or stainless steel.
 - .4 End connections shall be NPT internally threaded according to ANSI B1.20.1.
 - .5 The control valve flow rate (Cv) shall meet the requirements of ANSI/ISA S75.02.
 - .6 The control valve shall have an equal percentage flow characteristic, according to ANSI/ISA S75.11. A single glass filled PTFE V port insert shall provide both the ball seal and shall establish the flow coefficient of the valve. The V port insert shall be retained by the valve body itself, not requiring additional retaining components. Flow coefficient adapters requiring a retainer clip, or installed after final assembly of the valve or as inserts in the ball shall not be allowed.
 - .7 2-way valves and the A-AB path on 3-way valves shall meet the requirements of ANSI Class IV (0.01% of rated Cv) seat leakage, or better, according to ANSI/FCI 70.2, at the specified close-off pressure. Bypass path (B-AB) on 3-way valves shall meet the requirements of ANSI Class III (0.1% of rated Cv) seat leakage, or better, according to ANSI/FCI 70.2.
 - .8 Chilled and Hot water valve shall have a blow-out proof stem with two EPDM (peroxide cured) O-rings. External stem retainers will not be allowed.
 - .9 Valve stem shall be made of brass or stainless steel.
 - .10 Valve shall have the ability to be manually operated in the event of a power failure.
- .4 Flanged Valves, line size 2 1/2" and greater
 - .1 Valves 2 1/2" and larger shall be cast iron ANSI Class 125 with guided plug and PTFE packing.
- .5 Pressure Control Valves:
 - .1 Provide for all water systems where modulating water flow conditions are required to prevent excessive pump pressure build-up. Provide a valve for each closed loop water system. Valve to be globe type. Provide valves 2" and smaller with screwed end bodies and provide valves 2-1/2" and larger with flanged ends.

2.8 ELECTRONIC DAMPER AND VALVE ACTUATORS

- .1 General
 - .1 Electric control shall be direct coupled actuators.
 - .2 Damper actuators shall be Brushless DC Motor Technology with stall protection, bi-directional, fail safe spring return, all metal housing, manual override, independently adjustable dual auxiliary switch.
 - .3 The actuator assembly shall include the necessary hardware and proper mounting and connection to a standard ½" diameter shaft or damper blade.

- .4 Actuators shall be designed for mounting directly to the shaft without the need for connecting linkages.
- .5 All actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered.
- .6 All actuators having more than 100 lb-in torque output shall have a self-centering damper shaft clamp that guarantees concentric alignment of the actuator's output coupling with the damper shaft. The self-centering clamp shall have a pair of opposed "v" shaped toothed cradles; each having two rows of teeth to maximize holding strength. A single clamping bolt shall simultaneously drive both cradles into contact with the damper shaft.
- .7 All actuators having more than a 100 lb-in torque output shall accept a 1" diameter shaft directly, without the need for auxiliary adapters.
- .8 All actuators shall be designed and manufactured using ISO900 registered procedures, and shall be Listed under Standards UL873 and CSA22.2 No. 24-93 I.
- .9 Provide visual scale indicating percent of travel.
- .10 Provide feedback signal on all control valves over 2 inches and all damper actuators where specified.
- .11 Actuators shall be UL and CSA listed.
- .2 Electronic Valve Actuators
 - .1 The valves shall be provided with an actuator by the same manufacturer, factory installed.
 - .2 All actuators shall have visual position indication.
 - .3 No external programming device shall be required.
 - .4 Actuator shall be electric motor driving, microprocessor signal controlled.
 - .5 Electric Control Rangeability: 40:1
 - .6 Control Signal 0 to 10 VDC or 0 to 20 mA signal. 2 to 10 VDC or 4 to 20 mA operating range.
 - .7 Power 24 VAC, 50-60 Hz
 - .8 Fail Safe: Valves actuators shall position the valve in a fail safe position when the power supply is disrupted or the signal goes to 0. Fail-safe according to the following guidelines unless otherwise stated in the sequence of operations
 - .1 Power fail safe shall be via spring loaded mechanical means
 - .2 Any AHU hot water exposed to ventilation air shall fail open
 - .3 AHU Chilled water coils exposed to ventilation air in possible freezing conditions shall be fail open
 - .4 Terminal unit valves shall fail-in-place
 - .9 Fail in place valves on primary equipment such as chilled water systems, hot water systems and condenser water systems shall have a means to manually open the valve when power is not available, such as a hand wheel or a geared crank with a clutch.
 - .10 The actuator shall be designed with a current limiting motor protection. A release button (clutch) or handle on the actuator shall be provided to allow for manual override (except when actuator is spring return type).

- .11 Actuator shall provide minimum torque required for proper valve close-off. The close-off differential pressure rating of the valve shall exceed the highest possible head pressure available at the pump plus 10%, and still be rated for a Class IV leakage.
- .12 The actuator shall have the capability of adding auxiliary switches or feedback potentiometer if specified.
- .13 All automatic control valves installed in locations exposed to the elements shall be provided with weather resistant housings and heaters for climates that reach below freezing.
- .3 Electronic Damper Actuators
 - .1 Actuator shall be direct coupled (over the shaft), enabling it to be mounted directly to the damper shaft without the need for connecting linkage. The actuator-to-shaft clamp shall use a "V" bolt and "V" shaped, toothed cradle to attach to the damper shaft for maximum holding strength. Single bolt or set screw type fasteners are not acceptable.
 - .2 Damper operators shall be of the replaceable diaphragm piston type with external adjustable stops to limit the length of stroke in either direction. Operators shall be mounted on adjustable brackets. Operating arms shall have double yoke linkages and double set screws for fastening to damper shaft.
 - .3 Damper operators shall be selected to operate maximum damper loads of 2.6 m² (135 ft²). Where damper sizes exceed this area rating, multiple damper operators shall be provided.
 - .4 Actuator shall have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator. End switches to deactivate the actuator at the end of rotation or magnetic clutch are not acceptable.
 - .5 For power-failure/safety applications, a mechanical, spring return mechanism

2.9 DAMPER STATUS SWITCHES

- .1 Damper status switches shall be a lever operated, activated by damper blade movement and mounted securely on damper frame.
- .2 Damper switch shall have contact rating of 5 amperes at 120V AC and be CSA approved.

2.10 TEMPERATURE THERMOSTAT (DDC)

- .1 Digital room sensors without LCD display, day / night override button, and setpoint slide adjustment to $\pm 5^{\circ}\text{C}$ adjustment and override options. The setpoint slide adjustment can be software limited by the automation system to limit the amount of room adjustment.
 - .1 Temperature monitoring range +20/120°F -13° to 49°C)
 - .2 Output signal Changing resistance
 - .3 Accuracy at Calibration point $\pm 0.5^{\circ}\text{F}$ (+/- 0.3°C)
 - .4 Set Point and Display Range 55° to 95° F (13° to 35°C)

- .2 Provide metal guards on thermostat in common areas and gymnasiums. Common area thermostats shall not have temperature adjustment.
- .3 Sensor to be 10k wire, thermistor style.
- .4 Do not provide LCD display of space temperature.
- .5 Sensor shall have integral CO2 sensor. Refer to CO2 sensor details for requirements.
- .6 Integral CO2 sensor is not required for thermostats at building entrances serving forced flow unit heaters.

2.11 FLUID TEMPERATURE SENSORS

- .1 Immersion sensors shall be provided with a separable stainless steel well. Pressure rating of well is to be consistent with the system pressure in which it is to be installed. The well must withstand the flow velocities in the pipe.
- .2 The sensor shall have the following characteristics:
 - .1 Range Appropriate to application
 - .2 Output Signal 4 to 20 mA or resistive
 - .3 Accuracy 0.05% of maximum range, max 0.1 C

2.12 SEPARABLE BRASS THERMOWELLS

- .1 These shall be provided with immersion type bulbs for installation by plumbing section. (Stainless steel shall be used for immersion in glycol solutions.) Wells shall be packed with thermal conductive grease to increase speed of response. Thermowells shall have ½" IPS threads to receive sensor, and be of suitable length for the pipe diameter.

2.13 AIR TEMPERATURE SENSORS

- .1 Sensors shall be a minimum of 1.5 m (5ft) in length per 1 square meter of duct cross section.
- .2 All supply air sensors and mixed air sensors shall be 100 or 1000 OHM platinum, resistance temperature detector (RTD) type with a 7.5 m (25') averaging element. Each RTD may be provided with an industry standard, 4-20mA, transmitter mounted at the RTD as required.
 - .1 Temperature monitoring range -7°C to 49°C (20°F to 120°F)
 - .2 Output signal Changing resistance
 - .3 Accuracy at calibration point ± 0.3C (± 0.5F°)
- .3 All return air sensors shall be RTD or thermistor type temperature detectors. The sensor probe shall have a minimum length of 450 mm (18"). Each RTD may be provided with an industry standard, 4-20mA, transmitter mounted at the RTD as required.
 - .1 Temperature and monitoring range 4°C to 66°C (40°F to 150°F).
 - .2 Output Signal Changing Resistance
 - .3 Accuracy at calibration point 0.3C (± 0.5F°)

- .4 Outdoor air sensor shall be the PT-100 platinum 3 wire RTD type with a 4-20mA transmitter mounted at the sensor. The RTD shall be mounted in a weatherproof enclosure, the 4-20mA transmitter shall be mounted inside the building within an electrical box.
 - .1 Temperature and monitoring range -18°C to 49°C (0°F to 120°F).
 - .2 Output Signal Changing Resistance
 - .3 Accuracy at calibration point $\pm 0.3\text{C}$ ($\pm 0.5\text{F}^\circ$) over a range of
- .5 Sensors shall be provided with vented protective covers, mounted 1500 mm (60") from floor level.

2.14 LOW LIMIT THERMOSTATS

- .1 Thermostats shall have 6000 mm vapour tension sensing element sensitive to a temperature below its setpoint over 300 mm of its length.
- .2 Range shall be 1.7 to 7.2 degrees C.
- .3 Switch shall be snap acting and rated for 16 amperes at 120 VAC or 8 amperes at 575 VAC as required.
- .4 Thermostat shall have automatic reset feature.
- .5 Provide one thermostat for each 1 sq. m of coil face area or part thereof.
- .6 Thermostats shall be DPDT to facilitate monitoring by BMS.
- .7 Mount sensing element rigidly and as close as possible to the downstream face of the coil being protected or where shown on schematic diagrams. Freeze controls shall have 6 m capillary arranged in ducts for best possible protection.
- .8 Provide freeze stat for each 5.5 square meters of duct area where necessary, wired in series. Sensing element shall extend at least to two diagonally opposite corners of the coil.

2.15 CO2 DETECTOR

- .1 The sensor shall be the non-dispersive infrared style.
- .2 The sensor shall meet the following operating characteristics
 - .1 Range 0 to 5000 ppm
 - .2 Output Signal 0 to 10 vDC or 4-20 mA
 - .3 Accuracy +/- 50 ppm
- .3 Outputs shall be configured using optional software package to provide advanced control strategies using CO₂.
- .4 Sensor shall be self calibrating.
- .5 Wall mounting or duct mounting, depending on application.

2.16 ELECTRICAL DEVICES

- .1 Relays
 - .1 Control relays shall be UL listed plug-in type with dust cover and LED “energized” indicator. Contact rating, configuration, and coil voltage shall be suitable for application.
 - .2 Time delay relays shall be UL listed solid-state plug-in type with adjustable time delay. Delay shall be adjustable $\pm 200\%$ (minimum) from set point shown on plans. Contact rating, configuration, and coil voltage shall be suitable for application. Provide NEMA 1 enclosure when not installed in local control panel.
- .2 Override timers.
 - .1 Override timers shall be spring-wound line voltage, UL Listed, with contact rating and configuration as required by application. Provide 0-to-6-hour calibrated dial unless otherwise specified. Timer shall be suitable for flush mounting on control panel face and located on local control panels or where shown.
- .3 Current transmitters.
 - .1 AC current transmitters shall be the self-powered, combination split-core current transformer type with built-in rectifier and high-gain servo amplifier with 4 to 20 mA two-wire output. Unit ranges shall be 10 A, 20 A, 50 A, 100 A, 150 A, and 200 A full scale, with internal zero and span adjustment and $\pm 1\%$ full-scale accuracy at 500 ohm maximum burden.
 - .2 Transmitter shall meet or exceed ANSI/ISA S50.1 requirements and shall be UL/CSA Recognized.
 - .3 Unit shall be split-core type for clamp-on installation on existing wiring.
- .4 Current transformers.
 - .1 AC current transformers shall be UL/CSA Recognized and completely encased (except for terminals) in approved plastic material.
 - .2 Transformers shall be available in various current ratios and shall be selected for $\pm 1\%$ accuracy at 5 A full-scale output.
 - .3 Transformers shall be fixed-core or split-core type for installation on new or existing wiring, respectively.
 - .4 Status inputs for motors (pumps and fans) shall use inductive coils to monitor current draw from one phase of power.
 - .5 Current transformers shall be selected and configured for appropriate amperage range, and shall have 0 to 5 Volt output.
 - .6 BMS shall use AI points to monitor current transformers.
- .5 Voltage transmitters.
 - .1 AC voltage transmitters shall be self-powered single-loop (two-wire) type, 4 to 20 mA output with zero and span adjustment.
 - .2 Ranges shall include 100 to 130 VAC, 200 to 250 VAC, 250 to 330 VAC, and 400 to 600 VAC full-scale, adjustable, with $\pm 1\%$ full-scale accuracy with 500 ohm maximum burden.

- .3 Transmitters shall be UL/CSA Recognized at 600 VAC rating and meet or exceed ANSI/ISA S50.1 requirements.
- .6 Voltage transformers.
 - .1 AC voltage transformers shall be UL/CSA Recognized, 600 VAC rated, complete with built-in fuse protection.
 - .2 Transformers shall be suitable for ambient temperatures of 4°C to 55°C (40°F to 130°F) and shall provide $\pm 0.5\%$ accuracy at 24 VAC and a 5 VA load.
 - .3 Windings (except for terminals) shall be completely enclosed with metal or plastic material.
- .7 Power monitors.
 - .1 Power monitors shall be the three-phase type furnished with three-phase disconnect/shorting switch assembly, UL Listed voltage transformers, and UL Listed split-core current transformers.
 - .2 They shall provide a selectable rate pulse output for kWh reading and a 4 to 20mA output for kW reading. They shall operate with 5 A current inputs with a maximum error of $\pm 2\%$ at 1.0 power factor or $\pm 2.5\%$ at 0.5 power factor.
- .8 Current switches.
 - .1 Current-operated switches shall be self-powered, solid-state with adjustable trip current. The switches shall be selected to match the current of the application and output requirements of the DDC system. Switch shall be complete with LED and have four turn adjustment.

Part 3 Execution

3.1 GENERAL

- .1 The DDC controls project shall be performed in accordance with the general conditions of the contract. The contractor shall conduct all on-site work in conjunction with building operating staff to streamline the new system startup.
- .2 The summary of input/output channels describe the DDC system points. It is the responsibility of the Contractor to ensure compatibility of the mechanical systems, devices, and actuators with the DDC system.
- .3 All digital output control points located in unconditioned spaces shall be relocated to an accessible ventilated indoor location. All control devices, DDC panels, other shall be located inside the conditioned space of the building envelope.
- .4 All DDC system equipment will become the property of the Owner.

3.2 LABELLING

- .1 All control equipment is to be labelled with new similar lamicaid plates with a designation corresponding to the specific system point description/label. All lamicaoids shall be mechanically fastened to surfaces. Submit samples to Owner for approval.

3.3 COMMISSIONING - DDC SYSTEMS

- .1 Check the installation of each sensor, actuator, and controlled device.
- .2 Verify and record in as built OEM drawings the wiring of each I/O sensor and device as installed.
- .3 Calibrate each sensor as required.
- .4 Manually operate each output for every system with a portable Display Terminal supplied by the contractor for commissioning.
- .5 Tune each control loop and print the response of trends for hard copy record. Identify correct PID parameters on all print outs.
- .6 Verify all start/stop operations, e.g. "schedule control", "Optimized control", "unoccupied mode" setback.
- .7 Verify all custom control programs and alarm functions.
- .8 Perform end-to-end checks from an operator terminal to all sensors and actuators to verify system communications and control via LAN/WAN.
- .9 Verify all Echelon communications as specified and submit all point naming and identification values accordingly.

3.4 INSTALLATION

- .1 Install systems and related controls in accordance with approved shop drawings and manufacturer's recommendations using factory-trained journeymen certified by the Province of Ontario.
- .2 Locate thermostat, room sensors, etc., location as shown or as required.
- .3 Secure approval for damper motor locations and supports. Submit detail of damper motor location and support for approval.
- .4 Provide dampers, for installation by the sheet metal contractor on new and or existing dampers.

3.5 POINT DESCRIPTORS

- .1 Adopt and utilize a consistent naming convention in order to identify points and facilitate wildcard calling of all points, systems, and programs.

3.6 SYSTEM OPERATION

.1 General

Where Optimum Start Stop (OSS) is specified, equipment shall start-up based on global outdoor temperature, space temperature, and system response to assure that comfort conditions are reached at scheduled occupancy time (occupancy schedules are defined under time programs) and operate in both heating and cooling cycles. In all cases, the optimum start program shall operate fully stand-alone in the local GPC.

OSS shall include a Night Cycle program applying to (heating cycle only) (both heating and cooling cycle) with the outdoor air dampers closed. The space temperature shall be used to determine the "fan on" and/or "supply heat" command to maintain a low limit of 50-55 degrees for the heating cycle and the "fan on" and "supply cooling" command to maintain 82 degrees for the cooling cycle.

Where an Economizer Cycle (EC) is specified, it shall automatically enable the economizer mode based upon an enthalpy comparison of outdoor air and return air of each AHU.

Provide two-speed control for units over 7½ tons (refer to schedule on drawings).

.2 Data Control (D/C) and Graphics Summary

All hardware, custom software, application software, graphics, etc., necessary to accomplish the control sequences and display the graphics specified shall be provided as part of this contract. Provide all controllers, inputs, outputs, valves, dampers, actuators and flow meters required to provide the control and graphic data described. Provide software setpoints required for display in logical groups and graphics.

Each digital output shall have a software-associated monitored input. Any time the monitored input does not track its associated command output within a programmable time interval, a "command failed" alarm shall be reported.

Where calculated points (such as CFM) are shown, they shall appear in their respective logical groups.

Unless otherwise specified or approved prior to bidding, the primary analog input and the analog output of each DDC loop shall be resident in a single remote panel containing the DDC algorithm and shall function independent of any primary or UC communication links. Secondary (reset type) analog inputs may be received from the primary network, but approved default values and/or procedures shall be substituted in the DDC algorithm for this secondary input if network communications fail or if the secondary input becomes erroneous or invalid.

.3 Application Requirements

.1 Software

The microprocessor-based control system shall rely on software for non-critical interlocks and time delays. Where required by the specifications, these functions shall be provided by separate thermostats, relays, and delay timers.

.2 Interlocks

Safety and other interlocks may require relays depending on the specific devices being used. Some devices may require a special power supply as shown in the wiring details. Safeties shall be hardwired into the control circuit and shall also be monitored by the BMCS.

- .3 Sensors
Select duct insertion sensors to suit the application. For large ducts, use sensors with longer probe lengths. For heating and cooling coil freeze protection, use a long capillary type sensor. For mixed air and coil discharge temperature sensing, use averaging capillary type sensors.
- .4 Valves
Ensure that actuators meet all the job requirements (i.e., control signal, close off, action, etc.). Control valves shall be selected to suit both the medium and the specified configuration (i.e., Straight-thru, 3-way, screwed, flanged, etc.).
- .5 Damper Actuators
The total number of actuators may vary depending on the damper size. Consult the actuator's application literature to determine sizing requirements and use no less than 30% of the minimum number of actuators recommended.
- .4 Design Requirements
 - .1 Safeties: Smoke detector or high temperature interlocks will be hard-wired to the supply fan starter. These points will be assigned addresses in the DDC controller for alarm annunciation purposes only. AHU's with flows greater than 15,000 CFM will require a smoke detector or high temperature detector in the supply and return air ducts.
 - .2 Schedules: Time schedules will default to 6AM to 6PM, Monday through Friday.
 - .3 Actuators: Actuator output points will display as follows:
 - .1 0% = 2-way valve, closed.
 - .2 0% = 3-way valve, closed to the coil.
 - .3 0% = Mixed air dampers, full return air position.
 - .4 100% = 2-way valve, open.
 - .5 100% = 3-way valve, open to the coil.
 - .6 100% = Mixed air dampers, full fresh air.
 - .7 These requirements shall be the case no matter how the actuator is sequenced or whether it is a reverse or direct acting valve.
 - .4 Valves: Heating and cooling coil valves shall fail open to the coil. Mixed air dampers shall fail to the full return air position.
 - .5 Outdoor Sensors: Outdoor air temperatures and humidities (where applicable) are assumed to be Global points transferred to DDC controllers. If the BMCS system lacks global point capability, global points shall be replaced by hardware points connected to specific controllers; the I/O capacity of the controller being used must be checked to make sure the added points will fit in the controller and upgraded in point capacity if necessary.

3.7 ELECTRICAL

- .1 Rules and Regulations: The entire installation shall conform to Division 16 and shall comply with the Canadian Electrical Code and all local and Provincial codes. The contractor shall obtain an ESA certificate for his work.

- .2 Arrange for all the necessary inspections and approvals of built-up and modified control systems and relay panels by governing authorities. All electrical equipment, material, and its installation shall conform to the current requirements of the following authorities:
 - .1 C.S.A
 - .2 Ontario Hydro Safety Authority
 - .3 O.B.C. Building Codes / Fire Codes.
- .3 All wiring shall conform to governing codes and shall be inspected by request of the contractor for approval. The contractor shall obtain and purchase all necessary permits as required.
- .4 Wiring: All electric wiring in connection with this project shall be furnished and installed under this section.
 - .1 The Contractor shall be aware that cables carrying high currents run through ceiling and wall cavities. Signal interference or sensor inaccuracy or failure caused by existing cable runs shall be the responsibility of the Contractor and shall be covered under the warranty. The Contractor shall select sensors and use shielded cable or transmitters as necessary to prevent electrical interference with the control system operation.
 - .2 The Contractor shall coordinate fully the interconnection of factory assembled portions of system controls, field installed control systems and the electrical power system to provide a complete working installation.
 - .3 Power for control equipment shall not be taken from equipment motor leads. Power shall be from circuits dedicated for controls only.
 - .4 Transformers shall be sized for 150% of engineered capacity.
 - .5 All wires are to be numbered using wire labels at each end. These labels shall correspond to wire identification on the shop drawings and "as-built" drawings.
- .5 Electrical Isolation of I/O Points: To prevent serious damage to the field panels from surges, or RFI electrically induced spikes, protection in the following form shall be provided, as a minimum:
 - .1 Digital outputs singularly or collectively shall be galvanically isolated from the main panel processor.
 - .2 Analog outputs shall be galvanically isolated from each other and the main panel processor.
 - .3 Digital inputs shall be galvanically isolated from the main panel processor.
- .6 Panel Documentation: Mount an input/output layout sheet within each controller field panel. This sheet shall include the name of the points connected to each controller channel.

- .7 Conduits and Wiremold: All exposed wiring, whether for power, sensors, actuators, or data communications, shall be in metallic conduit or wiremold in all finished areas. This includes all wiring runs in and around rooftop HVAC units. All conduits shall have a minimum inside diameter of 13 mm.
 - .1 All conduits shall be installed out of the way in traffic areas, and parallel to the lines of the building. Flexible conduit may be used only in areas of vibration or expansion joints. All conduits shall be supported at least every 4 feet. Supports shall be located at each connector end of each conduit. High and low voltage wire shall not be run in the same conduit. Only wires of similar purpose shall be run in the same conduit; i.e. sensor or control, power, and communication wire shall be in separate conduit.
 - .2 The Contractor may use existing unused conduit from equipment that is no longer in service, if the opportunity arises during construction.
 - .3 Wiremold shall be as specified in Division 16. Colour shall be selected by the owner.
- .8 Pull Boxes and Junction Boxes: Pull boxes shall be located at a minimum spacing of 30m. The contractor is responsible for getting approvals from the Owner for locating pull boxes. Pull boxes shall comply with the Canadian Electrical Code. All boxes shall be clearly marked as part of the automated control system.
- .9 Enclosures: All enclosures shall be mounted such that the doors can open fully without interference with new or existing equipment. Except where expressly permitted in writing by the Owner or Engineer, enclosures shall be mounted in easily accessible locations where a technician can clearly see and easily access all components inside without a stool or ladder.
- .10 Power Protection: During the warranty period, the Contractor shall be responsible for parts and labour to repair or replace any system equipment damaged by power quality problems (spikes, sags, waveform anomalies, etc.). With that in mind, the Contractor shall provide appropriate power protection.
- .11 All wiring shall conform to governing codes and shall be inspected by request of the contractor for approval. The contractor shall obtain and purchase all necessary permits as required.
- .12 It is the responsibility of this contractor to provide dedicated 120 V, power from the spare breaker for the automation system from the nearest electrical panel.

3.8 CONTROL SYSTEM SOFTWARE

- .1 Programming: The system shall have all programming tools built-in to allow extensions and/or modifications on-site. Upon completion it shall be possible to make a safety backup to the tape drive using a simple command or choice in a menu. When desired, it shall be possible to reload the same database using a similar command or menu choice.

- .2 Shop Drawings: The Contractor shall provide to the Engineer complete schematic drawings for the entire control system for approval before work shall begin. This submittal shall be provided under this Division and include all control components purchased and installed for the project. Manufacturer's control terminals shall be indicated at each end of each wire. Upon completion of his work the controls contractor shall provide three sets of maintenance and operation manuals for distribution to the owner. Control wiring diagrams shall show all temperature controls, start/stop arrangement for each piece of equipment, equipment interlocks and any special connection information required for properly controlling the mechanical equipment.
- .3 Manuals: The Contractor shall provide three copies of the manual for the operator terminal software. The Contractor shall also provide three copies of all manuals used by the programmer(s) in setting up the system. This includes general programming manuals and any equipment-specific programming manuals for hardware used on the project.
- .4 Training: The Contractor shall provide four one-half day training sessions on-site and as soon as possible after system start up. The person providing the training shall be someone involved with the programming and completely familiar with the job. Exact training dates and times shall be arranged with the Owner.
- .5 Start Up of Control Systems: Once the Contractor has completed all installation and programming, he will arrange to demonstrate the system operation to the Engineer and Owner. If there are any deficiencies at this point, they will be documented by the Engineer. That documentation will be sent to the Contractor, and the Contractor will proceed to rectify the deficiencies as quickly as possible. The Contractor will then arrange a second demonstration.
 - .1 This process will be repeated, if necessary, until the Owner, Contractor, and Engineer all agree that the system meets this specification fully and there are no more deficiencies requiring correction.
 - .2 When the Owner and Engineer have agreed that all deficiencies have been corrected, the Contractor shall:
 - .1 Submit three (3) printed copies of the "As Built Drawings".
 - .3 At the completion of the startup, the Contractor shall submit to the Engineer a letter stating that he has made final calibrations and adjustments to the system and stating that the Owner's operating personnel have been instructed in its use or that instruction periods have been scheduled.
 - .4 The contractor shall work in conjunction with the owners' commissioning agent after start up is complete until the entire system is commissioned and accepted by the owner.

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 The control programs shall be modular and structured in order to provide specific control operation of all HVAC components indicated.
- .4 All control programs shall provide a minimum of 20% spare memory for expansion.
- .5 Each control program shall contain "REM" statements which explain the program operation.
- .6 Each control program shall open with a list of the I/O points used and controlled in the program.
- .7 Implement the following control program concepts in full, or partial as required, to provide complete HVAC equipment control. The programs shall perform all control strategies on the basis of protecting equipment operation, saving operational energy costs, and indicating alarm conditions. Programs which increase the system energy consumption or cause equipment failures will be refused and resolved by the contractor accordingly at not additional cost to the Board.
- .8 All space sensors shall be capable of indicating building low temperature. Alarm building low temperatures at OWS.
- .9 Provide individual DDC space control (with TCV's) of miscellaneous rad heaters, convectors, unit heater, force flows complete with night setback program.

4.2 MODES OF OPERATION

- .1 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. Wall fin radiation or convector hydronic heating shall be first source of heating. If space temperature is not satisfied than Unit ventilator hydronic heat or Rooftop Unit gas heat shall be second source of heating.
- .2 Cooling Mode: Mechanical cooling is enabled if the outdoor air temperature is above 18°C.
- .3 Carbon Dioxide Damper Override: In any air handling system with a return air or room air carbon dioxide sensor, it shall override the minimum position of the outdoor air damper during occupied mode. It shall override the minimum outdoor air damper between 0 and 40 % as the carbon dioxide varies between 1000 and 1200 ppm. All limit controls shall take priority to maintain safe supply air temperatures. An alarm shall be generated if the carbon dioxide level is higher than 1700 ppm or lower than 200 ppm.
- .4 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.

- .5 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.
- .6 Where Optimum Start Stop (OSS) is specified, equipment shall start-up based on global outdoor temperature, space temperature, and system response to assure that comfort conditions are reached at scheduled occupancy time (occupancy schedules are defined under time programs), and operate in both heating and cooling cycles. In all cases, the optimum start program shall operate fully stand-alone in the local GPC.

OSS shall include a Night Cycle program applying to (heating cycle only) (both heating and cooling cycle) with the outdoor air dampers closed. The space temperature shall be used to determine the "fan on" and/or "supply heat" command to maintain a low limit of 50-55 degrees for the heating cycle and the "fan on" and "supply cooling" command to maintain 82 degrees for the cooling cycle.
- .7 Where an Economizer Cycle (EC) is specified, it shall automatically enable the economizer mode based upon an enthalpy comparison of outdoor air and return air of each AHU or Unit Ventilator.
- .8 System Architecture: The control sequences will be performed by DDC controllers arranged as indicated in the system architecture diagrams included at the end of this specification.
- .9 Heating Control (miscellaneous washrooms and spaces with heat only): Provide individual DDC space control (with TCV's) of miscellaneous rad heaters, convectors, unit heater, force flows complete with night setback program.
- .10 Building Low Temperature: All space sensors shall be capable of indicating building low temperature. Alarm building low temperatures at OWS.

4.3 EQUIPMENT SERVICES

- .1 See the following description of equipment and systems that must be included in the control sequences.
 - .1 Six (6) new half-height non-ducted vertical-flow top-discharge thru-wall unit ventilators with hydronic heating coil, DX cooling coil with remote condensing unit, O/A damper, R/A damper, supply air fan. These six new unit ventilators replace six existing heating-only unit ventilators. All new controls. CO2 sensor for demand control ventilation. Economizer cycle (EC) and free cooling up maximum outdoor air rate as specified for each ventilator. Optimum Start Stop (OSS).
 - .1 Four (4) second floor unit ventilators (Classroom 13, 14, 15, 16) to be interlocked to associated louvered penthouse relief air vent. Motorized damper for relief air vent to modulate open for free cooling (EC) mode. All second-floor classrooms are connected to central exhaust that provides relief air for demand control operation during occupied hours.
 - .2 Unit ventilator serving Classroom 5 (first floor) is connected to central exhaust system to relieve demand control operation of the unit. Do not provide economizer (EC) operation for this unit ventilator.

- .3 Unit ventilator serving Classroom 6 (first floor) is **not** connected to central exhaust system for relief air. This classroom is equipped with an exhaust fan with variable speed ECM motor for relief air. This exhaust fan is to be interlocked to unit ventilator and shall modulate speed in coordination with outdoor air economizer position. This unit ventilator has economizer (EC) operation.
- .2 Two (2) new motorized damper zones are being added to existing unit ventilator system in Classroom 88. New unit ventilator zones serve interior spaces Office 86 and Office 87. Motorized damper position used for heating/cooling only. Minimum damper position to permit zero outdoor air.
 - .1 Office 86 and Office 87 are each equipped with exhaust / transfer fan. Transfer fan shall operate continuously based on occupancy.
- .3 One new exhaust fan for Classroom 6 relief air. Interlock to relative unit ventilator. See unit ventilator control sequence.
- .4 Two new exhaust / transfer fans for Office 86 and 87. Transfer fans operate based on occupancy. See unit ventilator control sequence.
- .5 Four (4) forced flow unit heaters are being brought onto the building automation system (BAS). These forced flow heaters operated previously based on stand-alone controls or pneumatic controls. CO2 reading is not required at thermostats for spaces served only by forced flow unit heaters.
- .6 CO2 sensors to be provided for all spaces where new ventilation is required.
 - .1 For all classrooms, demand control operation shall modulate outdoor air damper to maintain CO2 concentration withing maximum limit. Set outdoor air damper max position to 450 cfm where demand control max position is not indicated on drawings.
 - .2 For Office 86 and 87, the CO2 reading within the office shall be capable of adjusting the outdoor air damper position of Classroom 88 unit ventilator.

4.4 Please note that this is not complete representation of all equipment's and system. Control's contractor to review all drawings and specification and provide complete controls and sequence.

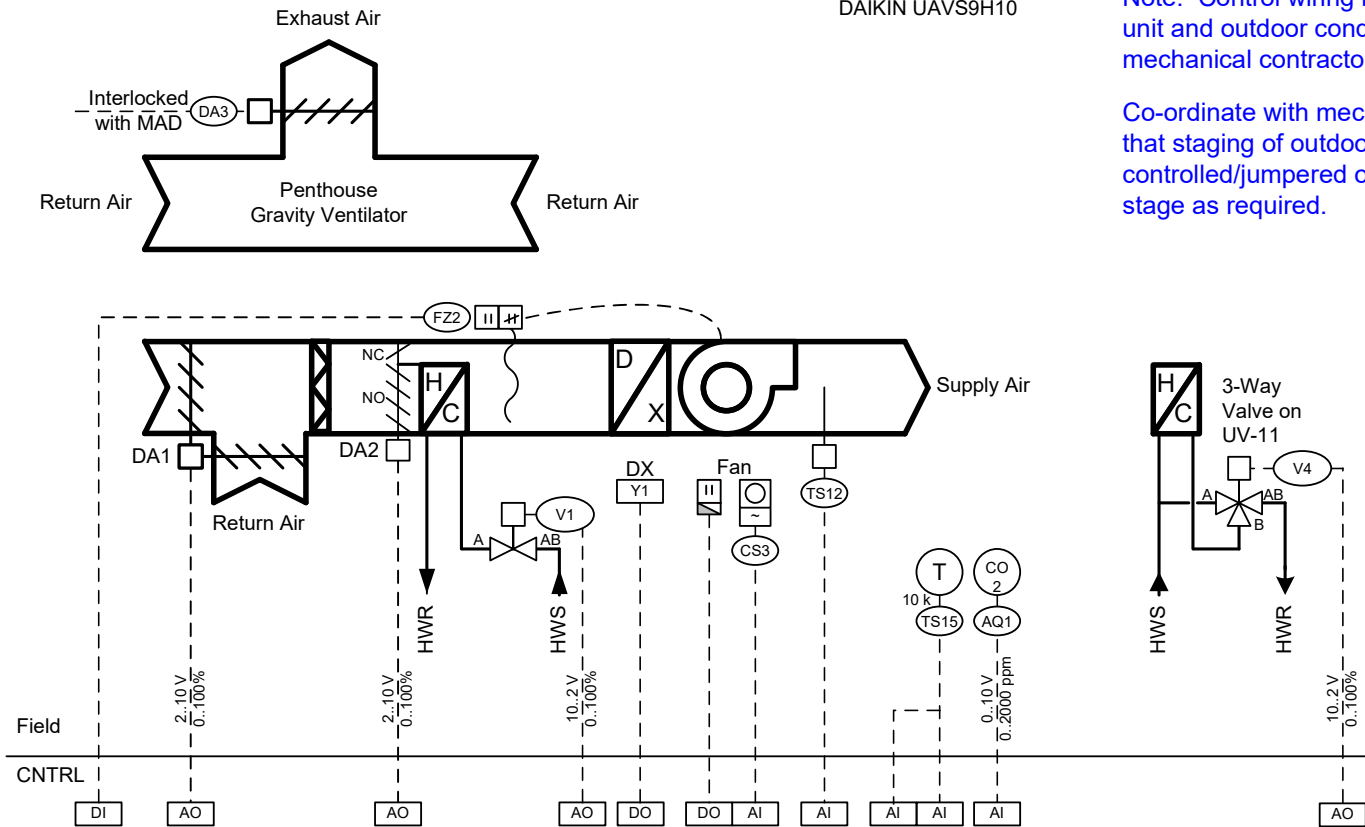
END OF SECTION

HORIZONTAL UNIT VENTS

TRANE VUVE1000
DAIKIN UAVS9H10

Note: Control wiring between indoor unit and outdoor condensing unit by mechanical contractor.

Co-ordinate with mechanical trade to ensure that staging of outdoor compressor units is controlled/jumpered out to operate as a single stage as required.



Six Systems As Shown					
Unit	Serves	CFM	hp	CNTRL	Notes
UV-9	Classroom 6	1000	1/4	UV09	EF3
UV-10	Classroom 5	1000	1/4	UV10	
UV-11	Classroom 16	1000	1/4	UV11	3W TCV
UV-12	Classroom 15	1000	1/4	UV12	2W TCV
UV-13	Classroom 14	1000	1/4	UV13	2W TCV
UV-14	Classroom 13	1000	1/4	UV14	2W TCV

Job:

Job Name: Courtland P.S.
HVAC Upgrade Phase 2

Owner:
Waterloo Region
District School Board

Drawn By:

Revision Date:
January 30, 2025

Title: **Unit Ventilators**

SEQUENCE OF OPERATION

Unoccupied Mode

The fan is off, the cooling is off, the face & bypass damper is in the face position and the mixing dampers are in the 0% outside air position. First the rad valves open then the fan cycles with full heating on high speed 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 fan runs continuously to maintain room temperature. The room temperature sensor modulates the mixing dampers in sequence with DX cooling to maintain the cooling setpoint, and modulates the face & bypass dampers and rad valve to maintain the heating setpoint. The setpoint can be adjusted +/-2°C at the room temperature sensor. The cooling setpoint is maintained at 2°C higher than the heating setpoint and will not go below 23.5°C. Fan status is monitored by a current sensor.

Limits and Safeties

- 1) If the outside air temperature exceeds the free cooling setpoint, the mixing dampers return to minimum position.
- 2) Mixed air damper minimum position control is provided during occupied periods (initially 10% OA).
- 3) The minimum outdoor damper position is increased from minimum to 40% as the CO₂ increases from 1000 to 1200 ppm.
- 4) The fan must be running before the mixing dampers and DX cooling will operate.
- 5) The supply air temperature 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 freezestat 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) If the hard-wired freezestat trips, the fan shuts down, outside air damper closes and face & bypass damper opens to face.
- 8) DX cooling is disabled when the outside air temperature falls below the global mechanical cooling disable setpoint (initially 14°C).
- 9) DX cooling has a minimum off time of 5 minutes.
- 10) DX cooling has a supply air temperature low limit (6/12°C).
- 11) 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 (42/40°C) or too low (14/16°C).
- 3) Supply air temperature too high (62/60°C) or too low (5/7°C).
- 4) Room CO₂ level too high (1700/1650 ppm) or too low (250/300 ppm).
- 5) Software or hardwired freeze-stat trips.
- 6) Fan runtime exceeded weekly runtime setpoint.

	Job:	Owner: Waterloo Region District School Board	Drawn By:	Title: Unit Ventilators	2
	Job Name: Courtland P.S. HVAC Upgrade Phase 2		Revision Date: January 30, 2025		

Co-ordinate with mechanical trade to ensure that staging of outdoor compressor units is controlled/jumpered out to operate as a single stage as required.

Figure 1 consists of two schematic diagrams, (a) and (b), illustrating different types of perimeter rad systems. Both diagrams show a dashed line representing a boundary. In diagram (a), labeled 'Type 1', a solid line labeled 'HWS' (Hot Water Supply) enters from the left, passes through a valve labeled 'AB', and then splits into two paths: one leading to a box labeled 'Perimeter Rad' and another leading to a dashed line labeled 'HWR' (Hot Water Return). An 'Ex' (Expansion) tank is connected to the HWS line before the valve 'AB'. In diagram (b), labeled 'Type 2', a dashed line labeled 'HWR' enters from the left, passes through a valve labeled 'AB', and then splits into two paths: one leading to a box labeled 'Perimeter Rad' and another leading to a solid line labeled 'HWS'. An 'Ex' (Expansion) tank is connected to the HWR line before the valve 'AB'.

SEQUENCE OF OPERATION

Unoccupied Mode

The fan is off, the face & bypass damper is in the face position, the DX cooling is off and the mixing dampers are in the 0% outside air position. First the rad valves open then 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 fan runs continuously to maintain room temperature. The room temperature sensor modulates the mixing dampers in sequence with DX cooling to maintain the cooling setpoint, and modulates the face & bypass dampers and rad valve to maintain the heating setpoint. The setpoint can be adjusted +/-2°C at the room temperature sensor. The cooling setpoint is maintained at 2°C higher than the heating setpoint and will not go below 23.5°C. Fan status is monitored by a current sensor.

Zone Damper

The room temperature sensor modulates the zone damper between minimum and maximum 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.

Limits and Safeties

- 1) If the outside air temperature exceeds the free cooling setpoint, the mixing dampers return to minimum position.
- 2) Mixed air damper minimum position control is provided during occupied periods (initially 10% OA).
- 3) The minimum outdoor damper position is increased from minimum to 40% as the CO₂ increases from 1000 to 1200 ppm.
- 4) The fan must be running before the mixing dampers and DX cooling will operate.
- 5) The supply air temperature 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 freezestat 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) If the hard-wired freezestat trips, the fan shuts down, outside air damper closes and face & bypass damper opens to face.
- 8) DX cooling is disabled when the outside air temperature falls below the global mechanical cooling disable setpoint (initially 14°C).
- 9) DX cooling has a minimum off time of 5 minutes.
- 10) DX cooling has a supply air temperature low limit (6/12°C).
- 11) The face & bypass damper is in the face position when DX cooling is operating.

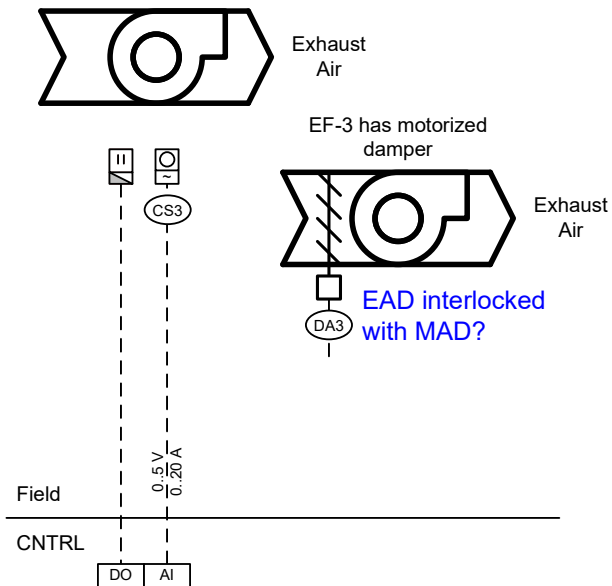
Alarms

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 (65/63°C) or too low (8/10°C).
- 4) Software or hardwired freeze-stat trips.
- 5) Fan runtime exceeded weekly runtime setpoint.
- 6) Room CO₂ level too high (1700/1650 ppm) or too low (250/300 ppm).

	Job:	Owner: Waterloo Region District School Board	Drawn By:	Title: Unit Ventilators	4
	Job Name: Courtland P.S. HVAC Upgrade Phase 2		Revision Date: January 30, 2025		

IN-LINE EXHAUST FANS



3 Systems as Shown				
UNIT	(cfm)	(hp)	Serves	CNTRL
EF-1	200	Fhp	Office 86	UV22A
EF-2	200	Fhp	Office 87	UV22A
EF-3	700	Fhp	Classroom 6	UV9

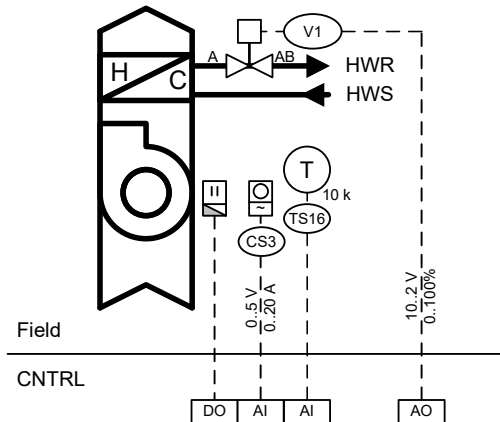
SEQUENCE OF OPERATION

The exhaust fan cycles based on time of the day schedule.

Alarms:

The fan status does not match the start/stop signal.

FAN FORCED HEATERS



2 Systems as Shown			
Serves	USGPM	Size	CNTRL
FFH2 - Stair B 905	4.23	3/4"	UV24
FFH3 - Stair D 901	4.23	3/4"	UV25

SEQUENCE OF OPERATION

Room sensor cycles the fan to maintain the occupied or unoccupied heating setpoint. Heating is locked out when the outside air temperature exceeds 10°C.

Alarms

The room temperature is too cold (14/16°C) or too hot (38/36°C) or if the fan status is incorrect.

Job:

Job Name: Courtland P.S.
HVAC Upgrade Phase 2

Owner:
Waterloo Region
District School Board

Drawn By:

Revision Date:
January 30, 2025

Title: **Miscellaneous Controls**

Division 26 Common Requirements for Electrical

26 00 11	Electrical Specification Index
	Common Contract Requirements for Electrical
26 01 15	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	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
	Panelboards
26 24 16	Panelboards
26 24 17	Moulded Case Circuit Breakers
	Low-Voltage Distribution Equipment
26 27 26	Wiring Devices
	Low-Voltage Circuit Protective Devices
26 28 16	Disconnect Switches
	Lighting
26 51 13	Lighting Equipment
26 51 16	Digital Occupancy & Daylight Control Systems
	Fire Detection and Alarm
28 31 24	Fire Alarm System (Conventional)

END OF SECTION

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.

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 Submit tender based on specified described equipment or Alternates listed.
- .2 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 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.
- .3 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, ducts, 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 ducts, conduits, equipment, fixtures, etc, to accommodate work from interferences anticipated and encountered. Determine exact route and location of each conduit and duct prior to installation.
 - .1 Make offsets, transitions, and changes in direction of ducts, and 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
 - .5 Feeder conduits
 - .6 Branch conduits
 - .7 Feeder cables
 - .8 Branch wiring
 - .9 Lighting fixtures (interior)
 - .10 Starters, contactors and control devices
 - .11 Wiring for mechanical equipment
 - .12 **Commissioning and Integrated System Testing**
 - .13 Electrical contractor closeout requirements (minimum of 3% but not less than \$15,000.00)
- .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 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Manufacturer test data where requested.
 - .3 Manufacturer to certify as to current model production.
 - .4 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
 - .2 Luminaires and ballasts

- .3 Fire Alarm devices
 - .4 Firestopping materials
 - .5 Wiring devices
 - .6 Emergency battery units and fixtures
 - .7 Occupancy sensors / Lighting Controls
 - .8 Roof cone
 - .9 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" x 11"), portrait with no additional formatting required by the consultant. Submissions requiring larger detail sheets shall not exceed 11" x 17".
 - .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.

1.14 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 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.
- .2 Reproduce drawings and specifications required by Electrical Safety Authority at no cost.
- .3 Notify Consultant of changes required by Electrical Safety Authority prior to making changes.
- .4 Furnish Certificates of Acceptance to Engineer from Electrical Safety Authority and other authorities having jurisdiction upon completion of work.
- .5 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.
- .2 Factory assemble control panels and component assemblies.

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 outdoor electrical equipment "equipment green" finish.
 - .2 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.

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.
- .4 Use colour coded wires in communication cables, matched throughout system.

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
Voice system	green
Data System	orange
Public address	black
Fire alarm	red

- .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 Owner may 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").
- .4 Voice/Data outlets: At height of adjacent outlet or at 400 mm (16").
- .5 Clocks: 2100 mm (84").

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, dry-core transformers and motor control centres, operating under normal load. State hour and date on which each load was measured, and voltage at time of test.

1.30 CONDUIT AND CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete shall be schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm (2") beyond either side.
- .2 Install cables, conduits and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.

1.31 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, communications, security.
- .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.

1.32 CO-ORDINATION OF PROTECTIVE DEVICES

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings as indicated on drawings or as determined from co-ordination study.

1.33 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 contractors 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.

1.34 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.

1.35 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 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.
 - .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 List of manufacturers, spare parts list and source.
 - .6 Copy of typewritten schedules for all new and renovated panels.
 - .7 Copy of all substantial performance final certificates.
 - .8 Copy of electrical shop drawings which have been stamped and reviewed by Consultant.
 - .9 Electrical As-built drawings including contractor company's as built stamp.
 - .10 Any special warranties on equipment required (i.e. LED lighting, digital lighting control).
 - .11 Certificate of completion from all associated sub-contractors.
 - .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 USB stick is to be provided containing both the approved manual and as-built drawings.

1.36 AS-BUILT DRAWINGS

- .1 Site records:
 - .1 Contractor shall provide 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 hard 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.

1.37 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.

1.38 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 Fire Alarm Verification Certificate.
 - .3 Emergency Lighting.
 - .4 Integrated Life Safety Systems Commissioning & Test Report.

1.39 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 Lighting Control System.
 - .6 **Outlet cover circuit labels**

1.40 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.

1.41 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.

1.42 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.
- .4 This contractor shall be responsible for providing all anchor bolts and associated formed concrete bases for lighting standards as detailed.

1.43 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 Through foundation walls PVC sleeves are acceptable.
- .7 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.

1.44 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.

1.45 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.

1.46 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.

1.47 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.

1.48 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.

1.49 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.

1.50 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.

1.51 ASBESTOS

- .1 If asbestos is suspected or identified cease all work in the immediate area in accordance with OSHA 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.**

1.52 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.

1.53 OWNER SUPPLIED EQUIPMENT

- .1 Connect to equipment supplied by the owner and make operable.
- .2 Design drawings are diagrammatic and do not necessarily indicate all specific final connection requirements. For the purposes of bidding, electrical trade shall include but not be limited to provision of a junction box to connect equipment wiring tail, provision of suitable disconnecting means, and flexible connection directly to equipment.

1.54 ENCLOSURES

- .1 This contractor must ensure that all electrical equipment mounted in sprinklered areas is provided with an enclosure in conformance with the Electrical Safety Code.

1.55 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.

1.56 INTEGRATED LIFE SAFETY SYSTEM TESTING

- .1 The Integrated Life Safety System Testing Coordinator (ITC) shall be hired by the electrical trade as indicated in specification
- .2 This electrical contractor shall work with the project Integrated Life Safety System Testing Coordinator (ITC) and participate in all phases of the Integrated Life Safety Systems testing process as specified within CAN/ULC S1001-11 (2024 Rev2 updates) as well as the electrical and architectural specifications.
- .3 During the Planning Phase of the Integrated Life Safety Systems Testing process this electrical contractor shall review the Integrated Testing Plan (ITP) and give written confirmation of this review and acknowledgement of affected systems under his responsibility as required by the electrical specifications per the shop drawing submittal process.
- .4 Prior to the building Integrated Life Safety Systems Testing this electrical contractor shall startup/commission/verify the operation of all systems under the responsibility of this electrical trade. This electrical trade shall give written indication of completed systems and provide copies of all inspection reports, start-up reports, commissioning reports, verification reports, etc. when requested by the ITC during the Implementation Phase.
- .5 Upon completion of the building Integrated Life Safety Systems Testing this electrical contractor shall rectify all deficiencies related to all systems under his responsibility during the Testing Phase in due time for the ITC to verify and document for the project team.

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 demolition and removing / reinstalling various existing devices.
- .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.

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 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 door hold open devices.

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, Ontario N3E 1A4
 - .3 Control Tech Systems
31 Regal Road
Guelph, Ontario N1K 1B6
 - .4 Lonergan Engineering
4 Industrial Parkway South
Aurora, Ontario L4G 3W1

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 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 Testing and operation of any generator (s) as applicable to the project.
 - .5 Other items that may be requested by the ITC.
 - .6 Re-commissioning of any items that may have failed.
 - .7 Re-setting of the system to proper operation after tests are completed.
 - .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.

.3 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.

- .4 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 and RW90 for below grade installations.
- .4 Minimum wire size shall be 8 AWG for all 120V circuits exceeding 60 meters in length.

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 and circuits originating from surge protected panels. 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 CONDUIT BOXES

- .1 Cast FS or FD ferrous alloy 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.**

2.4 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**
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 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.
- .2 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 Thermit welded type conductor connectors.
 - .5 Bonding jumpers, straps.
 - .6 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. Frames of motors, starters, control panels and 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 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 Flexible metal conduit: to CSA C22.2 No.56, aluminum and liquid-tight flexible metal.
- .4 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 Rigid conduit and mineral insulated conduit fittings shall be threaded type.
- .6 Coating: same as conduit.
- .7 Factory "ells" where 90° bends are required for 27 mm (1") and larger conduits.
- .8 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.

25-7705-RFT

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 areas, 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 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.
- .5 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.
- .6 Conduits terminating at electrical equipment in sprinklered areas are to be provided with insulated compression style connectors equal to Thomas & Betts Cat. #TC8XXSC or approved equal.
- .7 **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 (1/2").
- .8 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .9 Mechanically bend steel conduit over 27 mm (1") diameter.
- .10 Install fish cord in empty conduits.
- .11 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- .12 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 Telecommunication network system rough-in.
 - .2 Public address system rough-in.

Part 2 Products

2.1 TELECOMMUNICATION NETWORK SYSTEM ROUGH-IN

- .1 Outlets where noted shall be single gang flush mounted in wall or surface raceways.
- .2 Outlets if unwired are to be provided with blank coverplates to suit related sections of this specification.
- .3 Telecommunication Network installation shall be by Owner's approved vendor

2.2 PUBLIC ADDRESS SYSTEM ROUGH-IN

- .1 Provide conduit from device and outlet locations to nearest accessible ceiling space as noted on drawings.
- .2 Outlets if unwired are to be provided with blank coverplates to suit related sections of this specification.
- .3 Public address system installation shall be by Owner's approved vendor.

Part 3 Execution

3.1 TELECOMMUNICATION NETWORK SYSTEM ROUGH-IN

- .1 Outlets are to be installed complete with 21mm (3/4") conduit to corridor ceiling space or nearest zone conduit (if applicable).
- .2 Provide insulated bushings on all conduits terminated in ceiling space.

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. **Series rating is acceptable – submit information with shop drawings. Provide lamicoid label on feeder breaker. Lamicoid label to state "Series Rating Breaker." Lamicoid label to be size 2.**
- .5 Bus and breakers must be rated for kA (symmetrical) interrupting capacity 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

BREAKERS

- .15 Breakers: to Moulded Case Circuit Breakers Section.

- .16 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

2.2 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.
- .6 Install series rating lamicoids adjacent to all breakers utilized to achieve series ratings.

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 BREAKERS GENERAL

- .1 Moulded case circuit breakers must conform to CSA C22.1 No.5.1-M91 (latest edition.)
- .2 Bolt-on moulded case circuit breaker quick-make, quick-break type, for manual and automatic operation.
- .3 Common-trip breakers: with single handle for multi-pole applications.
- .4 Unless otherwise indicated moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

Part 3 Execution

3.1 INSTALLATION

- .1 Install circuit breakers as indicated complete with all necessary mounting hardware and filler panels if necessary.
- .2 Provide lamicoid labels for series rating breakers. Lamicoid label to state "Series Rating Breaker." Lamicoid to be size 2.

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 Occupancy sensor switches shall be dual technology style (PIR and Ultrasonic) where noted on the drawings.
- .2 Acceptable Materials:
 - .1 Single Relay Occupancy Sensor includes:
 - .1 Legrand Cat. #DW-100
 - .2 Greengate Cat. #ONW-D-1001
 - .3 Sensorswitch Cat. #WSXA Series
 - .2 Dual Relay Occupancy Sensor includes:
 - .1 Legrand Cat. #DW-200
 - .2 Greengate Cat. #ONW/VNW-D-1001-DMV-N
 - .3 Sensorswitch Cat. #WSXA Series

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

- .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 Where noted on plans for exterior weatherproof GFCI receptacles at grade, provide extra-duty single gang horizontal die cast receptacle covers. NEMA 3R rated complete with lockable hasp and reinforced hinge. Suitable for use with 12-gauge cord sets. Intermatic Cat. # WP1010HMXD or equal.
- .7 Where noted on plans for exterior weatherproof cover plates at GFCI receptacles on residential balconies above grade, within 760mm of balcony railing, to avoid climbing hazard provide product equal to Intermatic Cat. #WP7000 (low-profile, in-use, extra-duty).
- .8 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 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 Where split receptacle has one portion switched mount vertically and switch upper portion.
- .2 Occupancy sensors:
 - .1 Occupancy sensors shall be set to 5 minutes "delay to off" unless otherwise noted.
- .3 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.

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.

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 EMERGENCY LIGHTING UNITS (SELF CONTAINED)

- .1 Emergency lighting units must conform to CSA C22.2 No 141 (latest edition).
- .2 Supply voltage: as noted on drawings.
- .3 Battery: sealed, maintenance free, 10 year life.

Note: Battery units must be capable of supplying the wattage indicated for a minimum of 30 minutes or as specified.
- .4 Charger: solid state, multi rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01 V for plus or minus 10% input variations.

- .5 Solid state transfer circuit. EM backup AC fail operation.
- .6 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.
- .7 Signal lights: "AC Power ON" condition and "charging" condition.
- .8 Lamp type: integral high output LED, 100,000 hours at L70.
- .9 Ceiling mount brackets and recessed mounting kit as required to suit installation.
- .10 Auxiliary equipment:
 - .1 Test switch.

2.5 ACCEPTABLE LIGHTING MANUFACTURERS

- .1 Refer to the light fixture schedule as indicated on drawings.

Part 3 Execution

3.1 INSTALLATION

- .1 Locate and install luminaires as indicated.
- .2 Plaster frames/flange kits must be provided by this Division for fixtures recessed in plaster and/or drywall ceilings.

3.2 WIRING

- .1 Connect luminaires to lighting circuits as indicated.
- .2 Connect emergency lighting unit equipment to circuits as indicated.

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 American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE).
- .2 Underwriter Laboratories of Canada (ULC).
- .3 International Electrotechnical Commission.
- .4 International Organization for Standardization (ISO).
- .5 National Electrical Manufacturers Association (NEMA).

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings in accordance with Section 26 01 16.
- .2 Submit composite wiring diagrams and control schedule for each room control circuit type as proposed to be installed. Include load type, sequence of operation, sensor parameters, time delays, sensitivities and daylighting set points.
- .3 Catalog cut sheets with performance specifications demonstrating compliance with specified requirements.

1.3 SCOPE

- .1 This contractor is responsible to supply and install all equipment and control wiring as specified for the digital occupancy and daylight control systems. This contractor must coordinate these control systems with the lighting fixtures being supplied for the project to ensure intended function as specified.
- .2 Control Intent: Control Intent includes, but is not limited to:
 - .1 Defaults and initial calibration settings for such items as time delay, sensitivity, fade rates, etc.
 - .2 Initial sensor and switching zones.
- .3 All equipment must be CSA approved or approved at this contractor's expense by the Special Inspection Division of the Electrical Safety Authority.
- .4 Reference section 26 51 13 for Lighting information.

1.4 SYSTEM DESCRIPTION AND OPERATION

- .1 The Digital Lighting Control (room level) as defined under this section covers the following equipment:
 - .1 Digital Room Controllers – Self-configuring, digitally addressable one, two or three relay controllers.
 - .2 Digital Occupancy Sensors – Self-configuring, digitally addressable and calibrated occupancy sensors with LCD display and two-way active infrared (IR) communications.

- .3 Digital Switches – Self-configuring, digitally addressable pushbutton switches, dimmers, and scene switches with two-way active infrared (IR) communications.
- .4 Configuration Tools – Handheld remote for room configuration provides two-way infrared (IR) communications to digital devices and allows complete configuration and reconfiguration of the device / room from an accessible location.

1.5 LIGHTING CONTROL APPLICATIONS

- .1 Provide a minimum application of intended lighting control functions as detailed on design drawings and specified herein. Control functions shall include the following:
 - .1 Space Control Requirements – Provide occupancy/vacancy sensors with Manual-ON functionality in all spaces except toilet rooms, storerooms, or other applications where hands-free operation is desirable and Automatic-ON occupancy sensors are more appropriate. For spaces with multiple occupants, or where line-of-sight may be obscured, provide ceiling- or corner-mounted sensors.
 - .2 Bi-Level Lighting – Provide single zone, multi-level controls in any enclosed office, conference room, meeting room, and training room in all enclosed spaces except where variable dimming or multi-zone switching is used.
 - .3 Daylit Areas – All luminaries closest to the daylight source, and zoned separately from other fixtures in the space, shall be controlled separately from luminaires outside of daylit zones. Multiple-leveled switched daylight harvesting controls may be utilized for areas marked on drawings.

1.6 WARRANTY

- .1 Provide a five-year complete manufacturer's warranty on all products to be free of manufacturers' defects.
- .2 The labour required to replace these products must be included in the above warranty, however only for the extent of the contract guarantee and warranty period as noted in Electrical General Requirements.

1.7 QUALITY ASSURANCE

- .1 Manufacturer: Minimum 10-years experience in manufacture of lighting controls.

Part 2 Products

2.1 MANUFACTURERS

- .1 Basis of design product: WattStopper Digital Lighting Management (DLM). Acceptable alternates are subject to compliance and prior approval with specified requirements of this section, as one of the following:
 - .1 Cooper Controls (Greengate).
 - .2 Acuity Controls (nlight).

- .2 Substitutions:
 - .1 All proposed substitutions (clearly delineated as such) must be submitted in writing for approval by the design professional a minimum of 7 working days prior to the bid date and must be made available to all bidders.
 - .2 By using pre-approved substitutions, the contractor accepts responsibility and associated costs for all required modifications to circuitry, devices, and wiring.

2.2 DIGITAL WALL OR CEILING MOUNTED OCCUPANCY SENSOR SYSTEM

- .1 Wall or ceiling mounted (to suit installation) passive infrared (PIR), ultrasonic or dual technology digital (passive infrared and ultrasonic) occupancy sensor. Furnish the Company's system which accommodates the square-foot coverage requirements for each area controlled, utilizing room controllers, digital occupancy sensors and accessories which suit the lighting and electrical system parameters.
- .2 Digital Occupancy Sensors shall provide calibration and electronic documentation for the following features:
 - .1 Digital calibration and pushbutton programming for the following variables:
 - .1 Sensitivity – 0-100% in 10% increments
 - .2 Time delay – 1-30 minutes in 1 minute increments
 - .3 Test mode – Five second time delay
 - .4 Detection technology – PIR, Ultrasonic or Dual Technology activation and/or re-activation.
 - .5 Walk-through mode
 - .6 Load parameters including Auto/Manual-ON, blink warning, and daylight enable/disable when photosensors are included in the DLM local network.
 - .2 Two-way infrared (IR) transceiver to allow remote programming through handheld commissioning tool and control by remote personal controls.
 - .3 Device Status LEDs including:
 - .1 PIR Detection
 - .2 Ultrasonic detection
 - .3 Configuration mode
 - .4 Load binding
 - .4 Manual override of controlled loads.
 - .5 One or two RJ-45 port(s) for connection to DLM local network.
- .3 Multiple occupancy sensors may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required.

WattStopper product numbers: LMPX, LMDX, LMPC, LMUC, LMDC

2.3 DIGITAL WALL SWITCHES

- .1 Low voltage momentary pushbutton switches in 1, 2, 3, 4, 5, and 8 button configuration; colour per architect, compatible with wall plates with decorator opening. Wall switches shall include the following features:
 - .1 Two-way infrared (IR) transceiver for use with personal and configuration remote controls.
 - .2 Removable buttons for field replacement with engraved buttons and/or alternate color buttons. Button replacement may be completed without removing the switch from the wall.
- .2 Multiple digital wall switches may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required to achieve multi-way switching.
- .3 The following switch attributes may be changed or selected using a wireless configuration tool:
 - .1 Load and Scene button function may be reconfigured for individual buttons (from Load to Scene, and vice versa).
 - .2 Individual button function may be configured to Toggle, On only or Off only.
 - .3 Individual scenes may be locked to prevent unauthorized change.
 - .4 Switch buttons may be bound to any load on a room controller and are not load type dependent; each button may be bound to multiple loads.
- .4 Two RJ-45 ports for connection to DLM local network.
- .5 Multiple digital wall switches may be installed in a room by simply connecting them to the free topology DLM local network. No additional configuration will be required to achieve multi-way switching.
- .6 WattStopper product numbers: LMSW-101, LMSW-102, LMSW-103, LMSW-104, LMSW-105, LMSW-108, LMDM-101.

2.4 DIGITAL POWER PACKS (ROOM CONTROLLERS)

- .1 Room Controllers automatically bind the room loads to the connected devices in the space without commissioning or the use of any tools. Room Controllers shall be provided to match the room lighting load and control requirements. The controllers will be simple to install and will not have, dip switches, potentiometers or require special configuration. The control units will include the following features:
 - .1 Automatic room configuration to the most energy-efficient sequence of operation based upon the devices in the room.
 - .2 Simple replacement – Using the default automatic configuration capabilities, a room controller may be replaced with an off-the-shelf unit without requiring any configuration or setup.
 - .3 Device Status LEDs to indicate:
 - .1 Data transmission
 - .2 Device has power

- .3 Status for each load
 - .4 Configuration status
 - .4 Quick installation features including:
 - .1 Standard junction box mounting
 - .5 Plenum rated
 - .6 Manual override and LED indication for each load
 - .7 120 VAC, 60 Hz operation.
 - .8 Zero cross circuitry for each load.
- .2 On/Off Room Controllers shall include:
 - .1 One or multiple relay configuration to suit control details
 - .2 Efficient 150 mA switching power supply
 - .3 Sufficient sensor connection points to suit indicated function without the requirement for additional hardware
 - .4 Discrete model listed for connection to receptacles, for schedule-based control of plug loads within the space.
 - .1 One relay configuration only.
 - .2 Automatic-ON/OFF configuration.
 - .3 Optional Network Bridge for BACnet MS/TP communications
 - .5 Three RJ-45 DLM local network ports.
 - .6 WattStopper product numbers: LMRC-101, LMRC-102, LMPL-101, LMPL-201.
- .3 On/Off Room/Dimming enhanced Room Controllers shall include:
 - .1 One or multiple relay configuration to suit control details.
 - .2 Efficient 250 mA switching power supply.
 - .3 One 0-10 volt analog output per relay for control of compatible ballasts and LED drivers.
 - .4 The following dimming attributes may be changed or selected using a wireless configuration tool:
 - .1 Establish preset level for each load from 0-100%.
 - .2 Set high and low trim for each load.
 - .3 Set lamp burn in time for each load up to 100 hours.
 - .5 Four RJ-45 DLM local network ports.
 - .6 Optional Network Bridge for BACnet MS/TP communications.
 - .7 WattStopper product numbers: LMRC-211, LMRC-212, LMRC-213, LMPL-201, LMRC-311, LMRC-312, LMRC-313.

2.5 DIGITAL ROOM CONTROL SYSTEMS

- .1 Digital occupancy and daylight control system designed to control a small area of a building (room level). Digital devices connect to the room controller(s) using CAT 5e cables (LMRJ) with RJ-45 connectors which provide both data and power to room devices. Features of the system shall include:
 - .1 Plug n' Go automatic configuration and binding of occupancy sensors, switches and lighting loads to the most energy-efficient sequence of operation based upon the device attached.
 - .2 Simple replacement of any device in the system with a standard off the shelf unit without requiring commissioning, configuration or setup.
 - .3 Push n' Learn configuration to change the automatic configuration, including binding and load parameters without tools, using only the buttons on the digital devices which are part of the local system.
 - .4 Two-way infrared communications for control by handheld remotes, and configuration by a handheld tool including adjusting load parameters, sensor configuration and binding, within a line of sight of up to 30 feet from a sensor, wall switch or IR receiver.

2.6 CONFIGURATIONS TOOLS

- .1 A configuration tool facilitates optional customization of digital lighting control system featuring infrared communications.
- .2 Features and functionality of the wireless configuration tool shall include:
 - .1 Two-way infrared (IR) communication with DLM IR-enabled devices within a range of approximately 30 feet.
 - .2 Read, modify and send parameters for occupancy sensors, daylighting sensors, room controllers and buttons on digital wall switches.
 - .3 Save up to nine occupancy sensor setting profiles, and apply profiles to selected

Part 3 Execution

3.1 INSTALLATION

- .1 Install the work of this Section in accordance with manufacturer's printed instructions unless otherwise indicated.
- .2 When using wire for connections other than the DLM local network (LMRJ Cat 5e with RJ-45 connectors), provide detailed point to point wiring diagrams for every termination. Provide wire specifications and wire colors to simplify contactor termination requirements.
- .3 Calibrate all sensor time delays and sensitivity to guarantee proper detection of occupants and energy savings.
 - .1 Adjust time delay so that controlled area remains lighted for 5 minutes after occupant leaves area.
- .4 Install power packs in accessible maintenance areas unless noted otherwise. Provide access doors if power packs are installed above drywall ceilings.

- .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 Provide written or computer-generated documentation on the commissioning of the system including room by room description including:
 - .1 Sensor parameters, time delays, sensitivities, and daylighting setpoints.
 - .2 Sequence of operation, (e.g. manual ON, Auto OFF. etc.)
 - .3 Load Parameters (e.g. blink warning, etc.)
- .7 Re-commissioning – After 30 days from occupancy re-calibrate all sensor time delays and sensitivities to meet the Owner's Project Requirements. Provide a detailed report to the Architect / Owner of re-commissioning activity.

3.2 FACTORY COMMISSIONING

- .1 Upon completion of the installation, the system shall be commissioned by the manufacturer's factory authorized representative who will verify a complete fully functional system.
- .2 The electrical contractor shall provide both the manufacturer and the electrical engineer with ten working days written notice of the system startup and adjustment date.
- .3 Upon completion of the system commissioning the factory-authorized technician shall provide the proper training to the owner's personnel on the adjustment and maintenance of the system.
- .4 Factory commissioning shall include functional testing and documentation of the control system conforming to the "Functional Testing" requirements included in the current ASHRAE standard. This cost shall be included in the Tender Price.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 CAN/ULC-S524 (latest edition), Installation of Fire Alarm Systems.
- .2 ULC-S525-1978, Audible Signal Appliances for Fire Alarm Systems.
- .3 CAN/ULC-S529 (latest edition), Smoke Detectors.
- .4 CAN/ULC-S536 (latest edition), Inspection and Testing of Fire Alarm Systems.
- .5 CAN/ULC-S537-(latest edition), Verification of Fire Alarm Systems.
- .6 OBC (latest edition), Ontario Building Code.

1.2 DESCRIPTION OF SYSTEM

- .1 System includes:
 - .1 Renovation work required on existing base building single stage fire alarm system, including required tie-ins of new fire alarm devices to the main control panel **Edwards Fireshield Series** to carry out fire alarm and protection functions. This includes receiving alarm signals, initiating general alarm and supervising system continuously.
 - .2 Interface and zone modules.

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 the Electrical General Requirements Section.

1.5 OPERATION AND MAINTENANCE DATA

- .1 Provide operation and maintenance data for Fire Alarm System for incorporation into manual specified in the 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 MAINTENANCE MATERIALS

- .1 Include:
 - .1 10 % spare glass rods for total number of manual pull box stations if applicable.

1.7 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.**

Part 2 Products

2.1 MATERIALS

- .1 Equipment and devices: ULC listed and labeled and supplied by single manufacturer.
- .2 Audible signal devices: to ULC-S525.
- .3 Smoke detectors: to CAN/ULC-S529.

2.2 AUTOMATIC ALARM INITIATING DEVICES

- .1 Smoke detector: ceiling mounted, photo electric type, visual alarm indicator, complete with relay base where noted.

2.3 AUDIBLE SIGNAL DEVICES

- .1 Horn: flush mounted temporal horn, 24Vdc operation, 94 dBA rating at 3 m (10'), red finish, FM and ULC listed.

NOTE:

- .1 **Any surface mounted signal devices must be provided with suitable backboxes supplied by the manufacturer.**
- .2 **Set signal devices in classrooms to LOW setting.**

2.4 DOOR HOLD OPEN DEVICES

- .1 Units to be complete with the following features:
 - .1 Wall mounted style.
 - .2 Long life electromagnet.
 - .3 Low current operation.
 - .4 Completely silent operation.
 - .5 25 lbf (111N) minimum holding force.
 - .6 Adjustable swivel contact plate.
 - .7 Brushed zinc finish.
 - .8 Maintenance free operation.
 - .9 Water resistant design.
 - .10 ULC, CSA, and FM approved.

2.5 APPROVED EQUIPMENT

<u>DEVICE</u>		<u>EDWARDS</u> <u>(Existing EST</u> <u>Fireshield Series</u> <u>Panel)</u>		
Smoke Detectors (System Type c/w Relay Base)		EC2-RB		
Door Holder		1500 Series		
Horn		757 Series		

Part 3 Execution

3.1 INSTALLATION

- .1 Install systems in accordance with CAN/ULC-S524 (latest edition).
- .2 Locate and install detectors and connect to alarm circuit wiring. **Do not mount detectors within 1 m (39") of air outlets.** Maintain at least 600 mm (24") radius clear space on ceiling, below and around detectors.
- .3 Connect alarm circuits to main control panel.
- .4 Locate and install signal devices and connect to signaling circuits.
- .5 Locate and install door releasing devices.
Note: Door holders must release by way of local smoke detector and signal from main

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 Perform tests in accordance with Electrical General Requirements Section and CAN/ULC-S537 (latest edition).
NOTE: Entire fire alarm system and components are to be tested as per the noted code.
- .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 signaling circuits to ensure proper operation of system.
- .3 Qualifications:
 - .1 Persons performing any work on this fire alarm system must be CFAA certified. Submit certification upon request.
 - .2 **Provide “Integrated Testing” of this life safety system in conformance with the noted specification section. Include all associated costs in tender.**
- .4 Audibility Testing:
 - .1 The contractor is to coordinate an audibility test prior to occupancy of the facility. The test is to be performed by the representatives of the fire alarm manufacturer in the presence of the consultant. The test report is to be in chart form indicating:
 - .1 Project
 - .2 Date of test
 - .3 Room name and number
 - .4 Ambient dB level
 - .5 Alarm dB level
 - .6 Name of testing technician
 - .2 The test results are to be submitted to the consultant for review prior to issuing to owner’s representatives and/or authorities having jurisdiction.

END OF SECTION



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.

Courtland Avenue Public School

2024 Asbestos Audit Update Report

Project Location:

107 Courtland Avenue East, Kitchener, ON

Prepared for:

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

Prepared by:

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

January 31, 2024

MTE File No.: C34532-944

For Tender Purposes





MTE Consultants

520 Bingham Centre Drive, Kitchener, Ontario N2B 3X9

January 31, 2024

MTE File No.: C34532-944

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

RE: 2024 Asbestos Audit Update – Courtland Avenue Public School
107 Courtland Avenue East, Kitchener, Ontario

1.0 INTRODUCTION

MTE Consultants Inc. (MTE) was authorized by the Waterloo Region District School Board (WRDSB) to conduct the 2024 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.

- The following rooms:
 - WRDSB Room 40 – Not accessible with on keys on site and school staff did not have access keys.
- 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.
- 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 17, 2024. The two-storey school was constructed in 1928 with additions in 1964 and 1981. 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**.

4.1 Analytical Results

During this inspection, a total of 3 building material samples that are suspect ACM were collected with a total of 1 analysis being performed. Equal to or greater than 0.5%, asbestos by dry weight, the laboratory method detection limit (MDL), classifies the material as ACM according to O. Reg. 278/05. Samples collected were submitted for analysis to Paracel Laboratories Ltd. (Paracel), in Mississauga, Ontario. Paracel is certified under the National Voluntary Laboratory Accreditation Program to perform asbestos analysis of bulk samples by PLM. Laboratory analysis was conducted in accordance with the United States Environmental Protection Agency, Test Method EPA/600-R-93/116: Method for the Determination of Asbestos in Bulk Building Materials, June, 1993 by Polarized Light Microscopy as prescribed by O. Reg. 278/05.

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 801

- Fireproofing debris.

WRDSB Room 85

- 4 parged pipe fittings.

WRDSB Room 47

- 9" x 9" Brown with white vinyl floor tile.

WRDSB Room 821

- Fireproofing debris.

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 2.0. 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.



Zack Hopkins, B.E.S.
Technologist, Indoor Environments
519-743-6500 ext. 1300
zhopkins@mte85.com



Paul Semeniuk, B.E.S., C.E.T.
Manager, Indoor Environments
519-743-6500 ext. 1324
psemeniuk@mte85.com

ZJH: smk

Attach.

M:\34532\944\1 - Reports\4 - Formatted\Courtland Ave PS\34532-944_2024-01-31_Rpt_AAU_Courtland Ave PS.docx

Appendix A

Asbestos Management Database

For Tender Purposes

School Name		Legend:		Notes:							
Courtland Avenue Public School		HM - Homogenous Material - homogeneous with previously sampled material		All quantities provided on Figures, if known. Refer to the Asbestos Audit Update Report for condition of ACM and recommended actions.							
Date Built:		SL - Sample Location - Material Sampled									
Original: 1928		VC - Visually Confirmed - Material not sampled, deemed ACM		Dates provided in Material Description/Room Description columns indicates date of installation/renovation and confirms the finishes as non-ACM.							
Addition(s): 1964, 1981		NF - Non-Friable									
F - Friable											
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	Deck	Plaster		-	Non ACM	-			-
	Original Building	Structure	Concrete	Concrete		-	Non ACM	-			-
	Original Building	Facade	Brick Veneer	Brick and Mortar		-	Non ACM	-			-
	Original Building	Not Inspected	Not Inspected	Roofing Materials		NF	Suspect ACM	VC			-
	Original Building	Windows	Interior/Exterior Frames	Grey Sealant		-	Non ACM	SL	S06	5-Jun-18	ND
	Original Building	Doors	Interior Frames	Grey Sealant		-	Non ACM	SL	S07	5-Jun-18	ND
	Original Building	Doors	Exterior Frames	White Sealant		-	Non ACM	SL	S08	5-Jun-18	ND
	Original Building	Mastic	Mastic	Floor Tile Mastic		-	Non ACM	SL	S09, S07, S09	2010, 2013, 2013	ND
	1964 Addition	Structure	Concrete	Concrete		-	Non ACM	-			-
	1964 Addition	Facade	Brick Veneer	Brick and Mortar		-	Non ACM	-			-
	1964 Addition	Not Inspected	Not Inspected	Roofing Materials		NF	Suspect ACM	VC			-
	1964 Addition	Structure	Deck	Steel		-	Non ACM	-			-
	1964 Addition	Windows	Interior Frames	Black Sealant		-	Non ACM	SL	S09	5-Jun-18	ND
	1964 Addition	Windows	Interior Panes	Grey Sealant		-	Non ACM	SL	S10	5-Jun-18	ND
	1964 Addition	Windows	Exterior Frames	Grey Sealant		-	Non ACM	SL	S12	5-Jun-18	ND
	1964 Addition	Windows	Exterior Panes	Grey Sealant		-	Non ACM	SL	S11	5-Jun-18	ND
	1964 Addition	Doors	Exterior Frames	Silicon Sealant		-	Non ACM	VC			-
	1964 Addition	Mastic	Ceiling Tile 1' x 1'	All Patterns		-	Non ACM	SL	S01, S02, S06, S02, S02	Various	ND
Level 1											
19	Classroom	Floor	Vinyl Sheet Flooring	Beige (Post 2010)		-	Non ACM	SL	S05abc	2-Dec-09	ND
19	Classroom	Wall	Concrete	-		-	Non ACM	-			-
19	Classroom	Wall	Drywall	Drywall Joint Compound (Post 2010)		-	Non ACM	-			-
19	Classroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 2006)		-	Non ACM	-			-
19	Classroom	Structure	Trowel Applied Fireproofing	-		NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
19A	Washroom	Floor	Ceramic Tile	-		-	Non ACM	-			-
19A	Washroom	Wall	Concrete	-		-	Non ACM	-			-
19A	Washroom	Wall	Ceramic Tile	-		-	Non ACM	-			-
19A	Washroom	Wall	Drywall	Drywall Joint Compound (Post 2010)		-	Non ACM	-			-
19A	Washroom	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 2006)		-	Non ACM	-			-
20	Classroom	Floor	Vinyl Floor Tile 12"x 12"	White with Blue Fleck		-	Non ACM	HM	S04	2-Dec-09	ND
20	Classroom	Floor	Floor Tile Mastic	Black		NF	ACM	HM	S04ab	2013	2.3 Chrysotile

School Name		Legend:		Notes:							
Courtland Avenue Public School		HM - Homogenous Material - homogeneous with previously sampled material		All quantities provided on Figures, if known. Refer to the Asbestos Audit Update Report for condition of ACM and recommended actions.							
Date Built:		SL - Sample Location - Material Sampled		Dates provided in Material Description/Room Description columns indicates date of installation/renovation and confirms the finishes as non-ACM.							
Original: 1928		VC - Visually Confirmed - Material not sampled, deemed ACM									
Addition(s): 1964, 1981		NF - Non-Friable F - Friable									
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
20	Classroom	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
20	Classroom	Wall	Drywall	-	Drywall Joint Compound	-	Non-ACM	HM	34532-700-CAPS-S03ABC	4-Apr-13	ND
20	Classroom	Ceiling	Ceiling Tile 2' x 2'	-	Short Fissure Random Pinhole (2006)	-	Non ACM	-	-	-	-
20	Classroom	Ceiling	Drywall	-	Drywall Joint Compound	-	Non-ACM	HM	34532-700-CAPS-S03ABC	4-Apr-13	ND
20	Classroom	Structure	Trowel Applied Fireproofing	-	-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
20A	Classroom	Floor	Vinyl Floor Tile 12"x 12"	-	Beige Dense Fleck (Post 2010)	-	Non ACM	-	-	-	-
20A	Classroom	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
20A	Classroom	Wall	Drywall	-	Drywall Joint Compound	-	Non-ACM	HM	34532-700-CAPS-S03ABC	4-Apr-13	ND
20A	Classroom	Ceiling	Ceiling Tile 2' x 2'	-	Short Fissure Random Pinhole (2006)	-	Non-ACM	HM	34532-700-CAPS-S03ABC	4-Apr-13	ND
20A	Classroom	Ceiling	Drywall	-	Drywall Joint Compound	-	Non-ACM	HM	S16	2-Dec-09	4.3% Chrysotile
20A	Classroom	Structure	Trowel Applied Fireproofing	-	-	NF	ACM	HM	S05	2-Dec-09	ND
57	Changeroom	Floor	Vinyl Floor Tile 12"x 12"	-	Brown and White Flecks	-	Non ACM	HM	S04ab	2013	2.3 Chrysotile
57	Changeroom	Floor	Floor Tile Mastic	-	Black	NF	ACM	HM	S04ab	2013	2.3 Chrysotile
57	Changeroom	Floor	Ceramic Tile	-	-	-	Non ACM	-	-	-	-
57	Changeroom	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
57	Changeroom	Ceiling	Plaster	-	-	-	Non ACM	HM	S08	2-Dec-09	ND
57	Changeroom	Structure	Trowel Applied Fireproofing	-	-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
58	Shower	Floor	Vinyl Floor Tile 12"x 12"	-	Brown and White Flecks	-	Non ACM	HM	S05	2-Dec-09	ND
58	Shower	Floor	Floor Tile Mastic	-	Black	NF	ACM	HM	S04ab	2013	2.3 Chrysotile
58	Shower	Floor	Ceramic Tile	-	-	-	Non ACM	-	-	-	-
58	Shower	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
58	Shower	Ceiling	Plaster	-	-	-	Non ACM	HM	S08	2-Dec-09	ND
58	Shower	Structure	Trowel Applied Fireproofing	-	-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
59	Washroom	Floor	Vinyl Floor Tile 12"x 12"	-	Brown and White Flecks	-	Non ACM	HM	S05	2-Dec-09	ND
59	Washroom	Floor	Floor Tile Mastic	-	Black	NF	ACM	HM	S04ab	2013	2.3 Chrysotile
59	Washroom	Floor	Ceramic Tile	-	-	-	Non ACM	-	-	-	-
59	Washroom	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
59	Washroom	Ceiling	Plaster	-	-	-	Non ACM	HM	S08	2-Dec-09	ND
59	Washroom	Structure	Trowel Applied Fireproofing	-	-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
60	Changeroom	Floor	Vinyl Floor Tile 12"x 12"	-	Brown and White Flecks	-	Non ACM	HM	S05	2-Dec-09	ND
60	Changeroom	Floor	Floor Tile Mastic	-	Black	NF	ACM	HM	S04ab	2013	2.3 Chrysotile
60	Changeroom	Floor	Ceramic Tile	-	-	-	Non ACM	-	-	-	-
60	Changeroom	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
60	Changeroom	Ceiling	Plaster	-	-	-	Non ACM	HM	S08	2-Dec-09	ND
60	Changeroom	Floor	Vinyl Floor Tile 12"x 12"	-	Brown and White Flecks	-	Non ACM	HM	S05	2-Dec-09	ND
60	Changeroom	Storage	Plaster	-	-	-	Non ACM	SL	S13abc	2-Dec-09	ND
61	Storage	Floor	Vinyl Floor Tile 12"x 12"	-	Beige	-	Non ACM	HM	S04ab	2013	2.3 Chrysotile
61	Storage	Wall	Concrete	-	-	-	Non ACM	-	-	-	-

School Name		Legend:		Notes:							
Courtland Avenue Public School		HM - Homogenous Material - homogeneous with previously sampled material		All quantities provided on Figures, if known. Refer to the Asbestos Audit Update Report for condition of ACM and recommended actions.							
Date Built:		SL - Sample Location - Material Sampled		Dates provided in Material Description/Room Description columns indicates date of installation/renovation and confirms the finishes as non-ACM.							
Original: 1928		VC - Visually Confirmed - Material not sampled, deemed ACM									
Addition(s): 1964, 1981		NF - Non-Friable F - Friable									
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
61	Storage	Ceiling	Plaster	-	-	-	Non ACM	HM	S08	2-Dec-09	ND
61	Storage	Structure	Trowel Applied Fireproofing	-	-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
62	Stage	Floor	Wood	-	-	-	Non ACM	-	-	-	-
62	Stage	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
62	Stage	Wall	Plaster	-	-	-	Non ACM	HM	S08	2-Dec-09	ND
62	Stage	Ceiling	Plaster	-	-	-	Non ACM	HM	S08	2-Dec-09	ND
62	Stage	Structure	Trowel Applied Fireproofing	-	-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
63	Storage	Floor	Vinyl Floor Tile 12"x 12"	Beige	-	-	Non ACM	SL	S13abc	2-Dec-09	ND
63	Storage	Floor	Floor Tile Mastic	Black	-	NF	ACM	HM	S04ab	2013	2.3 Chrysotile
63	Storage	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
63	Storage	Ceiling	Plaster	-	-	-	Non ACM	HM	S08	2-Dec-09	ND
63	Storage	Structure	Trowel Applied Fireproofing	-	-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
64	Gym	Floor	Vinyl Floor Tile 12"x 12"	Beige	-	-	Non ACM	HM	S13	2-Dec-09	ND
64	Gym	Floor	Floor Tile Mastic	Black	-	NF	ACM	HM	S04ab	2013	2.3 Chrysotile
64	Gym	Floor	Vinyl Sheet Flooring	Wood (Post 2009)	-	-	Non ACM	-	-	-	-
64	Gym	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
64	Gym	Ceiling	Ceiling Tile 2' x 4'	-	-	-	Non ACM	HM	S02	2-Dec-09	ND
64	Gym	Structure	Trowel Applied Fireproofing	-	-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
65	Gym	Floor	Vinyl Floor Tile 12"x 12"	Beige	-	-	Non ACM	HM	S13	2-Dec-09	ND
65	Gym	Floor	Floor Tile Mastic	Black	-	NF	ACM	HM	S04ab	2013	2.3 Chrysotile
65	Gym	Floor	Vinyl Sheet Flooring	Wood (Post 2009)	-	-	Non ACM	-	-	-	-
65	Gym	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
65	Gym	Ceiling	Ceiling Tile 2' x 4'	-	-	-	Non ACM	HM	S02	2-Dec-09	ND
65	Gym	Structure	Trowel Applied Fireproofing	-	-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
66	Storage	Floor	Vinyl Floor Tile 12"x 12"	Beige	-	-	Non ACM	HM	S13	2-Dec-09	ND
66	Storage	Floor	Floor Tile Mastic	Black	-	NF	ACM	HM	S04ab	2013	2.3 Chrysotile
66	Storage	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
66	Storage	Deck	Metal Pan	Steel	-	-	Non ACM	-	-	-	-
66	Storage	Structure	Trowel Applied Fireproofing	-	-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
67	Instructor's Room	Floor	Vinyl Floor Tile 12"x 12"	Brown and White Flecks	-	-	Non ACM	HM	S05	2-Dec-09	ND
67	Instructor's Room	Floor	Floor Tile Mastic	Black	-	NF	ACM	HM	S04ab	2013	2.3 Chrysotile
67	Instructor's Room	Floor	Ceramic Tile	-	-	-	Non ACM	-	-	-	-
67	Instructor's Room	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
67	Instructor's Room	Ceiling	Plaster	-	-	-	Non ACM	HM	S08	2-Dec-09	ND
68	Washroom	Floor	Vinyl Floor Tile 12"x 12"	Brown and White Flecks	-	-	Non ACM	HM	S05	2-Dec-09	ND
68	Washroom	Floor	Floor Tile Mastic	Black	-	NF	ACM	HM	S04ab	2013	2.3 Chrysotile

School Name			Legend:	Notes:	
	Courtland Avenue Public School		HM - Homogenous Material - homogeneous with previously sampled material	All quantities provided on Figures, if known. Refer to the Asbestos Audit Update Report for condition of ACM and recommended actions.	
	Date Built:		SL - Sample Location - Material Sampled		
	Original: 1928		VC - Visually Confirmed - Material not sampled, deemed ACM	Dates provided in Material Description/Room Description columns indicates date of installation/renovation and confirms the finishes as non-ACM.	
	Addition(s): 1964, 1981		NF - Non-Friable F - Friable		

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
68	Washroom	Floor	Ceramic Tile	-	-	-	Non ACM	-	-	-	-
68	Washroom	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
68	Washroom	Ceiling	Plaster	-	-	-	Non ACM	HM	S08	2-Dec-09	ND
69	Storage	Floor	Vinyl Floor Tile 12"x 12"	-	Brown and White Flecks	-	Non ACM	HM	S05	2-Dec-09	ND
69	Storage	Floor	Floor Tile Mastic	Black	-	NF	ACM	HM	S04ab	2013	2.3 Chrysotile
69	Storage	Floor	Ceramic Tile	-	-	-	Non ACM	-	-	-	-
69	Storage	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
69	Storage	Ceiling	Plaster	-	-	-	Non ACM	-	-	-	-
70	Kitchen	Floor	Vinyl Floor Tile 12"x 12"	-	Brown and White Flecks	-	Non ACM	HM	S08	2-Dec-09	ND
70	Kitchen	Floor	Floor Tile Mastic	Black	-	NF	ACM	HM	S04ab	2013	2.3 Chrysotile
70	Kitchen	Wall	Ceramic Tile	-	-	-	Non ACM	-	-	-	-
70	Kitchen	Ceiling	Concrete	-	-	-	Non ACM	-	-	-	-
70	Kitchen	Plaster	-	-	-	-	Non ACM	HM	S08	2-Dec-09	ND
71	Washroom	Floor	Vinyl Rolled Flooring	Yellow Cobblestone	-	NF	ACM	HM	S12	2-Dec-09	15% Chrysotile
71	Washroom	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
71	Washroom	Ceiling	Plaster	-	-	-	Non ACM	HM	S08	2-Dec-09	ND
72	Washroom	Floor	Vinyl Rolled Flooring	Yellow Cobblestone	-	NF	ACM	SL	S12abc	2-Dec-09	15% Chrysotile
72	Washroom	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
72	Washroom	Ceiling	Plaster	-	-	-	Non ACM	HM	S08	2-Dec-09	ND
73	Tuck Shop	Floor	Vinyl Floor Tile 12"x 12"	-	Brown and White Flecks	-	Non ACM	HM	S05	2-Dec-09	ND
73	Tuck Shop	Floor	Floor Tile Mastic	Black	-	NF	ACM	HM	S04ab	2013	2.3 Chrysotile
73	Tuck Shop	Wall	Drywall	-	Drywall Joint Compound	-	Non ACM	HM	S03B, S05AB	4/4/2013, 06/5/18	ND
73	Tuck Shop	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
73	Tuck Shop	Ceiling	Ceiling Tile 2' x 4'	-	Long Fissure Random Pinhole	-	Non ACM	HM	S11	2-Dec-09	ND
74	Resource Room	Floor	Carpet	-	-	-	Non ACM	-	-	-	-
74	Resource Room	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
74	Resource Room	Ceiling	Plaster	-	-	-	Non ACM	HM	S08	2-Dec-09	ND
74	Resource Room	Ceiling	Ceiling Tile 2' x 4'	-	Long Fissure Random Pinhole	-	Non ACM	HM	S11	2-Dec-09	ND
75	Custodial Room	Floor	Carpet	-	-	-	Non ACM	-	-	-	-
75	Custodial Room	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
75	Custodial Room	Ceiling	Plaster	-	-	-	Non ACM	HM	S08	2-Dec-09	ND
75	Custodial Room	Ceiling	Ceiling Tile 2' x 4'	-	Long Fissure Random Pinhole	-	Non ACM	SL	S11abc	2-Dec-09	ND
76	Lunch Room	Floor	Wood	-	-	-	Non ACM	-	-	-	-
76	Lunch Room	Floor	Vinyl Sheet Flooring	-	Beige (Post 2010)	-	Non ACM	-	-	-	-
76	Lunch Room	Wall	Wood	-	-	-	Non ACM	-	-	-	-
76	Lunch Room	Wall	Concrete	-	-	-	Non ACM	-	-	-	-

School Name		Legend:		Notes:							
Courtland Avenue 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: 1928											
Addition(s): 1964, 1981											
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
76	Lunch Room	Wall	Drywall		Drywall Joint Compound	-	Non ACM	HM	S03B, S05AB	4/4/2013, 06/5/18	ND
76	Lunch Room	Ceiling	Plaster			-	Non ACM	HM	S08	2-Dec-09	ND
76	Lunch Room	Ceiling	Ceiling Tile 2' x 4'		Short Fissure Random Pinhole (Post 2010)	-	Non ACM	HM	S08	2-Dec-09	ND
76	Lunch Room	Piping	Pipe Insulation		Fibreglass insulation	-	Non ACM	-	-	-	-
76	Lunch Room	Piping	Pipe Fitting		Parged Cement	F	ACM	HM	S01	18-Mar-24	60% Chrysotile
77	Lunch Room	Floor	Wood			-	Non ACM	-	-	-	-
77	Lunch Room	Wall	Drywall		Drywall Joint Compound	-	Non ACM	HM	34532-700-CAPS-S03ABC	4-Apr-13	ND
77	Lunch Room	Wall	Concrete			-	Non ACM	-	-	-	-
77	Lunch Room	Ceiling	Plaster			-	Non ACM	HM	S08	2-Dec-09	ND
77	Lunch Room	Piping	Pipe Insulation		Fibreglass insulation	-	Non ACM	-	-	-	-
77	Lunch Room	Piping	Pipe Fitting		Parged Cement	F	ACM	HM	S01	18-Mar-24	60% Chrysotile
78	Resource Room	Floor	Vinyl Floor Tile 12"x 12"		Brown and White Flecks	-	Non ACM	HM	S05	2-Dec-09	ND
78	Resource Room	Wall	Drywall		Drywall Joint Compound	-	Non ACM	HM	34532-700-CAPS-S03ABC	4-Apr-13	ND
78	Resource Room	Ceiling	Plaster			-	Non ACM	HM	S08	2-Dec-09	ND
78	Resource Room	Piping	Pipe Fitting		Parged Cement	F	ACM	HM	S01	18-Mar-24	60% Chrysotile
79	Classroom	Floor	Vinyl Sheet Flooring		Beige (Post 2010)	-	Non ACM	-	-	-	-
79	Classroom	Wall	Concrete			-	Non ACM	-	-	-	-
79	Classroom	Wall	Drywall		Drywall Joint Compound	-	Non ACM	HM	34532-700-CAPS-S03ABC	4-Apr-13	ND
79	Classroom	Ceiling	Ceiling Tile 2' x 4'		Short Fissure Random Pinhole (Post 2010)	-	Non ACM	-	-	-	-
79	Classroom	Ceiling	Ceiling Tile Mastic		Brown Mastic	-	Non ACM	SL	S09abc	2-Dec-09	ND
79	Classroom	Ceiling	Plaster			-	Non ACM	HM	S08	2-Dec-09	ND
79	Classroom	Piping	Pipe Insulation		Fibreglass insulation	-	Non ACM	-	-	-	-
79	Classroom	Piping	Pipe Fitting		Parged Cement	F	ACM	HM	S01	18-Mar-24	60% Chrysotile
83	Storage	Floor	Concrete			-	Non ACM	-	-	-	-
83	Storage	Floor	Wood			-	Non ACM	-	-	-	-
83	Storage	Wall	Brick			-	Non ACM	-	-	-	-
83	Storage	Wall	Wood			-	Non ACM	-	-	-	-
83	Storage	Wall	Drywall		Drywall Joint Compound (Post 2010)	-	Non ACM	-	-	-	-
83	Storage	Ceiling	Drywall		Drywall Joint Compound (Post 2010)	-	Non ACM	-	-	-	-
83	Storage	Piping	Pipe Insulation		Fibreglass insulation	-	Non ACM	-	-	-	-
84	Boiler Room	Floor	Concrete			-	Non ACM	-	-	-	-
84	Boiler Room	Wall	Concrete			-	Non ACM	-	-	-	-
84	Boiler Room	Ceiling	Plaster			-	Non ACM	SL	S01abc	2-Dec-09	ND
84	Boiler Room	Piping	Pipe Insulation		Fibreglass insulation	-	Non ACM	-	-	-	-
84	Boiler Room	Structure	Trowel Applied Fireproofing			NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
85	Klin Room	Floor	Terrazzo			-	Non ACM	-	-	-	-

School Name		Legend:		Notes:							
Courtland Avenue 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: 1928											
Addition(s): 1964, 1981											
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
85	Kiln Room	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
85	Kiln Room	Deck	Concrete	-	-	-	Non ACM	-	-	-	-
85	Kiln Room	Structure	Trowel Applied Fireproofing	-	-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
801	Corridor	Floor	Terrazzo	-	-	-	Non ACM	-	-	-	-
801	Corridor	Floor	Ceramic Tile	-	-	-	Non ACM	-	-	-	-
801	Corridor	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
801	Corridor	Ceiling	Ceiling Tile 2' x 4'	-	Short Fissure Random Pinhole	-	Non ACM	SL	S02abc	2-Dec-09	ND
801	Corridor	Ceiling	Ceiling Tile 2' x 4'	-	Long Fissure Random Pinhole (Post 2010)	-	Non ACM	-	-	-	-
801	Corridor	Ceiling	Ceiling Tile 2' x 2'	-	Random Pinhole	-	Non ACM	SL	S06abc	2-Dec-09	ND
801	Corridor	Ceiling	Plaster	-	-	-	Non ACM	HM	S08	2-Dec-09	ND
801	Corridor	Piping	Pipe Fitting	-	Parged Cement	F	ACM	HM	S01	18-Mar-24	60% Chrysotile
801	Corridor	Piping	Pipe Insulation	-	Fibreglass insulation	-	Non ACM	-	-	-	-
801	Corridor	Piping	Pipe Insulation	-	Tar Paper	-	Non ACM	SL	S03abc	-	-
801	Corridor	Structure	Trowel Applied Fireproofing	-	-	NF	ACM	SL	S16abc	2-Dec-09	4.3% Chrysotile
802	Corridor	Floor	Terrazzo	-	-	-	Non ACM	-	-	-	-
802	Corridor	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
802	Corridor	Ceiling	Ceiling Tile 2' x 2'	-	Short Fissure Random Pinhole (2006)	-	Non ACM	-	-	-	-
802	Corridor	Trowel Applied	Trowel Applied Fireproofing	-	-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
802	Lobby	Piping	Pipe Fitting	-	Parged Cement	F	ACM	HM	S01	18-Mar-24	60% Chrysotile
802	Lobby	Structure	Trowel Applied Fireproofing	-	-	NF	ACM	SL	S16de	2-Dec-09	4.3% Chrysotile
803	Corridor	Floor	Vinyl Floor Tile 12"x 12"	-	Brown and White Flecks	-	Non ACM	HM	S05	2-Dec-09	ND
803	Corridor	Floor	Floor Tile Mastic	-	Black	NF	ACM	HM	S04ab	2013	2.3 Chrysotile
803	Corridor	Floor	Ceramic Tile	-	-	-	Non ACM	-	-	-	-
803	Corridor	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
803	Corridor	Ceiling	Plaster	-	-	-	Non ACM	HM	S08	2-Dec-09	ND
804	Corridor	Floor	Vinyl Floor Tile 12"x 12"	-	Brown and White Flecks	-	Non ACM	HM	S05	2-Dec-09	ND
804	Corridor	Floor	Floor Tile Mastic	-	Black	NF	ACM	HM	S04ab	2013	2.3 Chrysotile
804	Corridor	Floor	Ceramic Tile	-	-	-	Non ACM	-	-	-	-
804	Corridor	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
804	Corridor	Ceiling	Plaster	-	-	-	Non ACM	HM	S08	2-Dec-09	ND
805	Classroom	Floor	Ceramic Tile	-	-	-	Non ACM	-	-	-	-
805	Classroom	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
805	Classroom	Ceiling	Ceiling Tile 2' x 4'	-	Short Fissure Random Pinhole (Post 2006)	-	Non ACM	-	-	-	-
901	Stairwell	Floor	Terrazzo	-	-	-	Non ACM	-	-	-	-
901	Stairwell	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
901	Stairwell	Deck	Concrete	-	-	-	Non ACM	-	-	-	-

School Name			Legend:		Notes:						
Courtland Avenue 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								
Date Built:			All quantities provided on Figures, if known. Refer to the Asbestos Audit Update Report for condition of ACM and recommended actions.								
Original: 1928			Dates provided in Material Description/Room Description columns indicates date of installation/renovation and confirms the finishes as non-ACM.								
Addition(s): 1964, 1981											
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
902	Stairwell	Floor	Vinyl Floor Tile 12"x 12"	Beige		-	Non ACM	HM	S13	2-Dec-09	ND
902	Stairwell	Floor	Floor Tile Mastic	Black		NF	ACM	HM	S04ab	2013	2.3 Chrysotile
902	Stairwell	Wall	Concrete			-	Non ACM		-	-	-
902	Stairwell	Ceiling	Ceiling Tile 2' x 4'		Short Fissure Random Pinhole	-	Non ACM	HM	S02	2-Dec-09	ND
902	Stairwell	Structure	Trowel Applied Fireproofing			NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
903	Stairwell	Floor	Terrazzo			-	Non ACM		-	-	-
903	Stairwell	Wall	Concrete			-	Non ACM		-	-	-
903	Stairwell	Deck	Concrete			-	Non ACM		-	-	-
903	Stairwell	Structure	Trowel Applied Fireproofing			NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
904	Stairwell	Floor	Vinyl Floor Tile 12"x 12"		Yellow Dense Fleck (Post 2009)	-	Non ACM		-	-	-
904	Stairwell	Floor	Terrazzo			-	Non ACM		-	-	-
904	Stairwell	Wall	Concrete			-	Non ACM		-	-	-
904	Stairwell	Deck	Concrete			-	Non ACM		-	-	-
904	Stairwell	Structure	Trowel Applied Fireproofing			NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
905	Stairwell	Floor	Terrazzo			-	Non ACM		-	-	-
905	Stairwell	Wall	Concrete			-	Non ACM		-	-	-
905	Stairwell	Deck	Concrete			-	Non ACM		-	-	-
905	Stairwell	Structure	Trowel Applied Fireproofing			NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
906	Stairwell	Floor	Terrazzo			-	Non ACM		-	-	-
906	Stairwell	Floor	Wood			-	Non ACM		-	-	-
906	Stairwell	Wall	Plaster			-	Non ACM	HM	S08	2-Dec-09	ND
906	Stairwell	Wall	Concrete			-	Non ACM	HM	S08	2-Dec-09	ND
906	Stairwell	Ceiling	Plaster			-	Non ACM	HM	S08	2-Dec-09	ND
906	Stairwell	Deck	Concrete			-	Non ACM		-	-	-
951	Elevator Room	Wall	Concrete			-	Non ACM		-	-	-
951	Elevator Room	Wall	Drywall		Drywall Joint Compound (Post 2010)	-	Non ACM		-	-	-
951	Elevator Room	Ceiling	Drywall		Drywall Joint Compound (Post 2010)	-	Non ACM		-	-	-
Level 2											
1	Classroom	Floor	Vinyl Floor Tile 12"x 12"		Beige with White Fleck (Post 2010)	-	Non ACM		-	-	-
1	Classroom	Wall	Concrete			-	Non ACM		-	-	-
1	Classroom	Ceiling	Ceiling Tile 2' x 4'		Long Fissure Random Pinhole	-	Non ACM	HM	S11	2-Dec-09	ND
1	Classroom	Ceiling	Drywall		Drywall Joint Compound	-	Non-ACM	HM	34532-700-CAPS-S03ABC	4-Apr-13	ND
1	Classroom	Structure	Trowel Applied Fireproofing			NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
1	Classroom	Floor	Vinyl Floor Tile 12"x 12"		Beige	-	Non ACM	HM	S13	2-Dec-09	ND

School Name			Legend:		Notes:						
	Courtland Avenue Public School		HM - Homogenous Material - homogeneous with previously sampled material			All quantities provided on Figures, if known. Refer to the Asbestos Audit Update Report for condition of ACM and recommended actions.					
	Date Built:		SL - Sample Location - Material Sampled								
	Original: 1928		VC - Visually Confirmed - Material not sampled, deemed ACM			Dates provided in Material Description/Room Description columns indicates date of installation/renovation and confirms the finishes as non-ACM.					
	Addition(s): 1964, 1981		NF - Non-Friable F - Friable								
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
2	Classroom	Floor	Floor Tile Mastic	Black		NF	ACM	HM	S04ab	2013	2.3 Chrysotile
2	Classroom	Wall	Concrete			-	Non ACM	-	-	-	-
2	Classroom	Ceiling	Ceiling Tile 1' x 1'	Cellulose		-	Non ACM	-	-	-	-
2	Classroom	Structure	Trowel Applied Fireproofing	-		NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
3	Library	Floor	Vinyl Floor Tile 12"x 12"		Brown Dense Fleck (Post 2010)	-	Non ACM	-	-	-	-
3	Library	Wall	Concrete			-	Non ACM	-	-	-	-
3	Library	Wall	Drywall		Drywall Joint Compound	-	Non-ACM	SL	34532-700-CAPS-S03B	4-Apr-13	ND
3	Library	Ceiling	Ceiling Tile 2' x 4'		Short Fissure Random Pinhole	-	Non ACM	SL	S17abc	2-Dec-09	ND
3	Library	Ceiling	Ceiling Tile 1' x 1'		Brown Random Pinhole	-	Non ACM	HM	S05	21-May-15	ND
4	Library	Floor	Carpet			-	Non ACM	-	-	-	-
4	Library	Wall	Concrete			-	Non ACM	-	-	-	-
4	Library	Wall	Drywall		Drywall Joint Compound	-	Non-ACM	SL	34532-700-CAPS-S03B	4-Apr-13	ND
4	Library	Ceiling	Ceiling Tile 2' x 4'		Short Fissure Random Pinhole	-	Non ACM	SL	S17abc	2-Dec-09	ND
4	Library	Ceiling	Ceiling Tile 1' x 1'		Brown Random Pinhole	-	Non ACM	HM	S05	21-May-15	ND
5	Classroom	Floor	Vinyl Floor Tile 9"x 9"		Grey with White and Black Streak	-	Non ACM	HM	S15	2-Dec-09	ND
5	Classroom	Wall	Concrete			-	Non ACM	-	-	-	-
5	Classroom	Ceiling	Ceiling Tile 2' x 4'		Short Fissure Random Pinhole	-	Non ACM	HM	S17	2-Dec-09	ND
5	Classroom	Ceiling	Ceiling Tile 1' x 1'		Brown Random Pinhole	-	Non ACM	SL	S05ABC	21-May-15	ND
6	Classroom	Floor	Vinyl Floor Tile 12"x 12"		Green with White Fleck	NF	ACM	SL	S07abc	2-Dec-09	1.4% Chrysotile
6	Classroom	Wall	Concrete			-	Non ACM	-	-	-	-
6	Classroom	Ceiling	Ceiling Tile 2' x 4'		Short Fissure Random Pinhole	-	Non ACM	HM	S02	2-Dec-09	ND
7	Classroom	Floor	Carpet			-	Non ACM	-	-	-	-
7	Classroom	Floor	Vinyl Floor Tile 12"x 12"		Beige	-	Non ACM	HM	S13	2-Dec-09	ND
7	Classroom	Floor	Floor Tile Mastic	Black		NF	ACM	HM	S04ab	2013	2.3 Chrysotile
7	Classroom	Wall	Concrete			-	Non ACM	-	-	-	-
7	Classroom	Structure	Trowel Applied Fireproofing	-		NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
7	Classroom	Ceiling	Ceiling Tile 2' x 4'		Short Fissure Random Pinhole (Post 2022)	-	Non ACM	-	-	-	-
8	Classroom	Floor	Vinyl Floor Tile 12"x 12"		Beige	-	Non ACM	HM	S13	2-Dec-09	ND
8	Classroom	Floor	Floor Tile Mastic	Black		NF	ACM	HM	S04ab	2013	2.3 Chrysotile
8	Classroom	Wall	Concrete			-	Non ACM	-	-	-	-
8	Classroom	Ceiling	Ceiling Tile 2' x 4'		Short Fissure Random Pinhole (Post 2006)	-	Non ACM	-	-	-	-
8	Classroom	Structure	Trowel Applied Fireproofing	-		NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
33	Washroom	Floor	Terrazzo			-	Non ACM	-	-	-	-
33	Washroom	Wall	Concrete			-	Non ACM	-	-	-	-
33	Washroom	Wall	Ceramic Tile			-	Non ACM	-	-	-	-
33	Washroom	Ceiling	Plaster			-	Non ACM	HM	S08	2-Dec-09	ND

School Name		Legend:		Notes:							
Courtland Avenue 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: 1928											
Addition(s): 1964, 1981											
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
33	Washroom	Structure	Trowel Applied Fireproofing	-	Grey - Post 2018 Installation	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
34	Office	Floor	Vinyl Sheet Flooring	-	Drywall Joint Compound	-	Non ACM	-	-	-	-
34	Office	Wall	Drywall	-	Long Fissure Random Pinhole (2006)	-	Non ACM	HM	34532-700-CAPS-S03ABC	4-Apr-13	ND
34	Office	Ceiling	Ceiling Tile 2' x 4'	-	White/Grey Random Pinhole	NF	ACM	HM	34532-700-CAPS-S01ABC	4-Apr-13	3.8% Amosite
34	Office	Ceiling	Ceiling Tile 1' x 1'	-	Drywall Joint Compound	-	Non ACM	HM	34532-700-CAPS-S03ABC	4-Apr-13	ND
34	Office	Structure	Trowel Applied Fireproofing	-	Grey - Post 2018 Installation	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
35	Office	Floor	Vinyl Sheet Flooring	-	Drywall Joint Compound	-	Non ACM	-	-	-	-
35	Office	Wall	Drywall	-	Long Fissure Random Pinhole (2006)	-	Non ACM	SL	34532-700-CAPS-S03A	4-Apr-13	ND
35	Office	Ceiling	Ceiling Tile 2' x 4'	-	White/Grey Random Pinhole	NF	ACM	SL	34532-700-CAPS-S01ABC	4-Apr-13	3.8% Amosite
35	Office	Ceiling	Ceiling Tile 1' x 1'	-	Drywall Joint Compound	-	Non ACM	HM	34532-700-CAPS-S03ABC	4-Apr-13	ND
35	Office	Structure	Trowel Applied Fireproofing	-	Grey - Post 2018 Installation	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
36	Office	Floor	Vinyl Sheet Flooring	-	Grey - Post 2018 Installation	-	Non ACM	HM	S13	2-Dec-09	ND
36	Office	Wall	Drywall	-	Drywall Joint Compound	-	Non ACM	SL	34532-700-CAPS-S03C	4-Apr-13	ND
36	Office	Ceiling	Ceiling Tile 2' x 4'	-	Long Fissure Random Pinhole (2006)	-	Non ACM	-	-	-	-
36	Office	Ceiling	Ceiling Tile 1' x 1'	-	White/Grey Random Pinhole	NF	ACM	HM	34532-700-CAPS-S01ABC	4-Apr-13	3.8% Amosite
36	Office	Structure	Trowel Applied Fireproofing	-	Grey - Post 2018 Installation	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
37	Washroom	Floor	Terrazzo	-	-	-	Non ACM	-	-	-	-
37	Washroom	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
37	Washroom	Wall	Ceramic Tile	-	-	-	Non ACM	-	-	-	-
37	Washroom	Ceiling	Plaster	-	-	-	Non ACM	HM	S08	2-Dec-09	ND
37	Washroom	Structure	Trowel Applied Fireproofing	-	Beige	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
38	Custodial Room	Floor	Vinyl Floor Tile 12"x 12"	-	Black	NF	ACM	HM	S13	2-Dec-09	ND
38	Custodial Room	Floor	Floor Tile Mastic	-	Black	NF	ACM	HM	S04ab	2013	2.3 Chrysotile
38	Custodial Room	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
38	Custodial Room	Ceiling	Plaster	-	-	-	Non ACM	HM	S08	2-Dec-09	ND
38	Custodial Room	Piping	Pipe Fitting	-	Parged Cement	F	ACM	HM	S01	18-Mar-24	60% Chrysotile
39	Fan Room	Floor	Concrete	-	-	-	Non ACM	-	-	-	-
39	Fan Room	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
39	Fan Room	Deck	Concrete	-	-	-	Non ACM	-	-	-	-
39	Fan Room	Piping	Pipe Insulation	-	Fibreglass insulation	-	Non ACM	-	-	-	-
39	Fan Room	Piping	Pipe Fitting	-	Parged Cement	F	ACM	SL	S01abc	18-Mar-24	60% Chrysotile
39	Fan Room	Ducting	Flex Joint	-	-	NF	ACM	-	-	-	-
39	Fan Room	Structure	Trowel Applied Fireproofing	-	-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
40	Mechanical										

School Name		Legend:	Notes:	
	Courtland Avenue Public School	HM - Homogenous Material - homogeneous with previously sampled material	All quantities provided on Figures, if known. Refer to the Asbestos Audit Update Report for condition of ACM and recommended actions.	
	Date Built:	SL - Sample Location - Material Sampled		
	Original: 1928	VC - Visually Confirmed - Material not sampled, deemed ACM	Dates provided in Material Description/Room Description columns indicates date of installation/renovation and confirms the finishes as non-ACM.	
	Addition(s): 1964, 1981	NF - Non-Friable F - Friable		

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
41	Storage	Floor	Vinyl Sheet Flooring		Beige (Post 2010)	-	Non ACM	-	-	-	-
41	Storage	Wall	Drywall		Drywall Joint Compound	-	Non-ACM	SL	34532-700-CAPS-S03C	4-Apr-13	ND
41	Storage	Ceiling	Ceiling Tile 2' x 4'		Short Fissure Random Pinhole (Post 2010)	-	Non ACM	-	-	-	-
42	Washroom	Floor	Ceramic Tile		-	-	Non ACM	-	-	-	-
42	Washroom	Wall	Drywall		Drywall Joint Compound	-	Non-ACM	SL	34532-700-CAPS-S03C	4-Apr-13	ND
42	Washroom	Ceiling	Ceiling Tile 2' x 4'		Short Fissure Random Pinhole (Post 2010)	-	Non ACM	-	-	-	-
43	Washroom	Floor	Ceramic Tile		-	-	Non ACM	-	-	-	-
43	Washroom	Wall	Concrete		-	-	Non ACM	-	-	-	-
43	Washroom	Wall	Ceramic Tile		-	-	Non ACM	-	-	-	-
43	Washroom	Ceiling	Plaster		-	-	Non ACM	-	-	-	-
44	Changeroom	Floor	Vinyl Floor Tile 12"x 12"		Brown with White Dense Fleck (Post 2009)	-	Non ACM	HM	S08	2-Dec-09	ND
44	Changeroom	Wall	Concrete		-	-	Non ACM	-	-	-	-
44	Changeroom	Wall	Ceramic Tile		-	-	Non ACM	-	-	-	-
44	Changeroom	Ceiling	Plaster		-	-	Non ACM	HM	S08	2-Dec-09	ND
45	Shower	Floor	Ceramic Tile		-	-	Non ACM	-	-	-	-
45	Shower	Wall	Concrete		-	-	Non ACM	-	-	-	-
45	Shower	Wall	Ceramic Tile		-	-	Non ACM	-	-	-	-
45	Shower	Ceiling	Plaster		-	-	Non ACM	-	-	-	-
45	Shower	Floor	Ceramic Tile		-	-	Non ACM	HM	S08	2-Dec-09	ND
46	Shower	Wall	Concrete		-	-	Non ACM	-	-	-	-
46	Shower	Wall	Ceramic Tile		-	-	Non ACM	-	-	-	-
46	Shower	Ceiling	Plaster		-	-	Non ACM	-	-	-	-
47	Instructors Room	Floor	Vinyl Sheet Flooring		White (Post 2021)	-	Non ACM	HM	S08	2-Dec-09	ND
47	Instructors Room	Wall	Concrete		-	-	Non ACM	-	-	-	-
47	Instructors Room	Wall	Ceramic Tile		-	-	Non ACM	-	-	-	-
47	Instructors Room	Ceiling	Plaster		-	-	Non ACM	HM	S08	2-Dec-09	ND
47	Instructors Room	Structure	Trowel Applied Fireproofing		-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
48	Workroom	Floor	Vinyl Sheet Flooring		Beige (Post 2010)	-	Non ACM	-	-	-	-
48	Workroom	Wall	Drywall		Drywall Joint Compound	-	Non-ACM	SL	34532-700-CAPS-S03C	4-Apr-13	ND
48	Workroom	Ceiling	Ceiling Tile 2' x 4'		Short Fissure Random Pinhole (Post 2010)	-	Non ACM	-	-	-	-
810	Corridor	Floor	Vinyl Floor Tile 12"x 12"		Rose (Post 2000)	-	Non ACM	-	-	-	-
810	Corridor	Wall	Concrete		-	-	Non ACM	-	-	-	-
810	Corridor	Wall	Plaster		-	-	Non ACM	-	-	-	-
810	Corridor	Ceiling	Ceiling Tile 2' x 4'		Short Fissure Random Pinhole	-	Non ACM	HM	S08	2-Dec-09	ND
811	Corridor	Floor	Terrazzo		-	-	Non ACM	-	-	-	-
811	Corridor	Wall	Concrete		-	-	Non ACM	-	-	-	-

School Name			Legend:		Notes:						
	Courtland Avenue 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:										
	Original: 1928					Dates provided in Material Description/Room Description columns indicates date of installation/renovation and confirms the finishes as non-ACM.					
	Addition(s): 1964, 1981										
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
811	Corridor	Ceiling	Ceiling Tile 2' x 2'	Random Pinhole (White Drywall)	-	-	Non ACM	SL	S07ABC	21-May-15	ND
811	Corridor	Structure	Trowel Applied Fireproofing	-	-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
812	Corridor	Floor	Terrazzo	-	-	-	Non ACM	-	-	-	-
812	Corridor	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
812	Corridor	Ceiling	Ceiling Tile 2' x 2'	Random Pinhole	-	-	Non ACM	HM	S04	21-May-15	ND
812	Corridor	Structure	Trowel Applied Fireproofing	-	-	NF	ACM	SL	S16abc	2-Dec-09	4.3% Chrysotile
813	Corridor	Floor	Terrazzo	-	-	-	Non ACM	-	-	-	-
813	Corridor	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
813	Corridor	Wall	Plaster	-	-	-	Non ACM	HM	S08	2-Dec-09	ND
813	Corridor	Ceiling	Ceiling Tile 2' x 2'	Random Pinhole (White Drywall)	-	-	Non ACM	SL	S04ABC	21-May-15	ND
813	Corridor	Structure	Trowel Applied Fireproofing	-	-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
814	Corridor	Floor	Vinyl Floor Tile 12"x 12"	Brown Dense Fleck (Post 2010)	-	-	Non ACM	-	-	-	-
814	Corridor	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
814	Corridor	Ceiling	Plaster	-	-	-	Non ACM	HM	S08	2-Dec-09	ND
901	Stairwell	Floor	Terrazzo	-	-	-	Non ACM	-	-	-	-
901	Stairwell	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
901	Stairwell	Ceiling	Plaster	-	-	-	Non ACM	HM	S08	2-Dec-09	ND
901	Stairwell	Ceiling	Ceiling Tile 2' x 4'	Short Fissure Random Pinhole (Post 2010)	-	-	Non ACM	-	-	-	-
902	Stairwell	Floor	Terrazzo	-	-	-	Non ACM	-	-	-	-
902	Stairwell	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
902	Stairwell	Ceiling	Ceiling Tile 1' x 1'	Beige Random Pinhole	-	NF	ACM	HM	S06	21-May-15	2% Amosite, 0.5% Chrysotile
902	Stairwell	Structure	Trowel Applied Fireproofing	-	-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
903	Stairwell	Floor	Terrazzo	-	-	-	Non ACM	-	-	-	-
903	Stairwell	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
903	Stairwell	Deck	Concrete	-	-	-	Non ACM	-	-	-	-
903	Stairwell	Structure	Trowel Applied Fireproofing	-	-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
904	Stairwell	Floor	Terrazzo	-	-	-	Non ACM	-	-	-	-
904	Stairwell	Floor	Vinyl Floor Tile 12"x 12"	Brown Dense Fleck (Post 2010)	-	-	Non ACM	-	-	-	-
904	Stairwell	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
904	Stairwell	Deck	Concrete	-	-	-	Non ACM	-	-	-	-
904	Stairwell	Structure	Trowel Applied Fireproofing	-	-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
905	Stairwell	Floor	Terrazzo	-	-	-	Non ACM	-	-	-	-
905	Stairwell	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
905	Stairwell	Ceiling	Plaster	-	-	-	Non ACM	HM	S08	2-Dec-09	ND
905	Stairwell	Structure	Trowel Applied Fireproofing	-	-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
951	Storage	Floor	Ceramic Tile	-	-	-	Non ACM	-	-	-	-

School Name			Legend:		Notes:						
Courtland Avenue 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: 1928											
Addition(s): 1964, 1981											
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
951	Storage	Wall	Drywall		Drywall Joint Compound	-	Non-ACM	SL	34532-700-CAPS-S03C	4-Apr-13	ND
951	Storage	Ceiling	Drywall		Drywall Joint Compound	-	Non-ACM	SL	34532-700-CAPS-S03C	4-Apr-13	ND
Level 3											
11	Classroom	Floor	Vinyl Floor Tile 12"x 12"		Brown with Brown Fleck	-	Non-ACM	SL	34532-700-CAPS-S05ABC	4-Apr-13	ND
11	Classroom	Floor	Floor Tile Mastic		Black	-	Non-ACM	SL	34532-700-CAPS-S05ABC	4-Apr-13	ND
11	Classroom	Wall	Concrete		-	-	Non-ACM	-	-	-	-
11	Classroom	Ceiling	Ceiling Tile 2' x 4'		Long Fissure Random Pinhole	-	Non-ACM	HM	S11	2-Dec-09	ND
11	Classroom	Ceiling	Drywall		No Drywall Joint Compound	-	Non-ACM	-	-	-	-
11	Classroom	Structure	Trowel Applied Fireproofing		-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
12	Classroom	Floor	Vinyl Floor Tile 12"x 12"		White with Blue Fleck	-	Non-ACM	HM	S04	2-Dec-09	ND
12	Classroom	Floor	Floor Tile Mastic		Black	NF	ACM	HM	S04ab	2013	2.3 Chrysotile
12	Classroom	Wall	Concrete		-	-	Non-ACM	-	-	-	-
12	Classroom	Structure	Trowel Applied Fireproofing		-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
12	Classroom	Ceiling	Ceiling Tile 2' x 4'		Short Fissure Random Pinhole (Post 2022)	-	Non-ACM	-	-	-	-
13	Classroom	Floor	Vinyl Floor Tile 9"x 9"		Dark Green with White Streaks	-	Non-ACM	SL	34532-700-CAPS-S06ABC	4-Apr-13	ND
13	Classroom	Floor	Floor Tile Mastic		Black	-	Non-ACM	SL	34532-700-CAPS-S06ABC	4-Apr-13	ND
13	Classroom	Floor	Vinyl Floor Tile 12"x 12"		Blue Dense Fleck (Post 2010)	-	Non-ACM	HM	34532-700-CAPS-S05ABC	4-Apr-13	ND
13	Classroom	Wall	Concrete		-	-	Non-ACM	-	-	-	-
13	Classroom	Wall	Plaster		-	-	Non-ACM	HM	S08	2-Dec-09	ND
13	Classroom	Ceiling	Ceiling Tile 2' x 4'		Short Fissure Random Pinhole	-	Non-ACM	HM	S17	2-Dec-09	ND
13	Classroom	Ceiling	Ceiling Tile 1' x 1'		Brown Random Pinhole	-	Non-ACM	SL	S01ABC	21-May-15	ND
14	Classroom	Floor	Vinyl Floor Tile 9"x 9"		Grey with White Streaks	-	Non-ACM	SL	34532-700-CAPS-S07ABC	4-Apr-13	ND
14	Classroom	Floor	Floor Tile Mastic		Black	-	Non-ACM	SL	34532-700-CAPS-S07ABC	4-Apr-13	ND
14	Classroom	Wall	Concrete		-	-	Non-ACM	-	-	-	-
14	Classroom	Wall	Plaster		-	-	Non-ACM	HM	S08	2-Dec-09	ND
14	Classroom	Ceiling	Ceiling Tile 2' x 4'		Short Fissure Random Pinhole	-	Non-ACM	HM	S17	2-Dec-09	ND
14	Classroom	Ceiling	Ceiling Tile 1' x 1'		Brown Random Pinhole	-	Non-ACM	HM	S01	21-May-15	ND
15	Classroom	Floor	Vinyl Floor Tile 12"x 12"		Brown with Brown Fleck	-	Non-ACM	HM	34532-700-CAPS-S05ABC	4-Apr-13	ND
15	Classroom	Floor	Floor Tile Mastic		Black	-	Non-ACM	HM	34532-700-CAPS-S05ABC	4-Apr-13	ND
15	Classroom	Wall	Concrete		-	-	Non-ACM	-	-	-	-
15	Classroom	Ceiling	Ceiling Tile 2' x 4'		Short Fissure Random Pinhole	-	Non-ACM	HM	S17	2-Dec-09	ND
15	Classroom	Ceiling	Ceiling Tile 1' x 1'		Brown Random Pinhole	-	Non-ACM	HM	S01	21-May-15	ND
16	Classroom	Floor	Vinyl Floor Tile 9"x 9"		Grey with White Streaks	-	Non-ACM	HM	34532-700-CAPS-S07ABC	4-Apr-13	ND
16	Classroom	Floor	Floor Tile Mastic		Black	-	Non-ACM	HM	34532-700-CAPS-S07ABC	4-Apr-13	ND

School Name		Legend:			Notes:						
Courtland Avenue 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: 1928											
Addition(s): 1964, 1981											
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
16	Classroom	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
16	Classroom	Wall	Plaster	-	-	-	Non ACM	HM	S08	2-Dec-09	ND
16	Classroom	Ceiling	Ceiling Tile 2' x 4'	-	Short Fissure Random Pinhole	-	Non ACM	HM	S17	2-Dec-09	ND
16	Classroom	Ceiling	Ceiling Tile 1' x 1'	-	Brown Random Pinhole	-	Non ACM	HM	S01	21-May-15	ND
17	Classroom	Floor	Vinyl Floor Tile 12"x 12"	-	Brown with Brown Fleck	-	Non-ACM	HM	34532-700-CAPS-S05ABC	4-Apr-13	ND
17	Classroom	Floor	Floor Tile Mastic	-	Black	-	Non-ACM	HM	34532-700-CAPS-S05ABC	4-Apr-13	ND
17	Classroom	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
17	Classroom	Ceiling	Ceiling Tile 2' x 4'	-	Short Fissure Random Pinhole	-	Non ACM	HM	S17	2-Dec-09	ND
17	Classroom	Ceiling	Plaster	-	-	-	Non ACM	HM	S08	2-Dec-09	ND
17	Classroom	Structure	Trowel Applied Fireproofing	-	Yellow with White Streak	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
18	Classroom	Floor	Vinyl Floor Tile 12"x 12"	-	Black	NF	ACM	SL	S18abc	2-Dec-09	1.2% Chrysotile
18	Classroom	Floor	Floor Tile Mastic	-	-	-	Non-ACM	SL	34532-700-CAPS-S08ABC	4-Apr-13	ND
18	Classroom	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
18	Classroom	Ceiling	Ceiling Tile 2' x 4'	-	Short Fissure Random Pinhole	-	Non ACM	HM	S17	2-Dec-09	ND
18	Classroom	Ceiling	Drywall	-	Drywall Joint Compound	-	Non-ACM	HM	34532-700-CAPS-S03ABC	4-Apr-13	ND
18	Classroom	Structure	Trowel Applied Fireproofing	-	-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
49	Washroom	Floor	Terrazzo	-	-	-	Non ACM	-	-	-	-
49	Washroom	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
49	Washroom	Wall	Ceramic Tile	-	-	-	Non ACM	-	-	-	-
49	Washroom	Ceiling	Plaster	-	-	-	Non ACM	HM	S08	2-Dec-09	ND
49	Washroom	Structure	Trowel Applied Fireproofing	-	-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
50	Washroom	Floor	Terrazzo	-	-	-	Non ACM	-	-	-	-
50	Washroom	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
50	Washroom	Wall	Ceramic Tile	-	-	-	Non ACM	-	-	-	-
50	Washroom	Ceiling	Plaster	-	-	-	Non ACM	HM	S08	2-Dec-09	ND
50	Washroom	Structure	Trowel Applied Fireproofing	-	-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
51	Staff Room	Floor	Carpet	-	-	-	Non ACM	-	-	-	-
51	Staff Room	Wall	Drywall	-	Drywall Joint Compound	-	Non-ACM	HM	34532-700-CAPS-S03ABC	4-Apr-13	ND
51	Staff Room	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
51	Staff Room	Ceiling	Ceiling Tile 2' x 4'	-	Short Fissure Random Pinhole (Post 2022)	-	Non ACM	-	-	-	-
51	Staff Room	Structure	Trowel Applied Fireproofing	-	-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
52	Washroom	Floor	Terrazzo	-	-	-	Non ACM	-	-	-	-
52	Washroom	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
52	Washroom	Wall	Ceramic Tile	-	-	-	Non ACM	-	-	-	-
52	Washroom	Ceiling	Plaster	-	-	-	Non ACM	HM	S08	2-Dec-09	ND
53	Custodial Room	Floor	Terrazzo	-	-	-	Non ACM	-	-	-	-

School Name			Legend:		Notes:					
Courtland Avenue Public School			HM - Homogenous Material - homogeneous with previously sampled material							
Date Built:			SL - Sample Location - Material Sampled							
Original: 1928			VC - Visually Confirmed - Material not sampled, deemed ACM							
Addition(s): 1964, 1981			NF - Non-Friable							
			F - Friable							
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
53	Custodial Room	Wall	Concrete	-	-	Non ACM	-	-	-	-
53	Custodial Room	Ceiling	Plaster	-	-	Non ACM	HM	S08	2-Dec-09	ND
54	Washroom	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
54	Washroom	Wall	Concrete	-	-	Non ACM	-	-	-	-
54	Washroom	Wall	Ceramic Tile	-	-	Non ACM	-	-	-	-
54	Washroom	Ceiling	Plaster	-	-	Non ACM	HM	S08	2-Dec-09	ND
54	Washroom	Structure	Trowel Applied Fireproofing	-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
55	Storage	Floor	Ceramic Tile	-	-	Non ACM	-	-	-	-
55	Storage	Wall	Drywall	Drywall Joint Compound	-	Non-ACM	HM	34532-700-CAPS-S03ABC	4-Apr-13	ND
55	Storage	Ceiling	2' x 4' Ceiling Tile	Short Fissure Random Pinhole (Post 2010)	-	Non ACM	-	-	-	-
56	Washroom	Floor	Ceramic Tile	-	-	Non ACM	-	-	-	-
56	Washroom	Wall	Ceramic Tile	-	-	Non ACM	-	-	-	-
56	Washroom	Wall	Drywall	Drywall Joint Compound	-	Non-ACM	HM	34532-700-CAPS-S03ABC	4-Apr-13	ND
56	Washroom	Ceiling	2' x 4' Ceiling Tile	Short Fissure Random Pinhole (Post 2010)	-	Non ACM	-	-	-	-
820	Corridor	Floor	Vinyl Floor Tile 12"x 12"	Rose (Post 2000)	-	Non ACM	-	-	-	-
820	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
820	Corridor	Wall	Plaster	-	-	Non ACM	HM	S08	2-Dec-09	ND
820	Corridor	Ceiling	Ceiling Tile 2' x 2'	Short Fissure (White Drywall)	-	Non ACM	SL	S02ABC	21-May-15	ND
820	Corridor	Ceiling	Plaster	-	-	Non ACM	HM	S08	2-Dec-09	ND
821	Corridor	Floor	Vinyl Floor Tile 12"x 12"	Rose (Post 2000)	-	Non ACM	-	-	-	-
821	Corridor	Floor	Ceramic Tile	-	-	Non ACM	-	-	-	-
821	Corridor	Wall	Drywall	Drywall Joint Compound (Post 2010)	-	Non-ACM	-	-	-	-
821	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
821	Corridor	Wall	Plaster	-	-	Non ACM	HM	S08	2-Dec-09	ND
821	Corridor	Ceiling	Drywall	Drywall Joint Compound (Post 2010)	-	Non-ACM	-	-	-	-
821	Corridor	Wall	Plaster	-	-	Non ACM	HM	S08	2-Dec-09	ND
821	Corridor	Ceiling	Drywall	Drywall Joint Compound (Post 2010)	-	Non-ACM	-	-	-	-
821	Corridor	Ceiling	2' x 2' Ceiling Tile	Short Fissure Random Pinhole (Post 2022)	-	Non ACM	-	-	-	-
821	Corridor	Ceiling	Plaster	-	-	Non ACM	HM	S08	2-Dec-09	ND
821	Corridor	Structure	Trowel Applied Fireproofing	-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
822	Corridor	Floor	Vinyl Floor Tile 12"x 12"	Rose (Post 2000)	-	Non ACM	-	-	-	-
822	Corridor	Wall	Concrete	-	-	Non ACM	-	-	-	-
822	Corridor	Wall	Plaster	-	-	Non ACM	HM	S08	2-Dec-09	ND
822	Corridor	Ceiling	Ceiling Tile 2' x 2'	Drywall	-	Non ACM	SL	S01	5-Jun-18	ND
822	Corridor	Ceiling	Plaster	-	-	Non ACM	HM	S08	2-Dec-09	ND
822	Corridor	Structure	Trowel Applied Fireproofing	-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
901	Stairwell	Floor	Terrazzo	-	-	Non ACM	-	-	-	-
901	Stairwell	Wall	Plaster	-	-	Non ACM	HM	S08	2-Dec-09	ND

School Name		Legend:		Notes:							
Courtland Avenue Public School		HM - Homogenous Material - homogeneous with previously sampled material		All quantities provided on Figures, if known. Refer to the Asbestos Audit Update Report for condition of ACM and recommended actions.							
Date Built:		SL - Sample Location - Material Sampled									
Original: 1928		VC - Visually Confirmed - Material not sampled, deemed ACM		Dates provided in Material Description/Room Description columns indicates date of installation/renovation and confirms the finishes as non-ACM.							
Addition(s): 1964, 1981		NF - Non-Friable F - F Friable									
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
901	Stairwell	Ceiling	Ceiling Tile 2' x 4'	Long Fissure Random Pinhole	-	-	Non ACM	HM	S11	2-Dec-09	ND
903	Stairwell	Floor	Terrazzo	-	-	-	Non ACM	-	-	-	-
903	Stairwell	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
903	Stairwell	Deck	Concrete	-	-	-	Non ACM	-	-	-	-
903	Stairwell	Structure	Trowel Applied Fireproofing	-	-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
905	Stairwell	Floor	Terrazzo	-	-	-	Non ACM	-	-	-	-
905	Stairwell	Wall	Concrete	-	-	-	Non ACM	-	-	-	-
905	Stairwell	Ceiling	Ceiling Tile 1' x 1'	-	-	NF	ACM	HM	S06	21-May-15	2% Amosite, 0.5% Chrysotile
905	Stairwell	Structure	Trowel Applied Fireproofing	-	-	NF	ACM	HM	S16	2-Dec-09	4.3% Chrysotile
951	Elevator Room	Floor	Vinyl Sheet Flooring	Beige (2010)	-	-	Non ACM	-	-	-	-
951	Elevator Room	Wall	Drywall	Drywall Joint Compound (Post 2010)	-	-	Non-ACM	-	-	-	-
951	Elevator Room	Ceiling	2' x 4' Ceiling Tile	Short Fissure Random Pinhole (Post 2010)	-	-	Non ACM	-	-	-	-
951	Elevator Room	Ceiling	Drywall	Drywall Joint Compound (Post 2010)	-	-	Non-ACM	-	-	-	-
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:

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

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

3. THESE NUMBERS AND QUANTITIES ARE FOR INFORMATION ONLY. PHOTOGRAPHS MAY BE USED TO IDENTIFY MATERIALS. REFER TO ORIGINAL DRAWINGS AND REPORT.

1964 Addition - Floor Tile Mastic is ACM

Legend

- 13 Fixed Reference Number
- No Access
- Post 1985 Construction

Asbestos-Containing Materials (ACM):

- Floor Tile
- Roller Flooring
- Ceiling Tile at Ceiling Level
- 1x1 Ceiling Tiles Located within Falls
- Ceiling above non-ACM 2'x4' Ceiling Tiles
- 1964 Addition
- Non-Friable Soft Textured Ceiling
- Non-Friable Hard Textured Ceiling
- Spray-On Fire Proofing
- Transite (Asbestos Cement) Paneling
- Duct Insulation
- Trowel Applied Fire Proofing
- Pipe Filling Insulation w/ Quantity (Brackets Indicate # of Damaged Fittings)
- Pipe Insulation (Vertical and Horizontal)
- Transite (Asbestos Cement) Pipe (Vertical and Horizontal)
- 2x1 Duct Expansion Joints w/ Quantity (Brackets Indicate # of Damaged Joints)
- Friable Debris



PH: (519) 743-9500
www.mteinc.com

WATERLOO REGION
DISTRICT SCHOOL BOARD

PROJECT
2024 ASBESTOS
AUDIT UPDATE

DRAWING
COURTLAND AVENUE
PUBLIC SCHOOL

BASEMENT

Project Manager	P. Semmlak	Date	JANUARY 2024
Design By	WEDS	Project No.	5402544
Drawn By	SCT Lammick	Drawing No.	
Scale	N.T.S.		1.0

NOTES:

1. ALL QUANTITIES TO BE REVERSED WITH THE ASSOCIATED REPORT. LOCATIONS AND QUANTITIES ARE APPROXIMATE.
2. ALL KNOWN OR SUSPECT ASBESTOS-CONTAINING MATERIALS (ACM) ARE IDENTIFIED AND QUANTITIES ARE APPROXIMATE. DEPICTED ON THIS DRAWING. REFER TO THE REPORT FOR A COMPLETE LIST OF IDENTIFIED MATERIALS.
3. THESE NUMBERS COLOR DEPENDENT PHOTOGRAPHS MAY BE USED TO IDENTIFY MATERIALS. REFER TO ORIGINAL DRAWINGS AND REPORT.

Legend

- 13 Fixed Reference Number
No Access
Post 1985 Construction

Asbestos-Containing Materials (ACM):

- Floor Tile
Rolled Flooring
Ceiling Tile at Ceiling Level
1x1 Ceiling Tiles Located within Falls Ceiling above non-ACM 2'x4' Ceiling Tiles
Friable Soft Textured Ceiling
Non-Friable Hard Textured Ceiling
Spray-On Fire Proofing
Transite (Asbestos Cement) Paneling
Duct Insulation
Trowel Applied Fire Proofing
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



PH: (519) 743-6500
www.mteinc.com

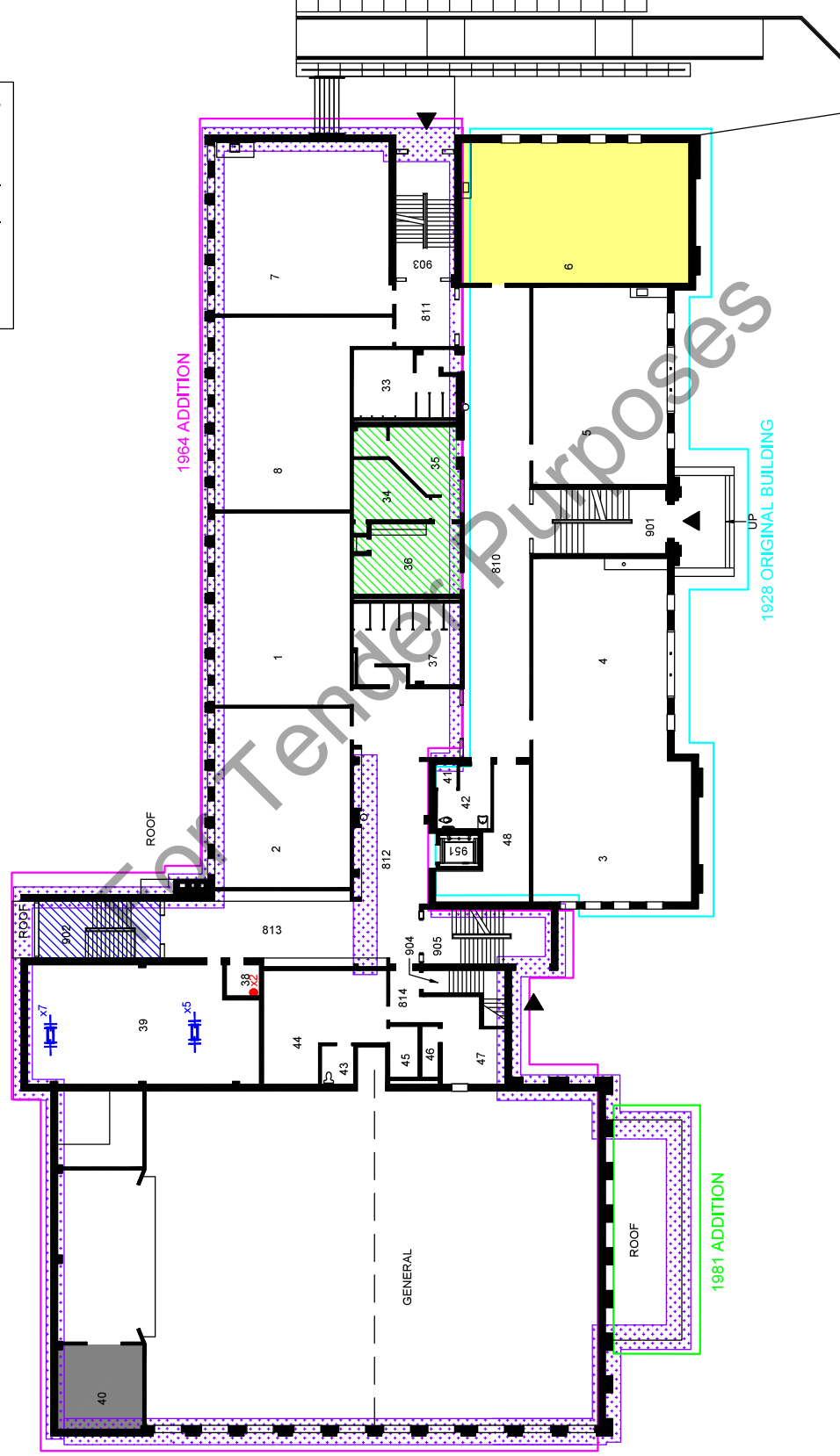
WATERLOO REGION
DISTRICT SCHOOL BOARD

2024 ASBESTOS
AUDIT UPDATE

COURTLAND AVENUE
PUBLIC SCHOOL
MAIN FLOOR

Project Manager	P. Semmlak	Date	JANUARY 2024
Design By	WDCS	Project No.	5403244
Drawn By	SCT Lammick	Drawing No.	
Scale	NTS		2.0

1964 Addition - Floor Tile Mastic is ACM



NOTES:

1. ALL QUANTITIES TO BE REVERSED WITH THE ASSOCIATED REPORT. LOCATIONS AND QUANTITIES ARE APPROXIMATE.

2. ALL KNOWN OR SUSPECT ASBESTOS-CONTAINING MATERIALS (ACM) ARE TO BE IDENTIFIED AND NOTED ON THIS DRAWING. REFER TO THE REPORT FOR A COMPLETE LIST OF IDENTIFIED MATERIALS.

3. THESE ARE COLOR DEPENDENT PHOTOGRAPHS MAY BE USED TO IDENTIFY MATERIALS. ADVISE REPORT TO ORIGINAL DRAWINGS AND REPORT.

Legend

- 13 Fixed Reference Number
- No Access
- Post 1985 Construction

Asbestos-Containing Materials (ACM):

- Floor Tile
- Roller Flooring
- Ceiling Tile at Ceiling Level
- 1x1' Ceiling Tiles Located within Falls Ceiling above non-ACM 2'x4' Ceiling Tiles
- Friable Soft Textured Ceiling
- Non-Friable Hard Textured Ceiling
- Spray-On Fire Proofing
- Transite (Asbestos Cement) Paneling
- Duct Insulation
- Trowel Applied Fire Proofing
- Pipe Fitting Insulation w/ Quantity (Brackets Indicate # of Damaged Fittings)
- Pipe Insulation (Vertical and Horizontal)
- Transite (Asbestos Cement) Pipe (Vertical and Horizontal)
- 2x11 Duct Expansion Joints w/ Quantity (Brackets Indicate # of Damaged Joints)
- Friable Debris



PH: (519) 743-9500
www.mte85.com

WATERLOO REGION
DISTRICT SCHOOL BOARD

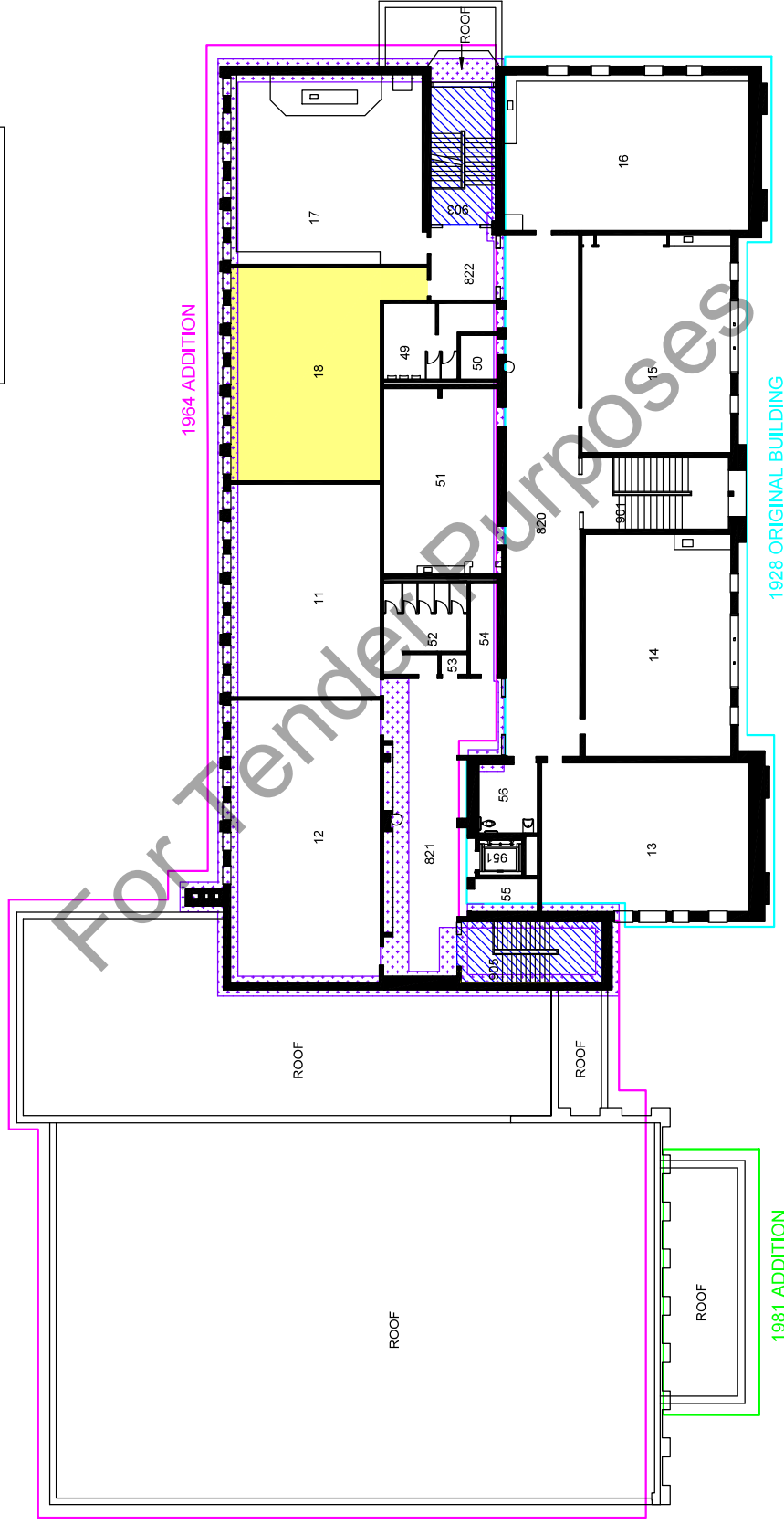
2024 ASBESTOS
AUDIT UPDATE

COURTLAND AVENUE
PUBLIC SCHOOL

SECOND FLOOR

Project Manager	P. Semmlak	Date	JANUARY 2024
Design By	WDCS	Project No.	5403244
Drawn By	SPC Lammak	Drawing No.	
Scale	NTS		3.0

1964 Addition - Floor Tile Mastic is ACM



Appendix C

Tables

For Tender Purposes

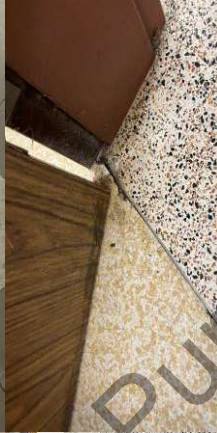
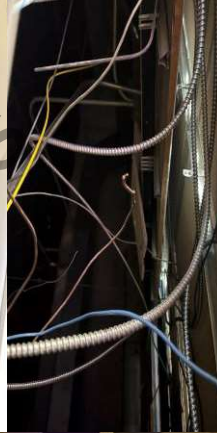
TABLE 1 - INTERNAL ABATEMENT MANAGEMENT						
Courtland Avenue Public School						
Material	WRDSB Fixed Reference Number	Material Description	Approximate Quantity	Photograph - Context	Photograph - Detail	Required Action
Asbestos Friable	76	Insulation on Pipe Fittings	1			Monitor Annually
Asbestos Non-Friable	6	12" x 12" Grey with White Vinyl Floor Tile	6 tiles			Monitor Annually
Asbestos Non-Friable	72	Vinyl Sheet Flooring - Beige Pebble	<1 m ²			Monitor Annually
Asbestos Non-Friable	36	1' x 1' Ceiling Tiles - Beige Random Pinhole	3 Loose tiles			Remove 3 loose ceiling tiles in accordance with O. Reg. 278/05 as a Type 1 Operation Monitor remaining damaged ceiling tiles annually
Asbestos Non-Friable	36	1' x 1' Ceiling Tiles - Beige Random Pinhole	General Damage to Ceiling Tiles			Monitor Annually

Table 1 and 2 - Damaged Materials - Courtland Ave PS 2024 AAU

TABLE 1 - INTERNAL ABATEMENT MANAGEMENT						
Courtland Avenue Public School						
Material	WRDSB Fixed Reference Number	Material Description	Approximate Quantity	Photograph - Context	Photograph - Detail	Required Action
Asbestos Non-Friable	18	12" x 12" Yellow with White Vinyl Floor Tile	1 Tile			Monitor Annually
Asbestos Non-Friable	902	1' x 1' Ceiling Tiles - Beige Random Pinhole	7 Tiles			Monitor Annually
Asbestos Non-Friable	903	1' x 1' Ceiling Tiles - Beige Random Pinhole	4			Removal in accordance with O. Reg. 278/05 <7.5 m ² as a Type1 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, 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, 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 1 and 2 - Damaged Materials - Courtland Ave PS 2024 AAU

TABLE 2 - EXTERNAL ABATEMENT MANAGEMENT					
Courtland Avenue Public School					
Material	WRDSB Fixed Reference Number	Material Description	Approximate Quantity	Photograph - Context	Photograph - Detail
None Identified					
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
2010 Asbestos Audit Update					
CAPS-S01A	0044	Ceiling Plaster	ND	-	No
CAPS-S01B			ND	-	No
CAPS-S01C			ND	-	No
CAPS-S02A	0040	2' x 4' Ceiling Tile - Short Fissure Random Pinhole	ND	-	No
CAPS-S02B			ND	-	No
CAPS-S02C			ND	-	No
CAPS-S03A	0040	Tar Paper - On Straight Runs of Mechanical Pipe	ND	-	No
CAPS-S03B			ND	-	No
CAPS-S03C			ND	-	No
CAPS-S04A	0043	12" x 12' Floor Tile - White with Blue Fleck	ND	-	No
CAPS-S04B			ND	-	No
CAPS-S04C			ND	-	No
CAPS-S05A	0041	12" x 12" Floor Tile - Brown & White Flecks	ND	-	No
CAPS-S05B			ND	-	No
CAPS-S05C			ND	-	No
CAPS-S06A	0040	2' x 2' Ceiling Tile	ND	-	No
CAPS-S06B			ND	-	No
CAPS-S06C			ND	-	No
CAPS-S07A	0038	12" x 12" Floor Tile - Green with White Flecks	1.4	Chrysotile	Yes
CAPS-S07B			NA	Chrysotile	Yes
CAPS-S07C			NA	Chrysotile	Yes
CAPS-S08A	0038	Ceiling Plaster	ND	-	No
CAPS-S08B			ND	-	No
CAPS-S08C			ND	-	No
CAPS-S09A	0038	Ceiling Tile Mastic	ND	-	No
CAPS-S09B			ND	-	No
CAPS-S09C			ND	-	No
CAPS-S10A	0038	2' x 4' Ceiling Tile - Medium Fissure Random Pinhole	ND	-	No
CAPS-S10B			ND	-	No
CAPS-S10C			ND	-	No
CAPS-S11A	0032	2' x 4' Ceiling Tile - Long Fissure Random Pinhole	ND	-	No
CAPS-S11B			ND	-	No
CAPS-S11C			ND	-	No
CAPS-S12A	0025	Vinyl Sheet Flooring - Yellow Cobblestone	15	Chrysotile	Yes
CAPS-S12B			NA	Chrysotile	Yes
CAPS-S12C			NA	Chrysotile	Yes
CAPS-S13A	0004	12" x 12" Floor Tile - Beige	ND	-	No
CAPS-S13B			ND	-	No
CAPS-S13C			ND	-	No
CAPS-S14A	1009	9" x 9" Floor Tile - Brown with White Flecks	1.3 (tile) <0.25 (mastic)	Chrysotile	Yes
CAPS-S14B			NA	Chrysotile	Yes
CAPS-S14C			NA	Chrysotile	Yes
CAPS-S15A	1009	9" x 9" Floor Tile - Grey with White and Black Streak	<0.25 (tile) <0.25 (mastic)	Chrysotile	Yes
CAPS-S15B			ND	Chrysotile	Yes
CAPS-S15C			ND	Chrysotile	Yes
CAPS-S16A	1016	Firespray	4.3	Chrysotile	Yes
CAPS-S16B			NA	Chrysotile	Yes
CAPS-S16C			NA	Chrysotile	Yes
CAPS-S16D			NA	Chrysotile	Yes
CAPS-S16E			NA	Chrysotile	Yes

Table 3 - Sample Summary Table

TABLE 3: BULK ASBESTOS SAMPLING SUMMARY					
Sample #	Location	Material Description	Asbestos Content (%)	Fibre Type	Is Material ACM
CAPS-S17A	1018	2' x 4' Ceiling Tile - Short Fissure Random Pinhole	ND	-	No
CAPS-S17B			ND	-	No
CAPS-S17C			ND	-	No
CAPS-S18A	2019	12" x 12" Floor Tile - Yellow and White	1.2	Chrysotile	Yes
CAPS-S18B			NA	Chrysotile	Yes
CAPS-S18C			NA	Chrysotile	Yes
2013 Asbestos Audit Update					
34532-700-CAPS-S01A	1025	1' x 1' Ceiling Tile - Large and Small Random Pinhole	3.8	Chrysotile	Yes
34532-700-CAPS-S01B			NA	-	Yes
34532-700-CAPS-S01C			NA	-	Yes
34532-700-CAPS-S02A	1025	1' x 1' Ceiling Tile Mastic	ND	-	No
34532-700-CAPS-S02B			ND	-	No
34532-700-CAPS-S02C			ND	-	No
34532-700-CAPS-S03A	1025	Drywall Joint Compound	ND	-	No
34532-700-CAPS-S03B	1018		ND	-	No
34532-700-CAPS-S03C	1023		ND	-	No
34532-700-CAPS-S04A	1013	Floor Tile Mastic - Black mastic under 9" x 9" VFT - Brown with white flecks	2.3	Chrysotile	Yes
34532-700-CAPS-S04B			NA	-	Yes
34532-700-CAPS-S05A	2020	12" x 12" Vinyl Floor Tile - Brown with brown fleck	Layer 1 (tile): ND Layer 2 (mastic): ND	-	No
34532-700-CAPS-S05B			Layer 1 (tile): ND Layer 2 (mastic): ND	-	No
34532-700-CAPS-S05C			Layer 1 (tile): ND Layer 2 (mastic): ND	-	No
34532-700-CAPS-S06A	2020	9" x 9" Vinyl Floor Tile - Dark Green with white streaks	Layer 1 (tile): ND Layer 2 (mastic): ND	-	No
34532-700-CAPS-S06B			Layer 1 (tile): ND Layer 2 (mastic): ND	-	No
34532-700-CAPS-S06C			Layer 1 (tile): ND Layer 2 (mastic): ND	-	No
34532-700-CAPS-S07A	2001	9" x 9" Vinyl Floor Tile - Grey with white streaks	Layer 1 (tile): ND Layer 2 (mastic): ND	-	No
34532-700-CAPS-S07B			Layer 1 (tile): ND Layer 2 (mastic): ND	-	No
34532-700-CAPS-S07C			Layer 1 (tile): ND Layer 2 (mastic): ND	-	No
34532-700-CAPS-S08A	2019	Black Floor Tile Mastic - 12" x 12" VFT - Yellow with white streaks	ND	-	No
34532-700-CAPS-S08B			ND	-	No
34532-700-CAPS-S08C			ND	-	No
34532-700-CAPS-S09A	0038	Black Floor Tile Mastic - 12" x 12" VFT - Green with white fleck	ND	-	No
34532-700-CAPS-S09B			ND	-	No
34532-700-CAPS-S09C			ND	-	No
2015 Asbestos Audit Update					
S01A	2000	1' x 1' Ceiling Tile - Brown	ND	-	No
S01B			ND	-	No
S01C			ND	-	No
S02A	2005	2' x 2' Ceiling Tile - White, Drywall	ND	-	No
S02B			ND	-	No
S02C			ND	-	No
S03A	2009	2' x 2' Ceiling Tile - Beige	1 0.5	Amosite & Chrysotile	Yes
S03B			NA	Amosite & Chrysotile	Yes
S03C			NA	Amosite & Chrysotile	Yes
S04A	1008	2' x 2' Ceiling Tile - White, Drywall	ND	-	No
S04B			ND	-	No
S04C			ND	-	No

Table 3 - Sample Summary Table

TABLE 3: BULK ASBESTOS SAMPLING SUMMARY					
Sample #	Location	Material Description	Asbestos Content (%)	Fibre Type	Is Material ACM
S05A	1020	1' x 1' Ceiling Tile - Brown	ND	-	No
S05B			ND	-	No
S05C			ND	-	No
S06A	1029	1' x 1' Ceiling Tile - Beige	2 0.5	Amosite & Chrysotile	Yes
S06B			NA	Amosite & Chrysotile	Yes
S06C			NA	Amosite & Chrysotile	Yes
S07A	1027	2' x 2' Ceiling Tile - White, Drywall	ND	-	No
S07B			ND	-	No
S07C			ND	-	No
2016 Asbestos Audit Update					
S01A	1027	2' x 2' Ceiling Tile - Large pinhole	ND	-	No
S01B			ND	-	No
S01C			ND	-	No
S02A	0041	1' x 1' Ceiling Tile - Large fissure small pinhole	0.85	Amosite	Yes
S02B			NA	Amosite	Yes
S02C			NA	Amosite	Yes
S03A	2009	2' x 2' Ceiling Tile - Large fissure small pinhole	0.85	Amosite	Yes
S03B			NA	Amosite	Yes
S03C			NA	Amosite	Yes
2018 Asbestos Audit Update					
S01A	2016	2'x2' Ceiling Tile - Drywall	ND	-	No
S01B			ND	-	No
S01C			ND	-	No
S02A	2010	1'x1' Ceiling Tile - Large and Small Pinhole	2	Amosite	Yes
S02B			NA	-	Yes
S02C			NA	-	Yes
S03A	2009	2'x2' Ceiling Tile - Long Fissure Random Pinhole	ND	-	Yes
S03B			1	Amosite	Yes
S03C			NA	-	Yes
S04A	2018	Drywall Joint Compound (1964 Addition)	ND	-	No
S05A	1018	Drywall Joint Compound (1928 Original Building)	ND	-	No
S05B			ND	-	No
S06A	-	Grey Interior Window Frame Sealant (1928 Original Building)	ND	-	No
S06B			ND	-	No
S06C			ND	-	No
S07A	-	Grey Interior Door Frame Sealant (1928 Original Building)	ND	-	No
S07B			ND	-	No
S07C			ND	-	No
S08A	-	White Exterior Door Frame Sealant (1928 Original Building)	ND	-	No
S08B			ND	-	No
S08C			ND	-	No
S09A	-	Black Interior Window Frame Sealant (1964 Addition)	ND	-	No
S09B			ND	-	No
S09C			ND	-	No
S10A	-	Grey Interior Window Pane Sealant (1964 Addition)	ND	-	No
S10B			ND	-	No
S10C			ND	-	No
S11A	-	Grey Exterior Window Pane Sealant (1964 Addition)	ND	-	No
S11B			ND	-	No
S11C			ND	-	No

Table 3 - Sample Summary Table

TABLE 3: BULK ASBESTOS SAMPLING SUMMARY					
Sample #	Location	Material Description	Asbestos Content (%)	Fibre Type	Is Material ACM
S12A	-	Grey Exterior Window Frame Sealant (1964 Addition)	ND	-	No
S12B			ND	-	No
S12C			ND	-	No
2024 Asbestos Audit Update					
S01A	Fan Room - 39	Parged Pipe Fitting	60	Chrysotile	Yes
S01B	Fan Room - 39	Parged Pipe Fitting	NA	Chrysotile	Yes
S01C	Fan Room - 39	Parged Pipe Fitting	NA	Chrysotile	Yes
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.					

Table 3 - Sample Summary Table

Certificate of Analysis

MTE Consultants Inc. (Kitchener)

520 Bingemans Centre Dr.
Kitchener, ON N2B 3X9
Attn: Paul Semeniuk

Client PO: 34532-944

Project: 34532-944 Courtland PS

Custody:

Report Date: 22-Mar-2024

Order Date: 20-Mar-2024

Order #: 2412221

This Certificate of Analysis contains analytical data applicable to the following samples as submitted:

Parcel ID

2412221-01

2412221-02

2412221-03

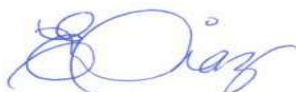
Client ID

S01A - Parged Pipe Fitting - Fan Room

S01B - Parged Pipe Fitting - Fan Room

S01C - Parged Pipe Fitting - Fan Room

Approved By:



Emma Diaz

Senior Analyst

Certificate of Analysis

Report Date: 22-Mar-2024

Client: MTE Consultants Inc. (Kitchener)

Order Date: 20-Mar-2024

Client PO: 34532-944

Project Description: 34532-944 Courtland PS

Asbestos, PLM Visual Estimation **MDL - 0.5%**

Parcel ID	Sample Date	Colour	Description	Asbestos Detected	Material Identification	% Content
2412221-01	18-Mar-24	White	Pipe Wrap	Yes	Client ID: S01A - Parged Pipe Fitting - Fan Room	
					Chrysotile	60
					Non-Fibers	40
2412221-02	18-Mar-24	White	Pipe Wrap		Client ID: S01B - Parged Pipe Fitting - Fan Room	
					not analyzed, positive stop	
2412221-03	18-Mar-24	White	Pipe Wrap		Client ID: S01C - Parged Pipe Fitting - Fan Room	
					not analyzed, positive stop	

** Analytes in bold indicate asbestos mineral content.

Analysis Summary Table

Analysis	Method Reference/Description	Lab Location	Lab Accreditation	Analysis Date
Asbestos, PLM Visual Estimation	AppE to SubE of 40CFR Part763 and EPA/600/R-93/116	1 - Mississauga	CALA 3762	21-Mar-24

Mississauga Lab: 15 - 6800 Kitimat Rd Mississauga, Ontario, L5N 5M1

Work Order Revisions | Comments

None

PROJECT-SPECIFIC DESIGNATED SUBSTANCE & HAZARDOUS MATERIALS ASSESSMENT

Courtland Avenue Public School
107 Courtland Avenue East
Kitchener, Ontario

Prepared for:
Jeff Cull,
Environmental Officer – Facility Services

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

Prepared by:
Safetech Environmental Limited



Per: Alyssa Nagy, B.Sc.,
Occupational Health & Safety Technician



Per: Shannon Deline, B.A.,
Project Coordinator



Reviewed by: Jeremy J. Gore, C.E.T., EP
Regional Manager – SWO

Safetech Project Number 2-3240081

TABLE OF CONTENTS

EXECUTIVE SUMMARY	i
1.0 INTRODUCTION	1
1.1 Background and Objectives	1
1.2 Scope of Work.....	2
1.3 Past Environmental Reports.....	2
2.0 METHODOLOGY	3
2.1 Designated Substances	4
2.1.1 Asbestos.....	4
2.1.2 Lead	5
2.1.3 Mercury	6
2.1.4 Silica.....	6
2.1.5 Other Designated Substances	6
2.2 Other Hazardous Materials	6
2.2.1 Chemical Hazards	6
2.2.2 Biological Hazards.....	7
2.2.3 Environmental Hazards	7
3.0 RESULTS.....	8
3.1 Designated Substances	8
3.1.1 Asbestos.....	8
3.1.2 Lead	12
3.1.3 Mercury	13
3.1.4 Silica.....	13
3.1.5 Other Designated Substances	13
3.2 Other Hazardous Materials	14
3.2.1 Chemical Hazards	14
3.2.2 Biological Hazards.....	14
3.2.3 Environmental Hazards	14

4.0	CONCLUSIONS AND RECOMMENDATIONS	15
4.1	Designated Substances	15
4.1.1	Asbestos.....	15
4.1.2	Lead	16
4.1.3	Mercury	17
4.1.4	Silica.....	17
4.1.5	Other Designated Substances	18
4.2	Other Hazardous Materials	18
4.2.1	Chemical Hazards	18
4.2.2	Biological Hazards.....	18
4.2.3	Environmental Hazards	18
5.0	Limitations	19

LIST OF TABLES

Table 1	Bulk Sample Analytical Results for Determination of Asbestos Content
Table 2	Results of Assessment for Asbestos-Containing Materials
Table 3	Results of Paint Condition and Lead Content Assessment

LIST OF APPENDICES

Appendix A	Condition Assessment Criteria for Asbestos-Containing Materials
Appendix B	Figures AS01, AS02 and AS03: Extent of Assessment Area and Sample Locations
Appendix C	Laboratory Certificates of Analysis – Asbestos and Lead
Appendix D	Site Photographs – October 31, 2024
Appendix E	Background Information on Designated Substances and Other Hazardous Materials

EXECUTIVE SUMMARY

Safetech Environmental Limited (Safetech) was retained by Jeff Cull with the Waterloo Region District School Board (WRDSB), to conduct a project-specific designated substance and hazardous materials (DSHM) assessment in preparation of upcoming renovation work within Courtland Avenue Public School located at 107 Courtland Avenue East in Kitchener, Ontario. The building will herein be referred to as the “site”.

The objective of our assessment was to determine the presence, location, condition, and approximate quantities (where possible) of designated substances and other hazardous materials within project-specific assessment areas that have the potential to be disturbed as part of upcoming renovation activities so that appropriate abatement and other control measures can be implemented to protect workers during work and control/classify waste materials, as mandated by Ontario regulations. It is Safetech’s understanding that the proposed renovation work includes locker removals, installment of new windows and upgrades to existing air-conditioning units within project-specific work areas as identified by marked-up floor plans provided by the Waterloo Region District School Board.

A summary of the designated substances and hazardous materials identified is provided below. This should be considered a summary only. Please refer to the Results (Section 3) and Conclusions and Recommendations (Section 4) of our report for additional details.

Asbestos

Asbestos was confirmed present within the following building materials observed within project-specific assessment areas:

- Trowel applied fireproofing on concrete deck above lay-in ceilings throughout corridor 801 of the basement;
- Parging cement on mechanical pipe fittings above lay-in ceilings within corridor 801 and at ceiling height within lunch rooms 76 and 77 of the basement; and,
- 12"x12" green with white fleck vinyl floor tiles within classroom 6 on the first floor.

Asbestos is also suspected present in the following materials, as access was not possible at the time of assessment due to height limitations (i.e. above 15 feet):

- Ceiling tile mastic associated with 1'x1' non-asbestos fixed-in-place ceiling tiles above lay-in ceilings in classrooms 5, 6, 13, 14, 15 and 16 (i.e. the original building).

No other asbestos-containing materials were identified or are suspected present within the project-specific assessment areas. This assessment was limited to sampling of materials that have the potential to be impacted by planned renovation work, as reported by the WRDSB. Assessment of other areas or materials within the building was not conducted. Asbestos-containing materials and other designated substances are present in other areas of the building, which are not identified in this report. If the scope of work expands beyond the limit of our assessment then stop work immediately and assess, as needed. Refer to Figures AS01 through AS03 in Appendix B for the extent of this assessment.

Lead

The following paint samples collected from project-specific assessment areas were determined to contain between 1000 µg/g and 5,000 µg/g of lead, and are considered 'lead-containing' by definition of the Environmental Abatement Council of Canada (EACC) Lead Guideline for Construction, Renovation, Maintenance or Repair.

- Beige paint on interior concrete block walls;
- Purple paint on interior wood window frames; and,
- Beige paint on interior plaster walls.

Lead is also suspected present in minor quantities as solder in pipe fittings and electrical equipment, and in lead-acid batteries of emergency light fixtures. Any disturbance of lead-containing paints and/or lead materials should be conducted in accordance with the procedures outlined in the EACC "Lead Guideline" (October 2014) and the Ministry of Labour, Immigration, Training and Skills Development (MLITSD) "Lead on Construction Projects" guideline (April 2011). The extent of procedures required depends on the type of work to be conducted.

Mercury

Mercury is deemed present in the form of mercury vapour within sealed fluorescent lamps. Lamps should be handled with care and kept intact to avoid potential exposure to mercury. R.R.O 1990 Regulation 347, waste mercury produced in amounts less than 5 kilograms (kg) are exempt from hazardous waste registration, treatment and disposal requirements and can be disposed of in landfill as regular waste.

Silica

Silica is deemed present in drywall and associated joint compounds, plaster finishes, lay-in acoustic ceiling tiles, caulking, mastics, ceramic tiles and grout, block and associated mortar, and all concrete materials and finishes. Work involving the disturbance of silica-containing materials should follow the procedures outlined in the MLITSD "Silica on Construction Projects" Guideline (April 2011). The appropriate engineering controls, work

practices, hygiene practices, personal protective measures and training necessary to conduct the work in a safe manner are provided in this guideline.

This assessment satisfies the Owner's requirements under Section 30 of the Ontario Occupational Health and Safety Act (OHSA), Revised Statutes of Ontario 1990, as amended.

Should you have any questions regarding the information contained in the report, please contact our office at 519.954.2732.

Safetech Environmental Limited

A handwritten signature in black ink, appearing to read 'Alyssa'.

Per: Alyssa Nagy, B.Sc.,
Occupational Health & Safety Technician
anagy@safetechenv.com

A handwritten signature in black ink, appearing to read 'Shannon'.

Per: Shannon Deline, B.A.
Project Coordinator
sdeline@safetechenv.com

A handwritten signature in black ink, appearing to read 'Jeremy'.

Reviewer: Jeremy J. Gore, C.E.T., EP
Regional Manager – SWO
jgore@safetechenv.com

November 20, 2024

Waterloo Region District School Board

51 Ardelt Avenue
Kitchener, Ontario N2C 2R5

Attention: Jeff Cull,
Environmental Officer – Facility Services
Jeff_cull@wrdsb.ca

**RE: Project-Specific Designated Substance & Hazardous Materials Assessment
Courtland Avenue Public School
107 Courtland Avenue East, Kitchener, Ontario**

1.0 INTRODUCTION

1.1 Background and Objectives

Safetech Environmental Limited (Safetech) was retained by Jeff Cull with the Waterloo Region District School Board (WRDSB), to conduct a project-specific designated substance and hazardous materials (DSHM) assessment in preparation of upcoming renovation work within Courtland Avenue Public School located at 107 Courtland Avenue East in Kitchener, Ontario (site). The objective of our assessment was to determine the presence, location, condition and approximate quantities of designated substances and other hazardous materials within project-specific assessment areas that have the potential to be disturbed as part of upcoming renovation activities so that appropriate abatement and other control measures can be implemented to protect workers during work and control/classify waste materials, as mandated by Ontario regulations.

This assessment satisfies the requirements under Section 30 of the Ontario Occupational Health and Safety Act (OHSA), Revised Statutes of Ontario 1990, as amended. Section 30(1) requires an assessment to determine if there are any designated substances present at a project site prior to construction or demolition activity. Sections 30(2), (3) and (4) require the constructor for a project to provide the findings in this report as part of the tendering information for any tendered project or to prospective contractors (and subcontractors) of a project before entering into a binding contract.

This report documents the findings of our on-site inspection that was conducted on October 31, 2024, and provides conclusions and recommendations based on our findings and knowledge of the planned renovation project.

1.2 Scope of Work

Our scope of work included the following activities:

- A review of existing environmental assessment report(s) provided by Jeff Cull of the WRDSB.
- A visual assessment of all project areas specific to the renovation project to identify the presence, location, condition and approximate quantities of designated substances and other hazardous building materials that may be present. The extent of our assessment area was defined by marked-up floor plans provided by the WRDSB on October 28, 2024.
- Collection, analysis and interpretation of representative bulk samples of suspect asbestos-containing building materials for the determination of asbestos content and material classification (limited to the project-specific assessment areas) only where deemed necessary if a data gap was identified by past environmental reports or a material was noted that does not match a reported description.
- Collection, analysis and interpretation of representative paint chip samples of suspect lead-containing paint for the determination of lead content and material classification (limited to the project-specific assessment areas).
- Preparation of a report to document findings and provide recommendations regarding control measures and/or special handling procedures for designated substances or specific hazardous materials that may be removed or disturbed as part of planned demolition activities.

This assessment only identified designated substances and hazardous materials that were deemed to be part of the building or somehow otherwise incorporated into the building structure and its finishes. Assessing occupant items such as stored products, furnishings, and items, etc., were beyond the scope of this assessment. In addition, our assessment did not include an investigation for underground materials or equipment (vessels, drums, underground storage tanks, pipes, cables, etc.). Furthermore, this assessment was limited to the areas investigated, and more specifically, to those materials that are readily accessible without demolition or alteration of building components for access.

1.3 Past Environmental Reports

Data from past environmental surveys was referenced in terms of understanding previous assessment results and obtaining a general understanding of the overall asbestos-containing material conditions. Where possible, Safetech relied upon results indicated in past surveys and only collected confirmatory samples as necessary.

The following environmental report was provided to Safetech:

- ‘2024 Asbestos Audit Update Report – Courtland Avenue Public School, 107 Courtland Avenue East, Kitchener, Ontario’ completed by MTE Consultants, dated January 31, 2024.

Based on our review of the previous asbestos reassessment report, the following asbestos-containing materials are present within the project-specific work areas:

- Trowel applied fireproofing;
- Parging cement on mechanical pipe fittings; and,
- 12"x12" green with white fleck vinyl floor tiles.

2.0 METHODOLOGY

The presence of hazardous materials was assessed by visual inspection. For the purpose of this assessment and this document, hazardous materials include designated substances as well as other chemical, biological and environmental hazards as defined below:

- **Designated Substances (as prescribed by Ontario Regulation 490/09):**
 - Acrylonitrile, Arsenic, Asbestos, Benzene, Coke Oven Emissions, Ethylene Oxide, Isocyanates, Lead, Mercury, Silica and Vinyl Chloride.
- **Other Hazardous Materials:**
 - **Chemical Hazards** – Urea Formaldehyde Foam Insulation (UFFI) and other obvious potential chemical hazards
 - **Biological Hazards** – Mould Contamination
 - **Environmental Hazards** – Polychlorinated Biphenyls (PCBs) and Ozone Depleting & Global Warming Substances

For background information regarding the above hazardous materials, please refer to Appendix E.

Destructive testing was not conducted as part of this assessment. Concealed locations such as above solid ceilings, within wall cavities, enclosed mechanical/pipe shafts and bulkheads, etc. were not investigated. Similarly, motors, blowers, electrical panels, etc., were not de-energized or disassembled to examine concealed conditions. Building materials that are not detailed within this assessment due to inaccessibility at the time of our site visit and/or uncovered during renovation activities should be assessed by a qualified person prior to their disturbance.

Bulk sampling followed by laboratory analysis was also conducted to confirm the presence/absence of selected hazardous materials. Bulk sampling was limited to asbestos in building materials and lead in paint. All other hazardous materials were identified by visual inspection only.

Where possible, observations regarding the location, quantity and condition of the hazardous materials identified were made in order to determine the potential for exposure and provide appropriate recommendations for remedial action, if necessary. Specific methodology for each individual hazardous material assessed is further detailed below.

2.1 Designated Substances

2.1.1 Asbestos

A visual inspection for the presence of both friable and non-friable asbestos-containing material (ACM) was performed within the assessment area. The condition of ACM was rated as Good, Fair or Poor based on our assessment criteria provided in Appendix A.

Although destructive testing was not conducted, details regarding the possible presence of ACM in enclosed locations were provided on a case-by-case basis where our visual inspection indicated this possibility. Materials that may be present in the surveyed area(s) that were not tested intrusively should be considered asbestos-containing until proven otherwise. This includes materials such as elevator brakes, roofing felts, mastics, high voltage wiring, mechanical packing and gaskets, vermiculite inside wall cavities or inaccessible ceiling spaces, and underground services or piping. These materials are recommended to be sampled immediately prior to renovation work if they are to be removed or have a potential to be disturbed.

Bulk samples of building materials were retrieved for all accessible building materials within the investigated areas that were suspected to be asbestos-containing, based on the historical use of the material and surveyor knowledge and experience. Bulk samples were retrieved in accordance with Section 3 and Table 1 of Ontario Regulation 278/05, *Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations (O. Reg. 278/05)*, made under the Occupational Health and Safety Act. The number of samples collected for each material was based on the type and quantity of the material present within the area(s) investigated.

Each individual sample was placed in a labelled, sealable, plastic bag for transportation to an independent laboratory (EMC Scientific Inc.). EMC Scientific Inc. is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) for bulk asbestos fibre analysis. Analysis for asbestos content was performed by the independent laboratory in accordance with the U.S. Environmental Protection Agency (EPA) Test Method EPA/600/R-93-116: Method for the Determination of Asbestos in Bulk Building Materials. June 1993.

This method identifies the asbestos fibre content of building materials using polarized light microscopy (PLM) analytical techniques, with confirmation of presence and type of asbestos made by dispersion staining optical microscopy. This analytical method meets the requirements set forth in Section 3 of O. Reg. 278/05.

In accordance with O. Reg. 278/05, an asbestos-containing material is defined as material that contains 0.5 per cent or more asbestos by dry weight. The laboratory was instructed to conduct “stop-positive” analysis for all materials. If a sample was found to be asbestos-containing no further analysis was conducted for samples taken from the same homogeneous material. The Laboratory Certificate of Analysis is included in Appendix C. Locations where ACM have been identified are detailed in this report. Recommendations pertaining to ACM were made based on the friability, accessibility, and condition of the material.

2.1.2 Lead

An assessment for lead in paint was conducted by retrieving paint chip samples from representative surfaces within the areas assessed. The condition of the painted surface from which each sample was taken was also visually assessed for signs of deterioration such as cracking, chipping, flaking, bubbling and deterioration due to friction. The condition of these surfaces were assessed as good, fair or poor based on the degree and extent of deterioration. The paint chip sample was retrieved by scraping the paint down to the base material substrate to ensure collection of all layers of paint. Care was taken to avoid collection of the underlying substrate to reduce analytical substrate matrix interference.

Upon completion of our assessment, the paint chip samples were submitted to an independent laboratory (Caduceon Environmental Laboratories) for the determination of lead content. This laboratory participates in and is accredited by the EPA (U.S. Environmental Protection Agency) for analysis of lead in paint chips through the American Industrial Hygiene Association (AIHA) Environmental Lead Laboratory Accreditation Program (ELLAP). Analysis was conducted by the laboratory following the EPA Method 6010. Result of analysis was reported by the laboratory in micrograms per gram ($\mu\text{g/g}$). The Laboratory Certificate of Analysis is included in Appendix C.

The presence of lead in other materials, such as lead sheeting, pigmented mortar, lead piping, lead solder, etc. were noted where observed but were not sampled to verify lead content. Lead can be present in these materials to varying degrees, depending on their age of application (refer to Appendix E for additional details) and should be considered lead-containing until proven otherwise.

2.1.3 Mercury

The type, quantity, and location of mercury-containing equipment and devices within the areas assessed were determined by visual inspection based on appearance, age and knowledge of historical uses. Sampling for mercury-containing building materials and dismantling of suspect mercury-containing equipment was not performed. Where possible, attempts were made to verify the presence/absence of mercury by gathering additional information such as equipment model number, serial number, etc.

2.1.4 Silica

The presence of crystalline silica in building materials was determined through visual inspection of building materials only, based on knowledge of the historic use of silica-containing materials in certain building materials. Sampling to verify the presence/absence of silica in building materials was not performed.

2.1.5 Other Designated Substances

Other designated substances (i.e. acrylonitrile, arsenic, benzene, coke oven emissions, ethylene oxide, isocyanates, and vinyl chloride) are typically not expected to be encountered in building materials as significant constituents or in a form that would represent an exposure concern. These substances were not included in our assessment unless specific information regarding their use (e.g. in a manufacturing process) was provided to us. Please refer to Appendix E for information regarding where these designated substances are typically found or used. No sampling for these designated substances was performed.

2.2 Other Hazardous Materials

2.2.1 Chemical Hazards

Urea Formaldehyde Foam Insulation (UFFI)

A visual inspection to evaluate the possible presence of Urea Formaldehyde Foam Insulation (UFFI) was conducted within the area(s) assessed. Our visual inspection was limited to looking for evidence of possible UFFI installation (i.e. repaired nozzle holes in walls) and overspray at wall/ceiling joints, etc. No material sampling was conducted as part of our assessment.

2.2.2 Biological Hazards

Mould Contamination

A visual inspection to determine the possibility of indoor mould growth was conducted within the area assessed. Our assessment was limited to looking for evidence of mould growth and water damage (staining, material deterioration, efflorescence, etc.) on the surface of building materials, which may be an indicator of hidden mould growth. No moisture content readings of building materials were taken to determine their current condition. Additionally, destructive testing to confirm the presence/absence of hidden mould growth and material sampling to verify the presence/absence of mould on suspect surfaces was beyond the scope of this assessment.

2.2.3 Environmental Hazards

Polychlorinated Biphenyls (PCBs)

The presence of PCB-containing electrical equipment within the area(s) assessed was identified through visual inspection and knowledge of the timeline of historical use.

For stand-alone transformers and capacitors, information from the manufacturer nameplate (such as the date of manufacture, dielectric fluid trade name or “Type Number”, etc.) was gathered, where possible, to further evaluate if the equipment may contain PCBs. This information was then compared to the information provided in the Environment Canada document entitled “*Handbook on PCB’s in Electrical Equipment*” (Third Edition, April 1988) to aid in identification. Transformers and capacitors confirmed to be manufactured after 1979 were assumed to not contain PCBs. If appropriate information could not be obtained it was assumed that the transformer or capacitor contained PCBs.

No sampling of materials or fluids within equipment was conducted to verify the presence/absence of PCBs. Inspection and testing of other materials for PCB content, including (but not limited to) caulking, asphalt, oil-based paint, plastics, switches, oil residue, electric cables and hydraulic fluids was beyond the scope of our assessment.

Ozone Depleting and Global Warming Substances

The presence of fixed equipment likely to contain ozone-depleting substances (ODS) and/or global-warming substances (GWS) was identified through visual inspection and knowledge of the timeline of historical use. This included equipment such as chillers, air-conditioners and fixed dry-chemical fire extinguishers, where chemicals such as hydrochlorofluorocarbons (HCFCs), hydrofluorocarbons (HFCs) or halons may be present. Where possible, information regarding the type and quantity of refrigerant present was obtained from the manufacturer nameplate.

Our visual assessment was limited to fixed equipment within the area(s) assessed and did not include portable equipment such as stand-alone refrigerators, freezers, water coolers, air-conditioners and fire extinguishers, etc.

3.0 RESULTS

Results of our visual assessment and bulk sample analytical findings are summarized in the sections below. Photographs of conditions observed are referenced in the appropriate section where applicable (as **P#**) and are included in Appendix D.

3.1 Designated Substances

3.1.1 Asbestos

Results of bulk sample analysis for the determination of asbestos content are summarized in Table 1. Materials have been classified as “ACM” or “Non-ACM” based on analytical results. Please refer to the Limitations section of this report (Section 5.0) for additional details. The Laboratory Certificate of Analysis is included in Appendix C.

TABLE 1
Bulk Sample Analytical Results for Determination of Asbestos Content
107 Courtland Avenue East Kitchener, Ontario
Sample Collection Date: October 31, 2024

Sample No.	Material Description	Sample Location	Asbestos Content	Material Classification
S01A	Trowel Applied Fireproofing	Basement- Corridor 801	10% Chrysotile	ACM
S01B			Not Analyzed	
S01C				
S02A	Interior White Window Caulking	Second Floor- Room 14	None Detected	Non-ACM
S02B				
S02C				

¹ As per O. Reg. 278/05, ACM contains $\geq 0.5\%$ asbestos by dry weight.

² Not Analyzed = Not analyzed due to positive asbestos result in previous sample.

Materials assessed for asbestos content are summarized in Table 2 based on the type/use of the material. The condition and friability of materials confirmed or suspected to be asbestos-containing (based on our visual assessment and results of bulk sample analysis) is provided. Condition (Cond.) ratings are provided as Good (G), Fair (F) or Poor (P) based on our Assessment Criteria provided in Appendix A. Estimates of quantity have only been provided for confirmed or suspected asbestos-containing materials that were deemed to have a potential to be disturbed as part of the upcoming renovation project. Any quantities provided should be considered rough estimates only and only apply to the limited project-specific assessment areas.

TABLE 2
Results of Assessment for Asbestos-Containing Materials
107 Courtland Avenue East Kitchener, Ontario
Date of Assessment: October 31, 2024

Sprayed and Loose Fill Insulating Materials	Location/Description	Cond.	Est. Quantity	Friability
Sprayed Fireproofing	None identified in project-specific work areas.	N/A	N/A	N/A
Trowel Applied Fireproofing	Trowel applied fireproofing was identified above lay-in ceilings throughout basement corridor 801 (P1). This material was sampled during a previous environmental survey and was determined to be asbestos-containing (refer to the report referenced in Section 1.3). Additional samples were collected for verification as previous report did not identify this material in the specific project work location. The material was confirmed to contain 10% Chrysotile asbestos (refer to S01 in Table 1).	Good	~30 m²	Friable
Sprayed Insulation	None identified in project-specific work areas.	N/A	N/A	N/A
Loose Fill / Vermiculite Insulation	None identified in project-specific work areas.	N/A	N/A	N/A
Thermal System Insulation	Location/Description	Cond.	Est. Quantity	Friability
Mechanical Pipe Insulation – Straights	Mechanical pipe straights within the areas assessed were observed to be uninsulated or insulated with non-asbestos fibreglass. No asbestos-containing pipe straight insulation was identified within project-specific work areas.	N/D	N/D	N/D
Mechanical Pipe Insulation – Fittings (elbows, valves, tees, hangars, etc.)	Parging cement on mechanical pipe fittings was identified above lay-in ceilings within corridor 801 and at ceiling height within lunch rooms 76 and 77 of the basement (P2). The material was sampled during a previous environmental survey and was determined to be asbestos-containing (refer to the report referenced in Section 1.3). Additional asbestos-containing parged pipe fittings may be present within concealed locations of project-specific work areas.	Good	~20	Friable
HVAC Duct Insulation	None identified in project-specific work areas.	N/A	N/A	N/A
Breeching / Exhaust Insulation	None identified in project-specific work areas.	N/A	N/A	N/A
Tank Insulation	None identified in project-specific work areas.	N/A	N/A	N/A
Boiler Insulation	None identified in project-specific work areas.	N/A	N/A	N/A

Other Mechanical Equipment Insulation	No other mechanical equipment insulation was identified within the project area.	N/A	N/A	N/A
Architectural Finishes & Finishing Materials	Location/Description	Cond.	Est. Quantity	Friability
Sprayed Texture / Stucco Finishes	None identified in project-specific work areas.	N/A	N/A	N/A
Plaster Finishes	Smooth plaster finishes were identified throughout project-specific assessment areas. The material was sampled during a previous environmental survey and was determined to not contain asbestos (refer to the report referenced in Section 1.3).	N/A	N/A	N/A
Drywall Joint Compound	Drywall finishes were identified within corridor 801 and classroom 77. The associated joint compound was sampled during a previous environmental survey and has been determined to not contain asbestos (refer to the report referenced in Section 1.3).	N/A	N/A	N/A
Ceiling Tiles	Location/Description	Cond.	Est. Quantity	Friability
Lay-in Acoustic Ceiling Tiles	2'x4' Short fissure random pinhole patterned ceiling tiles were identified throughout the areas assessed. The tiles were sampled during a previous environmental survey and has been determined to not contain asbestos (refer to the report referenced in Section 1.3).	N/A	N/A	N/A
	2'x4' Long fissure random pinhole patterned ceiling tiles were identified throughout the areas assessed. The tiles were sampled during a previous environmental survey and has been determined to not contain asbestos (refer to the report referenced in Section 1.3).	N/A	N/A	N/A
	2'x2' Random pinhole patterned ceiling tiles were identified throughout the areas assessed. The tiles were sampled during a previous environmental survey and has been determined to not contain asbestos (refer to the report referenced in Section 1.3).	N/A	N/A	N/A
Fixed-in-Place Ceiling Tiles	1'x1' ceiling tiles with a random pinhole pattern were identified above lay-in acoustic ceiling tiles within classrooms 5, 13, 14, 15, and 16. The tiles were sampled during a previous environmental survey and has been determined to not contain asbestos (refer to the report referenced in Section 1.3).	N/A	N/A	N/A

Ceiling Tile Mastic	Ceiling tile mastic associated with non-asbestos 1'x1' fixed in place ceiling tiles was identified above lay-in acoustic ceiling tiles within classrooms 5, 13, 14, 15, and 16 (i.e. the original building). This material was inaccessible at the time of assessment (due to height limitations) and is suspected of containing asbestos until sampling can be conducted to confirm or refute asbestos content.	Good	N/D	Non-Friable
	Ceiling tile mastic associated with non-asbestos 1'x1' fixed in place ceiling tiles was identified above lay-in acoustic ceiling tiles within corridor 801 in the basement (i.e. 1964 addition). The material was sampled during a previous environmental survey and was determined not to contain asbestos (refer to the report referenced in Section 1.3).	N/A	N/A	N/A
Flooring	Location/Description	Cond.	Est. Quantity	Friability
Vinyl Floor Tiles	12"x12" green with white fleck vinyl floor tiles were identified within classroom 6 (P3). The material was sampled during a previous environmental survey and was determined to contain Chrysotile asbestos (refer to the report referenced in Section 1.3). The associated mastic was determined to be non-asbestos.	Good	~ 22m ²	Non-Friable
	12"x12" brown with brown fleck vinyl floor tiles with white streaks were identified within classroom 15. The material was sampled during a previous environmental survey and was determined not to contain asbestos (refer to the report referenced in Section 1.3).	N/A	N/A	N/A
Vinyl Sheet Flooring	Beige vinyl sheet flooring was identified in classroom 76. The material was assessed during a previous environmental survey and determined to not contain asbestos (refer to the report referenced in Section 1.3).	N/A	N/A	N/A
	Light beige heat-welded vinyl sheet flooring was identified in classroom 5. This material was newly installed and is therefore not suspected of containing asbestos.	N/A	N/A	N/A
	White heat-welded vinyl sheet flooring was identified in classrooms 14 and 16. This material was visually assessed by the surveyor and determined to be newly installed, therefore it is not suspected of containing asbestos.	N/A	N/A	N/A
Asbestos Cement Products	Location/Description	Cond.	Est. Quantity	Friability
Piping	None identified in project-specific work areas.	N/A	N/A	N/A
Roofing, Siding, Wallboard	None identified in project-specific work areas.	N/A	N/A	N/A
Other Cement Products	None identified in project-specific work areas.	N/A	N/A	N/A

Misc. Materials	Location/Description	Cond.	Est. Quantity	Friability
Caulking	White window caulking was identified at interior window frames of classrooms 5, 14, 15, and 16. The material was sampled and determined to not contain asbestos (refer to sample set S02 in Table 1).	N/A	N/A	N/A
	Grey window caulking was identified at exterior window frames of classrooms 5, 6, 13, 14, 15 and 16. The material was sampled during a previous environmental survey and was determined not to contain asbestos (refer to the report referenced in Section 1.3).	N/A	N/A	N/A
Other Materials	Asbestos may be a component of other materials within the areas assessed which were not sampled due to inaccessibility. Any additional materials uncovered that are suspected of containing asbestos must be sampled prior to proceeding with any work.	N/D	N/D	N/D

Notes: N/A=Not Applicable; N/D=Not Determined

3.1.2 Lead

Laboratory analytical results for paints and surface coatings tested to determine lead content are summarized below in Table 3. The Laboratory Certificate of Analysis is included in Appendix C.

TABLE 3
Results of Paint Condition and Lead Content Assessment
107 Courtland Avenue East Kitchener, Ontario
Sample Collection Date: October 31, 2024

Sample No.	Location	Surface	Paint Colour	Condition	Lead Conc. (µg/g)	EACC Classification
LP01	Corridor 801	Concrete Block Wall	Beige	Good	2610	'Lead-Containing'
LP02	Room 15	Wood Windowsill	Purple	Good	3060	'Lead-Containing'
LP03	Room 15	Plaster Wall	Beige	Good	2480	'Lead-Containing'

Paint samples above 1000 µg/g but below 5000 µg/g are considered 'lead-containing' as per the October 2014 EACC Lead Guideline for Construction, Renovation, Maintenance or Repair. All three (3) paints sampled were found to have lead concentrations between 1000 µg/g and 5000 µg/g and are considered to be 'lead-containing'. Materials coated with lead-containing paints require special procedures when performing work that may disturb them or their coatings.

Interior beige paint identified on concrete block walls (**P4**), interior purple paint identified on wood frames, and interior beige paint identified on plaster finishes were determined to be 'lead-containing'.

Additional minor lead-containing materials suspected present within the investigated area include the following:

- Lead solder used in pipe fittings or electrical equipment; and,
- Lead acid batteries in emergency lighting.

3.1.3 Mercury

Mercury is deemed present in vapour form within fluorescent light tubes located throughout the areas assessed. No other equipment suspected of containing mercury was identified within the assessed areas.

3.1.4 Silica

A number of building materials were identified within the surveyed areas that are suspected to contain crystalline silica. This includes the following materials:

- Drywall and associated joint compounds;
- Plaster finishes;
- Lay-in acoustic ceiling tiles;
- Caulking;
- Mastics;
- Ceramic tiles and grout;
- Brick and associated mortar; and,
- All concrete finishes and materials.

3.1.5 Other Designated Substances

Acrylonitrile, arsenic, benzene, coke oven emissions, ethylene oxide, isocyanates, and vinyl chloride were not included in our assessment as these substances are not expected to be a significant component of building materials or present in a form that would represent an exposure concern. Additionally, no specific information regarding their use was provided to us.

3.2 Other Hazardous Materials

3.2.1 Chemical Hazards

No visible evidence of UFFI installation (i.e. injection openings) or overspray of foam insulation at wall/ceiling joints was identified. In addition, UFFI insulation within interior wall cavities is not suspected. No other hazardous materials were identified nor are they suspected present.

3.2.2 Biological Hazards

Mould Contamination

No mould growth was identified within the assessed areas.

3.2.3 Environmental Hazards

Polychlorinated Biphenyls (PCBs)

Fluorescent light fixtures were identified throughout the areas assessed. Lamp types that are ballast dependent were noted to be retrofitted with newer T8 lamps. Therefore, ballasts associated with all fluorescent lights fixtures are not suspected of containing PCBs.

Ozone Depleting and Global Warming Substances

No Ozone Depleting / Global Warming Substances were identified within the assessed areas at the time of the assessment.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 Designated Substances

4.1.1 Asbestos

Results of our assessment indicated that the following asbestos-containing materials are present within project-specific assessment areas that may be disturbed as part of the planned renovation project:

Friable Asbestos-Containing Materials

- Trowel applied fireproofing on the concrete deck above lay-in ceilings throughout corridor 801 of the basement.
- Parging cement on mechanical pipe fittings above lay-in ceilings within corridor 801 and at ceiling height within lunch rooms 76 and 77 of the basement.

Non-Friable Asbestos-Containing Materials

- 12"x12" green with white fleck vinyl floor tiles were identified within classroom 6 on the first floor.

Asbestos is also suspected present in the following materials, as access was not possible at the time of assessment due to height limitations (i.e. above 15 feet):

- Ceiling tile mastic associated with 1'x1' non-asbestos fixed-in-place ceiling tiles above lay-in ceilings in classrooms 5, 6, 13, 14, 15 and 16 (the original building).

No other asbestos-containing materials were identified or are suspected present within the project-specific assessment areas. This assessment was limited to sampling of materials that have the potential to be impacted by planned renovation work, as reported by the WRDSB. Assessment of other areas or materials within the building was not conducted. Asbestos-containing materials and other designated substances are present in other areas of the building, which are not identified in this report. If the scope of work expands beyond the limit of our assessment then stop work immediately and assess, as needed.

Non-friable asbestos-containing materials in GOOD condition can be managed in place until activities which could result in disturbance of this material. In the event the non-friable asbestos-containing materials are removed, Type 1 operations apply (provided that the material is wetted down and removed using non-powered hand held tools) as outlined in Ontario Regulation 278/05, *Designated Substance - Asbestos on Construction Projects and in Buildings and Repair Operations* – made under the Ontario Occupational Health and Safety Act. If the material cannot be adequately wetted, Type 2 operations apply.

As per O. Reg. 278/05, removal or disturbance of less than 1 square meter of friable ACM, such as parging cement and fireproofing, is classified as a Type 2 operation provided the removal is performed using non-powered hand tools only. Removal of greater than 1 square meter of friable ACM shall be conducted as a Type 3 operation

The removal or disturbance of ACM must follow the measures and procedures indicated in Ontario Regulation 278/05. This work should be conducted by workers who have received proper training by a “competent person” in the hazards of asbestos exposure, personal hygiene and work practices, and the use and care of respirators and protective clothing. Any worker/supervisor who works in a Type 3 operation must successfully complete the Asbestos Abatement Worker or Supervisor Training Program approved by the Ministry of Training, Colleges and Universities.

It is recommended that work involving the removal or disturbance of ACM be subject to inspection and testing to document conformance with Ontario Regulation 278/05 requirements. The degree of inspection and testing is dependent on site-specific conditions such as the type, duration, size and location of the work.

4.1.2 Lead

Interior beige paint on concrete block walls and plaster finishes, as well as interior purple paint on wood frames within the project-specific assessment areas were determined to be ‘lead-containing’ in accordance with the October 2014 EACC publication Lead Guideline for Construction, Renovation, Maintenance or Repair. Lead may also be present as a component in solder in pipe fittings and electrical equipment, and in lead-acid batteries of emergency light fixtures. Removal or disturbance of these materials, if applicable, should be performed using non-powered hand tools and no hot work should be performed on pipes containing solder.

Materials coated with lead-containing paints require special procedures when performing work that may disturb them or their coatings. Any disturbance of lead materials and/or lead-containing paints should be conducted in accordance with the procedures outlined in the EACC “Lead Guideline” (October 2014) and the MLITSD “Lead on Construction Projects” guideline (April 2011). The extent of procedures required depends on the type of work to be conducted.

If practicable, all bulk lead waste materials should be separated from other wastes and sent to a recycling facility. If not practicable, lead-containing waste should be handled and disposed of according to R.R.O. 1990 Regulation 347 (Reg. 347), *General – Waste Management*, made under the Environmental Protection Act. Under this regulation (and depending on the quantity of waste generated) the waste may be subject to analysis following the Toxicity Characteristic Leaching Procedure (TCLP) to determine if it is a “leachate toxic waste” based on the leachate quality criteria provided in Schedule 4 of the regulation. Such wastes must meet specific treatment requirements (Schedule 5) or undergo alternative treatment for hazardous debris (Schedule 8) prior to land disposal.

4.1.3 Mercury

Fluorescent light fixtures should be handled with care and kept intact to avoid potential exposure to mercury vapour present within the lamps/bulbs. Under Reg. 347, waste mercury produced in amounts less than 5 kilograms (kg) are exempt from hazardous waste registration, treatment and disposal requirements and can be disposed of in landfill as regular waste. Larger quantities of waste mercury must be treated and disposed of in accordance with the requirements of Reg. 347.

Although no mercury was visibly identified in other equipment, dismantling of equipment (if present) was not conducted to verify the presence/absence of mercury. It is cautioned that thermometers, barometers, and other measuring devices (pressure gauges/sensors, vacuum gauges, manometers, etc.), thermostats, and a variety of other electrical switches (temperature sensitive, tilt switches, float switches, etc.) may contain mercury that may not be visible without dismantling the equipment. Such devices should be assumed to contain mercury until proven otherwise and similar precautions to those outlined above should be taken if any of those items are to be disturbed or taken out of service in the future.

4.1.4 Silica

Suspect silica-containing materials were identified throughout the assessed areas. In their current state, building materials containing silica do not represent a risk to building occupants or construction workers. Risks associated with exposure to silica arise during demolition activities that cause silica dust to be created (particularly grinding, drilling or cutting operations and during major demolition), resulting in a crystalline silica inhalation hazard.

If any materials suspected to contain silica are to be removed or otherwise disturbed as a result of renovation or demolition activities it is recommended that procedures be put in place to control the generation of dust (such as routine water misting) and thus reduce the potential for worker exposure. Workers that have the potential to be exposed to airborne silica should also wear appropriate protective clothing and respiratory protection.

Any work involving the disturbance of silica-containing materials should follow the procedures outlined in the MLITSD "*Silica on Construction Projects*" guideline (April 2011). The appropriate engineering controls, work practices, hygiene practices, personal protective measures and training necessary to conduct the work in a safe manner are provided in this guideline. The general measures and procedures (or Type of operation) necessary depends on the type of work to be conducted.

4.1.5 Other Designated Substances

No other designated substances are expected to be a component of building materials within the surveyed area in a form that would represent an exposure concern. Therefore, no protective measures or procedures specific to acrylonitrile, arsenic, benzene, coke oven emissions, ethylene oxide, isocyanates, and vinyl chloride are considered necessary.

4.2 Other Hazardous Materials

4.2.1 Chemical Hazards

As no UFFI was identified or is suspected to be present within the surveyed area no further action is required. However, although intrusive testing was conducted, there is a remote possibility that UFFI could be hidden within locations such as exterior wall cavities that were not investigated. If suspect foam insulation is identified during demolition activities work should be stopped and the area should be re-assessed to evaluate conditions and determine appropriate control measures and worker protection, if necessary.

4.2.2 Biological Hazards

Mould Contamination

No mould growth was identified in the area(s) assessed, no action required.

4.2.3 Environmental Hazards

Polychlorinated Biphenyls (PCBs)

None identified in the area(s) assessed, no action required.

Ozone Depleting and Global Warming Substances

None identified in the area(s) assessed, no action required.

5.0 LIMITATIONS

The information and recommendations detailed in this report were carried out by trained professional and technical staff in accordance with generally accepted environmental and industrial hygiene work practices and procedures. Recommendations provided in this report have been generated in accordance with accepted industry guidelines and practices. These guidelines and practices are considered acceptable as of the date of this report.

In preparation of this report, Safetech Environmental Limited (Safetech) relied on information supplied by others, including without limitation, information pertaining to the history and operation of the site, and testing services provided by independent laboratories. Except as expressly set out in this report, Safetech has not made any independent verification of information provided by independent entities.

The collection of samples at the location noted was consistent with the scope of work agreed-upon with the person or entity to whom this report is addressed and the information obtained concerning prior site investigations. As conditions between samples may vary, the potential remains for the presence of unknown additional contaminants for which there were no known indicators.

The analytical method used for determination of asbestos content meets the requirements of O.Reg. 278/05. However, small asbestos fibres may be missed by PLM due to resolution limitations of the optical microscope. Interfering binder/matrix and/or low asbestos content may also hinder positive identification by PLM. These conditions are common for vermiculite attic insulation (VAI) and non-friable organically bound (NOB) materials such as vinyl floor tiles, roofing materials, mastics and caulking and can lead to “false negative” results. If PLM analytical results for these types of materials indicate no asbestos detected they have been reported as “Presumed Non-ACM”. Due to limitations of the analytical method we cannot confirm that low quantities of asbestos are not present in these samples using solely PLM analysis. Additional analytical procedures should be considered for such materials to rule out false negative results.

Conclusions are based on site conditions at the time of inspection and can only be extrapolated to an undefined limited area around inspected locations. The extent of the limited area depends on building construction and conditions. Building materials that are not detailed within this survey due to inaccessibility during the time of survey and/or are uncovered during demolition activities should be properly assessed by a qualified person prior to their disturbance. Safetech cannot warrant against undiscovered environmental liabilities. If any information becomes available that differs from the findings in this report, we request that we be notified immediately to reassess the conclusions provided herein.

No other person or entity is entitled to use or rely upon this report without the express written consent of Safetech Environmental Limited and the person or entity to who it is addressed. Any use that a third party makes of this report, or any reliance based on conclusions and recommendations made, are the responsibility of such third parties. Safetech accepts no responsibility for damages suffered by third parties as a result of actions based on this report.

Appendix A

Condition Assessment Criteria for Asbestos-Containing Materials

The condition of asbestos-containing materials identified within the surveyed area(s) was assessed as Good (G), Fair (F) or Poor (P). The assessment criteria used to determine condition is dependent on material characteristics, such as friability. The following Table summarizes the criteria used by Safetech to evaluate the condition of ACM.

Condition Assessment Criteria for Asbestos-Containing Materials

Sprayed Fireproofing, Sprayed Insulation and Sprayed Texture Finishes	
Good	• Surface shows no significant signs of damage, deterioration, or delamination (i.e. <1%). • Unencapsulated or unpainted fireproofing or texture finishes, where no delamination or damage is observed. • Encapsulated fireproofing or texture finishes where encapsulation applied after damage or fallout.
Fair	• Not utilized as part of condition assessment for these materials.
Poor	• Greater than 1% damage, delamination, or deterioration to surface.
In areas where damage exists in isolated locations, both Good and Poor may be applicable.	
Mechanical Insulation (boilers, breeching, ductwork, piping, tanks, equipment, etc.)	
Good	• Insulation completely covered in jacketing and exhibits no evidence of damage or deterioration. • Jacketing may have minor damage (i.e. scuffs or stains), but is not penetrated.
Fair	• Minor penetrating damage to jacketed insulation (cuts, tears, nicks, deterioration or delamination). • Undamaged insulation that had never been jacketed. • Insulation is exposed but not showing surface disintegration. • Extent of missing insulation ranges from minor to none. • Damage that can be repaired.
Poor	• Original insulation jacket is missing, damaged, deteriorated, or delaminated. • Insulation is exposed and significant areas have been dislodged. • Damage that cannot be easily repaired.
Non-Friable and Potentially Friable Materials (includes materials such as plaster finishes, drywall compound, ceiling tiles, asbestos cement products, vinyl asbestos tile and asbestos paper backed vinyl sheet flooring, etc., which have the potential to become friable when handled)	
Good	• No significant damage. • Material may be cracked or broken but is stable and not likely to become friable upon casual contact. • No friable debris present
Fair	• Not utilized as part of condition assessment for these materials.
Poor	• Material is severely damaged. • Debris is present or binder has disintegrated to the point where the material has become friable.
Asbestos-Containing Debris (noted separately from the presumed source material)	
Poor	• Debris is always considered to be in Poor condition.

Appendix B

Figures AS01, AS02, and AS03

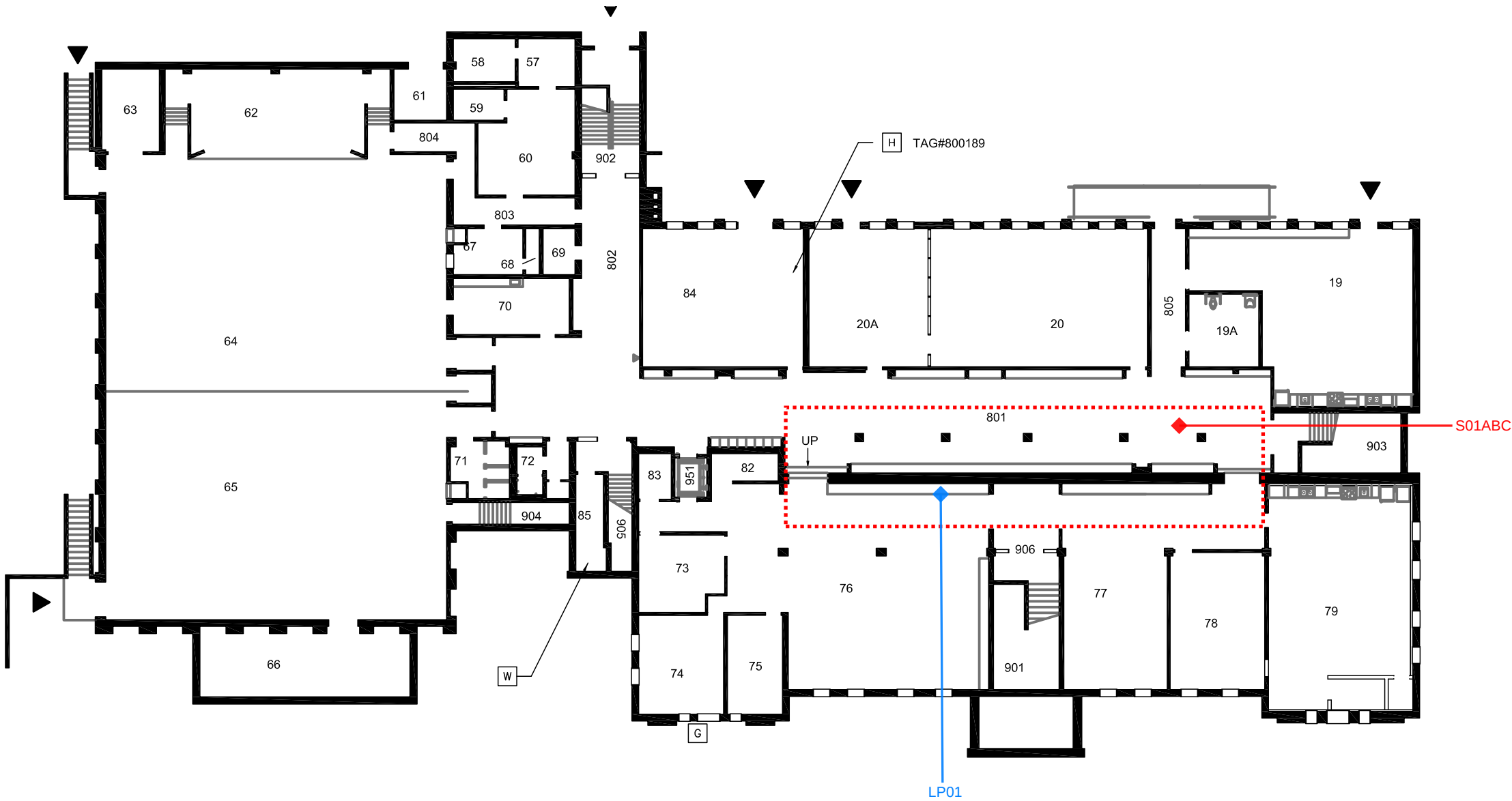
- NOTES:**
- 1. Refer to the report titled "Project-Specific Designated Substance & Hazardous Materials Assessment, Courtland Avenue Public School, 107 Courtland Avenue East, Kitchener, Ontario" for complete details.
 - 2. Figure to be referenced with the report.
 - 3. Figure is not to scale.
 - 4. Floor plans provided by Waterloo Region District School Board.
 - 5. Figure is colour dependent; photocopies may alter interpretations of the figure.
 - 6. Sample locations are approximate.
 - 7. The project-specific assessment area was defined by the Waterloo Region District School Board.
 - 8.Asbestos-containing materials and other designated substances are present in other areas of the building which are not identified in these figures of the report. If the scope of work expands beyond the limit of our assessment area then stop work immediately and assess as needed.

The following asbestos-containing materials are present within project-specific work areas:

- Trowel applied fireproofing on concrete deck above lay-in ceilings throughout corridor 801 of the basement;
- Parging cement on mechanical pipe fittings above lay-in ceilings within corridor 801 and at ceiling height within lunch rooms 76 and 77 of the basement; additional parged pipe fittings may be present within concealed locations of project-specific work areas; and,
- 12"x12" green with white fleck vinyl floor tiles within classroom 6 on the first floor.

Asbestos is also suspected present in the following materials, as access was not possible at the time of assessment due to height limitations (i.e. above 15 feet):

- Ceiling tile mastic associated with 1'x1' non-asbestos fixed-in-place ceiling tiles above lay-in ceilings in classrooms 5, 6, 13, 14, 15 and 16 (i.e. the original building).



BASEMENT

LEGEND:		PROJECT:		DRAWING NAME:		Prepared for:	Prepared by:
S01A Asbestos Bulk Sample and Sample Identification Number LP01 Lead Bulk Sample and Sample Identification Number Extent of Project Specific Assessment Area		Project-Specific DSHM Assessment Courtland Avenue Public School Renovation Project		Extent of Assessment and Designated Substance & Hazardous Materials Sample Locations for the Courtland Avenue Public School Renovation Project		 Waterloo Region District School Board 51 Ardel Avenue Kitchener, Ontario N2C 2R5	 Safetech Environmental Limited 100 Hanson Avenue, Unit 2, Kitchener, ON N2C 2E2
		Safetech Project No.:	2-3240081	SURVEY DATE:	October 31, 2024		
		Building Address:	107 Courtland Avenue East, Kitchener, Ontario	DRAWING BY:	SD		
				DRAWING #:	AS-01		
				APPROVED BY:	JJG		

NOTES:

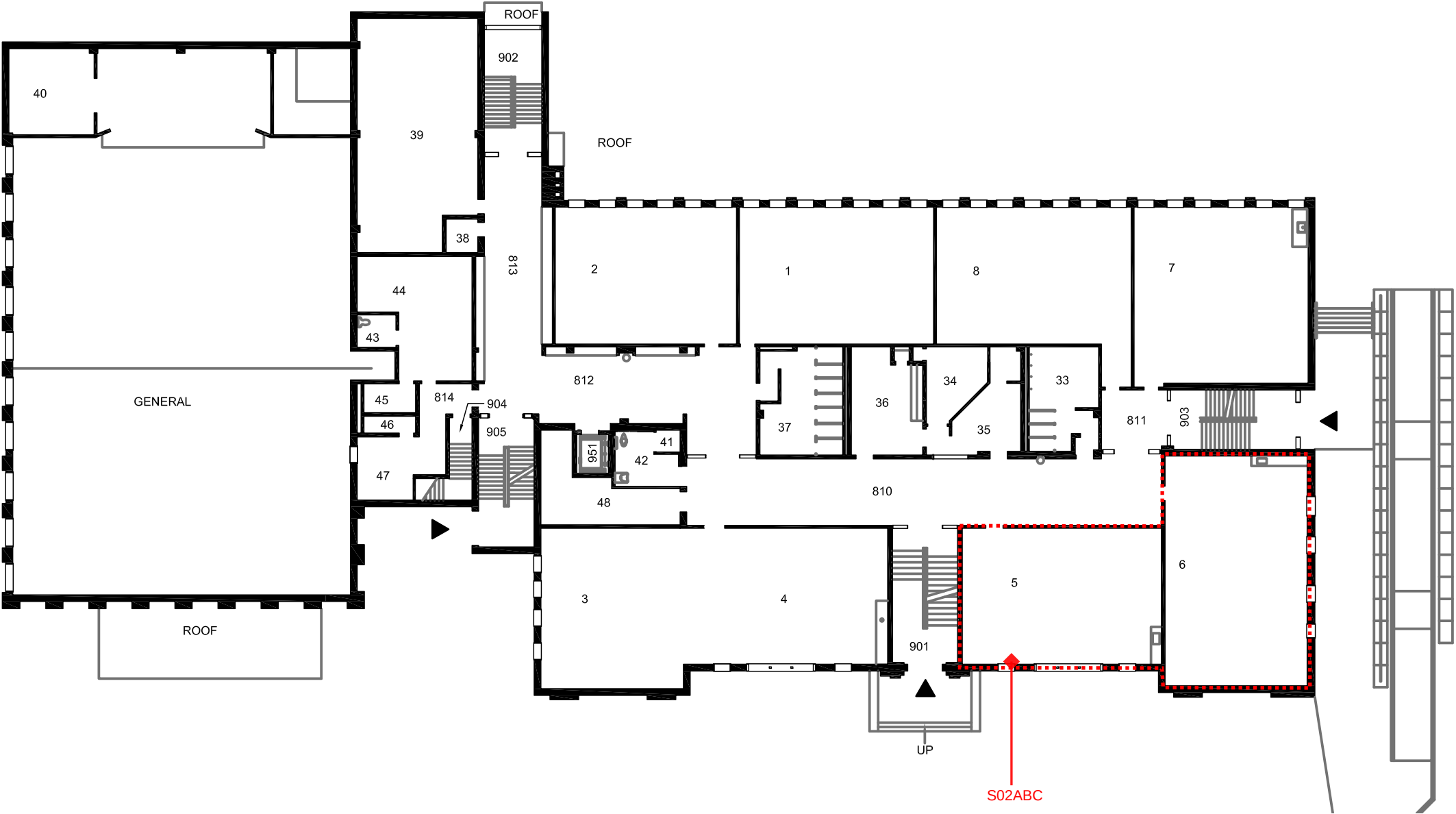
- 1. Refer to the report titled "Project-Specific Designated Substance & Hazardous Materials Assessment, Courtland Avenue Public School, 107 Courtland Avenue East, Kitchener, Ontario" for complete details.
- 2. Figure to be referenced with the report.
- 3. Figure is not to scale.
- 4. Floor plans provided by Waterloo Region District School Board.
- 5. Figure is colour dependent; photocopies may alter interpretations of the figure.
- 6. Sample locations are approximate.
- 7. The project-specific assessment area was defined by the Waterloo Region District School Board.
- 8.Asbestos-containing materials and other designated substances are present in other areas of the building which are not identified in these figures of the report. If the scope of work expands beyond the limit of our assessment area then stop work immediately and assess as needed.

The following asbestos-containing materials are present within project-specific work areas:

- Trowel applied fireproofing on concrete deck above lay-in ceilings throughout corridor 801 of the basement;
- Parging cement on mechanical pipe fittings above lay-in ceilings within corridor 801 and at ceiling height within lunch rooms 76 and 77 of the basement; additional parged pipe fittings may be present within concealed locations of project-specific work areas; and,
- 12"x12" green with white fleck vinyl floor tiles within classroom 6 on the first floor.

Asbestos is also suspected present in the following materials, as access was not possible at the time of assessment due to height limitations (i.e. above 15 feet):

- Ceiling tile mastic associated with 1'x1' non-asbestos fixed-in-place ceiling tiles above lay-in ceilings in classrooms 5, 6, 13, 14, 15 and 16 (i.e. the original building).



FIRST FLOOR

LEGEND:		PROJECT:		DRAWING NAME:		Prepared for:	Prepared by:
S01A Asbestos Bulk Sample and Sample Identification Number LP01 Lead Bulk Sample and Sample Identification Number Extent of Project Specific Assessment Area	Project-Specific DSHM Assessment Courtland Avenue Public School Renovation Project		Extent of Assessment and Designated Substance & Hazardous Materials Sample Locations for the Courtland Avenue Public School Renovation Project				
	Safetech Project No.:	2-3240081	SURVEY DATE:	October 31, 2024	Waterloo Region District School Board 51 Ardel Avenue Kitchener, Ontario N2C 2R5	Safetech Environmental Limited 100 Hanson Avenue, Unit 2, Kitchener, ON N2C 2E2	
	Building Address:	107 Courtland Avenue East, Kitchener, Ontario	DRAWING BY:	SD			
DRAWING #:			AS-02				
				APPROVED BY:	JJG		

NOTES:

1. Refer to the report titled "Project-Specific Designated Substance & Hazardous Materials Assessment, Courtland Avenue Public School, 107 Courtland Avenue East, Kitchener, Ontario" for complete details.

2. Figure to be referenced with the report.

3. Figure is not to scale.

4. Floor plans provided by Waterloo Region District School Board.

5. Figure is colour dependent; photocopies may alter interpretations of the figure.

6. Sample locations are approximate.

7. The project-specific assessment area was defined by the Waterloo Region District School Board.

8.Asbestos-containing materials and other designated substances are present in other areas of the building which are not identified in these figures of the report. If the scope of work expands beyond the limit of our assessment area then stop work immediately and assess as needed.

The following asbestos-containing materials are present within project-specific work areas:

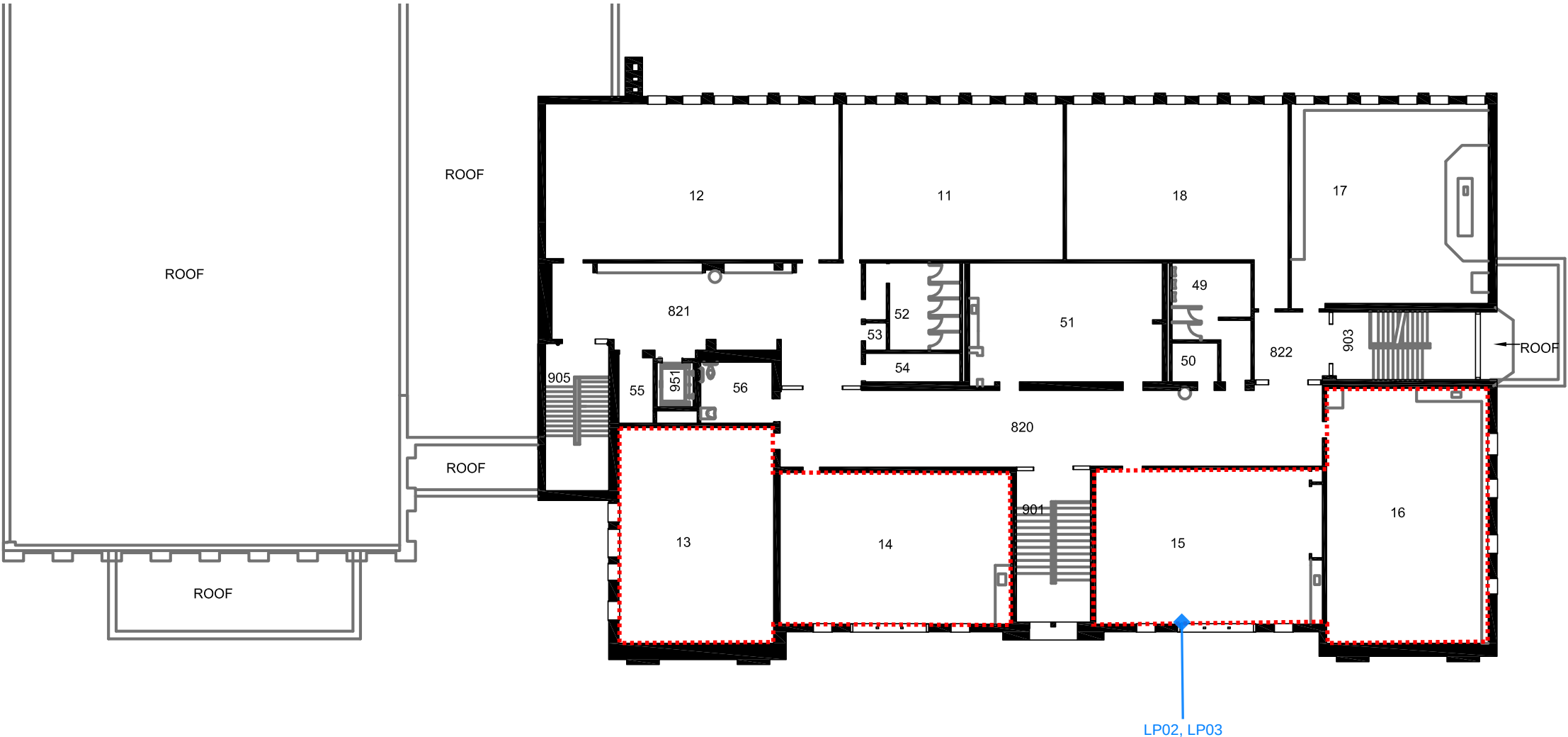
-Trowel applied fireproofing on concrete deck above lay-in ceilings throughout corridor 801 of the basement;

- Parging cement on mechanical pipe fittings above lay-in ceilings within corridor 801 and at ceiling height within lunch rooms 76 and 77 of the basement; additional parged pipe fittings may be present within concealed locations of project-specific work areas; and,

- 12"x12" green with white fleck vinyl floor tiles within classroom 6 on the first floor.

Asbestos is also suspected present in the following materials, as access was not possible at the time of assessment due to height limitations (i.e. above 15 feet):

- Ceiling tile mastic associated with 1'x1' non-asbestos fixed-in-place ceiling tiles above lay-in ceilings in classrooms 5, 6, 13, 14, 15 and 16 (i.e. the original building).



SECOND FLOOR

LEGEND:		PROJECT:		DRAWING NAME:		Prepared for:	Prepared by:
S01A Asbestos Bulk Sample and Sample Identification Number LP01 Lead Bulk Sample and Sample Identification Number Extent of Project Specific Assessment Area		Project-Specific DSHM Assessment Courtland Avenue Public School Renovation Project		Extent of Assessment and Designated Substance & Hazardous Materials Sample Locations for the Courtland Avenue Public School Renovation Project		 Waterloo Region District School Board 51 Ardelt Avenue Kitchener, Ontario N2C 2R5	 Safetech Environmental Limited 100 Hanson Avenue, Unit 2, Kitchener, ON N2C 2E2
	Safetech Project No.:	2-3240081		SURVEY DATE:	October 31, 2024		
	Building Address:	107 Courtland Avenue East, Kitchener, Ontario		DRAWING BY:	SD		
				DRAWING #:	AS-03		
				APPROVED BY:	JJG		

Appendix C

Laboratory Certificates of Analysis – Asbestos & Lead

Laboratory Analysis Report

To:

Alyssa Nagy
Safetech Environmental Ltd.
100 Hanson Avenue, Unit 2
Kitchener, Ontario
N2C 2E2

EMC LAB REPORT NUMBER: A111365

Job/Project Name: Courtland Avenue Public School

Analysis Method: Polarized Light Microscopy – EPA 600

Date Received: Nov 4/24

Date Analyzed: Nov 11/24

Analyst: Rahul Patel

Reviewed By: Malgorzata Sybydlo

No. of Phases Analyzed:

Job No: 2-3240081

Number of Samples: 6

Date Reported: Nov 11/24

Client's Sample ID	Lab Sample No.	Description/Location	Sample Appearance	SAMPLE COMPONENTS (%)			
				Asbestos Fibres		Non-asbestos Fibres	Non-fibrous Material
S01a	A111365-1 ⁵	Travel applied fireproofing	White, cementitious material with fibres	Chrysotile	10	5	85
S01b	A111365-2	Travel applied fireproofing	NA	NA			
S01c	A111365-3	Travel applied fireproofing	NA	NA			
S02a	A111365-4	Interior window caulking	White, caulking	ND			100
S02b	A111365-5	Interior window caulking	White, caulking	ND			100
S02c	A111365-6	Interior window caulking	White, caulking	ND			100

Note:

1. Bulk samples are analyzed using Polarized Light Microscopy (PLM) and dispersion staining techniques. The analytical procedures are in accordance with EPA 600/R-93/116 method.
2. The results are only related to the samples analyzed. **ND** = None Detected (no asbestos fibres were observed), **NA** = Not Analyzed (analysis stopped due to a previous positive result)
3. This report may not be reproduced, except in full without the written approval of EMC Scientific Inc. This report may not be used by the client to claim product endorsement by NVLAP or any other agency of the U.S. Government.
4. The Ontario Regulatory Threshold for asbestos is 0.5%. The limit of quantification (LOQ) is 0.5%.
5. Vermiculite is present but too small to analyze.

C.O.C.: -

REPORT No: 24-034831 - Rev. 0

Report To:

EMC Scientific Inc.
5800 Ambler Dr. #100
Mississauga, ON L4W 4J4

CADUCEON Environmental Laboratories

2378 Holly Lane
Ottawa, ON K1V 7P1

Attention: Alister Haddad

DATE RECEIVED: 2024-Nov-06
DATE REPORTED: 2024-Nov-08
SAMPLE MATRIX: Paint Chips

CUSTOMER PROJECT: Courtland Ave. Public School
P.O. NUMBER: 2-3240081

Analyses	Qty	Site Analyzed	Authorized	Date Analyzed	Lab Method	Reference Method
ICP/OES (Solid)	3	OTTAWA	APRUDYVUS	2024-Nov-07	D-ICP-02	EPA 6010

R.L. = Reporting Limit

NC = Not Calculated

Test methods may be modified from specified reference method unless indicated by an *

			Parameter
			Lead
			Units
			µg/g
			R.L.
			5
Client I.D.	Sample I.D.	Date Collected	-
LP01 Beige on concrete wall	24-034831-1	2024-Oct-31	2610
LP02 Purple on wood window	24-034831-2	2024-Oct-31	3060
LP03 Beige on plaster wall	24-034831-3	2024-Oct-31	2480



Andrea Schneider
Laboratory Manager

Appendix D

Site Photographs – October 31, 2024



P1 – Asbestos-Containing Trowel Applied Fireproofing

Photograph of asbestos-containing trowel applied fireproofing identified above the ceiling in corridor 801 of the basement.



P2 – Asbestos-Containing Mechanical Pipe Fittings

Asbestos-containing paring cement on mechanical pipe fittings was identified above ceiling in within corridor 801 and at ceiling within lunch rooms 76 and 77.



P3 – Asbestos-Containing 12"x12" Green with White Fleck Vinyl Floor Tiles

Asbestos-containing 12"x12" green with white fleck vinyl floor tiles were identified within classroom 6.



P4 – Lead-Containing Beige Paint

Photograph of lead-containing beige paint identified on finishes throughout the building.

Appendix E

Background Information on Designated Substances and Other Hazardous Materials

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.

Section 14 of O. Reg. 490/09 exempts an employer and the workers of an employer who engage in construction from the requirements of the regulation. However, designated substances are still required to be identified prior to the beginning of a demolition or renovation project to ensure that construction workers (and potentially building occupants) are adequately protected from the hazards posed by the presence of these materials if the planned work may cause them to be disturbed. Accordingly, under Section 30 of the OHSA building owners are required to perform an assessment to determine whether any designated substances are present at the project site before the beginning of the project. The owner is also required to prepare a list of designated substances that are present at the site and provide this list to prospective constructors before entering into a binding contract with the constructor. This way, contractors and construction workers are made aware of designated substances present within the work area so that appropriate measures can be taken during the work to limit exposure to these substances.

Designated Substances and Hazardous Materials Assessments are conducted to conform to the requirements of Section 30 of the OHSA. The assessments are performed to identify designated substances (and other hazardous materials) within the work area that may present a hazard to workers if disturbed. These substances are commonly a component of building materials or equipment found in buildings. Additional information regarding the eleven designated substances including their properties, uses and health effects are provided below.

Acrylonitrile

Acrylonitrile (ACN) is a clear, colourless or pale yellow liquid with a pungent onion- or garlic-like, irritating odour. It is highly flammable and as such is a severe fire and explosion hazard.

Acrylonitrile is used mainly as a monomer or comonomer in the production of acrylic fibres, plastics, resins and nitrile rubbers. Historically, a mixture of acrylonitrile and carbon tetrachloride was used as a pesticide; however, all pesticide uses have stopped. Based on its use as a chemical intermediate, exposure to acrylonitrile is primarily occupational, via inhalation during its manufacture and use. Therefore, this designated substance is not expected to be encountered in buildings where it is not either produced or used in a manufacturing process.

Acute (short-term) exposure of workers to acrylonitrile has been observed to cause mucous membrane irritation, headaches, dizziness, and nausea. More significant exposures may lead to symptoms such as limb weakness, labored and irregular breathing, impaired judgment, cyanosis, collapse, and convulsions. Exposure of the skin to high concentrations of acrylonitrile in the air may irritate the skin and cause it to turn red while direct skin contact with acrylonitrile may cause the skin to blister and peel. The International Agency for Research on Cancer (IARC) concluded that there is inadequate evidence in humans for the carcinogenicity of acrylonitrile, but has classified it as possibly carcinogenic to humans (Group 2B).

Arsenic

Arsenic is a naturally occurring mineral, widely distributed in the earth's crust. Elemental arsenic (sometimes referred to as metallic arsenic) is a silver-gray or white brittle metal. However, arsenic is usually found in the environment combined with other elements such as oxygen, chlorine, and sulfur to form inorganic arsenic compounds. Arsenic has no odour and is almost tasteless.

Arsenic and its compounds have a variety of commercial uses. Inorganic arsenic compounds are mainly used as a wood preservative. Copper chromated arsenic (CCA) is used to make "pressure-treated" lumber. CCA-treated wood is no longer used for residential applications but may still be used in industrial applications. Arsenic is also used in metallurgy for hardening copper, lead and certain metal alloys, in pigment production, in the manufacture of certain types of glass, and in semiconductors and light-emitting diodes. Inorganic arsenic compounds are no longer used as pesticides in agriculture; however, organic arsenic compounds, namely cacodylic acid, disodium methylarsenate (DSMA), and monosodium methylarsenate (MSMA), are used, as yet, as pesticides – principally on cotton.

Today, workplace exposure to arsenic may still occur in some occupations that use arsenic, such as copper or lead smelting, wood treating, or pesticide application. Exposure to arsenic within buildings other than where it is used as part of the manufacturing process is unlikely and therefore arsenic is not expected to be encountered as part of a routine hazardous building materials assessment.

Human exposure to arsenic can cause both short and long term health effects. Short-term or acute effects can occur within hours or days of exposure. If you breathe high levels of inorganic arsenic, then you are likely to experience a sore throat and irritated lungs. Longer exposure at lower concentrations can lead to skin effects (such as darkened patches of skin and areas of thickened skin), and also to circulatory and peripheral nervous disorders. An important concern is the ability of inhaled inorganic arsenic to increase the risk of cancer. Long term exposure to arsenic has been linked to cancer of the bladder, lungs, skin, kidneys, nasal passages, liver and prostate. The IARC classifies arsenic and arsenic compounds as "carcinogenic to humans" (Group 1).

Asbestos

Asbestos is the name given to a number of naturally occurring fibrous minerals found in the environment. Ontario Regulation 490/09 (Designated Substances) defines asbestos as any one of the following fibrous silicates: actinolite; amosite; anthophyllite; chrysotile; crocidolite; and tremolite. Asbestos fibres have several desirable characteristics such as high textile strength, the ability to be spun and woven, and resistance to heat and most chemicals. These characteristics have resulted in the historical use of asbestos in a wide variety of building materials and other manufactured goods. Examples of products where asbestos has been used include roofing shingles, ceiling and floor tiles, insulation, sprayed fireproofing, gaskets, and friction products such as automotive brakes and clutches.

The peak years for asbestos use were in the 1960s and early 1970s. Therefore, asbestos is commonly found in building materials of this era. The use of asbestos in building materials and other products has decreased significantly since this time. Friable asbestos-containing materials (material that when dry can be crumbled, pulverized or powdered by hand pressure), such as sprayed fireproofing and sprayed insulation, ceased use circa 1973. Mechanical thermal system insulation ceased use circa 1981 while sprayed acoustic texture coat finishes ceased use circa 1982. Non-friable asbestos-containing materials were generally manufactured for a longer period of time (with the exception of plaster finishes which ceased use circa 1960's). Asbestos-containing drywall joint compound ceased use circa 1980. Vinyl floor tiles, vinyl sheet flooring and acoustic ceiling tile ceased use 1982. Other non-friable materials continued to be produced into the 1990's, including roofing materials (ceased use circa 1991) and floor adhesives (ceased use circa 1992). Today, asbestos is a controlled substance, and is banned for use in most products sold in Canada under the Hazardous Products Act (with the exception of certain roof shingles, clutch facings and brake linings).

Potentially harmful exposure to asbestos occurs through inhalation of air containing asbestos fibres. The greatest risk for workplace exposure to airborne asbestos is in occupations that produce and use asbestos, such as in mining and milling operations or in the manufacture of products containing asbestos. Exposure to airborne asbestos fibres may also occur to construction workers, trades people, maintenance workers and other building occupants in buildings constructed with asbestos-containing materials; especially during building renovations or repairs or if the materials are in poor condition or are otherwise disturbed.

Health risks associated with asbestos exposure are dependent on several factors such as the type and airborne concentration of asbestos, and period of exposure. In general, the greater the exposure to asbestos, the greater the chance of developing harmful health effects. Typically, chronic, daily exposure to elevated airborne concentrations of asbestos over a period of years is required for health effects to eventually manifest themselves. Health effects associated with exposure to asbestos can result in asbestosis (a scarring of the lungs which makes breathing difficult), mesothelioma (a rare cancer of the lining of the chest or abdominal cavity) and lung cancer. The link between exposure to asbestos and other types of cancers and health effects is less clear.

Benzene

Benzene is a clear, colourless liquid with a characteristic, sweet or aromatic hydrocarbon odour. It is a liquid at room temperature but evaporates into the air very quickly, making it a highly flammable vapour as well as an extremely flammable liquid.

Benzene is formed from both natural processes and human activities. Natural sources of benzene include volcanoes and forest fires. Benzene is also a natural part of crude oil, gasoline, and cigarette smoke. It is produced from petroleum and coal sources and is used mainly in the manufacture of other chemicals which are used to make plastics, resins, and nylon and synthetic fibres. Benzene is also used to make some types of rubbers, lubricants, dyes, detergents, drugs, and pesticides.

Exposure to pure benzene within buildings other than where it is produced or used as part of a manufacturing process is unlikely. Therefore benzene is not expected to be encountered as part of a routine hazardous building materials assessment.

Exposure to benzene primarily occurs through inhalation of airborne vapours. Short-term (acute) health effects associated with overexposure to benzene vapours can result in symptoms such as headache, nausea, dizziness, drowsiness and confusion, with unconsciousness or even death at very high levels. Long-term (chronic) exposure to Benzene may cause blood and bone marrow effects which can lead to anemia and leukemia (cancer of the blood-forming organs) as well as cause damage to the immune system, increasing the chance for infection. The IARC classifies benzene as "carcinogenic to humans" (Group 1).

Coke Oven Emissions

Coke Oven Emissions refers to the benzene soluble fraction of total particulate matter emitted during the destructive distillation or carbonization of coal for the production of coke (pure carbon). These emissions are a mixture of coal tar, coal tar pitch, volatiles (including benzene, toluene and xylene), creosote, polycyclic aromatic hydrocarbons (PAHs – including benzo(a)pyrene, benzanthracene, chrysene and phenanthrene), and metals (including cadmium, arsenic, beryllium and chromium). Condensed coke oven emissions are a brownish, thick liquid or semisolid with a naphthalene-like odour, while uncondensed coke oven emissions are vapours that escape when the ovens are changed and emptied and are a component of fugitive emissions.

The coke produced is used as a component in the manufacturing of iron and steel. Coke is also used to synthesize calcium carbide and to manufacture graphite and electrodes. Additional chemicals recovered from the coke oven emissions (such as benzene, toluene, naphthalene, sulfur, and ammonium sulfate) are used as raw materials for plastics, solvents, dyes, drugs, waterproofing, paints, pipe coating, roads, roofing, insulation, and as pesticides and sealants.

Coke oven emissions would only be present within facilities producing or using coke as part of the manufacturing process and thus occupational exposure is limited to those workers in the aluminum, steel, graphite, electrical, and construction industries. Therefore, coke oven emissions are not a contaminant of concern during a routine hazardous building materials assessment.

Chronic (long-term) exposure to coke oven emissions can result in chronic bronchitis (particularly those who smoke) and additional health effects such as conjunctivitis, severe dermatitis, and lesions of the respiratory system and digestive system. However, the greatest concern regarding chronic exposure to coke oven emissions is the increased risk of cancer. The IARC classifies coke production as "carcinogenic to humans" (Group 1). The site at which excess cancer rates have been identified most commonly among workers in coke production is the lung. Excess risk for kidney cancer has also been associated with work in coke plants. Additional studies have also reported excess risks for other types of cancers such as cancer of the large intestine and pancreas.

Ethylene Oxide

Ethylene oxide is colourless gas with a somewhat sweet odour. It is extremely flammable and also dangerously reactive. Ethylene oxide exists as a compressed gas that has been produced since the early 1900s. It is used primarily as a chemical intermediate in the production of ethylene glycol, glycol ethers, non-ionic surfactants and other industrial chemicals. Much smaller amounts are used as a non-explosive mixture with nitrogen or carbon dioxide for sterilizing medical instruments and supplies in hospitals and industrially for the fumigation of spices.

Most people are not likely to be exposed to ethylene oxide because it is not commonly found in the environment. Exposure to ethylene oxide is generally limited to those facilities where it is made or used. Therefore, ethylene oxide is not a contaminant of concern during a routine hazardous building materials assessment, although the presence of it should be determined in buildings such as hospitals if construction activities are to occur in or adjacent to areas where it is used or stored.

Exposure to ethylene oxide can result in irritation to the skin or eyes; however, the greatest risk for health effects is through inhalation. This can result in irritation to the nose, throat and respiratory tract, with damage to the central nervous system at higher concentrations. Exposure to high concentrations may cause headache, nausea, dizziness, drowsiness, and incoordination. Exposure to ethylene oxide is also a cancer hazard and possible reproductive hazard. In epidemiological studies of exposure to ethylene oxide, the most frequently reported association has been with lymphatic and haematopoietic cancer. The IARC has concluded that there is limited evidence for the carcinogenicity of ethylene oxide in humans and sufficient evidence for carcinogenicity in experimental animals, classifying ethylene oxide as “carcinogenic to humans” (Group 1).

Isocyanates

Isocyanates are a family of highly reactive, low molecular weight, manufactured chemicals containing one or more isocyanate groups (-NCO). An isocyanate that has two isocyanate groups is known as a diisocyanate, which are the most common type of isocyanates used for manufacturing other products. The most commonly used diisocyanates include methylene diphenyl diisocyanate (MDI), toluene diisocyanate (TDI), and hexamethylene diisocyanate (HDI).

When isocyanates are combined with other compounds that contain free hydroxyl functional groups (i.e. -OH) they react and begin to form polyurethane polymers. These polyurethanes find significant application in the manufacture of rigid and flexible foams. Flexible foam is primarily used for cushioning, while rigid foam is used mainly for insulation. Polyurethanes are also used in the production of adhesives, elastomers, and coatings and are increasingly used in the automobile industry, autobody repair, and building insulation materials.

This diversity of applications means that exposures to isocyanates can occur in a broad range of production facilities from small workshops to automated production lines. Jobs that may involve exposure to isocyanates include painting, foam-blowing, and the manufacture of many polyurethane products. Exposure to isocyanates within buildings where it is not produced or used as part of manufacturing is unlikely, as products such as rigid foam insulation that may be used in buildings has already undergone the curing process. Completely cured products are fully reacted and therefore are considered to be inert and non-toxic. However, some products such as spray foams, coatings, sealants and adhesives may be sold and used in an uncured form. An example would be an adhesive, which is sold to be initially applied in an uncured form and as it cures (hardens), bonds two pieces of wood together. Such products can provide potential exposure to building occupants and construction workers during the application and use of these products. However, for the purposes of a routine hazardous building materials assessment, products that may have contained isocyanate as part of the manufacturing process (e.g. rigid foam) or during the application/installation process (e.g. spray foam, adhesives and sealants) are assumed to be fully cured and would no longer contain free isocyanate.

Direct skin contact with isocyanates can cause marked skin irritation, resulting in reddening, swelling and blistering. However the greatest route of exposure to isocyanates is through inhalation of fine vapours or droplets. Airborne exposure to isocyanates can result in irritation to the mucous membranes of the eyes and respiratory tracts. This results in symptoms such as excessive tear secretion, dry throat, dry cough, chest pains and difficulty in breathing. Isocyanates are also a major cause of work-related asthma worldwide. Increased exposure to isocyanates can lead to sensitization. Once sensitized, individuals are subject to severe asthma attacks (which in some cases has been reported to result in death) if they are re-exposed.

Lead

Lead is a naturally occurring metal found in small amounts in the earth's crust. It is usually found in ore with zinc, silver and (most abundantly) copper, and is extracted together with these metals. Metallic lead is bluish-white in colour but soon tarnishes to a dull grey when exposed to air. When melted into liquid form it has a shiny chrome-silver appearance.

Lead is soft, dense, highly malleable and resistant to corrosion, with poor electrical conductivity as compared to most other metals. Such properties have resulted in lead being used in many applications, including products and materials commonly found in buildings. It is present as a component of lead-acid batteries, ammunition, PVC plastics, and older brass and chrome-plated brass faucets. As a building component, lead has been used in water distribution piping, as an alloy in solder, in electrical conduits, roofs and roofing details, and as an additive to paints, ceramic glazes and mortars as pigments

or for anti-corrosion properties. Lead has also used as sheeting inside buildings for shielding X-rays and for sound attenuation.

Exposure to lead can occur for workers in workplaces that produce the above materials but also to construction workers, building maintenance personnel and the general population due to the widespread historical use of lead in building materials and consumer products. Most exposure to lead occurs through ingestion or inhalation, with the health effects being the same. Overexposure to lead can result in damage to nervous connections and can cause blood and brain disorders, severe damage to the kidneys and ultimately death. Infants and young children are especially vulnerable to the health effects of lead, as overexposure has been proven to result in the permanent reduction in cognitive capacity. In pregnant women, high levels of exposure to lead may cause miscarriage. The IARC has concluded that lead and inorganic lead compounds are “possibly carcinogenic to humans” (Group 2B).

The known serious health effects associated with lead exposure has brought about widespread reduction in its use. The use of lead in building materials and consumer products has decreased substantially since the 1970s to where lead is no longer being used in building materials and consumer products or is present at significantly lower concentrations. For example, unleaded gasoline was introduced in Canada in 1975, after which leaded gasoline was phased out and banned in 1990. Lead-based solder has been banned since the 1980s and most solder used today is either lead-free or has very low lead concentrations. Up until the 1960s, lead was added to paints in significant quantities. Since that time, the concentration of lead in paint has decreased. The federal government began reducing the amount of lead allowed in interior paint in 1976 (to 0.5% by weight). By 1991, paint manufacturers in Canada and the U.S. voluntarily stopped adding lead to paint, reducing lead concentrations to background levels. In 2005 the *Surface Coating Materials Regulations* came into effect to limit the concentration of lead in paint (to 0.06% by weight) for both interior and exterior paints sold to consumers. This was since amended in 2011 to further reduce the allowable lead limit (to 0.009% by weight) and extended to include all consumer paints and coatings.

Mercury

Mercury is a naturally occurring element found in the earth's crust, with natural deposits generally found as a vermilion red ore called cinnabar. Mercury can exist as metallic mercury, organic mercury or inorganic mercury. Metallic or elemental mercury has unique properties as compared to other metals. It is the only pure metal that is a liquid at room temperature, having a silvery-white, shiny appearance. Mercury is the densest liquid known, which produces a colourless, odourless vapour at room temperature.

The unique properties of mercury have resulted in it being used in a wide variety of applications. Properties such as its coefficient of expansion and ability to conduct electricity has resulted in mercury being used in thermometers, barometers and other

measuring devices (blood pressure gauges, vacuum gauges, manometers, etc.), thermostats and a variety of other electrical switches (temperature sensitive, tilt switches, float switches, etc.). Mercury is also used in antifouling paints, dry cell or button batteries, and numerous lighting products, including fluorescent lamps and a variety of High Intensity Discharge (HID) lamps such as mercury vapour, metal halide and high pressure sodium lamps. HID lamps are used for street lights, floodlights and industrial lighting applications. Because of the wide variety of uses mercury can be found as a component of machinery, equipment and lighting within buildings; although many of its uses have been phased out over the years.

The health effects of mercury exposure depend on its chemical form (elemental, inorganic or organic), the route of exposure (inhalation, ingestion or skin contact), and the level of exposure. Vapours from liquid elemental mercury and methyl mercury are more easily absorbed than inorganic mercury salts and can, therefore, cause more harm. Exposure to mercury occurs mainly from breathing contaminated air or ingesting contaminated water and food. Mercury is a neurotoxin, which means it can adversely affect the central nervous system. Upon exposure, mercury tends to accumulate quickly in the brain where it tightly binds with the tissue and is released at a very slow rate. The nervous system effects of mercury toxicity are sometimes referred to as "Mad Hatter's Disease" since mercurous nitrate was used in making felt hats. High levels of exposure to mercury can also lead to harmful effects on the digestive and respiratory systems, and the kidneys. Many mercury compounds may also be teratogenic or capable of causing birth defects.

Mercury compounds can also be toxic at low levels in the environment. The characteristics of mercury that make it an environmental problem are its toxicity and persistence in the environment, and its ability to accumulate and bioconcentrate as methyl mercury in fish and fish-eating predators such as large fish or loons. Therefore, proper disposal of mercury-containing materials is essential. The improper disposal of mercury-containing products such as fluorescent light bulb tubes, high intensity discharge lamps, mercury vapour lamps, mercury thermometers and thermostats can lead to the release of mercury from municipal landfills. Used fluorescent and HID lamps may be classified as hazardous waste due to their mercury content and should be recycled if possible rather than being disposed of in landfill.

Silica

Silica (silicon dioxide) is the name of a group of minerals that contain silicon and oxygen in a chemical combination and have the general formula SiO_2 . It is one of the most common minerals in the earth's crust. Silica can be present as crystalline silica (free silica) or amorphous silica (combined silica), and exists in many forms. The three most common crystalline forms of silica encountered in the workplace environment are quartz, tridymite, and cristobalite. Quartz is by far the most common crystalline silica found in nature, being abundant in most rock types, notably granites, sandstones, quartzites and in sands and soils. Cristobalite and tridymite are found in volcanic rocks. Amorphous silica is found in

nature as biogenic silica and as silica glass of volcanic origin. One form of biogenic silica, diatomaceous earth, originates from the skeletons of diatoms deposited on sea floors. From a health perspective it is the crystalline silica forms that raise the biggest concerns.

Silica is present in numerous building materials and products, including concrete, brick, stone, terrazzo, refractory brick, etc. Low concentrations of silica are also possible in plaster, drywall, acoustical ceiling tiles, drywall joint compound, mortars and adhesives. Because of the wide usage of quartz-containing materials, workers may be exposed to crystalline silica in a large variety of industries and occupations. Occupational exposure to silica dust occurs in cement and brick manufacturing, asphalt pavement manufacturing, china and ceramic manufacturing, and the tool and die, steel and foundry industries. Exposure to silica also occurs during many different construction and maintenance activities. The most severe exposures to crystalline silica result from abrasive blasting activities using silica sand. Other activities that may produce crystalline silica dust include jack hammering, rock/well drilling, concrete mixing, concrete drilling, tuck pointing, and brick and concrete block cutting and sawing. Additionally, crystalline silica exposures occur in the maintenance, repair and replacement of refractory brick furnace linings.

Adverse health effects associated with silica exposure result from inhalation of the respirable fraction of crystalline silica, which can arise from many of the activities outlined above. The main health effects associated with silica exposure are lung cancer and silicosis. The IARC has concluded that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is “carcinogenic to Humans” (Group 1). Silicosis is caused by scarring of the lung tissue from breathing in silica dust. This scarring is permanent and causes a reduction in the lungs’ ability to take in oxygen, making it difficult to breathe and in severe cases can be disabling, or even fatal. Since silicosis affects lung function, it also makes one more susceptible to lung infections like tuberculosis.

Vinyl Chloride

Vinyl chloride is a manufactured substance that does not occur naturally. It is used as a chemical intermediate and not an end product. Vinyl chloride exists in liquid form if kept under high pressure or at low temperatures. At room temperature, it is a colourless gas. It burns easily and is not stable at high temperatures.

Most of the vinyl chloride produced is used to make a polymer called polyvinyl chloride (PVC). PVC is used to make a variety of plastic products including pipes, wire and cable coatings, vinyl flooring, vinyl wallpaper and window frames. It is also used to make furniture, upholstery and packaging materials. One of the concerns regarding PVC is that upon burning it will emit toxic fumes. Contaminants emitted when PVC is burned include hydrochloric acid, carbon monoxide, and carbon dioxide, along with lesser amounts of dioxin and furan.

Vinyl chloride is reported to be slightly irritating to the eyes and respiratory tract in humans. Central nervous system effects (including dizziness, drowsiness, fatigue, headache, visual and/or hearing disturbances, memory loss, and sleep disturbances) as well as peripheral nervous system symptoms (peripheral neuropathy, tingling, numbness, weakness, and pain in fingers) have been reported in workers exposed to vinyl chloride. Short-term (acute) exposure to extremely high levels of vinyl chloride has also reportedly caused loss of consciousness, lung and kidney irritation, and inhibition of blood clotting in humans. The most significant health effect associated with exposure to vinyl chloride is that it is a known human carcinogen that causes a rare cancer of the liver. It has been classified by the IARC as "carcinogenic to humans" (Group 1). Brain cancer, lung cancer, and some cancers of the blood also may be connected with breathing vinyl chloride over long periods.

OTHER HAZARDOUS MATERIALS

CHEMICAL HAZARDS

Urea Formaldehyde Foam Insulation

Urea-formaldehyde foam insulation (UFFI) was developed in as an improved means of insulating difficult-to-reach cavities. It was typically made at the construction site from a mixture of urea-formaldehyde resin, a foaming agent and compressed air. When the mixture is injected into the wall, urea and formaldehyde unite and "cure" into an insulating foam plastic. Its appearance is like ordinary shaving cream. Dry, it can be a white or tan colour, and fluffy like styrofoam. Over time UFFI shrinks significantly and may begin to degrade due to its crumbly texture.

UFFI was installed primarily in wall cavities during the 1970's as an energy conservation measure. The insulation was used most extensively from 1975 to 1978, during the period of the Canadian Home Insulation Program (CHIP), when financial incentives were offered by the government to upgrade home insulation levels. In addition to detached homes it can be found in common areas and walls of semi-detached homes, apartment buildings and condominiums. UFFI was also used to a lesser degree in some commercial and industrial buildings.

UFFI installation has been banned in Canada under the Hazardous Products Act (HPA) since December, 1980 due to concerns regarding the health effects of exposure to formaldehyde. Formaldehyde is a colourless, pungent-smelling gas. Health effects include eye, nose, and throat irritation; wheezing and coughing; fatigue; skin rash; nausea; headache; dizziness; and severe allergic reactions.

Sometimes, a slight excess of formaldehyde was often added to ensure complete "curing" with the urea to produce the urea-formaldehyde foam. The excess formaldehyde was given off after installation during the initial curing process, which typically took a few days to a week to complete. UFFI was sometimes improperly installed or used in locations where it should not have been, resulting in continued off-gassing of formaldehyde past the initial curing stage. Since UFFI was last installed in 1980, it should have little effect on indoor formaldehyde levels today. However, if UFFI comes in contact with water or moisture, it could begin to break down. Due to the age of the insulation UFFI may also begin to degrade and crumble into a fine powder. Under these conditions UFFI may release more formaldehyde and consideration should be given to removing the material using properly trained remediation personnel.

BIOLOGICAL HAZARDS

Mould

Mould is part of the fungi kingdom, which also includes mushrooms and yeasts. They are a naturally occurring and essential part of our environment since they break down dead organic material in the outdoor environment (such as leaves, wood and other plant debris), which they use as a food source.

Mould reproduces by means of tiny spores that are so small they can't be seen by the naked eye. Because of their small size mould spores easily become airborne and can travel long distances, entering indoor environments through ventilation systems, open windows or doors, or tracked in on footwear. Therefore, mould spores are a commonly detected in indoor air and as a component of settled dust.

Under normal conditions, the presence of indoor mould is not an issue. However, if conditions exist that allow it to grow and multiply indoors it can become a potential hazard. Several factors will affect what moulds will grow within a building and how fast they will grow. This includes parameters such as temperature, airflow, and the pH (i.e. acidity/alkalinity) of the food substrate. However, the most important parameter affecting mould growth is water availability, as all moulds need some amount of moisture for them to be able to grow. Buildings that have had a history of water damage are at greater risk of indoor mould growth.

Indoor mould growth may present a risk to the building structure itself through decomposition of building materials. Health risks to building occupants may also occur as

a result of indoor mould growth. Construction or renovation work which disturbs mould-contaminated materials increases this risk of exposure to building occupants and the construction workers themselves. Health effects associated with exposure to mould most commonly results in allergic type reactions such as runny nose, cough, congestion, eye irritation and aggravation of asthma, headache and fatigue. Exposure to very high concentrations of airborne mould spores (such as those that may be observed during disturbance of mould-contaminated building materials) can result in more serious health effects such as Organic Dust Toxic Syndrome (ODTS) or Hypersensitivity Pneumonitis (HP), where flu-like symptoms (fever, chills, cough, fatigue, shortness of breath, body aches, etc.) are exhibited. The chronic form of HP may occur from long-term exposure to lower levels of mould and results in a continued worsening in shortness of breath or cough. A variety of species of mould have also been documented to cause serious invasive infections, which are generally limited to individuals whose immune systems are already somehow compromised.

ENVIRONMENTAL HAZARDS

Polychlorinated Biphenyls

Polychlorinated biphenyls (PCBs) are a class of man-made organic chemicals known as chlorinated hydrocarbons. They vary in consistency from thin, light-coloured liquids to yellow or black waxy solids. They were manufactured in the United States from 1929 until their manufacture was banned in 1979. Although PCBs were not manufactured in Canada, they were imported from the U.S. over the years. Canada banned the import, manufacture and sale of PCBs in 1977.

PCBs are non-flammable, chemically stable over a wide range of temperature and physical conditions, not soluble in water, unaffected by acids, base or corrosive chemicals, and have a high dielectric or electrical insulating capacity. Due to these unique properties PCBs were used in hundreds of industrial and commercial applications, most commonly in electrical transformers and capacitors, including those capacitors found in light ballasts. They were also used as coolants, fire retardants and as insulation and in a number of other commercial applications including carbonless copy paper, dust suppressors for roads, hydraulic fluids, caulking compounds, plasticizers and lubricating oils and heat-transfer applications.

Although PCBs were found to be extremely useful in many industrial and commercial applications some of their chemical properties also made them an environmental and health hazard. PCBs are nearly indestructible and therefore persist if released into the natural environment. Their high fat and low water solubility result in a build-up (bioaccumulation) of PCBs in the fatty tissue of animals and humans if ingested/inhaled. Because PCBs persist in the fatty tissue of animals their concentration will tend to increase the higher up the food chain.

Most of what is known about the human health effects of PCBs is based on exposures due to accidental releases or job-related activities. These exposures are much higher than the levels normally found in the environment. The adverse health effects include a severe form of acne (chloracne), swelling of the upper eyelids, discolouring of the nails and skin, numbness in the arms and/or legs, weakness, muscle spasms, chronic bronchitis, and problems related to the nervous system. The International Agency for Research on Cancer (IARC) classifies PCBs as “probably carcinogenic to humans” (Group 2A) based on limited evidence that long-term, high-level occupational exposure can lead to increased incidence of liver and kidney cancers. The long-term impact of low-level exposures to PCBs that is common in the general population is unclear. The current state of knowledge suggests that low-level exposures to PCBs are unlikely to cause adverse health effects. However, people eating large amounts of certain sports fish, wild game and marine mammals are at increased risk for higher exposures and possible adverse health effects.

Ozone Depleting and Global Warming Substances

There are several different types of chemicals that are being or have been used as refrigerants in commercial, home and vehicle air conditioners and refrigerators or as fire extinguishing agents in portable and fixed fire extinguishing equipment. This includes groups of chemical compounds known as chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs) and halons. Some of these chemicals have also been used as foam blowing agents, as cleaning solvents for electrical components, as aerosol spray propellants, and in hospital sterilization procedures. Fixed halon fire extinguishing systems have historically been used in areas such as data centers, IT rooms, museums, libraries, surgical suites, and other locations where use of water-based suppressants could irreparably damage electronics or vital archival collections. There is a large number of halon fire extinguishing systems still in service in Canada.

The concern regarding past and present use of many of the chemicals used as refrigerants or fire extinguishing agents is that they are ozone-depleting substances (ODS). When released into the environment these chemicals break down in the stratosphere and release chlorine or bromine, which destroy the stratospheric ozone layer. The ozone layer screens the earth from some of the sun's harmful ultraviolet rays (UVB). As the ozone layer is depleted, higher UVB levels reach the earth, resulting in increased exposure to UVB. Increased exposure to UVB can cause skin cancer and plays a major role in malignant melanoma development. It can also increase the likelihood of cataracts and may also suppress proper functioning of the body's immune system and the skin's natural defenses.

CFCs, HCFCs and halons are also known to be greenhouse gases and contribute to global warming due to the build-up of these heat-trapping gases in the atmosphere. Hydrofluorocarbons (HFCs) are a common replacement chemical for CFC and HCFC



refrigerants; and although they do not have any ozone depleting potential they are a potent greenhouse gas.

Due to the ozone-depleting potential and/or global warming potential of CFCs, HCFCs, HFCs and halons it is important to control their use and emission into the environment. The manufacture and use of CFCs has stopped while transitional refrigerants (HCFCs) are scheduled to be phased out of production. No phase-out dates are currently planned for any HFCs. In Ontario, Regulation 463/10, "Ozone Depleting Substances and Other Halocarbons" (made under the Environmental Protection Act) enhances the control and management of substances that deplete the ozone layer and contribute to global warming. This regulation has requirements to prevent or minimize ozone-depleting substances and other halocarbons emissions, which serves a dual environmental benefit of lowering emissions that destroy the ozone layer and contribute to climate change.

25-7705-RFT - Courtland Avenue Public School HVAC, Exterior and Interior Upgrades

Opening Date: February 14, 2025 10:00 AM

Closing Date: March 17, 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	25-7705-RFT Courtland Avenue Public School HVAC, Exterior and Interior Upgrades 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.		